COMPUTING RESEARCH NEWS

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CRN At-A-Glance

CRA 2022 Taulbee Survey: Record Doctoral Degree Production; More Increases in Undergrad Enrollment Despite Increased Degree Production

This article and the accompanying figures and tables present the results from the 52nd annual CRA Taulbee Survey. The survey, conducted annually by the Computing Research Association, documents trends in student enrollment, degree production, employment of graduates, and faculty salaries in academic units in the United States and Canada that grant the Ph.D. in computer science (CS), computer engineering (CE), or information (I). Most of these academic units are departments, but some are colleges or schools of information or computing. In this report, we will use the term "department" to refer to the unit offering the program.

see page 2 for details

CRA Senior Communications Specialist Shar Steed is Moving On!

This issue of CRN marks the last of Shar Steed's tenure at CRA, as she's leaving us to pursue other opportunities. Shar has handled the bulk of CRA's communications responsibilities since 2012, when she joined us as a Communications Specialist from AAAS. In the intervening 10+ years, she rose to Senior Communications Specialist and helped facilitate a complete rebranding of CRA, presided over the revamping of the CRA website, socials, and our newsletters, helped launch several new publications – including the CRA Member Book and the initial version of the CV Database, and just in general made CRA communications work. We will miss all her contributions, and her role as an amazing member of the CRA staff.

She's leaving CRA to put her talents to use tackling communications issues for another association. We wish her the best of luck and much success in her new position!

In This Issue

2022 Taulbee Survey
Record Doctoral Degree Production; More Increases in Undergrad Enrollment Despite Increased Degree Production

By Stuart Zweben and Betsy Bizot

This article and the accompanying figures and tables present the results from the 52nd annual CRA Taulbee Survey[1]. The survey, conducted annually by the Computing Research Association, documents trends in student enrollment, degree production, employment of graduates, and faculty salaries in academic units in the United States and Canada that grant the Ph.D. in computer science (CS), computer engineering (CE), or information (I)[2]. Most of these academic units are departments, but some are colleges or schools of information or computing. In this report, we will use the term "department" to refer to the unit offering the program.

CRA gathers survey data during the fall. Responses received by February 28, 2023, are included in the analysis. The period covered by the data varies from table to table. Degree production and enrollment (Ph.D., Master's, and Bachelor's) refer to the previous academic year (2021-22). Data for new students in all categories refer to the current academic year (2022-23). Projected student production and information on faculty salaries are also for the current academic year; salaries are those effective January 1, 2023.

We surveyed a total of 297 Ph.D.-granting departments and received responses from 182, for an overall response rate of 61 percent, the same rate as last year. The response rates from CE and Canadian departments in particular continue to be low. The U.S. CS response rate of 71 percent is, as usual, the highest of all the categories; however, it is lower than last year's 73 percent and the lowest for the past quarter century. Responses from Canadian institutions increased this year due to a concerted effort in conjunction with CSCAN/INFO-CAN. The number of departments surveyed increased by fifteen overall this year, ten U.S. CS departments and five Canadian departments. Figure 1 shows the history of the survey's response rates. Response rates are inexact because some departments provide only partial data, and some institutions provide a single joint response for multiple departments. Thus, in some tables the number of departments shown as reporting will not equal the overall total number of respondents shown in Figure 1 for that category of department.

To account for the changes in response rate, we will comment not only on aggregate totals but also on averages per department reporting or data from those departments that responded to both 2021 and 2022 surveys. This is a more meaningful indication of the one-year changes affecting the data. Readers also should bear in mind that the data from the 2020-21 and even 2021-22 academic years is affected by COVID-related issues within the education system. Therefore, comparisons in this report with prior years should be interpreted with appropriate COVID-related caveats.

Degree, enrollment, and faculty salary data for the U.S CS departments are stratified according to: a) whether the institution is public or private; and b) the tenure-track faculty size of the reporting department. The faculty size strata deliberately overlap, so that data from most departments affect multiple strata. This may be especially useful to departments near the boundary of one stratum. Salary data is also stratified according to the population of the locale in which the institution is located.[3] These stratifications allow our readers to see multiple views of important data, and hopefully gain new insights from them. In addition to tabular presentations of data, we will use "box and whisker" diagrams to show medians, quartiles, and the range between the 10th and 90th percentile data points.

New this year is data about doctoral program applications. This data is of interest not only to our academic departments but to organizations such as the National Science Foundation who study pathways to the doctorate. The applications data is reported at the end of the doctoral program section.

We also begin including annual updates to data about disability accommodations, Pell grant students and first-generation undergraduate students. This data was first collected in last year's Taulbee Survey as part of the Department Profiles

section. We report this year's data in a separate section following the section about master's and bachelor's program production and enrollment.

We thank all the respondents to this year's questionnaire. The participating departments are listed at the end of this article. CRA member respondents will again be given the opportunity to obtain certain survey information for a self-selected peer group. Instructions for doing this will be emailed to all such departments.

Doctoral Program Production, Enrollment, Employment, and Applications

(Tables 1, D1-D14; Figures D1-D6)

Degree Production

Total doctoral degree production reached an all-time high of 2,105 in 2021-22, breaking the former record of 1,997 in 2019-20 (Figure D1). Production increased in 2021-22 compared with 2020-21 among all department types except for U.S. Information departments. The

Figure 1. Number of Respondents to the Taulbee Survey

Year	US CS Depts.	US CE Depts.	Canadian	US Information	Total
1995	110/133 (83%)	9/13 (69%)	11/16 (69%)		130/162 (80%)
1996	98/131 (75%)	8/13 (62%)	9/16 (56%)		115/160 (72%)
1997	111/133 (83%)	6/13 (46%)	13/17 (76%)		130/163 (80%)
1998	122/145 (84%)	7/19 (37%)	12/18 (67%)		141/182 (77%)
1999	132/156 (85%)	5/24 (21%)	19/23 (83%)		156/203 (77%)
2000	148/163 (91%)	6/28 (21%)	19/23 (83%)		173/214 (81%)
2001	142/164 (87%)	8/28 (29%)	23/23 (100%)		173/215 (80%)
2002	150/170 (88%)	10/28 (36%)	22/27 (82%)		182/225 (80%)
2003	148/170 (87%)	6/28 (21%)	19/27 (70%)		173/225 (77%)
2004	158/172 (92%)	10/30 (33%)	21/27 (78%)		189/229 (83%)
2005	156/174 (90%)	10/31 (32%)	22/27 (81%)		188/232 (81%)
2006	156/175 (89%)	12/33 (36%)	20/28 (71%)		188/235 (80%)
2007	155/176 (88%)	10/30 (33%)	21/28 (75%)		186/234 (79%)
2008	151/181 (83%)	12/32 (38%)	20/30 (67%)	9/19 (47%)	192/264 (73%)
2009	147/184(80%)	13/31 (42%)	16/30 (53.3%)	12/20 (60%)	188/265 (71%)
2010	150/184 (82%)	12/30 (40%)	18/29 (62%)	15/22 (68%)	195/265 (74%)
2011	142/185 (77%)	13/31 (42%)	13/30 (43%)	16/21 (76%)	184/267 (69%)
2012	152/189 (80%)	11/32 (34%)	14/30 (47%)	16/26 (62%)	193/277 (70%)
2013	144/188 (77%)	10/30 (33%)	14/26 (54%)	11/22 (50%)	179/266 (67%)
2014	143/188 (76%)	13/31 (42%)	12/26 (46%)	13/19 (68%)	181/268 (68%)
2015	146/190(77%)	8/32 (25%)	12/26 (46%)	12/18 (67%)	178/266 (67%)
2016	150/188 (80%)	8/33 (24%)	11/26 (42%)	14/21 (67%)	183/268 (68%)
2017	148/192 (77%)	8/35 (23%)	11/30 (37%)	14/24 (58%)	181/281 (64%)
2018	143/195 (73%)	5/34 (15%)	12/30 (40%)	14/24 (58%)	174/283 (61%)
2019	148/192 (77%)	7/35 (20%)	11/29 (38%)	15/22 (68%)	181/278 (65%)
2020	150/193 (78%)	6/35 (17%)	8/29 (28%)	15/22 (68%)	179/279 (64%)
2021	142/195 (73%)	6/35 (17%)	8/29 (28%)	15/23 (65%)	171/282 (61%)
2022	146/205 (71%)	7/35 (20%)	14/34 (41%)	15/23 (65%)	182/297 (61%)

number of departments reporting 2021-22 data also increased from their 2020-21 levels for all except the U.S. I departments.

Across all department types, the 2,105 total degrees constitutes an 11.2 percent increase over 2020-21. On a per-department basis, the overall increase was from 13.5 in 2020-21 to 14.2 in 2021-22, or 5.2 percent. In U.S. CS departments, the total degree increases were 6.4 percent overall and 3.7 percent per department (Table D1).

Among all departments reporting both this year and last year, the number of total doctoral degrees increased by 11.3 percent. Among U.S. CS departments reporting both years, the increase was 12.0 percent (Table 1).

Figure D3 shows the relationship between doctoral degree production and department faculty size. The strata used for U.S. CS departments are described in the section on faculty salaries. The figure indicates little relationship between doctoral degrees per tenure-track faculty and faculty size.

Gender diversity among 2021-22 Ph.D. recipients fell from its 2020-21 levels, both overall and in CS. Female recipients comprised 22.1 percent of 2021-22 CS awardees compared to 23.3 percent in 2020-21. Overall, female recipients in 2021-22 comprised 22.9 percent of Ph.D. awarded compared to 24.7 percent in 2020-21. However, the 2021-22 values still exceed the respective 2019-20 levels of 19.9 percent in CS and 21.7 percent overall (Table D2).

With respect to race/ethnicity, among Ph.D. recipients whose ethnicity is known, Non-resident Aliens comprised 65.9 percent of the total In CS and 66.9 percent of the total overall. The corresponding percentages last year were 68.6 percent and 67.4 percent. In contrast to these relatively small downward CS changes, the I area exhibited a large increase from last year's report, with 65.5 percent of Ph.D. recipients being Non-resident Aliens compared with 53.7 percent in 2020-21. The fraction of Ph.D. recipients who are White rose in CS but fell sharply in I and fell slightly overall (Table D3). The combined percentage of CS doctoral graduates who are American Indian or Alaska Native, Black or African American, Native Hawaiian/Pacific Islander, Hispanic, or Multiracial Non-Hispanic was 3.9 percent, compared with 4.4 percent in 2020-21 and 3.8 percent in 2019-20.

In CS, a slightly higher percentage of male than female 2021-22 doctoral recipients were Non-resident Alien, and a slightly higher percentage of female than male doctoral recipients were White.

Table 1. Degree Production and Enrollment Change From Previous Year

	Total						Only Departments Responding Both Years					
	US CS Only			All Departments			US CS Only			All Departments		
PhDs	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**
PhD Awarded	1,691	1,799	6.4%	1,893	2,105	11.2%	1,531	1,714	12.0%	1,695	1,887	11.3%
#Units PhD Awd	113	110	-2.7%	136	134	-1.5%	97	97		114	114	
PhD Enrollment	16,052	16,628	3.6%	18,448	20,284	10.0%	14,795	15,401	4.1%	17,048	17,870	4.8%
#Units PhD Enr	125	124	-0.8%	150	154	2.7%	111	111		132	132	
New PhD Enroll	3,146	3,041	-3.3%	3,624	3,711	2.4%	2,988	2,877	-3.7%	3,442	3,332	-3.2%
#Units New PhD	126	127	0.8%	152	159	4.6%	115	115		138	138	
Bachelor's	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**	**2021**	**2022**	**% chg**
BS Awarded	34,690	37,062	6.8%	40,552	44,981	10.9%	31,256	33,416	6.9%	36,408	39,094	7.4%
#Units BS Awd	122	118	-3.3%	144	148	2.8%	105	105		123	123	
BS Enrollment	156,584	172,298	10.0%	182,810	209,754	14.7%	144,729	150,848	4.2%	169,398	176,181	4.0%
#Units BS Enr	124	119	-4.0%	147	150	2.0%	107	107		127	127	
New BS Majors	34,078	39,083	14.7%	39,865	47,497	19.1%	31,533	34,250	8.6%	36,376	39,277	8.0%
#Units New BS	115	105	-8.7%	137	133	-2.9%	96	96		115	115	
BS Enroll/Dept	1,262.8	1,447.9	14.7%	1,244	1,398	12.4%	1,353	1,409.8	4.2%	1,333.8	1,387.3	4.0%

In 2020-21, an equal percentage of male and female CS recipients were Non-resident Alien, while a slightly higher percentage of male than female recipients were White (Table D9).

Doctoral Program Enrollment

The total doctoral enrollment reported by this year's responding departments jumped by 10.0 percent when all departments are included and increased by 3.6 percent if only U.S. CS departments are included. When only departments that reported both years are considered, doctoral enrollment increased 4.8 percent when aggregated across all department types and increased by 4.1 percent across U.S. CS departments, almost identical to what was observed last year among departments reporting year-over-year (Table 1).

Table D1. PhD Production and Pipeline by Department Type

Department Type	# Depts	PhDs Awarded		PhDs Next Year		Passed Qualifier		Passed Thesis (if dept has)		
		#	Avg/ Dept	#	Avg/ Dept	#	Avg/ Dept	#	# Dept	Avg/ Dept
US CS Public	88	1,311	14.9	1,450	16.5	1,432	16.3	1,151	71	16.2
US CS Private	33	488	14.8	680	20.6	638	19.3	326	20	16.3
US CS Total	121	1,799	14.9	2,130	17.6	2,070	17.1	1,477	91	16.2
US CE	5	104	20.8	192	38.4	138	27.6	102	3	34.0
US Info	12	102	8.5	136	11.3	153	12.8	130	11	11.8
Canadian	10	100	10.0	140	14.0	166	16.6	150	5	30.0
Grand Total	148	2,105	14.2	2,598	17.6	2,527	17.1	1,859	110	16.9

Table D2. PhDs Awarded by Gender

	CS		CE		I		Total	
Male	1,351	77.8%	183	85.5%	80	55.2%	1,614	77.0%
Female	384	22.1%	31	14.5%	65	44.8%	480	22.9%
Nonbinary/Other	2	0.1%	0	0.0%	0	0.0%	2	0.1%
Total Known Gender	1,737		214		145		2,096	
Gender Unknown	5		1		3		9	
Grand Total	1,742		215		148		2,105	

Table D3. PhDs Awarded by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	1,072	65.9%	157	75.8%	93	65.5%	1,322	66.9%
Amer Indian or Alaska Native	2	0.1%	1	0.5%	0	0.0%	3	0.2%
Asian	164	10.1%	18	8.7%	17	12.0%	199	10.1%
Black or African-American	28	1.7%	1	0.5%	3	2.1%	32	1.6%
Native Hawaiian/Pac Islander	1	0.1%	0	0.0%	0	0.0%	1	0.1%
White	327	20.1%	21	10.1%	24	16.9%	372	18.8%
Multiracial, not Hispanic	7	0.4%	5	2.4%	1	0.7%	13	0.7%
Hispanic, any race	26	1.6%	4	1.9%	4	2.8%	34	1.7%
Total Residency & Ethnicity Known	1,627		207		142		1,976	
Resident, ethnicity unknown	80		7		4		91	
Residency unknown	35		1		2		38	
Grand Total	1,742		215		148		2,105	

Table D4. Employment of New PhD Recipients By Specialty

	Artificial Intelligence/Machine Learning	Computer-Supported Coop Work	Computing Education	Databases/Information Retrieval	Graphics/Visualization	Hardware/Architecture	High Performance Computing	Human-Computer Interaction	Informatics: Biomedical/Other Science	Information Science	Information Systems	Networks	Operating Systems	Programming Languages/Compilers	Robotics/Vision	Scientific/Numerical Computing	Security/Information Assurance	Social Computing/Social Informatics/	Software Engineering	Theory and Algorithms	Other	Unknown	Total	
North American PhD Granting Depts.																								
Tenure-Track	22	0	3	5	2	3	4	12	2	6	2	2	7	1	3	0	13	0	7	5	5	4	108	7.0%
Researcher	7	0	1	0	2	0	0	4	5	1	0	3	3	1	1	0	2	0	0	3	2	1	36	2.3%
Postdoc	40	0	22	1	9	3	0	11	8	2	1	5	6	3	8	0	19	7	1	13	7	10	176	11.4%
Teaching Faculty	6	0	15	2	2	0	0	5	1	0	1	2	1	1	3	0	1	0	1	1	3	3	48	3.1%
North American, Other Academic																								
Other CS/CE/I Dept	4	0	0	1	0	0	1	2	1	2	0	1	1	0	0	0	5	0	1	1	1	4	25	1.6%
Non-CS/CE/I Dept	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	5	0.3%
North American, Non-Academic																								
Industry	280	0	10	89	35	32	16	34	30	18	7	41	24	29	52	5	39	16	78	42	44	44	965	62.5%
Government	3	0	0	1	0	0	4	3	2	1	0	1	0	0	3	0	0	0	1	1	1	3	24	1.6%
Self-Employed	1	0	0	1	2	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	0	9	0.6%
Unemployed	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	5	0.3%
Other	8	0	0	3	0	0	0	0	1	2	1	1	0	1	0	0	3	0	5	0	5	0	30	1.9%
Total Inside North America																								
	372	0	51	105	53	38	25	71	52	34	13	56	42	36	71	5	83	23	95	66	71	69	1,431	92.7%
Outside North America																								
Ten-Track in PhD	9	0	5	3	1	3	2	3	1	0	0	0	1	0	0	1	2	0	2	0	3	3	39	2.5%
Researcher in PhD	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	5	0.3%
Postdoc in PhD	2	0	4	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	0	2	14	0.9%
Teaching in PhD	1	0	2	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	1	0	9	0.6%
Other Academic	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	4	0.3%
Industry	10	0	0	5	1	3	1	3	1	3	0	1	3	0	1	0	1	0	0	0	2	1	36	2.3%
Government	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1%
Self-Employed	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1%
Unemployed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Other	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0.2%
Total Outside NA	24	0	11	10	4	7	5	9	4	3	2	4	4	0	2	1	5	0	3	1	6	7	112	7.3%
Total with Employment Data, Inside North America plus Outside North America																								
	396	0	62	115	57	45	30	80	56	37	15	60	46	36	73	6	88	23	98	67	77	76	1,543	
Employment Type & Location Unknown																								
	40	0	2	13	16	13	5	8	14	13	3	22	21	5	6	7	14	1	12	25	20	302	562	
Grand Total	**436**	**0**	**64**	**128**	**73**	**58**	**35**	**88**	**70**	**50**	**18**	**82**	**67**	**41**	**79**	**13**	**102**	**24**	**110**	**92**	**97**	**378**	**2,105**	

U.S. CS departments in public institutions with tenure-track faculty size above 20-25 have larger doctoral enrollment per faculty member than do smaller sized departments. There is no discernable difference based on tenure-track faculty size in enrollment per faculty member at U.S. CS departments in private institutions (Figure D4).

The fraction of females among enrolled doctoral students rose for the seventh straight year, from 25.9 percent to 26.1 percent across the three areas of CS, CE and I combined. In CS, the fraction of females rose from 24.4 percent in 2020-21 to 24.9 percent in 2021-22 (Table D7).

Table D4a. Detail of Industry Employment

	Artificial Intelligence/Machine Learning	Computer-Supported Coop Work	Computing Education	Databases/Information Retrieval	Graphics/Visualization	Hardware/Architecture	High Performance Computing	Human-Computer Interaction	Informatics: Biomedical/Other Science	Information Science	Information Systems	Networks	Operating Systems	Programming Languages/Compilers	Robotics/Vision	Scientific/Numerical Computing	Security/Information Assurance	Social Computing/Social Informatics/CSCW	Software Engineering	Theory and Algorithms	Other	Unknown	Total	
Inside North America																								
Research	176	0	6	69	26	18	6	26	23	12	4	20	12	15	39	4	25	15	30	23	19	25	593	61.5%
Non-Research	81	0	3	15	7	10	7	4	4	5	2	14	11	11	10	1	11	1	46	14	24	7	288	29.8%
Postdoctorate	6	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	2	11	1.1%
Type Not Specified	17	0	1	5	2	4	3	4	2	1	1	7	1	3	2	0	3	0	2	4	1	10	73	7.6%
Total Inside NA	280	0	10	89	35	32	16	34	30	18	7	41	24	29	52	5	39	16	78	42	44	44	965	
Outside North America																								
Research	5	0	0	5	0	1	0	0	0	1	0	1	1	0	0	0	1	0	0	0	1	1	17	47.2%
Non-Research	2	0	0	0	1	2	1	3	1	1	0	0	1	0	1	0	0	0	0	0	1	0	14	38.9%
Postdoctorate	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	5.6%
Type Not Specified	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	8.3%
Total Outside NA	10	0	0	5	1	3	1	3	1	3	0	1	3	0	1	0	1	0	0	0	2	1	36	

Table D5. New PhD Students by Department Type

	CS				CE				I				Total	
Department Type	**New Admit**	**MS to PhD**	**Total**	**Avg. per Dept.**	**New Admit**	**MS to PhD**	**Total**	**Avg. per Dept.**	**New Admit**	**MS to PhD**	**Total**	**Avg. per Dept.**	**Total**	**Avg. per Dept.**
US CS Public	1,750	147	1,897	21	83	2	85	7	84	7	91	9	2,073	23
US CS Private	912	45	957	27	3	0	3	3	8	0	8	4	968	27
US CS Total	2,662	192	2,854	23	86	2	88	6	92	7	99	8	3,041	24
US CE	0	0	0		166	24	190	32	0	0	0		190	32
US Info	19	0	19	10	0	0	0		203	11	214	15	233	17
Canadian	218	26	244	22	3	0	3	3	0	0	0		247	23
Grand Total	2,899	218	3,117	23	255	26	281	13	295	18	313	12	3,711	24

Table D5a. New PhD Students from Outside North America

Department Type	CS	CE	I	Total New Outside	Total New	% outside North America
US CS Public	1,191	58	47	1,296	2,073	62.5%
US CS Private	427	2	3	432	968	44.6%
US CS Total	1,618	60	50	1,728	3,041	56.8%
US CE	0	120	0	120	190	63.2%
US Info	17	0	134	151	233	64.8%
Canadian	82			82	247	33.2%
Grand Total	1,717	180	184	2,081	3,711	56.1%

Table D6. PhD Enrollment by Department Type

Department Type	# Depts	CS		CE		I		Total	
US CS Public	90	10,548	63.1%	683	35.5%	672	41.1%	11,903	58.7%
US CS Private	34	4,628	27.7%	45	2.3%	52	3.2%	4,725	23.3%
US CS Total	124	15,176	90.7%	728	37.9%	724	44.3%	16,628	82.0%
US CE	6		0.0%	1,162	60.5%		0.0%	1,162	5.7%
US Info	13	111	0.7%		0.0%	912	55.7%	1,023	5.0%
Canadian	11	1,439	8.6%	32	1.7%		0.0%	1,471	7.3%
Grand Total	154	16,726		1,922		1,636		20,284	

Table D7. PhD Enrollment by Gender

	CS		CE		I		Total	
Male	12,111	74.9%	1,519	79.7%	833	53.3%	14,463	73.6%
Female	4,023	24.9%	386	20.3%	724	46.3%	5,133	26.1%
Nonbinary/Other	39	0.2%	0	0.0%	6	0.4%	45	0.2%
Total Known Gender	16,173		1,905		1,563		19,641	
Gender Unknown	553		17		73		643	
Grand Total	16,726		1,922		1,636		20,284	

Table D8. PhD Enrollment by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	9,356	65.8%	1,325	71.8%	819	53.3%	11,500	65.4%
Amer Indian or Alaska Native	24	0.2%	1	0.1%	11	0.7%	36	0.2%
Asian	1,285	9.0%	146	7.9%	136	8.9%	1,567	8.9%
Black or African-American	233	1.6%	24	1.3%	81	5.3%	338	1.9%
Native Hawaiian/Pac Islander	9	0.1%	3	0.2%	0	0.0%	12	0.1%
White	2,827	19.9%	289	15.7%	410	26.7%	3,526	20.0%
Multiracial, not Hispanic	171	1.2%	20	1.1%	40	2.6%	231	1.3%
Hispanic, any race	308	2.2%	37	2.0%	39	2.5%	384	2.2%
Total Residency & Ethnicity Known	14,213		1,845		1,536		17,594	
Resident, ethnicity unknown	444		60		27		531	
Residency unknown	2,069		17		73		2,159	
Grand Total	16,726		1,922		1,636		20,284	

Table D9. PhDs Awarded by Gender and Ethnicity, From 133 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	842	230	0	0	66.6%	64.2%	0.0%	135	21	0	1	76.7%	70.0%		51	40	0	2	68.9%	61.5%		1,322	66.9%
Amer Indian or Alaska Native	2	0	0	0	0.2%	0.0%	0.0%	1	0	0	0	0.6%	0.0%		0	0	0	0	0.0%	0.0%		3	0.2%
Asian	119	43	1	1	9.4%	12.0%	50.0%	16	2	0	0	9.1%	6.7%		9	8	0	0	12.2%	12.3%		199	10.1%
Black or African-American	20	7	0	1	1.6%	2.0%	0.0%	0	1	0	0	0.0%	3.3%		1	2	0	0	1.4%	3.1%		32	1.6%
Native Hawaiian/ Pac Islander	0	1	0	0	0.0%	0.3%	0.0%	0	0	0	0	0.0%	0.0%		0	0	0	0	0.0%	0.0%		1	0.1%
White	249	76	1	1	19.7%	21.2%	50.0%	19	2	0	0	10.8%	6.7%		12	11	0	1	16.2%	16.9%		372	18.8%
Multiracial, not Hispanic	7	0	0	0	0.6%	0.0%	0.0%	2	3	0	0	1.1%	10.0%		0	1	0	0	0.0%	1.5%		13	0.7%
Hispanic, any race	25	1	0	0	2.0%	0.3%	0.0%	3	1	0	0	1.7%	3.3%		1	3	0	0	1.4%	4.6%		34	1.7%
Total Residency & Ethnicity Known	1,264	358	2	3				176	30	0	1				74	65	0	3				1,976	
Resident, ethnicity unknown	62	17	0	1				6	1	0	0				4	0	0	0				91	
Residency unknown	25	9	0	1				1	0	0	0				2	0	0	0				38	
Gender Totals	1,351	384	2	5				183	31	0	1				80	65	0	3				2,105	
%	77.8%	22.1%	0.1%					85.5%	14.5%	0.0%					55.2%	44.8%	0.0%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table D10. PhD Enrollment by Gender and Ethnicity, From 154 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	7,014	2,262	11	69	66.3%	65.1%	34.4%	1,053	272	0	0	71.2%	74.3%		459	354	3	3	55.8%	50.4%	60.0%	11,500	65.4%
Amer Indian or Alaska Native	18	4	0	2	0.2%	0.1%	0.0%	1	0	0	0	0.1%	0.0%		3	8	0	0	0.4%	1.1%	0.0%	36	0.2%
Asian	878	391	1	15	8.3%	11.3%	3.1%	114	32	0	0	7.7%	8.7%		63	72	0	1	7.7%	10.3%	0.0%	1,567	8.9%
Black or African-American	141	89	0	3	1.3%	2.6%	0.0%	18	6	0	0	1.2%	1.6%		33	46	1	1	4.0%	6.6%	20.0%	338	1.9%
Native Hawaiian/ Pac Islander	5	4	0	0	0.0%	0.1%	0.0%	0	3	0	0	0.0%	0.8%		0	0	0	0	0.0%	0.0%	0.0%	12	0.1%
White	2,153	628	15	31	20.3%	18.1%	46.9%	250	38	0	1	16.9%	10.4%		232	175	1	2	28.2%	24.9%	20.0%	3,526	20.0%
Multiracial, not Hispanic	129	41	1	0	1.2%	1.2%	3.1%	12	8	0	0	0.8%	2.2%		18	22	0	0	2.2%	3.1%	0.0%	231	1.3%
Hispanic, any race	246	54	4	4	2.3%	1.6%	12.5%	30	7	0	0	2.0%	1.9%		14	25	0	0	1.7%	3.6%	0.0%	384	2.2%
Total Residency & Ethnicity Known	10,584	3,473	32	124				1,478	366	0	1				822	702	5	7				17,594	
Resident, ethnicity unknown	282	97	6	59				40	20	0	0				8	15	1	3				531	
Residency unknown	1,245	453	1	370				1	0	0	16				3	7	0	63				2,159	
Gender Totals	12,111	4,023	39	553				1,519	386	0	17				833	724	6	73				20,284	
%	74.9%	24.9%	0.2%					79.7%	20.3%	0.0%					53.3%	46.3%	0.4%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table D11. PhD Enrollment by Gender

	CS		CE		I		Total	
Male	2,021	72.5%	203	80.6%	187	54.7%	2,411	71.3%
Female	758	27.2%	49	19.4%	148	43.3%	955	28.2%
Nonbinary/Other	9	0.3%	0	0.0%	7	2.0%	16	0.5%
Total Known Gender	2,788		252		342		3,382	
Gender Unknown	165		0		17		182	
Grand Total	2,953		252		359		3,564	

Table D12. PhD Enrollment by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	1,573	64.7%	183	72.9%	206	61.9%	1,962	65.0%
Amer Indian or Alaska Native	0	0.0%	0	0.0%	2	0.6%	2	0.1%
Asian	292	12.0%	28	11.2%	33	9.9%	353	11.7%
Black or African-American	44	1.8%	3	1.2%	20	6.0%	67	2.2%
Native Hawaiian/Pac Islander	2	0.1%	0	0.0%	0	0.0%	2	0.1%
White	416	17.1%	30	12.0%	53	15.9%	499	16.5%
Multiracial, not Hispanic	38	1.6%	3	1.2%	7	2.1%	48	1.6%
Hispanic, any race	68	2.8%	4	1.6%	12	3.6%	84	2.8%
Total Residency & Ethnicity Known	2,433		251		333		3,017	
Resident, ethnicity unknown	103		1		2		106	
Residency unknown	417		0		24		441	
Grand Total	2,953		252		359		3,564	

Doctoral enrollment diversity by race/ethnicity rebounded somewhat in 2021-22. The overall fraction of doctoral students who were neither Non-resident Aliens, Asian, nor White was 5.7 percent; it was 6.2 percent in 2019-20 but only 5.3 percent in 2020-21. In CS programs, the fraction was 5.3 percent compared with 5.0 percent in 2020-21 and 6.0 percent in 2019-20 (Table D8). However, the fraction of overall enrolled doctoral students who were Non-resident Aliens rose to 65.4 percent in 2021-22. Figure D2 shows the history of Non-resident Alien enrollment as a fraction of total doctoral enrollment.

White students comprise a greater percentage of enrolled males than enrolled females in all three disciplines, as has been the case in recent years. Non-resident Aliens also comprise a somewhat greater percentage of male students in CS and I, but not in CE (Table D10).

At U.S. CS departments, the average number of students per department who passed qualifier exams in 2021-22 decreased to 17.1 from last year's reported 18.2. At private institutions, the average jumped from 16.9 to 19.3; the average at public institutions decreased from 18.6 to 16.3. The average number per U.S. CS department who passed thesis candidacy exams in 2021-22 (most, but not all, departments have such exams) increased from 15.1 in 2020-21 to 16.2 in 2021-22; here, increases were present at both public and private institutions (Table D1).

The number of reported new Ph.D. students per department decreased slightly this year compared with last year's reporting departments when all departments are considered (23.6 reported this year vs 23.8 last year). U.S. CS departments at both public and private institutions showed declines, outweighing increases at each of the other department types. Among departments that reported both years, the number of new Ph.D. students

Table D13. New PhD Enrollment by Gender and Ethnicity, From 152 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	1,128	423	3	19	64.7%	64.1%	33.3%	145	38	0	0	71.4%	79.2%		125	79	2	0	69.1%	54.9%	28.6%	1,962	65.0%
Amer Indian or Alaska Native	0	0	0	0	0.0%	0.0%	0.0%	0	0	0	0	0.0%	0.0%		2	0	0	0	1.1%	0.0%	0.0%	2	0.1%
Asian	201	88	3	0	11.5%	13.3%	33.3%	24	4	0	0	11.8%	8.3%		12	18	3	0	6.6%	12.5%	42.9%	353	11.7%
Black or African-American	29	15	0	0	1.7%	2.3%	0.0%	3	0	0	0	1.5%	0.0%		11	9	0	0	6.1%	6.3%	0.0%	67	2.2%
Native Hawaiian/ Pac Islander	2	0	0	0	0.1%	0.0%	0.0%	0	0	0	0	0.0%	0.0%		0	0	0	0	0.0%	0.0%	0.0%	2	0.1%
White	309	105	2	0	17.7%	15.9%	22.2%	25	5	0	0	12.3%	10.4%		24	26	2	1	13.3%	18.1%	28.6%	499	16.5%
Multiracial, not Hispanic	23	14	1	0	1.3%	2.1%	11.1%	3	0	0	0	1.5%	0.0%		3	4	0	0	1.7%	2.8%	0.0%	48	1.6%
Hispanic, any race	52	15	0	1	3.0%	2.3%	0.0%	3	1	0	0	1.5%	2.1%		4	8	0	0	2.2%	5.6%	0.0%	84	2.8%
Total Residency & Ethnicity Known	1,744	660	9	20				203	48	0	0				181	144	7	1				3,017	
Resident, ethnicity unknown	84	19	0	0				0	1	0	0				2	0	0	0				106	
Residency unknown	193	79	0	145				0	0	0	0				4	4	0	16				441	
Gender Totals	2,021	758	9	165				203	49	0	0				187	148	7	17				3,564	
%	72.5%	27.2%	0.3%					80.6%	19.4%	0.0%					54.7%	43.3%	2.0%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

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decreased among both U.S. CS departments and all departments combined (Tables 1 and D5).

Tables D11-D13 break down the newly enrolled doctoral students by gender, race/ethnicity, and gender x race/ethnicity. These tables are, respectively, similar in format to Tables D7, D8 and D10 for total enrollment. The profile of new doctoral students is more diverse than that of the overall doctoral enrollment in both the gender and race/ethnicity dimensions. It also is more diverse than the corresponding new doctoral enrollment profile in last year's tables.

The proportion of new doctoral students from outside North America dropped from 57.3 percent last year to 56.1 percent this year. U.S. CS departments at private institutions and Canadian departments experienced declines, while the other department types showed increases (Table D5a).

Figure D5 shows a graphical view of the Ph.D. pipeline for U.S. computer science and Canadian departments, the main producers of CS doctoral degrees. The data in this graph are normalized by the number of reporting departments. The graph offsets the qualifier data by two years from the data for new students, and offsets the graduation data by five years from the data for new students. These data have been useful in estimating the timing of changes in production rates. The graph predicts a leveling off in Ph.D. production next year. U.S. CS departments at public institutions and Canadian institutions forecast small changes in production per department in 2022-23

Table D14. PhD Applications to begin in 2022-2023 Academic Year (N=109)

	International	Domestic	Total	% Intl
Male	22,507	7,671	30,178	74.6%
Female	7,004	2,458	9,462	74.0%
Nonbinary	84	93	177	47.5%
Gender Unk	1,223	177	1,400	87.4%
Total	30,818	10,399	41,217	74.8%
Compare to New PhD Enroll				64.7%

PhD Applications, Domestic Breakdown by Race/Ethnicity

	Native Amer	Asian	Black	Pac Islander	White	Multiracial	Hispanic	Race/Eth Unk	Total	% Black/ Native Am/ Hispanic
Male	19	2,369	321	16	3,088	246	441	1,171	7,671	10.4%
Female	18	886	178	0	904	98	95	279	2,458	11.8%
Nonbinary	0	25	8	1	35	7	1	16	93	10.8%
Gender Unk	0	11	5	0	24	1	7	129	177	6.8%
Total	37	3,291	512	17	4,051	352	544	1,595	10,399	10.7%

All Departments with data for all years

N=93	International	Domestic	Total
2019	30,517	9,947	40,464
2020	31,501	10,996	42,497
2021	36,140	12,179	48,319
2022	27,812	9,805	37,617

All US CS Departments with data for all years

N=78	International	Domestic	Total	% Intl	% Intl New PhD Enroll CS (new in 2020)
2019	27,542	9,039	36,581	75.3%	
2020	28,261	9,860	38,121	74.1%	56.9%
2021	32,431	10,932	43,363	74.8%	62.5%
2022	24,852	8,835	33,687	73.8%	64.7%

Figure D1. PhD Production

CRA Taulbee Survey 2022

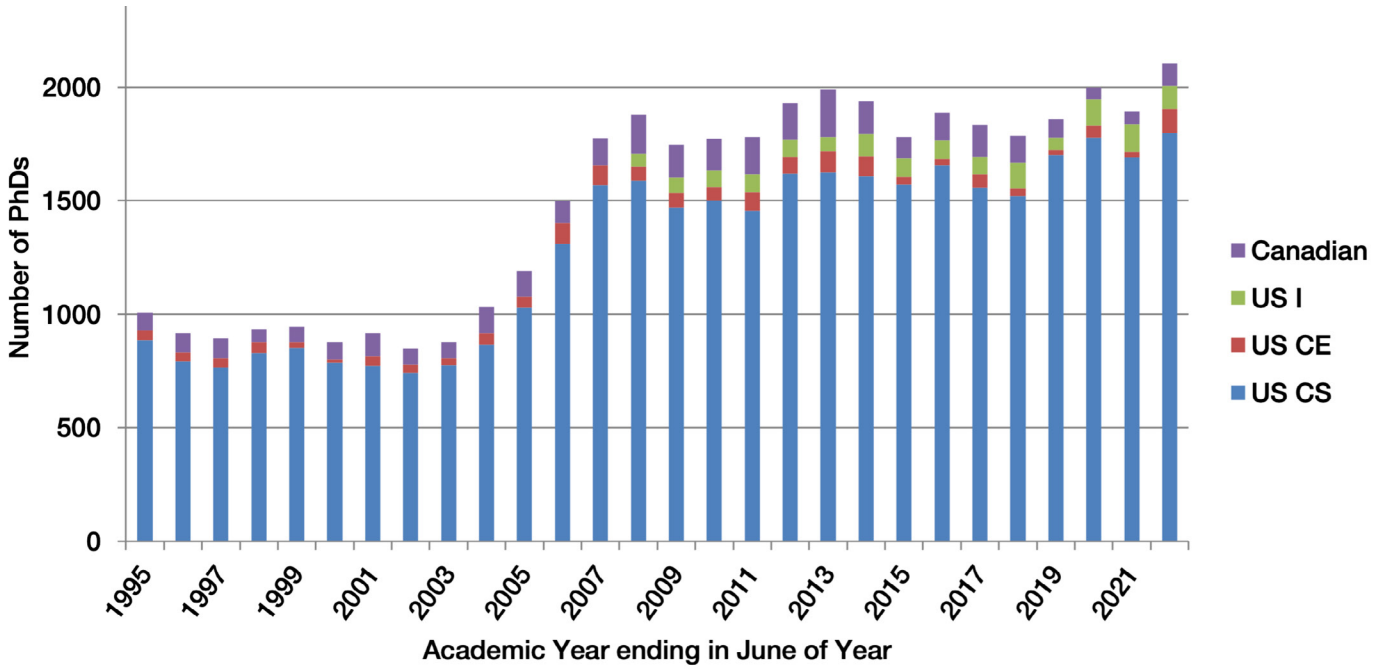


Figure D2. Nonresident Aliens as Fraction of PhD Enrollments

CRA Taulbee Survey 2022

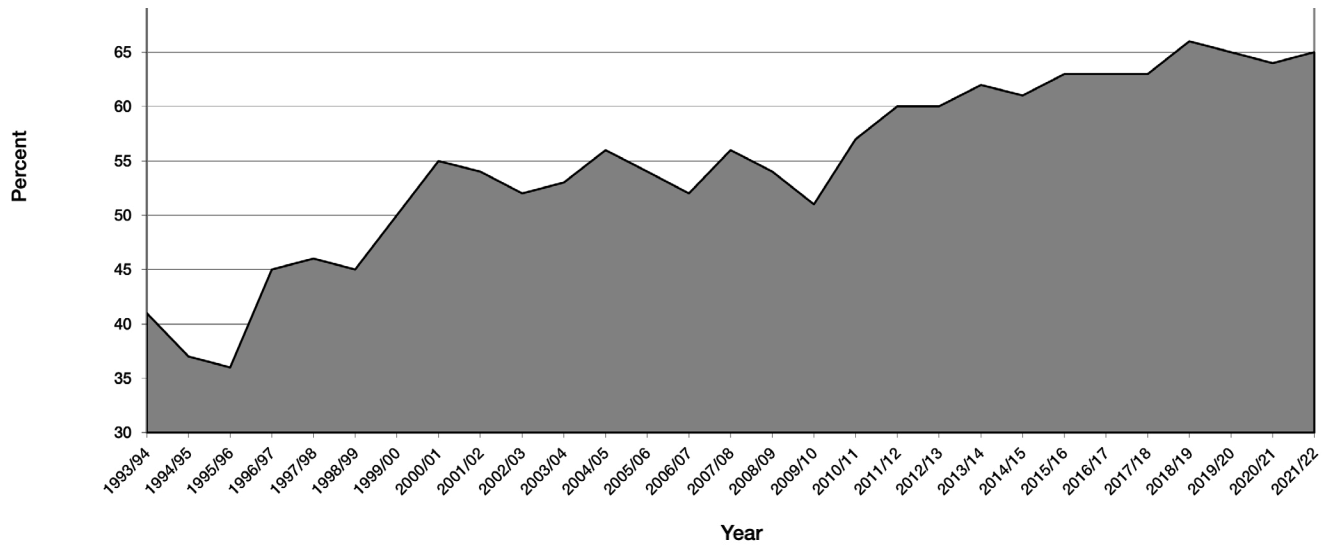


Figure D3. PhD Degrees Granted by Tenure-Track Size

CRA Taulbee Survey 2022

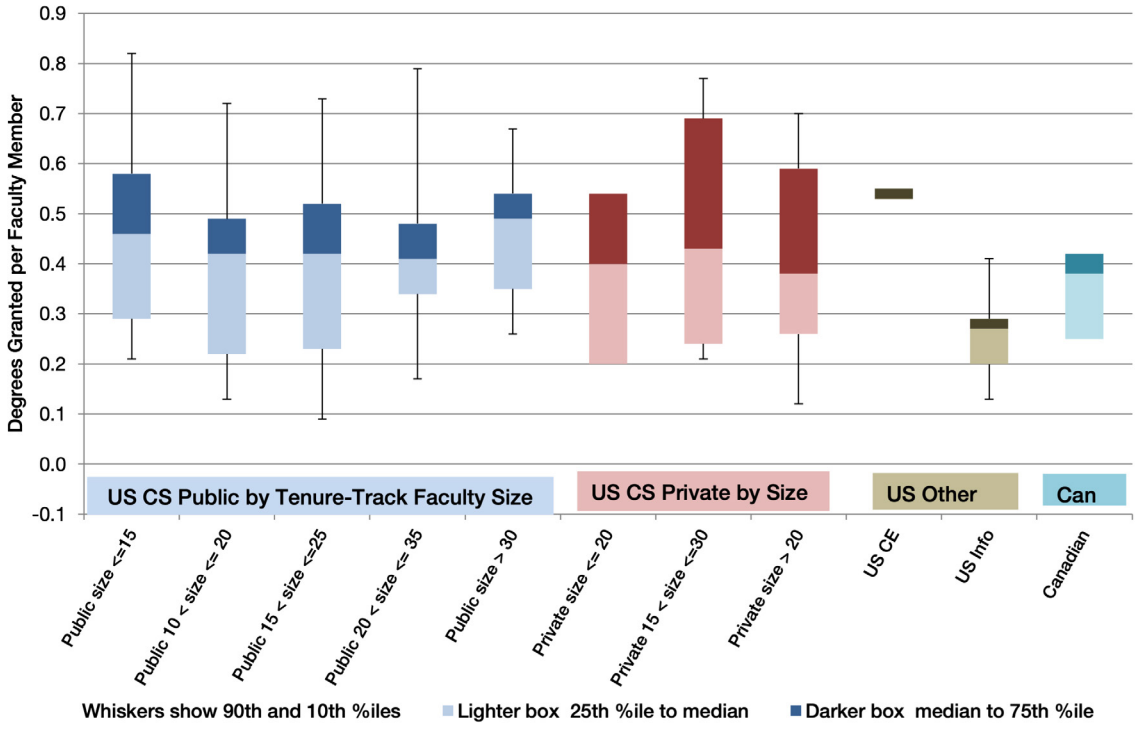


Figure D4. PhD Enrollment Normalized by Tenure-Track Size

CRA Taulbee Survey 2022

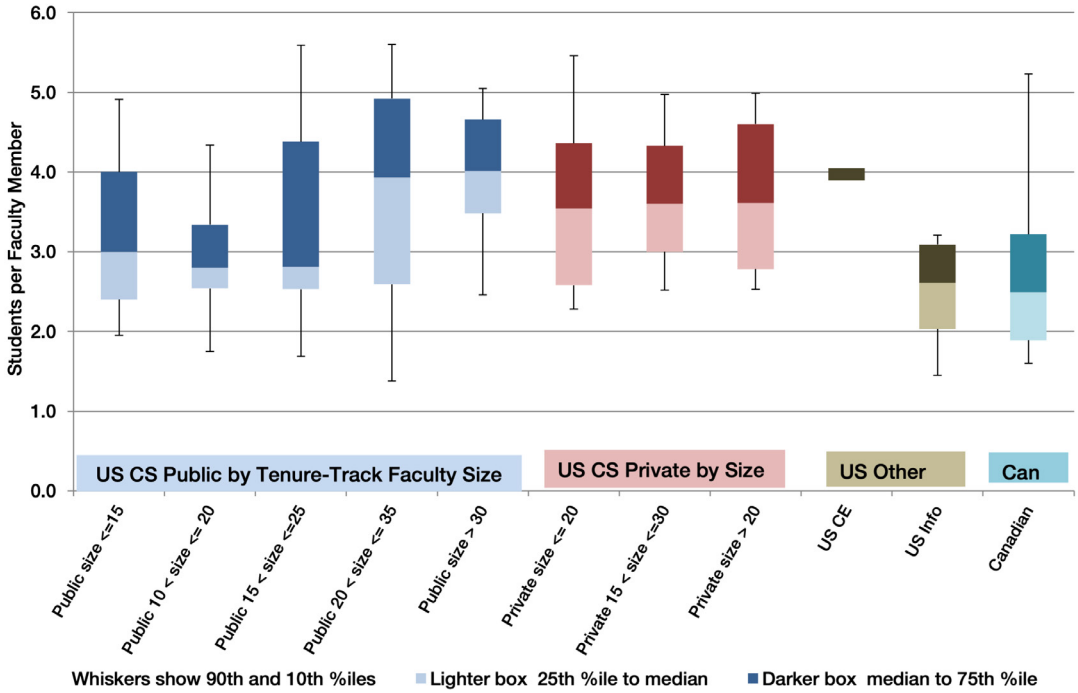


Figure D5. CS Pipeline corrected for year of entry

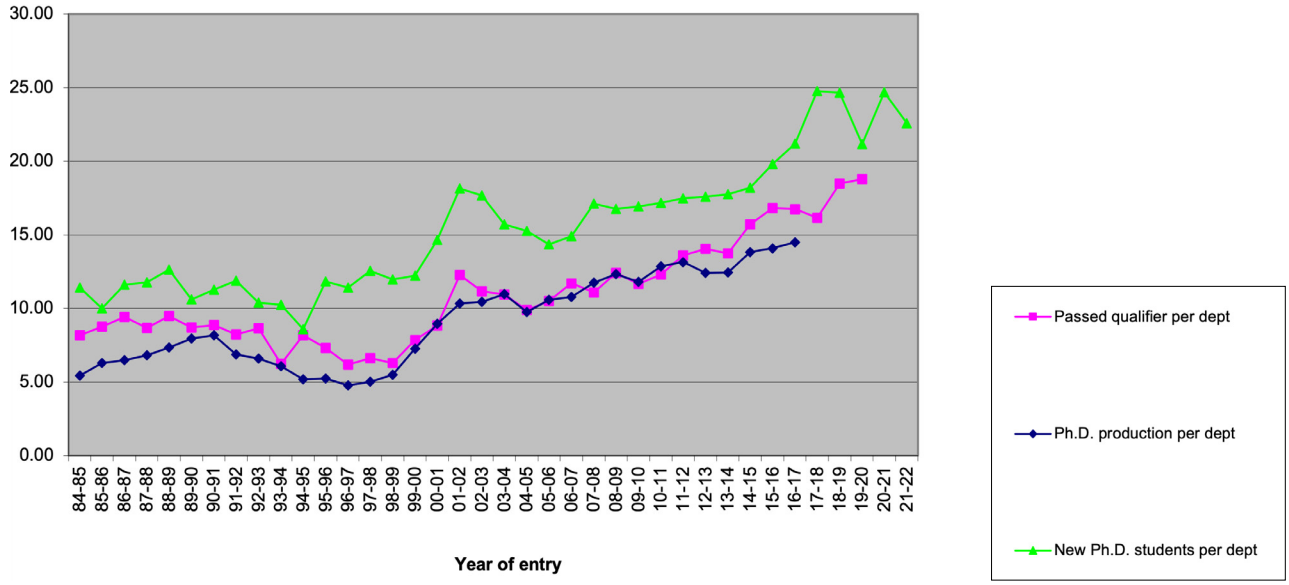
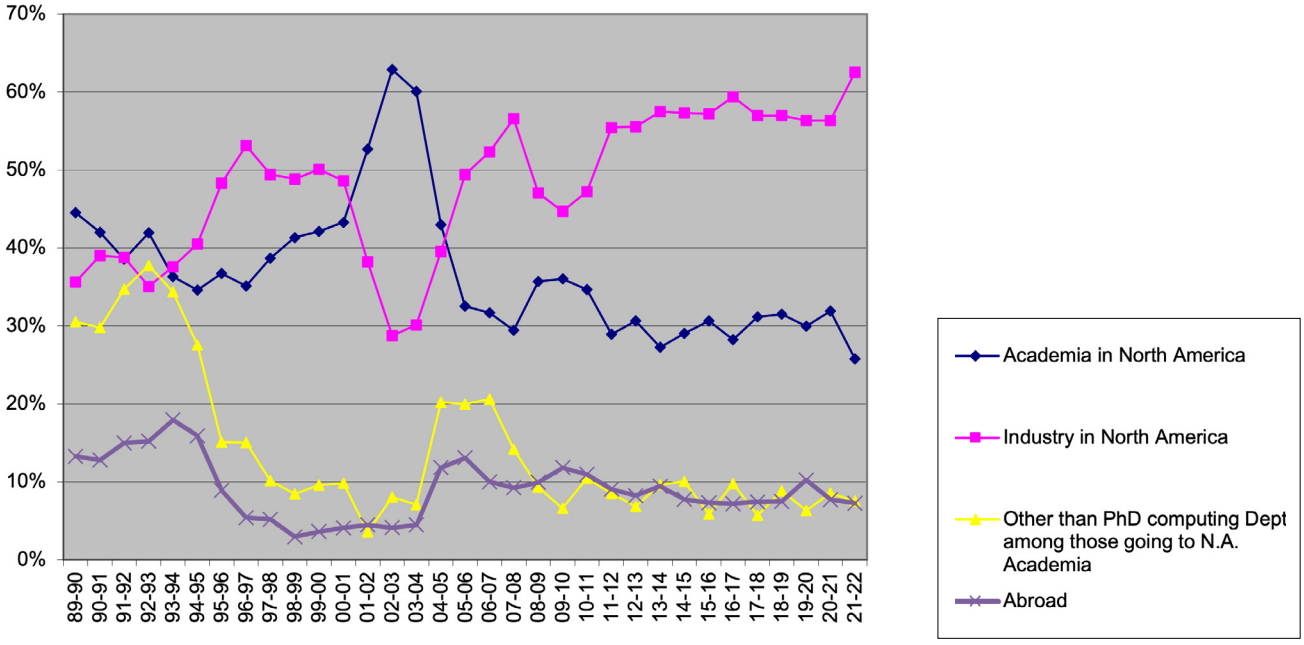


Figure D6. Employment Trends for New Ph.D.s



while other department types are forecasting increases in Ph.D. production (Table D1). Based on past experience, the amount of the increase tends to be less than departments estimate.

Ph.D. Employment

Figure D6 shows the employment trend of new Ph.D.s in academia and industry within North America, those taking employment outside of North America, and those going to academia in North America who took positions in departments other than Ph.D.-granting CS and CE departments. Table D4 shows a more detailed breakdown of the employment data for new Ph.D.s.

Among the new 2021-22 Ph.D.s for whom employment information was known, the percentage who took positions in North American industry in 2022-23 was 62.5 percent, considerably higher than the 56.3 percent reported last year for the new 2020-21 Ph.D.s. Conversely, the percentage who took North American academic jobs was 25.8, considerably lower than last year's reported 32.0 percent.

About 2/3 of the doctoral graduates who went to North American industry and for whom the type of industry position was known took research positions (Table D4a), compared with 58 percent who did so last year. This year, definitive data was provided for over 92 percent of the graduates who went to North American industry, but this is slightly lower last year's percentage. Among those graduates taking academic positions in North America, the percentage who did not go to a doctoral-granting computing department was 7.5, compared to 8.5 reported in last year's survey. This number has oscillated for the last several years.

Of those graduates whose employment is known, 7.3 percent of Ph.D. graduates reported taking positions outside of North America, slightly below the 7.7 percent reported last year. A somewhat smaller percentage of these graduates went to an industry position than did so last year (32 vs 37 percent), while a much larger percentage (52 vs 31 percent) went to some kind of tenure-track, research, or postdoc position in a doctoral-granting institution. Definitive data was provided for 92 percent of the graduates who went to non-North American industry positions, the same percentage as reported last year.

When academic and industry postdocs are combined, the result is that 12.8 percent of 2021-22 doctoral graduates whose employment was known took some type of postdoctoral position. Last year, the reported percentage was 14.4. Only 6.4 percent of these were industry postdocs, versus approximately 12 percent last year.

There were five doctoral graduates for whom employment information was known who were reported as unemployed. However, 26.7 percent of new Ph.D.s' employment status was unknown, lower than the 28.3 percent reported last year. The lack of information about the employment of more than one in four graduates may skew the real overall percentages for certain employment categories.

Table D4 also indicates the areas of specialty of new Ph.D.s. Artificial intelligence/machine learning continues to be by far the most popular area, again comprising 1/4 of all doctoral degrees awarded for which the area was known. Databases/information retrieval, software engineering, security/information assurance, and theory/algorithms rounded out the top five among the defined areas. Databases/information retrieval and theory/algorithms were not in last year's top five, while human computer interaction and networking dropped out of the top five this year. Approximately 18 percent of the Ph.D.s are categorized into the area "unknown"; last year about ¼ were unknown. Another 4.6 percent were categorized as "other," more than fifth place theory/algorithms.

Doctoral Program Applications

For the first time, this year we asked departments to report information about the number of domestic and international applications for their 2022-23 doctoral programs, disaggregated by gender and race/ethnicity. To try to get some perspective on the numbers reported for 2022-23, we also asked departments to report domestic and international totals (not disaggregated) for the previous three years. There were 93 departments that provided domestic and international totals for all four years. Of these, 78 were U.S. CS departments.

Table D14 shows that, for 2019-20 through 2021-22 matriculations, the number of applications increased in both the domestic and international categories. However, for 2022-23, applications in both categories decreased, by 19 percent for domestic applications and 23 percent for international applications, for an overall decline of 22 percent. Over the four-year period, domestic applications varied between 25 and 26 percent of the yearly

total. These results held whether all 93 departments or just the 78 U.S. CS departments are considered.

More departments provided data for the most recent (2022-23) year. Table D14 shows the breakdown of both domestic and international applications by gender (note that the international breakdown by gender effectively includes gender x race/ethnicity for Non-resident Aliens), and the breakdown of domestic applications by gender x race/ethnicity for the other race/ethnicity categories. For the 109 departments that provided this data, 25.6 percent of their applications were domestic, slightly lower than the 26.1 percent for the 93 departments that reported data for all four years. Female applicants were 23.8 percent of the total applications and 24.0 percent of the domestic applications. White and Asian applications comprised 83.4 percent of the total domestic applications for which race/ethnicity was known.

Master's and Bachelor's Program Production and Enrollments

This section reports data about enrollment and degree production for master's and bachelor's programs in the doctoral-granting departments. Although the absolute number of degrees and enrolled students reported herein only reflect departments that offer the doctoral degree, the trends observed in the master's and bachelor's data from these departments tend to strongly reflect trends in the larger population of programs that offer such degrees.

Master's

(Tables M1-M8; Figures M1-M2)

Overall master's degree production per reporting department decreased slightly in 2021-22, although total reported master's degrees increased since more departments reported. The 2.6 percent overall decrease included a 5.1 percent decrease at U.S. CS departments, but increases in Canadian and U.S. I departments. CE master's production per department was unchanged. Bear in mind that the CE, I and Canadian results comprise many fewer departments than do the U.S. CS results, and therefore can be more greatly influenced by small changes in the specific departments reporting. The U.S. CS decline was due to the 19.1 percent decrease among departments at public institutions; departments at private institutions experienced a 24.2 percent increase (Table M1).

Figure M1 shows the master's degrees granted per tenure-track faculty for the various department types. In U.S. CS departments, larger departments tend to produce more master's degrees

Table M1. Master's Degrees Awarded by Department Type

Department Type	# Depts	CS		CE		I		Total	
US CS Public	90	8,142	55.4%	222	25.7%	826	20.5%	9,190	46.9%
US CS Private	33	5,840	39.7%	16	1.8%	464	11.5%	6,320	32.3%
US CS Total	123	13,982	95.1%	238	27.5%	1,290	32.0%	15,510	79.2%
US CE	5		0.0%	611	70.6%		0.0%	611	3.1%
US Info	14	69	0.5%		0.0%	2,603	64.6%	2,672	13.6%
Canadian	11	645	4.4%	16	1.8%	139	3.4%	800	4.1%
Grand Total	153	14,696		865		4,032		19,593	

Table M2. Master's Degrees Awarded by Gender

	CS		CE		I		Total	
Male	10,526	73.7%	619	73.6%	2,028	51.2%	13,173	69.0%
Female	3,753	26.3%	222	26.4%	1,931	48.8%	5,906	30.9%
Nonbinary/Other	12	0.1%	0	0.0%	1	0.0%	13	0.1%
Total Known Gender	14,291		841		3,960		19,092	
Gender Unknown	405		24		72		501	
Grand Total	14,696		865		4,032		19,593	

per faculty member, with a more pronounced difference in departments at private institutions.

The proportion of female graduates among CS master's degree recipients decreased from 27.8 percent in 2020-21 to 26.3 percent in 2021-22. In CE, 26.4 percent of graduates were female, up from 25.7 percent, and the I area had 48.8 percent female graduates in 2021-22 after multiple years of having more female than male graduates. Aggregating all areas, the percentage of master's degree graduates who were female declined from 31.7 to 30.9 percent (Table M2).

In CS, the proportion of master's degrees that went to Non-resident Aliens declined sharply, from 65.2 percent in 2020-21 to 50.4 percent in 2021-22. Decreases also were observed in the smaller areas of CE (76.0 to 66.3 percent) and I (44.3 to 31.9 percent). The aggregate percentage over all three areas was 47.3 percent versus 62.2 percent reported last year. The percentage of CS master's recipients among the combined American Indian/Alaska Native, Black/African-American, Native Hawaiian/Pacific Islander, Hispanic, and Multiracial categories was 8.2 percent versus 5.1 percent in 2020-21 (Table M3).

Two years ago, the Taulbee Survey reported that the average number of new master's students enrolled in 2020-21 fell considerably from its level of the previous year, and that the decrease was entirely due to the decline in new enrollments from outside of North America. This was one of the byproducts of the COVID pandemic. Therefore, it is not surprising that the 2021-22 graduation rate for Non-resident Aliens was similarly affected.

As has been the case for several years, a larger proportion of female CS and CE degree recipients than male CS and CE degree recipients were Non-resident Alien, while a larger percentage of male CS and CE degree recipients than female CS and CE degree recipients were White (Table M7). In the I area, Non-resident

Table M3. Master's Degrees Awarded by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	6,475	50.4%	540	66.3%	1,158	31.9%	8,173	47.3%
Amer Indian or Alaska Native	22	0.2%	0	0.0%	6	0.2%	28	0.2%
Asian	2,278	17.7%	97	11.9%	527	14.5%	2,902	16.8%
Black or African-American	269	2.1%	17	2.1%	213	5.9%	499	2.9%
Native Hawaiian/Pac Islander	8	0.1%	0	0.0%	1	0.0%	9	0.1%
White	3,050	23.7%	131	16.1%	1,431	39.5%	4,612	26.7%
Multiracial, not Hispanic	222	1.7%	7	0.9%	123	3.4%	352	2.0%
Hispanic, any race	522	4.1%	22	2.7%	167	4.6%	711	4.1%
Total Residency & Ethnicity Known	12,846		814		3,626		17,286	
Resident, ethnicity unknown	486		19		154		659	
Residency unknown	1,364		32		252		1,648	
Grand Total	14,696		865		4,032		19,593	

Table M4. Master's Degrees Expected Next Year by Department Type

Department Type	# Depts	CS		CE		I		Total	
US CS Public	87	11,910	65.8%	311	27.8%	587	13.3%	12,808	54.2%
US CS Private	31	5,597	30.9%	36	3.2%	495	11.2%	6,128	25.9%
US CS Total	118	17,507	96.7%	347	31.1%	1,082	24.5%	18,936	80.1%
US CE	4		0.0%	768	68.8%		0.0%	768	3.2%
US Info	14	79	0.4%	0	0.0%	3,259	73.7%	3,338	14.1%
Canadian	9	514	2.8%	2	0.2%	83	1.9%	599	2.5%
Grand Total	145	18,100		1,117		4,424		23,641	

Table M5. New Master's Students by Department Type

Department Type	CS			CE			I			Total			Outside North America	
	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.	# Depts	%
US CS Public	15,106	92	164.2	575	18	31.9	974	13	74.9	16,655	92	181	11,061	66.4%
US CS Private	6,596	35	188.5	36	3	12	598	5	119.6	7,230	35	206.6	4,912	67.9%
US CS Total	21,702	127	170.9	611	21	29.1	1,572	18	87.3	23,885	127	188.1	15,973	66.9%
US CE		0		605	6	100.8		0		605	6	100.8	485	80.2%
US Info	86	2	43	0	0		2,770	14	197.9	2,856	14	204	1,614	56.5%
Canadian	892	11	81.1	35	1	35	83	1	83	1,010	11	91.8	445	44.1%
Grand Total	22,680	140	162	1,251	28	44.7	4,425	33	134.1	28,356	158	179.5	18,517	65.3%

Table M6. Total Master's Enrollment by Department Type

Department Type	CS			CE			I			Total		
	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.	Total	# Depts	Avg. per Dept.
US CS Public	35,061	89	393.9	941	19	49.5	2,655	18	147.5	38,657	90	429.5
US CS Private	18,040	32	563.8	80	3	26.7	2,128	5	425.6	20,248	32	632.8
US CS Total	53,101	121	438.9	1,021	22	46.4	4,783	23	208	58,905	122	482.8
US CE		0		1,916	6	319.3		0		1,916	6	319.3
US Info	254	2	127		0		6,447	13	495.9	6,701	13	515.5
Canadian	2,278	11	207.1	142	1	142	556	2	278	2,976	11	270.5
Grand Total	55,633	134	415.2	3,079	29	106.2	11,786	38	310.2	70,498	152	463.8

Aliens again comprised a larger percentage of male master's graduates than female master's graduates, while a smaller percentage of male master's graduates than female master's graduates were White. These relationships are likely to continue into the near future based on the current enrollment breakdown by gender and ethnicity (Table M8).

The average number of new master's students enrolled in U.S. CS departments rose again this year, from 159.9 to 188.1. Once again, public and private institutions both showed an Increase, and the increase was greater at public institutions. Two-thirds of the new U.S. CS students are from outside North America, with the proportions only slightly changed from last year in both public and private institutions (Table M5).

The other department types also experienced increases in the average number of new master's students per department. The CE and I departments reported an increase in the fraction of new master's students from outside North America, while Canadian departments reported a decrease in this fraction.

All three areas forecast considerably higher degree production for 2022-23 than they experienced in 2021-22 (Table M4). Overall enrollment per department reported by this year's master's programs (Table M6) was more than 30 percent higher than that reported by last year's master's programs.

Figure M2 illustrates master's enrollment per tenure-track faculty member for the various department types. In U.S. CS departments, larger departments tend to have more master's students per faculty member. As was the case with respect to master's degree production, this tendency is more pronounced for departments in private institutions.

Table M7. Master's Degrees Awarded by Gender and Ethnicity, From 153 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	4,415	1,936	2	122	46.9%	59.0%	18.2%	379	161	0	0	62.9%	76.3%		639	518	0	1	35.2%	28.8%	0.0%	8,173	47.3%
Amer Indian or Alaska Native	18	4	0	0	0.2%	0.1%	0.0%	0	0	0	0	0.0%	0.0%		3	3	0	0	0.2%	0.2%	0.0%	28	0.2%
Asian	1,641	633	0	4	17.4%	19.3%	0.0%	67	30	0	0	11.1%	14.2%		259	265	1	2	14.3%	14.7%	100.0%	2,902	16.8%
Black or African-American	204	64	0	1	2.2%	2.0%	0.0%	13	4	0	0	2.2%	1.9%		101	111	0	1	5.6%	6.2%	0.0%	499	2.9%
Native Hawaiian/ Pac Islander	8	0	0	0	0.1%	0.0%	0.0%	0	0	0	0	0.0%	0.0%		1	0	0	0	0.1%	0.0%	0.0%	9	0.1%
White	2,536	503	9	2	26.9%	15.3%	81.8%	119	12	0	0	19.7%	5.7%		670	755	0	6	36.9%	41.9%	0.0%	4,612	26.7%
Multiracial, not Hispanic	174	48	0	0	1.8%	1.5%	0.0%	4	3	0	0	0.7%	1.4%		58	65	0	0	3.2%	3.6%	0.0%	352	2.0%
Hispanic, any race	427	93	0	2	4.5%	2.8%	0.0%	21	1	0	0	3.5%	0.5%		83	84	0	0	4.6%	4.7%	0.0%	711	4.1%
Total Residency & Ethnicity Known	9,423	3,281	11	131				603	211	0	0				1,814	1,801	1	10				17,286	
Resident, ethnicity unknown	351	132	0	3				10	9	0	0				87	64	0	3				659	
Residency unknown	752	340	1	271				6	2	0	24				127	66	0	59				1,648	
Gender Totals	10,526	3,753	12	405				619	222	0	24				2,028	1,931	1	72				19,593	
%	73.7%	26.3%	0.1%					73.6%	26.4%	0.0%					51.2%	48.8%	0.0%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table M8. Master's Enrollment by Gender and Ethnicity, From 152 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	19,588	9,627	23	180	56.4%	69.4%	52.3%	1,566	579	0	0	71.8%	82.4%		2,634	1,992	2	1	46.8%	40.6%	20.0%	36192	58.0%
Amer Indian or Alaska Native	26	8	0	0	0.1%	0.1%	0.0%	1	2	0	0	0.0%	0.3%		14	12	0	2	0.2%	0.2%	0.0%	65	0.1%
Asian	4,663	1,890	3	51	13.4%	13.6%	6.8%	176	50	0	0	8.1%	7.1%		624	568	1	3	11.1%	11.6%	10.0%	8,029	12.9%
Black or African-American	762	321	1	2	2.2%	2.3%	2.3%	40	11	0	0	1.8%	1.6%		289	272	1	3	5.1%	5.5%	10.0%	1,702	2.7%
Native Hawaiian/ Pac Islander	28	6	0	0	0.1%	0.0%	0.0%	0	0	0	0	0.0%	0.0%		72	48	0	0	1.3%	1.0%	0.0%	154	0.2%
White	7,673	1,514	12	16	22.1%	10.9%	27.3%	313	51	0	0	14.3%	7.3%		1,592	1,647	5	35	28.3%	33.6%	50.0%	12,858	20.6%
Multiracial, not Hispanic	491	139	1	0	1.4%	1.0%	2.3%	22	3	0	0	1.0%	0.4%		127	115	1	1	2.3%	2.3%	10.0%	900	1.4%
Hispanic, any race	1,504	362	4	8	4.3%	2.6%	9.1%	64	7	0	0	2.9%	1.0%		282	252	0	3	5.0%	5.1%	0.0%	2,486	4.0%
Total Residency & Ethnicity Known	34,735	13,867	44	257				2,182	703	0	0				5,634	4,906	10	48				62,386	
Resident, ethnicity unknown	1,505	542	9	8				18	8	0	0				313	238	0	6				2,647	
Residency unknown	2,532	1,134	10	990				8	3	0	157				86	78	0	467				5,465	
Gender Totals	38,772	15,543	63	1,255				2,208	714	0	157				6,033	5,222	10	521				70,498	
%	71.3%	28.6%	0.1%					75.6%	24.4%	0.0%					53.6%	46.4%	0.1%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Figure M1. Master's Degrees Granted by Tenure-Track Size

CRA Taulbee Survey 2022

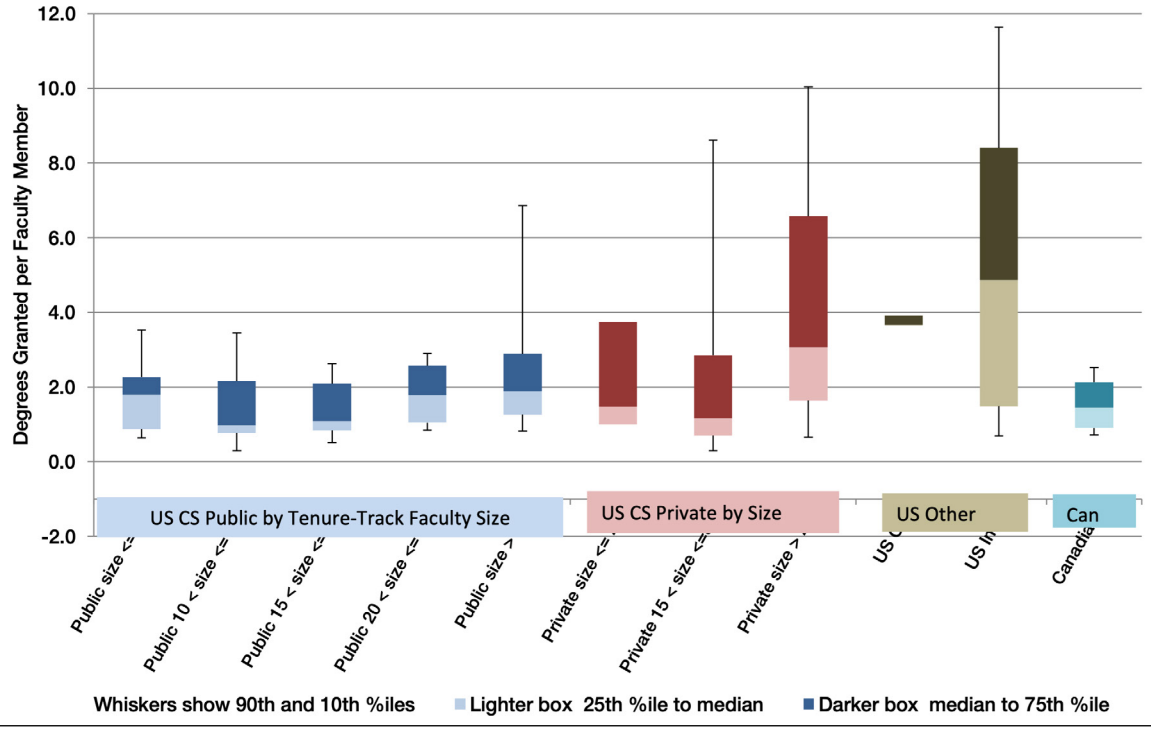
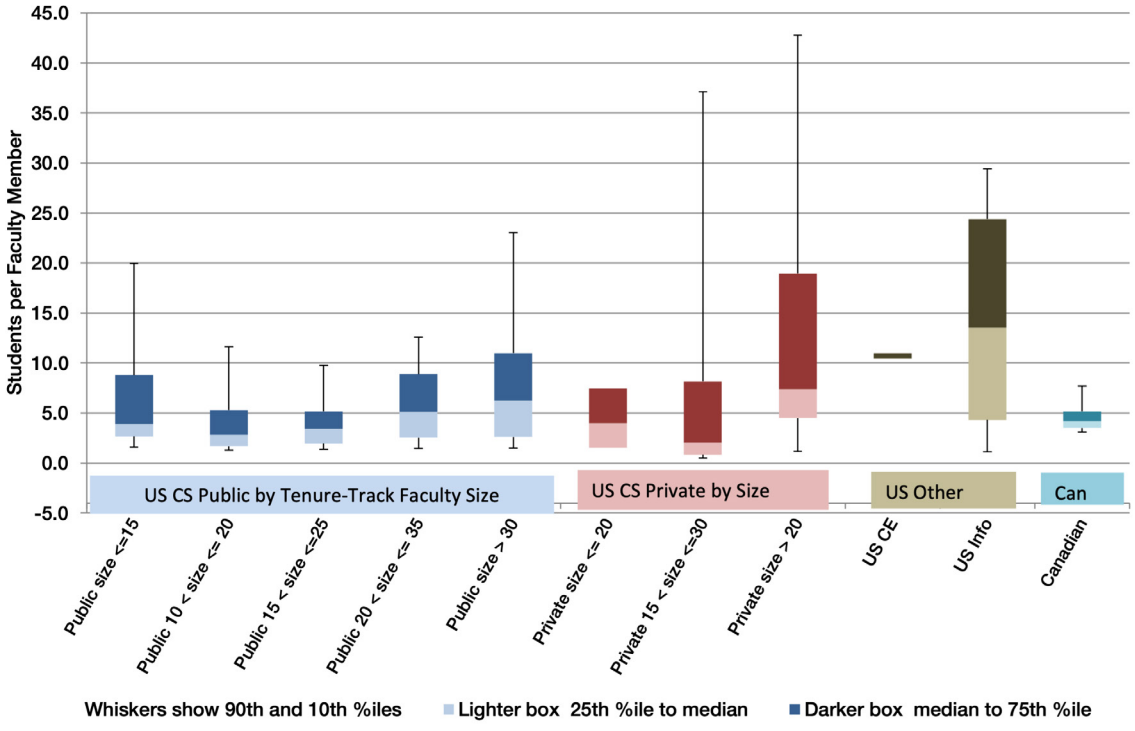


Figure M2. Master's Enrollment Normalized by Tenure-Track Size

CRA Taulbee Survey 2022



Bachelor's

(Tables 1, B1-B9; Figures B1-B5)

After a 1.7 percent reported increase in bachelor's degree production in 2020-21, the overall increase in 2021-22 across the three computing areas returned to double digits, at 10.9 percent. There was a 7.9 percent increase in CS degrees compared with 3.8 percent in last year's report. On a per-department basis, total bachelor's degree production rose overall by 7.9 percent across all department types and 10.5 percent in U.S. CS departments. Last year's corresponding per-department increases were 7.4 and 8.8 percent, respectively. Total computer science degree production in U.S. CS departments rose 6.8 percent, and 7.8 percent per department.

When considering only those departments that reported both years, the increase in total degree production across the CS, CE and I areas was 7.4 percent among all departments and 6.9 percent

Table B1. Bachelor's Degrees Awarded by Department Type

Department Type	# Depts	CS		CE		I		Total	
US CS Public	87	25,220	70.7%	1,793	61.8%	2,521	39.3%	29,534	65.7%
US CS Private	31	6,492	18.2%	147	5.1%	889	13.9%	7,528	16.7%
US CS Total	118	31,712	88.9%	1,940	66.9%	3,410	53.2%	37,062	82.4%
US CE	5		0.0%	766	26.4%		0.0%	766	1.7%
US Info	14	384	1.1%		0.0%	3,004	46.8%	3,388	7.5%
Canadian	11	3,570	10.0%	195	6.7%		0.0%	3,765	8.4%
Grand Total	148	35,666		2,901		6,414		44,981	

Table B2. Bachelor's Degrees Awarded by Gender

	CS		CE		I		Total	
Male	26,587	77.7%	2,331	81.7%	4,628	72.2%	33,546	77.2%
Female	7,595	22.2%	514	18.0%	1,779	27.8%	9,888	22.7%
Nonbinary/Other	35	0.1%	7	0.2%	1	0.0%	43	0.1%
Total Known Gender	34,217		2,852		6,408		43,477	
Gender Unknown	1,449		49		6		1,504	
Grand Total	35,666		2,901		6,414		44,981	

Table B3. Bachelor's Degrees Awarded by Ethnicity

	CS		CE		I		Total	
Nonresident Alien	4,399	15.2%	307	11.9%	500	9.0%	5,206	14.0%
Amer Indian or Alaska Native	33	0.1%	3	0.1%	7	0.1%	43	0.1%
Asian	8,795	30.3%	741	28.6%	1,267	22.8%	10,803	29.1%
Black or African-American	1,004	3.5%	111	4.3%	416	7.5%	1,531	4.1%
Native Hawaiian/Pac Islander	28	0.1%	6	0.2%	9	0.2%	43	0.1%
White	10,970	37.8%	1,058	40.9%	2,502	44.9%	14,530	39.1%
Multiracial, not Hispanic	1,072	3.7%	80	3.1%	232	4.2%	1,384	3.7%
Hispanic, any race	2,708	9.3%	281	10.9%	635	11.4%	3,624	9.8%
Total Residency & Ethnicity Known	29,009		2,587		5,568		37,164	
Resident, ethnicity unknown	1,266	16.7%	255		121		1,642	17.8%
Residency unknown	5,391		59		725		6,175	
Grand Total	35,666		2,901		6,414		44,981	

Table B4. Bachelor's Degrees Expected Next Year by Department Type

Department Type	# Depts	CS		CE		I		Total	
US CS Public	84	24,003	67.1%	1,742	52.9%	1,951	35.0%	27,696	62.1%
US CS Private	28	6,937	19.4%	145	4.4%	374	6.7%	7,456	16.7%
US CS Total	112	30,940	86.5%	1,887	57.3%	2,325	41.7%	35,152	78.8%
US CE	5		0.0%	1,275	38.7%		0.0%	1,275	2.9%
US Info	14	403	1.1%	0	0.0%	3,245	58.3%	3,648	8.2%
Canadian	9	4,421	12.4%	130	3.9%		0.0%	4,551	10.2%
Grand Total	140	35,764		3,292		5,570		44,626	

Table B5. New Bachelor's Students by Department Type

	CS				CE				I				Total	
Department Type	Major	Pre-Major	# Depts	Avg. Major /Dept	Total	Pre-Major	# Depts	Avg. Major /Dept	Total	Pre-Major	# Depts	Avg. Major /Dept	Total Major	Avg. Major /Dept
US CS Public	26,845	12,266	79	339.8	1,866	1,282	24	77.8	2,697	540	24	112.4	31,408	397.6
US CS Private	7,013	1,951	23	304.9	178	27	6	29.7	484	27	4	121	7,675	333.7
US CS Total	33,858	14,217	102	331.9	2,044	1,309	30	68.1	3,181	567	28	113.6	39,083	383.2
US CE			0		1,369	0	5	273.8			0		1,369	273.8
US Info	450	254	2	225	0	0	0		1,809	506	12	150.8	2,259	188.3
Canadian	4,563	823	10	456.3	223		1	223			0		4,786	478.6
Grand Total	38,871	15,294	114	341	3,636	1,309	36	101	4,990	1,073	40	124.8	47,497	368.2

Table B6. Total Bachelor's Enrollment by Department Type

	CS				CE				I				Total	
Department Type	Major	Pre-Major	# Depts	Avg. Major / Dept	Total	Pre-Major	# Depts	Avg. Major /Dept	Total	Pre-Major	# Dept	Avg. Major /Dept	Total Major	Avg. Major / Dept
US CS Public	119,269	21,693	87	1,370.90	9,316	2,010	29	321.2	11,626	1,080	26	447.2	140,211	1,611.60
US CS Private	27,494	2,854	31	886.90	646	45	7	92.3	3,947	27	6	657.8	32,087	1,002.70
US CS Total	146,763	24,547	118	1,243.80	9,962	2,055	36	276.7	15,573	1,107	32	486.7	172,298	1,447.90
US CE			0		4,160	42	6	693.3			0		4,160	693.30
US Info	1,631	385	2	815.50		0	0		10,869	832	14	776.4	12,500	892.90
Canadian	19,785	2,002	11	1,798.60	1,011	1,011	1	1011			0		20,796	1,890.50
Grand Total	168,179	26,934	131	1,283.80	15,133	3,108	43	351.9	26,442	1,939	46	574.8	209,754	1,398.40

among U.S. CS departments (Tables 1 and B1). Both increases are larger than the corresponding increases reported last year.

Figure B1 shows the trend in total CS and CE bachelor's degree production since 1995 for all departments reporting to the Taulbee Survey. Based on department forecasts (Table B4), U.S. CS bachelor's degree production in 2022-23 seems likely to remain steady while production in other department types is expected to rise considerably. However, actual bachelor's degree production tends to exceed departmental projections.

Figure B3 shows bachelor's degrees granted normalized by department tenure-track faculty size. In U.S. CS departments at private institutions, larger departments produce fewer degrees per tenure-track faculty member than do smaller departments. There is no obvious relationship relative to size of U.S. CS departments at public institutions.

Gender diversity among bachelor's graduates was about the same in 2021-22 as in 2020-21, both in CS (22.2 percent female in 2021-22 vs 22.3 percent in 2020-21) and when aggregated over all three disciplines (22.7 percent both years). The percentage of I graduates who are female decreased again in 2021-22, from 29.1 percent to 27.8 percent, and the percentage of CE bachelor's graduates who are female increased again, from 17.0 percent to 18.0 percent. In CS, about four percent of the graduates were reported with gender unknown, higher than was the case last year and higher than the other areas (Table B2).

The percentage of bachelor's graduates who are White decreased in CS and overall, while it increased slightly in the CE and I areas. The percentage awarded to Non-resident Aliens decreased in all three areas, with the overall percentage dropping to 14.0 percent from 15.6 percent in 2020-21. Conversely, the percentage awarded to Asians increased in all three areas, with an overall value of 29.1 percent in 2021-22 compared with 27.3 percent in 2020-21. All other ethnicities combined comprise 17.8 percent of those for whom ethnicity is known across the three areas combined, up from 17.4 percent reported last year. In CS, the corresponding values are 16.7 percent and 16.1 percent. Hispanics again make up the largest share of these other ethnicities at 9.8 percent overall and 9.3 percent in CS, up from 9.6 and 9.1 percent, respectively, in 2020-21. Slightly Increased percentages also were reported for Black and Multiracial graduates (Table B3).

The number of reported new undergraduate computing majors showed increases almost across the board for 2022-23. The total count increased by 19.1 percent across all departments and by 14.7 percent in U.S. CS departments. On a per-department basis, the average number of new majors rose 23.8 percent overall and 25.9 percent in U.S. CS departments. The U.S. CS numbers per department were up 25.1 percent at public institutions and 31.1 percent at private institutions. U.S. CE department numbers rose 17.4 percent per department and Canadian department numbers increased by 1.6 percent per department. Only U.S. Info departments showed a decline, of 3.5 percent. When viewed by area of computing, the overall number of new CS students rose by 21.5 percent, with a 28.3 percent increase in new CE students and a 16.6 percent increase in I students (Table B5).

When only departments reporting both this year and last year are considered, the count of new majors increased by 8.0 percent across all departments, and 8.6 percent at U.S. CS departments. This is the second consecutive year of such increases, following two years of decreases among departments reporting in consecutive years (Table 1). Figure B2 illustrates the trend in the total number of newly declared computing undergraduate majors as reported in the Taulbee Survey.

Again this year, total reported enrollment in the major generally exhibited continued growth, when normalized for the number of departments reporting. The exception was in Canadian departments, where the number of majors per department in CS, CE, and I combined declined by 5.9 percent. However, there were more Canadian departments reporting this year (11 vs 6 last year), and the total count of majors in reporting Canadian departments actually increased by 72.5 percent. At U.S. CS departments, the number of majors in CS, CE, and I combined increased 14.7 percent per department. U.S. CS departments at public institutions showed a 16.9 percent increase per department, while the increase at private institutions was 13.5 percent. CE departments showed a 3.2 percent increase per department and I departments reported a 1.1 percent increase. Like the Canadian departments, there is a small number of departments in each of these two department types and year-to-year changes can be strongly impacted by a small change in the specific departments reporting.

In aggregate across all department types, total enrollment across the three computing areas increased 12.4 percent per department (Table B6). However, when only departments reporting both years are considered, the increases in enrollment per department are a more modest 4.0 percent when all departments are considered, and 4.2 percent when only U.S. CS departments are considered (Table 1).

Looking only at CS enrollment, the increase in majors per department reporting is 13.2 percent for all departments combined, and 12.5 percent for U.S. CS departments. The U.S. CS growth is at departments in both public and private institutions again this year, at 14.3 and 10.4 percent, respectively (Table B6). Last year's reported increases were 8.8 and 7.2 percent, respectively.

Figure B4 shows total enrollment per tenure-track faculty member for the various department types. In U.S. CS

Table B7. Bachelor's Degrees Awarded by Gender and Ethnicity, From 148 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	3,252	1,133	3	11	14.4%	17.8%	17.6%	243	63	1	0	11.5%	13.6%	25.0%	349	151	0	0	8.7%	9.8%	0	5,206	14.0%
Amer Indian or Alaska Native	30	3	0	0	0.1%	0.0%	0.0%	3	0	0	0	0.1%	0.0%	0.0%	6	1	0	0	0.1%	0.1%	0	43	0.1%
Asian	6,338	2,437	7	13	28.1%	38.4%	41.2%	562	179	0	0	26.5%	38.7%	0.0%	787	479	0	1	19.6%	30.9%	0	10,803	29.1%
Black or African-American	709	294	1	0	3.1%	4.6%	5.9%	86	25	0	0	4.1%	5.4%	0.0%	312	104	0	0	7.8%	6.7%	0	1,531	4.1%
Native Hawaiian/ Pac Islander	22	5	1	0	0.1%	0.1%	5.9%	6	0	0	0	0.3%	0.0%	0.0%	7	2	0	0	0.2%	0.1%	0	43	0.1%
White	9,204	1,745	3	18	40.7%	27.5%	17.6%	915	142	1	0	43.2%	30.7%	25.0%	1,890	608	1	3	47.1%	39.3%	1	14,530	39.1%
Multiracial, not Hispanic	812	256	0	4	3.6%	4.0%	0.0%	63	15	2	0	3.0%	3.2%	50.0%	168	64	0	0	4.2%	4.1%	0	1,384	3.7%
Hispanic, any race	2,224	475	2	7	9.8%	7.5%	11.8%	242	39	0	0	11.4%	8.4%	0.0%	496	139	0	0	12.4%	9.0%	0	3,624	9.8%
Total Residency & Ethnicity Known	22,591	6,348	17	53				2,120	463	4	0				4,015	1,548	1	4				37,164	
Resident, ethnicity unknown	940	278	13	35				202	50	3	0				70	49	0	2				1,642	
Residency unknown	3,056	969	5	1,361				9	1	0	49				543	182	0	0				6,175	
Gender Totals	26,587	7,595	35	1,449				2,331	514	7	49				4,628	1,779	1	6				44,981	
%	77.7%	22.2%	0.1%					81.7%	18.0%	0.2%					72.2%	27.8%	0.0%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table B8. Bachelor's Enrollment by Gender and Ethnicity, From 150 Departments

	CS							CE							I							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	11,858	3,864	8	399	11.2%	13.1%	7.4%	1,266	343	2	6	11.4%	13.6%	8.0%	1,393	586	0	0	8.0%	9.1%	0.0%	19,725	11.3%
Amer Indian or Alaska Native	202	51	0	14	0.2%	0.2%	0.0%	19	4	0	0	0.2%	0.2%	0.0%	31	14	0	0	0.2%	0.2%	0.0%	335	0.2%
Asian	29,106	10,567	29	170	27.5%	35.9%	26.9%	3,154	885	7	4	28.3%	35.1%	28.0%	3,126	1,743	4	3	17.9%	27.0%	28.6%	48,798	28.0%
Black or African-American	5,636	2,070	2	38	5.3%	7.0%	1.9%	596	181	2	7	5.3%	7.2%	8.0%	1,540	629	0	2	8.8%	9.7%	0.0%	10,703	6.1%
Native Hawaiian/ Pac Islander	97	32	0	0	0.1%	0.1%	0.0%	11	2	0	0	0.1%	0.1%	0.0%	19	6	0	0	0.1%	0.1%	0.0%	167	0.1%
White	41,137	8,254	54	544	38.8%	28.1%	50.0%	4,308	678	11	49	38.7%	26.9%	44.0%	8,245	2,371	8	6	47.2%	36.7%	57.1%	65,665	37.6%
Multiracial, not Hispanic	4,114	1,250	3	74	3.9%	4.3%	2.8%	449	113	1	5	4.0%	4.5%	4.0%	679	309	1	2	3.9%	4.8%	7.1%	7,000	4.0%
Hispanic, any race	13,827	3,320	12	92	13.0%	11.3%	11.1%	1,338	317	2	5	12.0%	12.6%	8.0%	2,453	795	1	1	14.0%	12.3%	7.1%	22,163	12.7%
Total Residency & Ethnicity Known	105,977	29,408	108	1,331				11,141	2,523	25	76				17,486	6,453	14	14				174,556	
Resident, ethnicity unknown	5,011	1,759	40	50				988	254	6	5				302	160	0	7				8,582	
Residency unknown	11,746	4,512	28	8,209				56	16	1	42				1,362	644	0	0				26,616	
Gender Totals	122,734	35,679	176	9,590				12,185	2,793	32	123				19,150	7,257	14	21				209,754	
%	77.4%	22.5%	0.1%					81.2%	18.6%	0.2%					72.5%	27.5%	0.1%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table B9. Undergraduate Representative Course Enrollments 2019-2022, Department-Level Percentiles

Intro for Non-Majors																			
Number of Students in Course					% of Students Who Are Majors					% of Students Who Are Female					% of Students Who Are BHN				
(N=53)	2019	2020	2021	2022	(N=40)	2019	2020	2021	2022	(N=31)	2019	2020	2021	2022	(N=24)	2019	2020	2021	2022
25	88	83	94	99	25	0.2	0.3	0.1	0.0	25	26.8	29.6	30.0	30.6	25	17.3	15.3	17.8	17.8
50	218	210	190	194	50	3.5	5.0	6.4	4.0	50	42.6	41.3	39.5	43.3	50	22.2	25.4	26.2	27.3
75	530	477	475	566	75	15.3	11.7	13.3	13.7	75	49.5	46.8	52.1	54.3	75	36.0	37.2	40.1	36.6
Intro for Majors																			
Number of Students in Course					% of Students Who Are Majors					% of Students Who Are Female					% of Students Who Are BHN				
(N=62)	2019	2020	2021	2022	(N=49)	2019	2020	2021	2022	(N=38)	2019	2020	2021	2022	(N=30)	2019	2020	2021	2022
25	197	186	197	176	25	17.9	27.2	24.6	27.9	25	20.2	19.8	19.9	19.6	25	15.4	14.7	14.8	17.0
50	322	316	313	340	50	39.2	50.4	50.1	53.5	50	26.4	24.9	25.4	27.1	50	23.6	24.1	24.8	22.6
75	580	628	616	639	75	59.0	68.2	73.2	72.3	75	34.2	34.1	33.8	36.2	75	32.2	33.3	38.3	37.0
Mid-Level																			
Number of Students in Course					% of Students Who Are Majors					% of Students Who Are Female					% of Students Who Are BHN				
(N=59)	2019	2020	2021	2022	(N=47)	2019	2020	2021	2022	(N=36)	2019	2020	2021	2022	(N=29)	2019	2020	2021	2022
25	113	135	131	147	25	50.8	52.9	52.1	54.9	25	16.0	15.5	15.2	18.6	25	13.8	11.3	11.9	12.2
50	167	187	197	210	50	69.2	69.3	74.1	68.1	50	19.4	21.7	21.3	22.7	50	15.2	18.3	17.8	16.3
75	350	331	292	329	75	88.6	89.6	91.1	88.4	75	27.7	29.3	27.9	29.3	75	26.8	27.6	30.6	30.6
Upper Level																			
Number of Students in Course					% of Students Who Are Majors					% of Students Who Are Female					% of Students Who Are BHN				
(N=58)	2019	2020	2021	2022	(N=47)	2019	2020	2021	2022	(N=36)	2019	2020	2021	2022	(N=29)	2019	2020	2021	2022
25	76	75	90	84	25	71.7	71.0	73.5	72.8	25	13.9	16.0	16.7	14.5	25	9.9	12.3	9.5	7.7
50	124	147	142	154	50	86.5	83.3	87.5	90.2	50	18.8	19.2	19.5	19.2	50	13.8	16.2	16.8	16.8
75	264	268	231	282	75	97.4	97.1	98.6	97.6	75	22.9	22.9	24.7	25.2	75	29.2	26.2	30.9	27.2

departments at private institutions, the larger departments have a lower enrollment per faculty member, while at public institutions, there is no clear relationship between enrollment per tenure-track faculty member and faculty size.

Figure B5 shows the enrollment trend in U.S. CS departments from Taulbee Survey data since this surge began. It illustrates both the relatively flat number of average new majors per department from 2018 through 2021 and the fifteen consecutive years of growth in average total majors per department through academic year 2021-22. The average enrollment per U.S. CS department has increased to more than six times its level in fall 2006. For the past nine years, it has exceeded the previous peak of about 400, reached during the dot-com enrollment surge. Currently, it is more than three times that peak.

The fraction of the total CS bachelor's enrollment in 2021-22 that is female was reported as 22.5 percent of those whose gender was known, as compared with 21.9 percent reported last year for 2020-21. With respect to racial/ethnic diversity, the fraction of total 2021-22 enrollment aggregated across all three computing areas, among races/ethnicities other than Non-resident Alien,

Asian and White, is 23.1 percent. Last year it was 21.7 percent. In CS, these other races/ethnicities comprised 22.5 percent of total enrollment versus 20.9 percent reported last year (Table B8).

In all three computing areas (CS, CE, and I), Resident Asians and Non-resident Aliens continue to comprise a larger fraction of female enrollment than male enrollment, while a larger fraction of male enrollment than female enrollment is White (Table B8). Table B7 indicates that the same comparisons again hold true for degree awardees in each area; last year, Non-resident Aliens were approximately an equal fraction of male and female CE awardees.

The Taulbee Survey also has been viewing enrollment using selected CS course level data. Such data was first reported in CRA's Generation-CS report for the fall terms in 2005, 2010 and 2015. The Taulbee Survey began collecting follow-up data in the 2016 survey, and now does so annually. Table B9 provides rolling four-year enrollment trends in four types of departmental courses: an introductory course for non-majors, an introductory course for majors, an intermediate level course, and an upper-level course.

Departments select an appropriate course at their institution in each category; they are asked to provide the total enrollment in each of these courses, and the percentage enrollment within the course for majors and specific gender and race/ethnicity categories. The number of departments (N) reporting each type of data is indicated in parentheses. The table shows the quartile values for the data reported by these departments.

During the four-year period, median enrollments increased each year only for mid-level courses, but in 2022 were at their highest levels in the intro course for the major as well as the mid-level and upper-level courses. The median percent of students who are majors showed no uniform change across the four-year period in any of the courses, but in 2022 is at its highest level in the intro course for majors and the upper-level course. Median gender diversity also showed no uniform change across the four years but was at its highest level in 2022 in all courses except for the upper-level course. Racial/ethnicity diversity increased monotonically only for the intro course for non-majors but was monotonically non-decreasing for the upper-level course.

Figure B1. BS Production (CS & CE)

CRA Taulbee Survey 2022

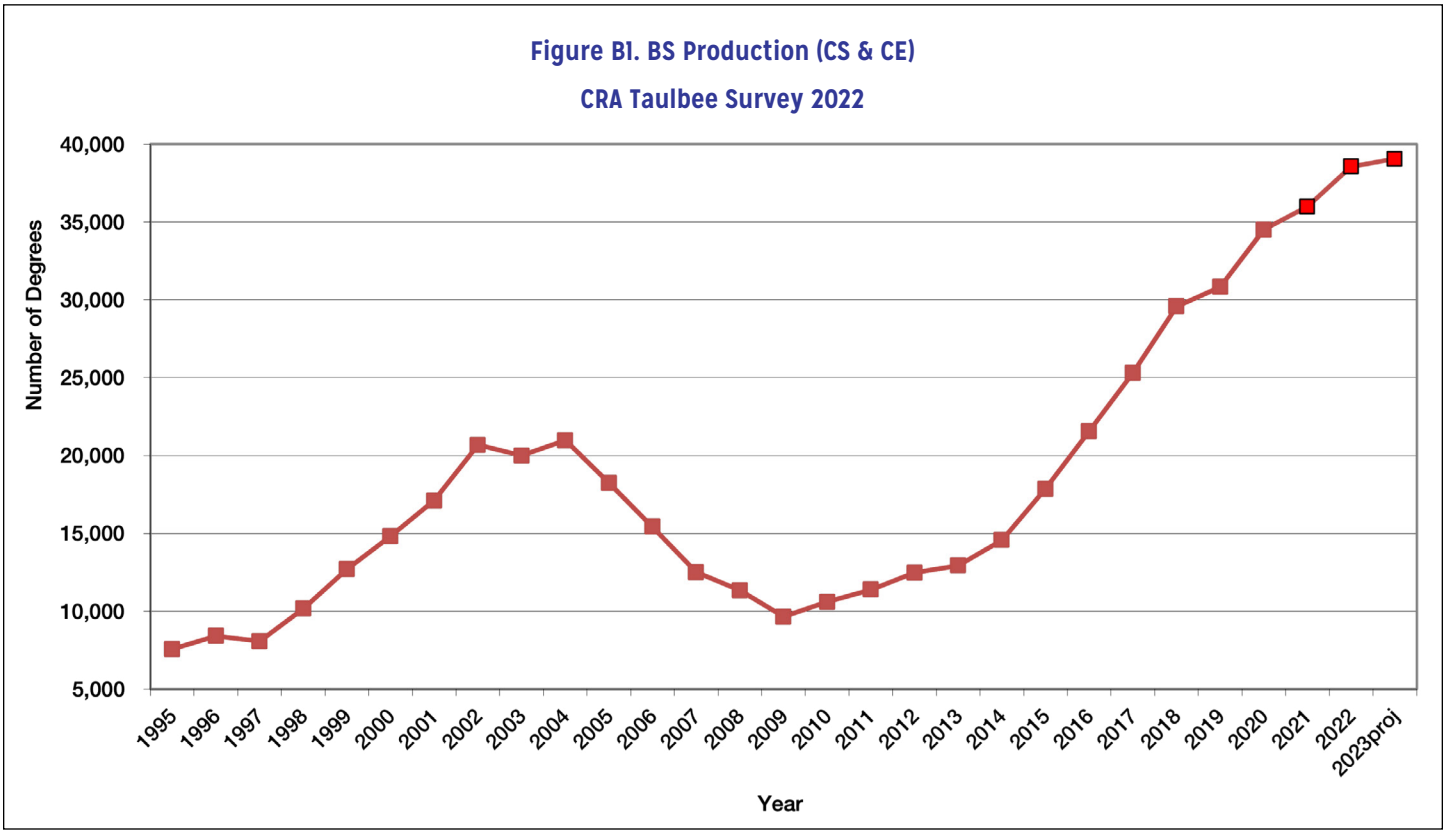


Figure B2. Newly Declared Undergraduate Majors: CS, CE, and I (beginning in 2008)

CRA Taulbee Survey 2022

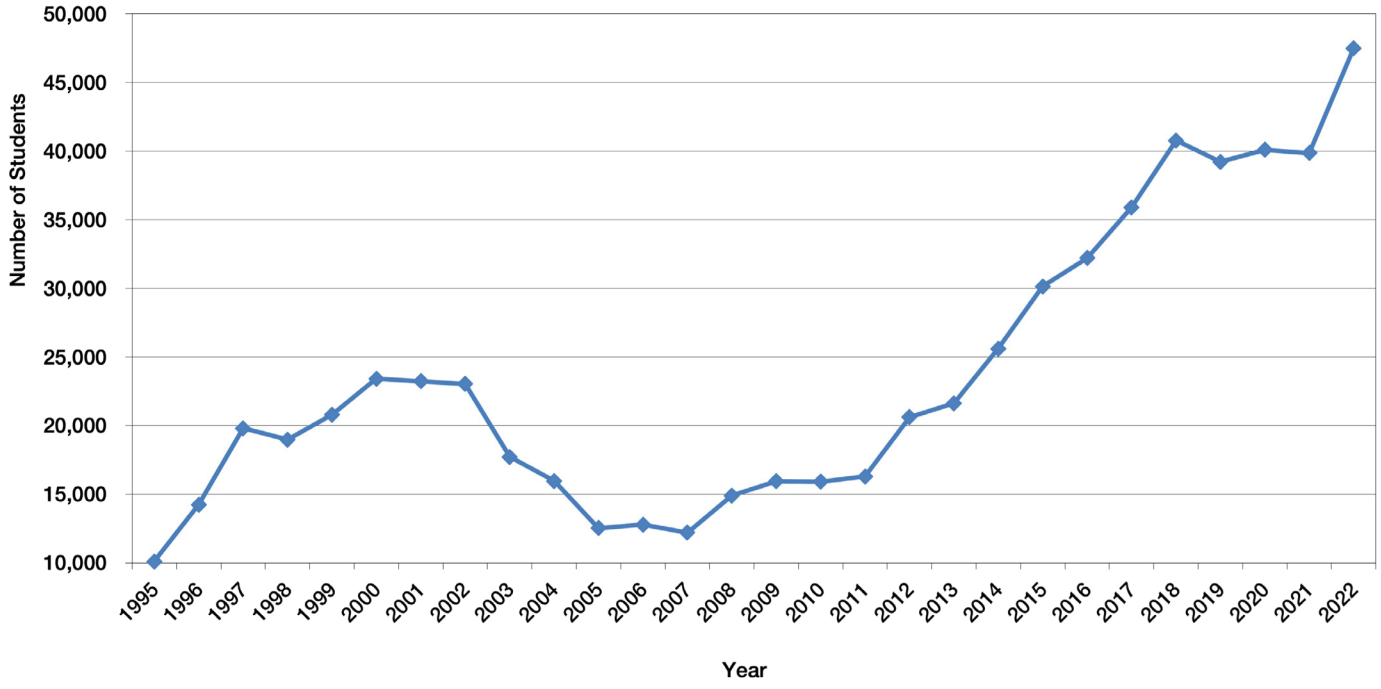


Figure B3. Bachelor's Degrees Granted by Tenure-Track Size

CRA Taulbee Survey 2022

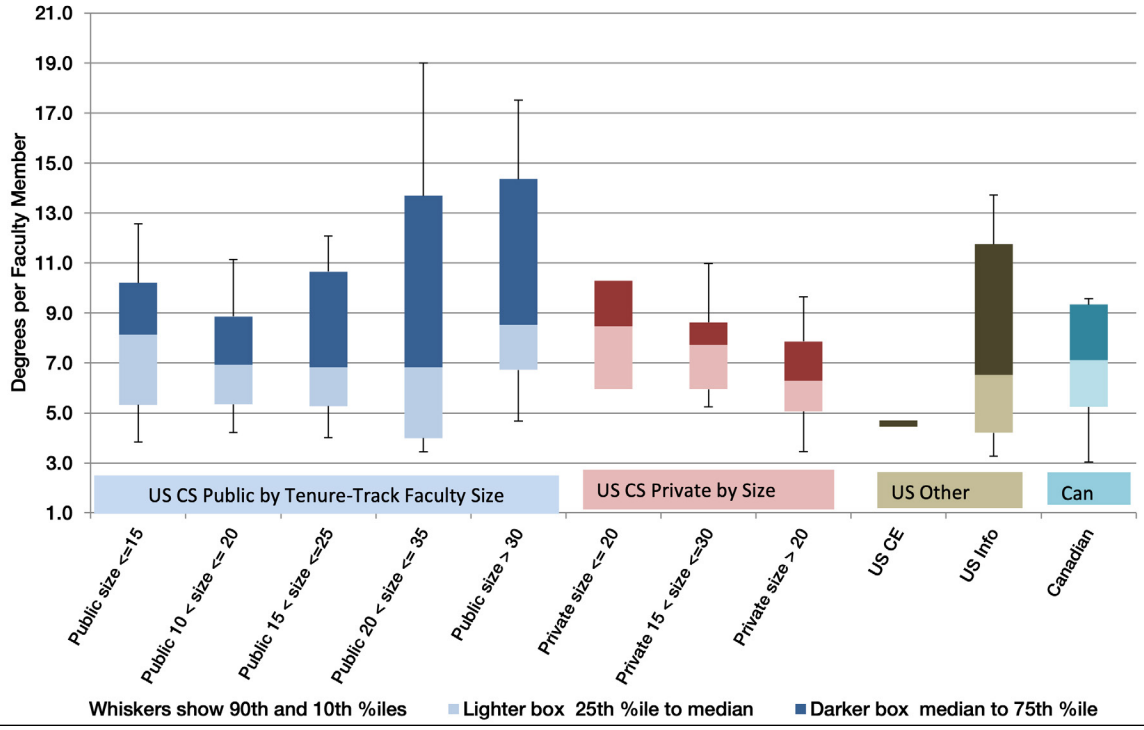


Figure B4. Bachelor's Enrollment Normalized by Tenure-Track Size

CRA Taulbee Survey 2022

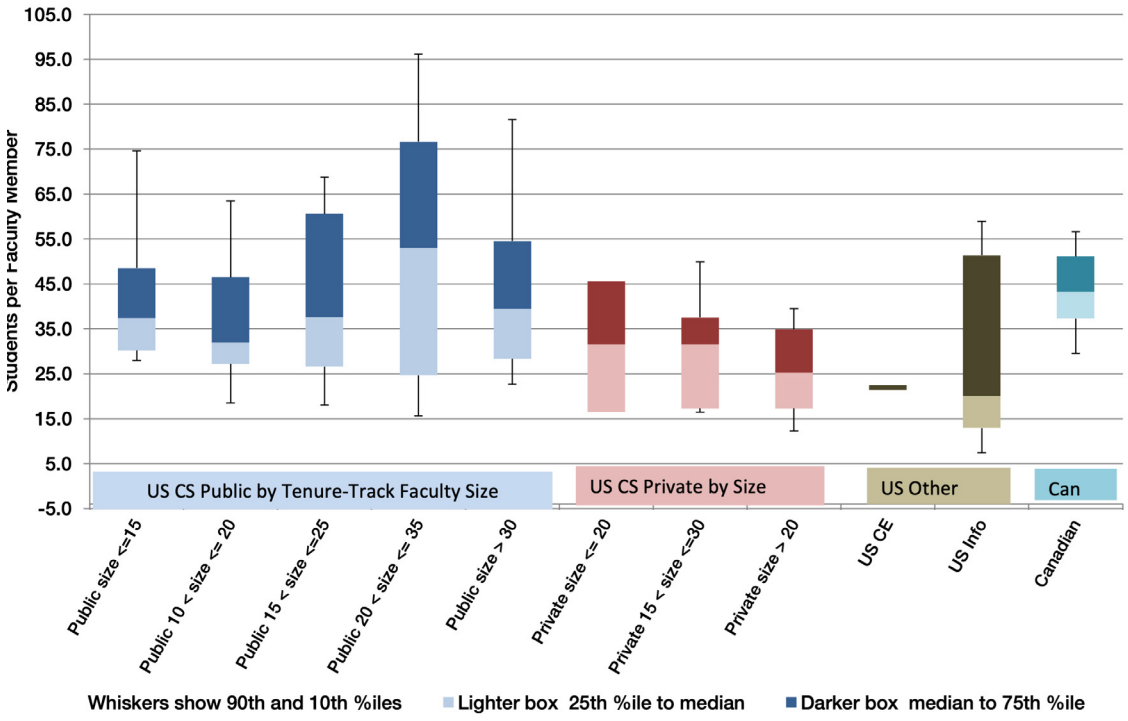
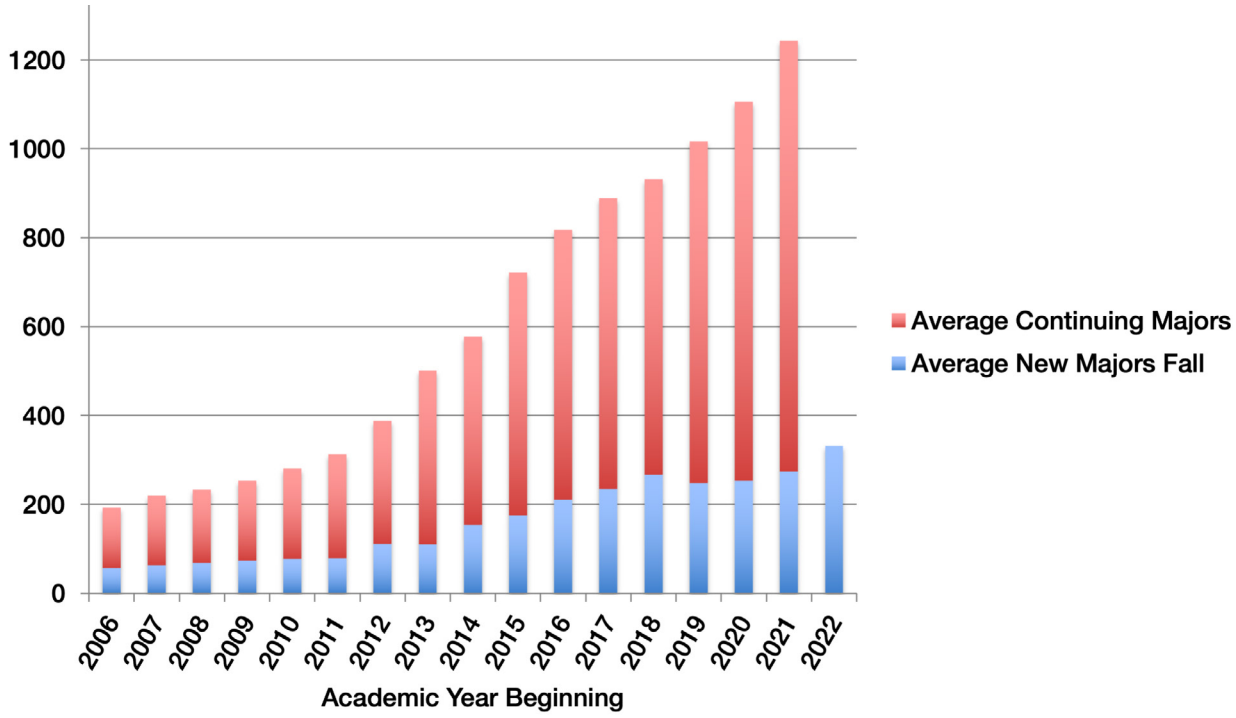


Figure B5. Average New and Continuing CS Majors per Academic Unit (U.S. CS Programs Only)

CRA Taulbee Survey 2022



Student Disability and Socioeconomic Data
(Table 2)

For the first time last year we obtained information about the number of students at each degree level who received accommodations for disabilities during the past academic year, the number of undergraduate students who were first-generation college students, and the number who were recipients of Pell grants. We obtained this information again this year. Last year, we obtained data from about 1/3 to 1/2 of the departments. This year, we had a few more responses for disability information at each degree level, a similar number reporting about first-generation status, and slightly fewer reporting about Pell grants (Table 2).

The table indicates that nearly 2/3 of the reporting departments showed no graduate students receiving disability accommodations, and that the average reporting department has between 1 and 2 percent of its graduate students receiving accommodations at both the master's and doctoral levels. The doctoral percentage is similar to that reported last year, while the master's level is slightly higher. At the undergraduate level, 4.1 percent of the undergraduate majors receive disability accommodations at those departments that provided data about accommodations, the same percentage reported last year.

In those departments reporting information about Pell grants and first-generation status, 20.9 percent of their undergraduate students are known to be receiving Pell grants, and 23.7 percent are first-generation college students. Last year, the percentages were 21.7 and 19.3, respectively. For the 62 departments reporting Pell grant information, the table disaggregates them into departments at public and private institutions. Departments at public institutions report somewhat a higher percentage of Pell grant students than do departments at private institutions.

Faculty Demographics
(Tables F1-F10; Figure F1)[4]

Table F1 shows the current (2022-23) and anticipated sizes, in FTE, for tenure-track, teaching, and research faculty, and postdocs. Teaching faculty are separately reported in subcategories called "Teaching Professors" and "Other

Table 2. Students With Disability Accommodations, Pell Grants, and First Generation Status (was Table Prof29 in previous year's report)

	Number of Depts	Total Enrollment	Total With Accommodations	Percent of Enrollment With Accommodations	Percent of Depts Reporting Zero Accommodations	Max Dept Percent of Accommodations	Average Number of Students With Accommodations
PhD	82	10,536	119	1.1%	63%	13%	1.4
Masters	71	28,656	436	1.5%	66%	24%	6.14
Bachelors	56	85,977	3,560	4.1%	38%	34%	63.57
	Number of Depts	**Total Enrollment**	**Total With That Status**	**Percent of Enrollment With Status**			
Pell Grant	62	90,789	19,013	20.9%	[Overall per NCES 32.1%]		
First Generation	75	106,876	25,303	23.7%			
		% Pell from Taulbee		**% Pell NCES, Dependent Student***	**%Pell NCES, Independent Student***		
Pell Grant, US Public	53	21.4%		41.5%	25.4%		
Pell Grant, US Private	9	16.4%		14.3%	12.2%		

* Source of NCES Pell Data, Federal Pell Grant Program of the Higher Education Act: Primer, Congressional Research Service, Updated Jan. 24, 2023.

2022 Taulbee Survey *(continued)*

Table F1. Actual and Anticipated Faculty Size by Position and Department Type

	Actual		Projected				Expected 2-Yr Growth		# Depts
	2022-23		2023-24		2024-25				
US CS Public	Total	Average	Total	Average	Total	Average	#	%	
TenureTrack	3,237	36	3,471	38	3,633	40	396	12.2%	91
Teaching Professors	649	7	734	8	800	9	151	23.3%	71
Other Instructors	551	6	573	6	605	7	54	9.8%	69
Research	176	2	193	2	206	2	30	17.0%	28
Postdoc	199	2	231	3	264	3	65	32.7%	40
Total	4,812	53	5,201	57	5,507	61	695	14.4%	
US CS Private									
TenureTrack	1,420	38	1,500	41	1,555	42	135	9.5%	37
Teaching Professors	298	8	319	9	335	9	37	12.4%	31
Other Instructors	185	5	194	5	208	6	23	12.4%	25
Research	115	3	124	3	127	3	12	10.4%	15
Postdoc	254	7	268	7	281	8	27	10.6%	21
Total	2,273	61	2,405	65	2,506	68	233	10.3%	
US CS Total									
TenureTrack	4,657	36	4,970	39	5,188	41	531	11.4%	128
Teaching Professors	947	7	1,053	8	1,135	9	188	19.9%	102
Other Instructors	736	6	767	6	812	6	76	10.3%	94
Research	291	2	317	3	333	3	42	14.4%	43
Postdoc	453	4	499	4	545	4	92	20.3%	61
Total	7,085	55	7,606	59	8,013	63	928	13.1%	
US CE									
TenureTrack	187	31	194	32	199	33	12	6.4%	6
Teaching Professors	25	4	28	5	29	5	4	16.0%	6
Other Instructors	14	2	15	3	16	3	2	14.3%	5
Research		0		0		0			0
Postdoc	2	0	3	1	3	1	1	50.0%	1
Total	228	38	240	40	247	41	19	8.3%	
US Info									
TenureTrack	452	30	482	32	496	33	44	9.7%	15
Teaching Professors	216	14	239	16	247	16	31	14.4%	14
Other Instructors	139	9	166	11	166	11	27	19.4%	11
Research	8	1	8	1	9	1	1	12.5%	5
Postdoc	29	2	33	2	36	2	7	24.1%	8
Total	844	56	928	62	953	64	109	12.9%	
Canadian									
TenureTrack	436	44	441	44	446	45	10	2.3%	10
Teaching Professors	63	6	63	6	63	6	0	0.0%	6
Other Instructors	30	3	32	3	32	3	2	6.7%	5
Research	4	0	4	0	4	0	0	0.0%	1
Postdoc	47	5	52	5	57	6	10	21.3%	2
Total	581	58	593	59	603	60	22	3.8%	
Grand Total									
TenureTrack	5,733	36	6,088	38	6,329	40	596	10.4%	159
Teaching Professors	1,252	8	1,383	9	1,474	9	222	17.7%	128
Other Instructors	919	6	980	6	1,027	7	108	11.8%	115
Research	303	2	329	2	346	2	43	14.2%	49
Postdoc	531	3	587	4	641	4	110	20.7%	72
Total	8,737	55	9,366	59	9,816	62	1,079	12.3%	

2022 Taulbee Survey *(continued)*

Instructors". "Teaching Professors" on average have more varied responsibilities in teaching, scholarship, service/governance, etc., and higher expectations for visibility outside the unit or the institution. "Other Instructors" are more focused on teaching introductory or mid-level courses and tend to have shorter contract lengths, though they are still full-time faculty (the Taulbee Survey does not collect data on course-by-course adjuncts other than typical stipends per course; see the section on faculty salaries).

The righthand column of Table F1 shows, for each row, the number of departments that provided non-zero values for actual 2022-23 faculty in the particular category. Entries for averages per department are reported based on the number of departments that provided tenure-track faculty information, not on the number of departments that had at least one person reported in the faculty category. For the tenure-track faculty rows, these computations are the same. This has been the historical manner in which the averages have been reported in this table. However, last year we reported averages with respect to the number of departments that reported at least one person in the faculty category, giving skewed results when comparing with the previous year. When we make comparisons with last year in the analysis below, we use last year's corrected averages, not the ones reported in Table F1 of the 2021 published Taulbee Report. These corrected averages can be computed from the tenure-track information in last year's published table.

The average tenure-track faculty size in U.S. CS departments increased by 6.4 percent over last year. With respect to teaching faculty in U.S. CS departments, the average number of Teaching Professors per department increased by 7.2 percent, while the average number of Other Instructors increased by 9.6 percent.

U.S. CS departments in both public and private institutions have about the same number of total teaching faculty on average, but private institutions tend to have more Teaching Professors and fewer Other Instructors. U.S. CE, U.S. I, and Canadian departments also reported a preference for the Teaching Professor category of teaching faculty. The average number of Teaching Professors grew faster at private institutions than that at public institutions (11.0 percent at private vs 5.6 percent at public), while the average of Other Instructors grew faster at public institutions (11.9 percent vs 3.7 percent).

Table F2. Vacant Positions 2021-22 by Position and Department Type

	Tried to fill	Filled
US CS Public		
TenureTrack	337	288
Teaching Professors	86	67
Other Instructors	69	66
Research	18	21
Postdoc	48	77
Total	558	518
US CS Private		
TenureTrack	120	109
Teaching Professors	47	37
Other Instructors	24	19
Research	11	13
Postdoc	52	53
Total	254	231
US CS Total		
TenureTrack	457	397
Teaching Professors	133	104
Other Instructors	93	85
Research	29	34
Postdoc	100	130
Total	812	749
US CE		
TenureTrack	15	13
Teaching Professors	7	6
Other Instructors		
Research		
Postdoc	7	6
Total	29	25
US Info		
TenureTrack	45	36
Teaching Professors	30	27
Other Instructors	3	4
Research	4	3
Postdoc	23	26
Total	105	96
Canadian		
TenureTrack	32	22
Teaching Professors	4	3
Other Instructors	8	4
Research	2	3
Postdoc	27	50
Total	73	82
Grand Total		
TenureTrack	549	468
Teaching Professors	174	140
Other Instructors	104	93
Research	35	39
Postdoc	157	212
Total	1,019	951

2022 Taulbee Survey *(continued)*

The average number of research faculty and postdocs at U.S. CS departments each increased in 2022-23, by 5.0 and 7.1 percent, respectively. Increases in the postdoc average took place at both public and private institutions, while average research faculty decreased at public institutions but increased at private institutions.

All department types are forecasting an increase in the number of tenure-track faculty per department for each of the next two years. Growth also is expected next year for teaching faculty across all department types, and further growth is expected two years hence for all department types except Canadian departments.

Table F2a. Reasons Positions Left Unfilled

Reason	# Reported	% of Reasons
Didn't find a person who met our hiring goals	19	15%
Offers turned down	69	55%
Technically vacant, not filled for admin reasons	5	4%
Hiring in progress	29	23%
Other	4	3%
Total Reasons Provided	126	
Problems with persons not meeting hiring goals		**# Given**
Specialty Area (Senior HCI, Senior AI/ML, AI, accessibility/HHD, bioinformatics, quantum, unspecified)		8
Too few candidates, candidates unprepared, lack of qualified teaching faculty applicants		7

Table F3. Gender of Newly Hired Faculty

	Tenure-Track		Teaching Professors		Other Instructors		Research		Postdoc		Total	
Male	322	71.6%	83	68.0%	68	70.1%	25	65.8%	147	76.2%	645	71.7%
Female	126	28.0%	39	32.0%	29	29.9%	13	34.2%	45	23.3%	252	28.0%
Nonbinary/Other	2	0.4%	0	0.0%	0	0.0%	0	0.0%	1	0.5%	3	0.3%
Unknown	5		0		4		0		6		15	
Total	455		122		101		38		199		915	

Table F4. Ethnicity of Newly Hired Faculty

	Tenure-Track		Teaching Professors		Other Instructors		Research		Postdoc		Total	
Nonresident Alien	72	19.3%	16	14.0%	5	7.1%	13	36.1%	34	22.4%	140	18.8%
American Indian / Alaska Native	6	1.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	6	0.8%
Asian	142	38.0%	21	18.4%	15	21.4%	7	19.4%	55	36.2%	240	32.2%
Black or African-American	12	3.2%	7	6.1%	0	0.0%	1	2.8%	4	2.6%	24	3.2%
Native Hawaiian/ Pacific Islander	2	0.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.3%
White	106	28.3%	59	51.8%	36	51.4%	13	36.1%	50	32.9%	264	35.4%
Multiracial, not Hispanic	4	1.1%	0	0.0%	1	1.4%	0	0.0%	2	1.3%	7	0.9%
Hispanic, any race	12	3.2%	2	1.8%	2	2.9%	0	0.0%	0	0.0%	16	2.1%
Resident, race/ethnic unknown	18	4.8%	9	7.9%	11	15.7%	2	5.6%	7	4.6%	47	6.3%
Total known residency	374		114		70		36		152		746	
Residency Unknown	50	85.6%	12	84.2%	12	79.9%	1	91.6%	39	91.5%	114	86.4%
Total	424		126		82		37		191		860	

Table F5. Faculty Losses

Died	14
Retired	112
Took Academic Position Elsewhere	156
Took Nonacademic Position	66
Remained, but Changed to Part Time	18
Other	24
Unknown	15
Total	405

Figure F1 illustrates the comparative changes at U.S. CS departments in undergraduate enrollment, tenure-track faculty and teaching faculty since 2006, when the current enrollment surge began. This figure updates, with recent years' data, a figure from the Generation-CS report. The graph shows that teaching faculty increases during the past few years have approximately kept pace with enrollment growth. However, since the enrollment surge began, the cumulative growth in teaching faculty is only about half of the growth in majors. During the same period, tenure-track faculty size has increased by about

Table F6. Gender of Current Faculty

	Full		Associate		Assistant		Teaching Professors		Other Instructors		Research		Postdoc		Total	
Male	1,959	82.8%	1,015	76.3%	1,226	73.0%	709	69.6%	547	71.0%	231	74.3%	386	69.3%	6,073	75.6%
Female	407	17.2%	315	23.7%	450	26.8%	307	30.1%	222	28.8%	80	25.7%	169	30.3%	1,950	24.3%
Nonbinary/Other	0	0.0%	1	0.1%	3	0.2%	3	0.3%	1	0.1%	0	0.0%	2	0.4%	10	0.1%
Unknown	119		46		69		59		34		18		69		414	
Total	2,485		1,377		1,748		1,078		804		329		626		8,447	

Table F7. Ethnicity of Current Faculty

	Full		Associate		Assistant		Teaching Professors		Other Instructors		Research		Postdoc		Total	
Nonresident Alien	19	0.90%	29	2.40%	231	14.90%	63	6.50%	25	3.50%	25	8.70%	111	22.50%	503	6.70%
American Indian / Alaska Native	7	0.30%	1	0.10%	5	0.30%	1	0.10%	3	0.40%	0	0.00%	0	0.00%	17	0.20%
Asian	687	30.80%	385	31.30%	569	36.70%	160	16.50%	82	11.40%	64	22.40%	153	31.00%	2,100	28.10%
Black or African-American	29	1.30%	37	3.00%	37	2.40%	28	2.90%	27	3.80%	8	2.80%	10	2.00%	176	2.40%
Native Hawaiian/ Pacific Islander	6	0.30%	5	0.40%	12	0.80%	2	0.20%	4	0.60%	0	0.00%	0	0.00%	29	0.40%
White	1,331	59.70%	666	54.10%	570	36.70%	631	65.10%	467	64.90%	170	59.40%	162	32.90%	3,997	53.40%
Multiracial, not Hispanic	10	0.40%	9	0.70%	14	0.90%	4	0.40%	3	0.40%	2	0.70%	5	1.00%	47	0.60%
Hispanic, any race	45	2.00%	36	2.90%	38	2.40%	44	4.50%	21	2.90%	7	2.40%	16	3.20%	207	2.80%
Resident, race/ ethnic unknown	95	4.30%	64	5.20%	76	4.90%	37	3.80%	88	12.20%	10	3.50%	36	7.30%	406	5.40%
Total known residency	2,229		1,232		1,552		970		720		286		493		7,482	
Residency Unknown	256	0.043	145	0.071	196	0.068	107	0.081	84	0.081	43	0.059	133	0.062	964	0.064
Total	2,485		1,377		1,748		1,077		804		329		626		8,446	

Table F8. Current Tenured and Tenure-Track Faculty by Gender and Ethnicity, From 151 Departments

	Full Professor							Associate Professor							Assistant Professor							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N	Total	%
Nonresident Alien	17	2	0	0	1.0%	0.5%		25	4	0	0	2.9%	1.4%	0	170	61	0	0	0	15.6%	0.0%	279	5.8%
Amer Indian or Alaska Native	3	4	0	0	0.2%	1.1%		0	1	0	0	0.0%	0.4%	0	2	3	0	0	0	0.8%	0.0%	13	0.3%
Asian	578	103	0	6	33.4%	28.2%		283	97	0	5	32.5%	34.5%	0	438	125	0	6	0	32.1%	0.0%	1,641	34.3%
Black or African-American	22	7	0	0	1.3%	1.9%		21	16	0	0	2.4%	5.7%	0	19	18	0	0	0	4.6%	0.0%	103	2.2%
Native Hawaiian/ Pac Islander	5	1	0	0	0.3%	0.3%		3	2	0	0	0.3%	0.7%	0	10	2	0	0	0	0.5%	0.0%	23	0.5%
White	1,061	238	0	32	61.4%	65.2%		508	148	1	9	58.3%	52.7%	1	388	172	2	8	0	44.1%	100.0%	2,567	53.7%
Multiracial, not Hispanic	7	2	0	1	0.4%	0.5%		7	2	0	0	0.8%	0.7%	0	11	2	0	1	0	0.5%	0.0%	33	0.7%
Hispanic, any race	36	8	0	1	2.1%	2.2%		25	11	0	0	2.9%	3.9%	0	31	7	0	0	0	1.8%	0.0%	119	2.5%
Total Residency & Ethnicity Known	1,729	365	0	40				872	281	1	14				1,069	390	2	15				4,778	
Resident, ethnicity unknown	73	11	0	11				44	14	0	6				52	18	0	6				235	
Residency unknown	157	31	0	68				99	20	0	26				105	42	1	48				597	
Gender Totals	1,959	407	0	119				1,015	315	1	46				1,226	450	3	69				5,610	
%	82.8%	17.2%	0.0%					76.3%	23.7%	0.1%					73.0%	26.8%	0.2%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table F9a. Current Non-Tenure-Track Faculty by Gender and Ethnicity, From 144 Departments

	Teaching Professors							Other Instructors							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Total	%
Nonresident Alien	43	20	0	0	6.7%	7.3%	0.0%	18	7	0	0	4.1%	4.0%	0.0%	88	5.6%
Amer Indian or Alaska Native	0	1	0	0	0.0%	0.4%	0.0%	3	0	0	0	0.7%	0.0%	0.0%	4	0.3%
Asian	101	57	0	2	15.6%	20.7%	0.0%	55	25	0	2	12.4%	14.4%	0.0%	242	15.5%
Black or African-American	18	10	0	0	2.8%	3.6%	0.0%	14	13	0	0	3.2%	7.5%	0.0%	55	3.5%
Native Hawaiian/ Pac Islander	2	0	0	0	0.3%	0.0%	0.0%	4	0	0	0	0.9%	0.0%	0.0%	6	0.4%
White	446	175	3	8	69.0%	63.6%	100.0%	329	127	1	10	74.1%	73.0%	100.0%	1,098	70.2%
Multiracial, not Hispanic	2	2	0	0	0.3%	0.7%	0.0%	1	1	0	1	0.2%	0.6%	0.0%	7	0.4%
Hispanic, any race	34	10	0	0	5.3%	3.6%	0.0%	20	1	0	0	4.5%	0.6%	0.0%	65	4.2%
Total Residency & Ethnicity Known	646	275	3	10				444	174	1	13				1,565	
Resident, ethnicity unknown	22	14	0	1				56	30	0	2				125	
Residency unknown	41	18	0	48				47	18	0	19				191	
Gender Totals	709	307	3	59				547	222	1	34				1,881	
%	69.6%	30.1%	0.3%					71.0%	28.8%	0.1%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

Table F9b. Current Non-Tenure-Track Research Faculty and Postdoctorates by Gender and Ethnicity, From 116 Departments

	Non-Tenure-Track Research							Postdoctorates							Ethnicity Totals	
	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Male	Fem	Nonb	N/R	% of M*	% of F*	% of N*	Total	%
Nonresident Alien	21	3	0	1	10.3%	4.2%		84	25	1	1	27.2%	20.2%	0.5	136	18.6%
Amer Indian or Alaska Native	0	0	0	0	0.0%	0.0%		0	0	0	0	0.0%	0.0%	0	0	0.0%
Asian	44	20	0	0	21.7%	27.8%		102	44	0	7	33.0%	35.5%	0	217	29.6%
Black or African-American	6	2	0	0	3.0%	2.8%		8	2	0	0	2.6%	1.6%	0	18	2.5%
Native Hawaiian/Pac Islander	0	0	0	0	0.0%	0.0%		0	0	0	0	0.0%	0.0%	0	0	0.0%
White	126	44	0	0	62.1%	61.1%		100	50	1	11	32.4%	40.3%	0.5	332	45.3%
Multiracial, not Hispanic	1	1	0	0	0.5%	1.4%		2	2	0	1	0.6%	1.6%	0	7	1.0%
Hispanic, any race	5	2	0	0	2.5%	2.8%		13	1	0	2	4.2%	0.8%	0	23	3.1%
Total Residency & Ethnicity Known	203	72	0	1				309	124	2	22				733	
Resident, ethnicity unknown	8	2	0	0				16	15	0	5				46	
Residency unknown	20	6	0	17				61	30	0	42				176	
Gender Totals	231	80	0	18				386	169	2	69				955	
%	74.3%	25.7%	0.0%					69.3%	30.3%	0.4%						

* % of M, % of F, and % of N columns are the percent of that gender who are of the specified ethnicity, of those whose ethnicity is known

1/10 the rate of enrollment growth. For well over a decade, the gap between growth in tenure-track faculty and growth in undergraduate enrollment has been getting wider.

Canadian departments, on average, are larger than U.S. CS departments, in terms of both tenure-track and total faculty. While their average tenure-track faculty size exceeds that of both U.S. CS public and private departments, their total faculty size lies in between. Among U.S. CS departments, those at private universities are on average larger than those at public universities in both tenure-track and total faculty size, as has been observed consistently for many years.

When examining the size of U.S. CE and I departments, it is important to note that we ask departments to report only computing-related faculty, so departments with Library Science or EE programs may report only part of their faculty.

Table F2 summarizes faculty hiring this past year. Departments in the U.S. were quite successful in hiring tenure-track faculty. The success rate at this year's reporting U.S. CS departments was 86.9 percent, an increase from last year's reported 79.8 percent. At public universities, it was 85.5 percent vs 76.7 percent last year and at private universities it was 90.8 percent vs 87.9 percent last year. U.S. CE departments had a success rate of 86.7 percent and U.S. I departments had a success rate of 80.0 percent. Canadian departments had a lower success rate than U.S. departments, at 68.8 percent, but this also was higher than the 59.3 percent reported last year. In aggregate across all types of departments, the tenure-track hiring success rate was 85.2 percent, compared to 78.0 percent in last year's report and the 74.1 percent reported two years ago.

The number of reported new tenure-track hires also increased after two consecutive years of decline. This year's respondents reported 468 new tenure-track hires compared with 341 reported last year. This year's figure is even larger than the 422 in the pre-COVID 2019 Taulbee Survey.

The hiring of teaching faculty also generally was successful, with an aggregate success rate across all department types of 80.5 percent for Teaching Professors and 89.4 percent for Other Instructors. The number of reported hires increased in both categories of teaching faculty, from 111 to 140 Teaching Professors, and from 72 to 93 Other Instructors.

Table F2a summarizes the reasons for unsuccessful searches. When hiring was unsuccessful, the most common reason was that offers were turned down. Other reasons were typically some form of inability to find a qualified candidate. Frequently this was for lack of applicants in the area sought, and the area most often mentioned was AI/ML. Other cases involved the strength or experience of the applicants.

Gender diversity among newly hired faculty for 2022-23 was somewhat weaker than that reported last year. When all categories of academic positions (tenure-track, teaching faculty, research faculty, and postdoc) are considered collectively, the fraction of female hires was 28.0 percent vs 30.2 percent for 2021-22 hires. For tenure-track positions, the decline was from 31.5 percent to 28.0 percent (Table F3). However, these percentages still are higher than the percentage of females among new Ph.D.s produced during the past year (22.9 percent), which as stated earlier in this report also dropped from the level reported last year.

Table F10. Source of New Faculty

Source	Full	Associate	Assistant	Teaching Prof	Other Instruc	Research	Postdoc	Total	% Total from Source	% Assistant from Source
New PhD	0	1	98	20	11	12	79	221	34%	32%
From Postdoc	2	1	80	7	1	1	11	103	16%	26%
From Other Academic	22	49	105	42	13	8	37	276	43%	35%
From Industry	4	4	19	10	4	2	5	48	7%	6%
Total With Hire Source	28	55	302	79	29	23	132	648		
Hired Without PhD	0	0	12	11	29	6	1	59		
% Hired Without PhD			4%	14%	100%	26%				

Among new tenure-track faculty whose residency is known, White, Non-resident Alien and Asian hires collectively comprise 85.6 percent. Among newly hired teaching faculty, these three categories comprise 82.6 percent of the new hires, while among research faculty it is 91.6 percent and among postdocs it is 91.5 percent (Table F4). The tenure-track and teaching faculty percentages are similar to those reported last year, while the values for the other categories of faculty are higher; higher values indicate decreased overall diversity.

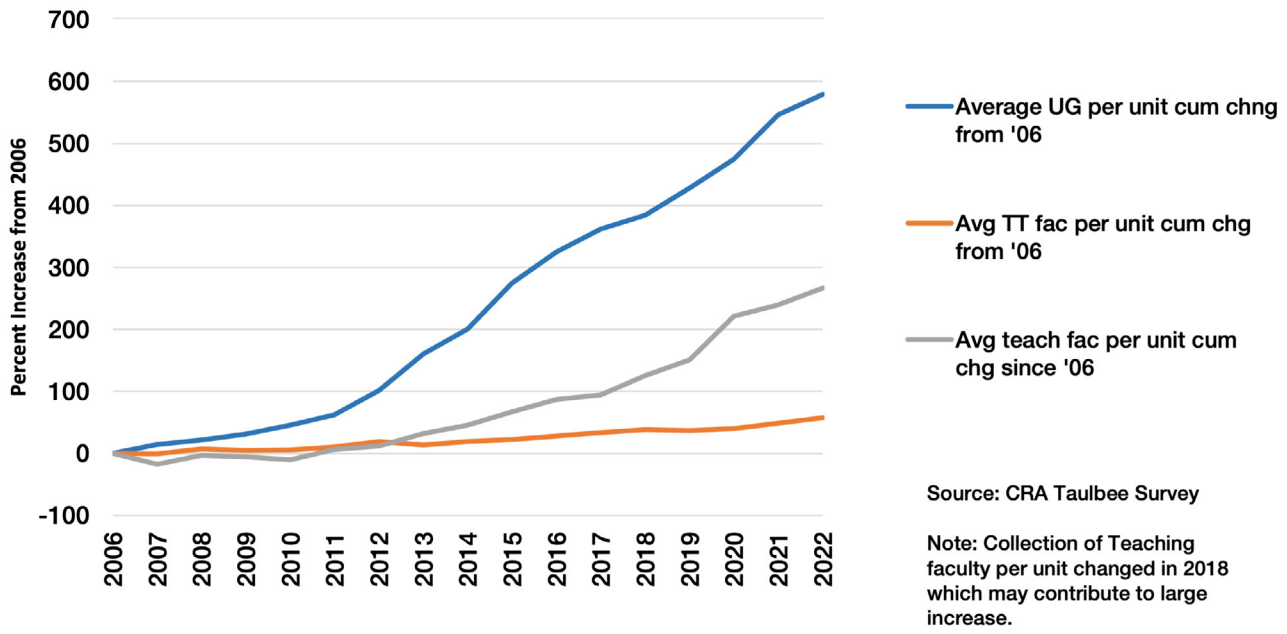
Table F10 shows the sources of new faculty of each type. For newly hired Assistant Professors, the fraction who had been postdocs in the previous year was about 26 percent compared to 30 percent last year. Since we began collecting such information in 2015, this percentage has ranged from 21 to 31 percent. About 33 percent of new Assistant Professors were new Ph.Ds (similar to last year), while about 35 percent of new Assistant Professors were in other academic positions the previous year (higher than last year's 27 percent). We don't know the previous academic rank of the new Assistant Professors who came from other academic positions; they might have been teaching faculty or research faculty as a transitional position, or they might have come from other tenure-track positions.

Among senior faculty hires, 83 had information about their previous position reported this year compared to 68 last year, Of this year's new senior hires, 85 percent came from other academic institutions and about ten percent came from industry. Last year these two values were 82 percent and seven percent, respectively. Among Teaching Professors, 14 percent were hired without a Ph.D, while 100 percent of new Other Instructors were hired without a Ph.D. Last year's respective percentages were 14 and 88 percent. This year, 26 percent of new research faculty did not have a Ph.D., compared with 29 percent reported last year. This percentage has been declining each year over a four-year period.

The number of faculty losses reported this year increased by a third over that reported last year (Table F5). The largest increase over last year's reported figures was for faculty departing for other academic position, which was the most-cited reason among all categories. Faculty departing for industry positions also had a large increase over last year's value,

Figure FI. Comparative Change in Majors and instructional Resources per U.S. CS Unit

CRA Taulbee Survey 2022



while retirements had the third largest increase and was the second largest overall category. This year there are more losses reported in the "other" and "unknown" categories than there were last year.

The proportion of current faculty who are female is slightly higher this year than last year (24.3 percent vs 23.9 percent), when assessed in aggregate over all faculty types including all tenure-track ranks (Table F6). Most faculty types are within one-half of one percent of the percentages of female faculty reported last year. The exceptions are Associate Professors (0.8 percent lower this year), Other Instructors (0.8 percent higher this year), and postdocs (4.7 percent higher this year). Table F7 shows the breakdown of race/ethnicity among current faculty in each category. The proportion of current faculty who are American Indian, Black, Native Hawaiian, Multiracial or Hispanic collectively totals between 4.3 percent (for Full Professors) and 8.1 percent (for both categories of teaching faculty). Aggregated across all categories of faculty, the proportion Is 6.4 percent, an increase over last year's reported 5.9 percent.

The vast majority of departments reported gender by race/ethnicity breakdowns of their faculty. Table F8 shows, for each race/ethnicity category at each tenure-track faculty rank, the percentage of total male faculty at that rank represented by that race/ethnicity category, and the percentage of total female faculty at that rank represented by that category. Tables F9a and F9b do likewise, respectively, for teaching faculty and for research faculty and postdocs. The patterns among the tenure-track faculty are similar to what they were last year. At the Full Professor level, there is a small shift among females from Asian to White. Asians comprise a smaller proportion of male Associate Professors, and there is a small shift among female Associate Professors from Non-resident Alien and Asian to White and Black. At the Assistant Professor level, there is a small shift among males from Non-resident Alien and White to Asian, and a small shift among females from Asian and Black to Non-resident Alien. With respect to teaching faculty, there are small shifts among male Teaching Professors from Non-resident Alien to Asian, and small shifts among female Teaching Professors from White to Non-resident Alien. Asians comprise a larger proportion of male Other Instructors, while there is a small shift among female Other Instructors from White and Hispanic to Asian. Research faculty and postdocs showed larger downward changes in the proportion of males who are White. A smaller downward change was present among female postdocs who are Non-resident Alien. The decreased proportion of White male research faculty was offset by a sizeable increase in the proportion of Non-resident Aliens and a small increase in the proportion of Asians, while the decrease in the proportion of White male postdocs was offset by small increased proportions of Blacks and Hispanics and a larger increase for Non-resident Aliens. Small shifts among female research faculty were present from Non-resident Alien and White toward Asian and Black, and female postdocs showed small shifts from Black and Multiracial to a larger increase in the Asian category.

Research Expenditures

(Table R1; Figures R1-R2)

Table R1 shows the distribution of departments' total research expenditure (including indirect costs or "overhead" as stated on project budgets) from external sources of support. Figures

Table R1. Total Expenditure from External Sources for Computing Research

Department Type	# Depts	Percentile of Department Averages				
		10th	25th	50th	75th	90th
US CS Public	65	$1,181,832	$3,049,198	$6,225,294	$13,401,794	$21,794,899
US CS Private	25	$2,170,997	$3,028,088	$9,198,926	$18,440,000	$22,974,428
US CE	2					
US Info	11	$1,578,213	$4,556,417	$6,234,007	$7,180,596	$7,513,062
Canadian	6			$6,450,366		

Figure R1. Research Expenditures Normalized by Tenure-Track Size

CRA Taulbee Survey 2022

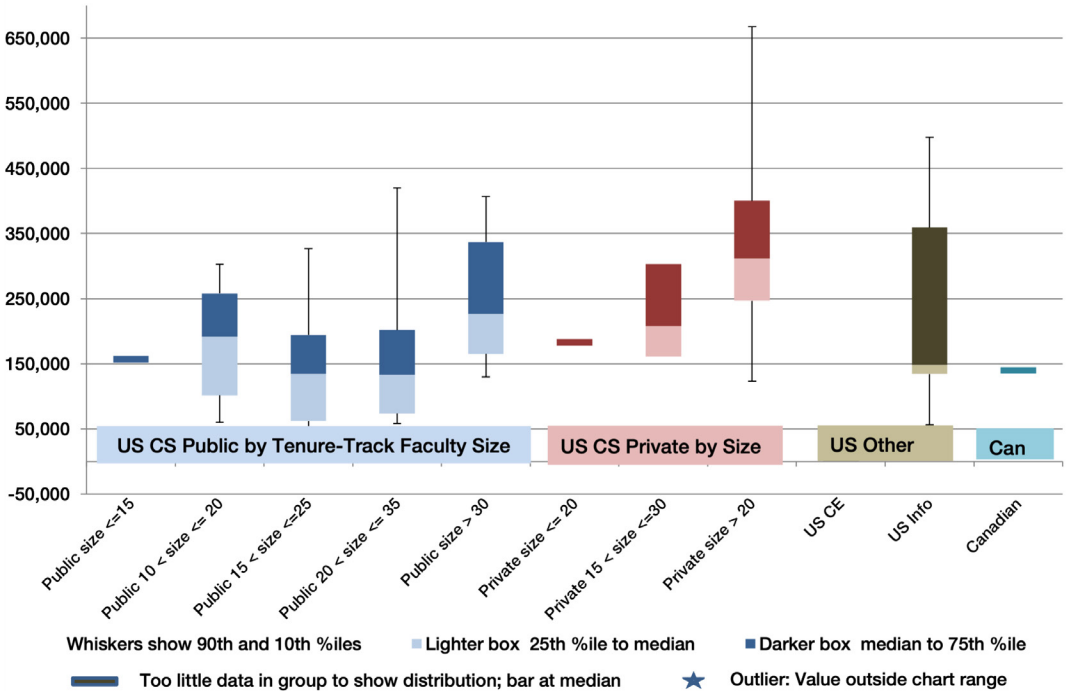
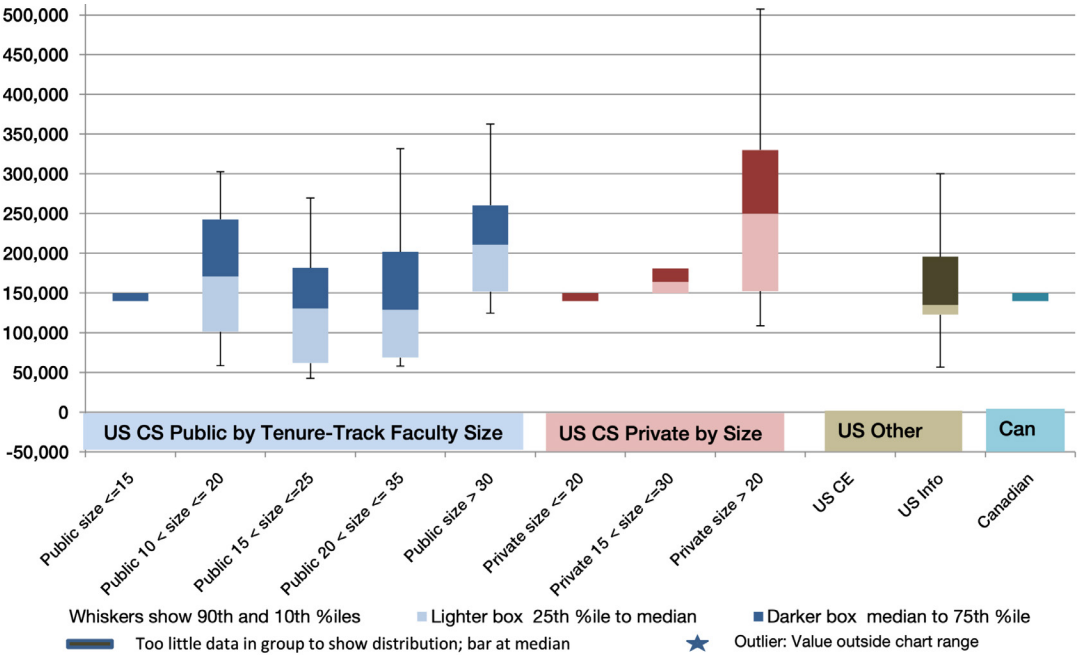


Figure R2. Research Expenditures Normalized by Tenure-Track + Research Faculty + Postdoctorates

CRA Taulbee Survey 2022



R1 and R2 show the per capita expenditure, where capitation is computed two ways. The first (Figure R1) is relative only to the number of tenure-track faculty members. The second (Figure R2) is relative to research faculty and postdocs as well as tenure-track faculty. Canadian levels are shown in Canadian dollars.

Median research expenditures for 2021-22 increased over reported 2020-21 levels at public U.S. CS departments (9.5 percent) and U.S. I departments (6.7 percent). In contrast, U.S. CS private departments reported a 5.2 percent decline in median research expenditures. An insufficient number of Canadian and CE departments reported expenditure information last year to allow for comparisons.

The U.S. CS data show that larger departments in private institutions have more external funding per capita than smaller departments. In public institutions, there is a less clear relationship between per capita expenditures and faculty size. These statements hold for each capitation method.

Graduate Student Support

(Tables G1-G2; Figures G1-G3)

Table G1 shows the number of doctoral students supported as full-time students as of fall 2022, further categorized as teaching assistants (TAs), research assistants (RAs), and full-support fellows. The table also shows the split between those on institutional vs. external funds. Table G1a shows similar data for supported master's students.

The average number of TAs on institutional funds among doctoral students in U.S. CS departments decreased 3.0 percent, from 37.7 to 36.6. Departments in public institutions had a 3.8 percent decrease, while those at private institutions had a 9.0 percent increase. U.S. I departments reported a 13.7 percent increase from last year. No comparisons are made for CE and Canadian departments due to the small number reporting last year.

Among research associates, the average number of doctoral students per U.S. CS department who were supported on

Table G1. Doctoral Students Supported as Full-Time Students by Department Type

		On Institutional Funds						On External Funds						Total
Department Type	# Dept	Teaching Assistants		Research Assistants		Full-Support Fellows		Teaching Assistants		Research Assistants		Full-Support Fellows		
US CS Public	82	3,361.78	0.4	1,267.99	0.1	294.25	0.0	21.5	0.0	4,393.29	0.5	228.5	0.0	9,567.31
US CS Private	31	770.98	0.2	982.44	0.2	431.50	0.1	39.0	0.0	1,867.65	0.4	172.3	0.0	4,263.82
US CS Total	113	4,132.76	0.3	2,250.43	0.2	725.75	0.1	60.5	0.0	6,260.94	0.5	400.8	0.0	13,831.13
US CE	4	177.0	0.2	26.0	0.0	121.0	0.1		0.0	393.0	0.4	192.0	0.2	909.0
US Info	14	310.99	0.4	134.80	0.2	84.50	0.1	0.8	0.0	320.08	0.4	27.0	0.0	878.13
Canadian	7	229.70	0.3	147.0	0.2	2.0	0.0	0.0	0.0	216.90	0.3	67.0	0.1	662.60
Grand Total	138	4,850.45	0.3	2,558.23	0.2	933.25	0.1	61.3	0.0	7,190.92	0.4	686.8	0.0	16,280.86

Table G1a. Master's Students Supported as Full-Time Students by Department Type

		On Institutional Funds						On External Funds						Total
Department Type	# Dept	Teaching Assistants		Research Assistants		Full-Support Fellows		Teaching Assistants		Research Assistants		Full-Support Fellows		
US CS Public	72	1,946.13	0.70	141.50	0.05	66.0	0.02	6.0	0.0	607.15	0.22	5.0	0.0	2,771.78
US CS Private	19	607.0	0.85	24.0	0.03	7.0	0.01	6.0	0.01	60.94	0.09	10.0	0.01	714.94
US CS Total	91	2,553.13	0.73	165.50	0.05	73.0	0.02	12.0	0.0	668.09	0.19	15.0	0.0	3,486.72
US CE	2	94.0	0.57	37.0	0.22		0.0		0.0	34.0	0.21		0.0	165.0
US Info	14	206.70	0.78	18.75	0.07	11.0	0.04	0.0	0.0	27.50	0.10	0.0	0.0	263.95
Canadian	6	440.50	0.49	111.0	0.12	0.0	0.0	0.0	0.0	233.0	0.26	120.0	0.13	904.50
Grand Total	113	3,294.33	0.68	332.25	0.07	84.0	0.02	12.0	0.0	962.59	0.20	135.0	0.03	4,820.17

Table G2. Fall 2022 Academic-Year Graduate Stipends by Department Type and Support Type

Teaching Assistantships						
Percentiles of Department Averages						
Department Type	**# Depts**	**10th**	**25th**	**50th**	**75th**	**90th**
US CS Public	89	$16,236	$18,378	$21,938	$24,000	$27,504
US CS Private	30	$22,350	$24,604	$30,375	$36,500	$39,786
US CE	5			$22,032		
US Info	14	$18,810	$24,094	$26,540	$29,453	$32,886
Canadian	7		$7,073	$10,000	$16,274	
Research Assistantships						
Percentiles of Department Averages						
Department Type	**# Depts**	**10th**	**25th**	**50th**	**75th**	**90th**
US CS Public	91	$17,560	$19,059	$22,000	$25,000	$29,000
US CS Private	35	$22,500	$25,821	$32,784	$37,795	$39,816
US CE	5			$22,806		
US Info	14	$18,810	$24,094	$26,540	$27,608	$32,589
Canadian	8		$15,272	$21,196	$22,500	
Full-Support Fellows						
Percentiles of Department Averages						
Department Type	**# Depts**	**10th**	**25th**	**50th**	**75th**	**90th**
US CS Public	46	$21,375	$24,116	$28,000	$30,431	$34,667
US CS Private	31	$25,245	$29,237	$34,000	$37,795	$39,540
US CE	3					
US Info	10	$23,328	$24,791	$28,905	$33,250	$34,200
Canadian	6			$26,804		

Figure G1. Teaching Assistantship Stipends

CRA Taulbee Survey 2022

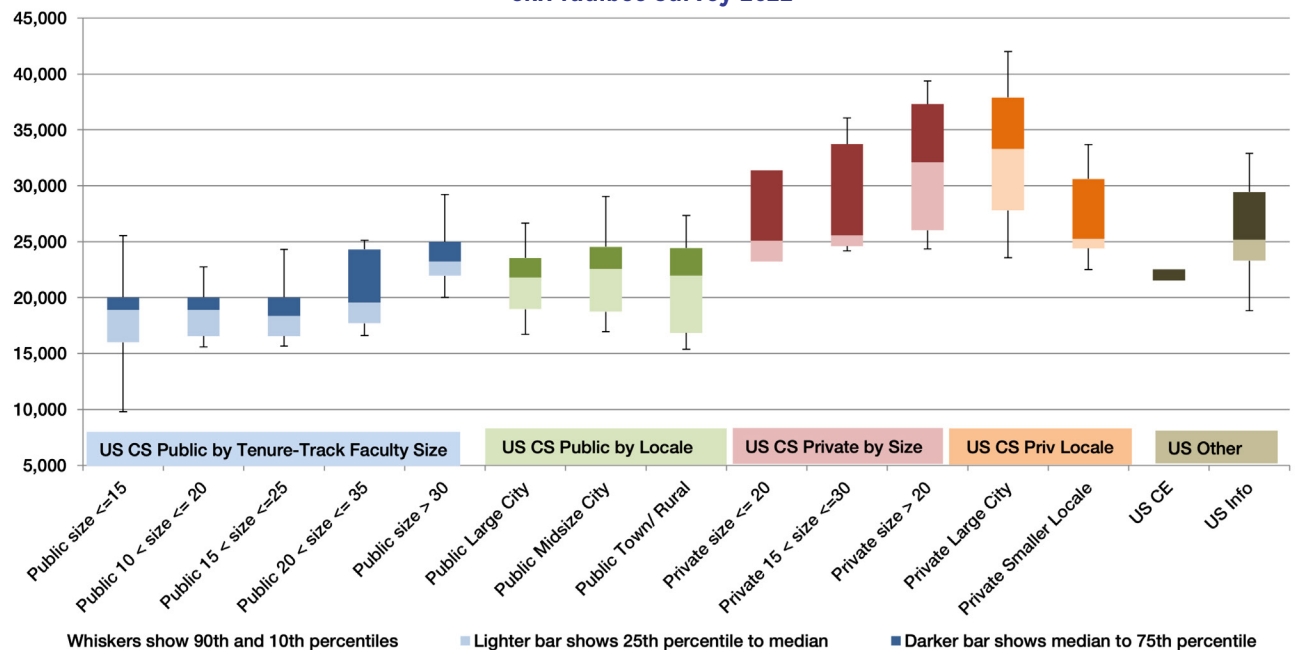


Figure G2. Research Assistantship Stipends

CRA Taulbee Survey 2022

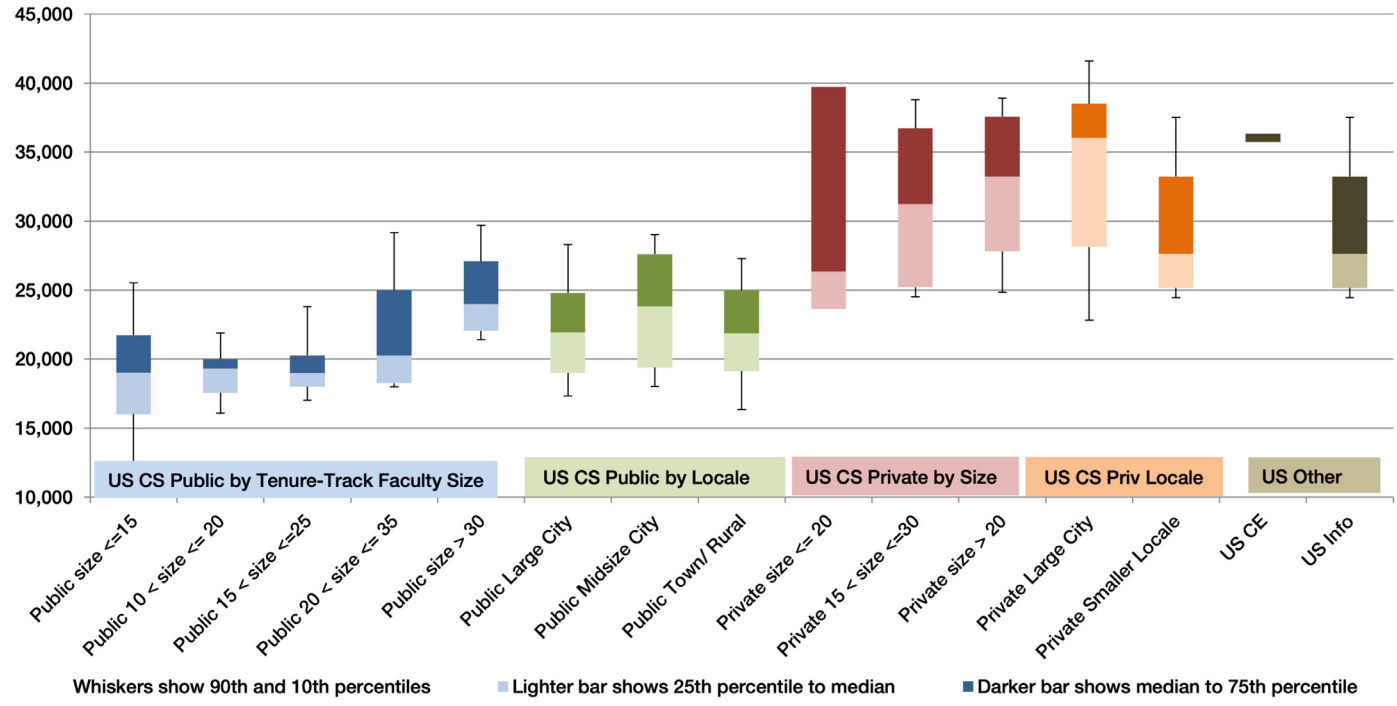
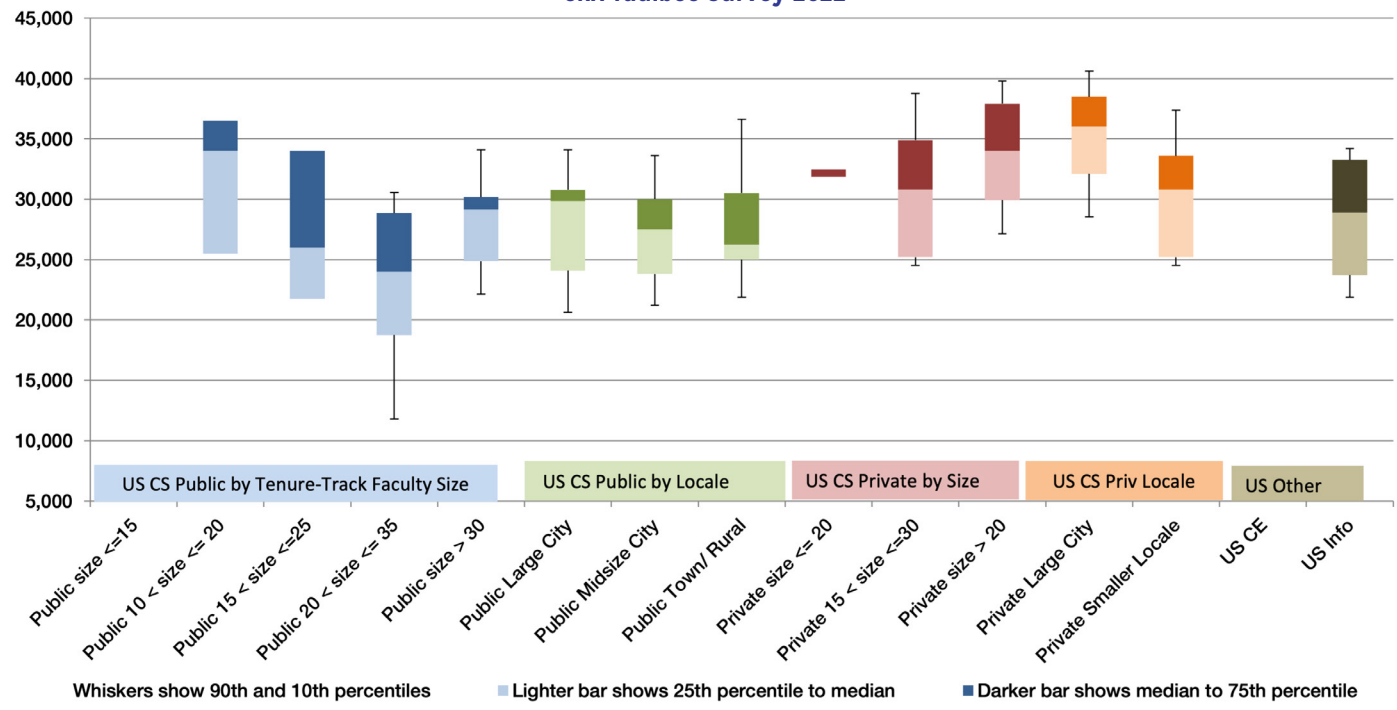


Figure G3. Full Support Fellows Stipends

CRA Taulbee Survey 2022



external funding increased compared to last year in both public (10.9 percent) and private (9.4 percent) institutions. At U.S. I departments, there was little change in the average per department. There also was little change in the average per department for research associates supported on institutional funds, both at US. CS and at U.S. I departments.

In U.S. CS departments, the average number of full-support fellows on both institutional and external funds increased compared with last year. In U.S. I departments, there was an increase in the average number of full-support fellows on institutional funds, but not on external funds.

Aggregated across all department types, about 30 percent of supported doctoral students are TAs, 60 percent are RAs, and 10 percent are full-support fellows. These percentages don't change much from year to year, though there is a small shift from TAs to fellows this year. Among U.S. CS departments, those at private institutions have a greater fraction of their supported students on RAs and full-support fellows, and a smaller fraction on TAs, than do departments at public institutions.

Among supported master's students aggregated across all department types, 69 percent are TAs, compared with 71 reported last year. Conversely, 27 percent are RAs, compared with last year's 25 percent. The remainder are full-support fellows. At U.S. CS departments, TA support comprises a higher percentage than the aggregate, while RA and full-support fellow support comprises slightly lower percentages than the aggregate. Private institutions have a higher percentage of their supported master's students employed as TAs than do public institutions, while the reverse is true for RA support.

Table G2 shows the distribution of stipends for TAs, RAs, and full-support fellows. U.S. CS data is further broken down in this table by public and private institution. Figures G1-G3 further break down the U.S. CS data by size of department and by geographic location of the university.

Compared with last year's report, the median TA salaries at U.S. CS departments at both public and private institutions increased between 9 and 10 percent. Median TA salaries at private institutions again are over one-third higher than at public institutions. For RAs, median salaries at U.S. CS institutions rose 6.0 percent at public institutions and 7.6 percent at private institutions. Median RA salaries at private institutions are nearly 50 percent higher than at public institutions. For full-support fellows, median salaries rose ten percent at U.S. CS departments at both public and private institutions. Median full-support fellow salaries are more than 20 percent higher at private institutions than at public institutions. Median stipends at U.S. I schools fall in between those at public and private U.S. CS departments for all three types of support, but they are much closer to the levels of public institutions.

In U.S. CS departments at private institutions, larger departments have higher median stipends than smaller departments, and departments in large cities have higher median stipends than those in smaller locales. These relationships hold for TAs, RAs, and full-support fellows. In public institutions, RA stipends are higher in larger departments, and full-support fellow stipends tend to be higher in larger locales.

Faculty Salaries

(Tables S1-S22; Figures S1-S9)

Each department was asked to report individual (but anonymous) faculty salaries if possible; otherwise, the department was requested to provide the mean salary for each rank (full, associate, and assistant professors and non-tenure-track teaching faculty, research faculty, and post-doctorates) and the number of persons at each rank. The salaries are those in effect on January 1, 2023 for U.S. departments; nine-month salaries are reported in U.S. dollars. For Canadian departments, twelve-month salaries are reported in Canadian dollars. Respondents were asked to include salary supplements such as salary monies from endowed positions.

U.S. CS data is reported in Tables S1-S16 and in the box and whiskers diagrams comprising Figures S1-S9. Data for CE, I, Canadian, and new Ph.D.s are reported in Tables S17-S20. The tables and diagrams contain distributional data (first decile, quartiles, and ninth decile) computed from the department averages only. Thus, for example, a table row labeled "50" or the median line in a diagram is the median of the averages for the departments that reported within the stratum (the number of such departments reporting is shown in the "depts" row). Therefore, it is not a true median of all the salaries.

In these tables, we report salary data for senior faculty based on time in rank, for more meaningful comparison of individual or departmental faculty salaries with national averages. We report associate professor salaries for time in rank of 7 years or less, and of more than 7 years. For full professors, we report time in rank of 7 years or less, 8 to 15 years, and more than 15 years. We also disaggregate teaching faculty salaries into the two subclasses, Teaching Professors and Other Instructors. Within each subclass, there is further breakdown into persons with time in rank of less than 3 years, 3-5 years, 6-8 years, and 9 or more years. The teaching faculty salary disaggregations are in Tables S1a to S19a.

Table S1. Nine-month Salaries, 142 Responses of 197 US CS Departments, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	119	125	127	140	103	131	138	140	133	39	45
Indiv	750	636	666	2,108	362	748	1,154	1,437	1,534	191	395
10	$145,239	$139,695	$134,403	$140,093	$107,058	$112,476	$114,402	$99,302	$68,110	$67,959	$49,425
25	$167,435	$158,135	$151,225	$158,491	$115,272	$122,035	$122,880	$106,139	$79,492	$78,860	$57,136
50	$192,674	$187,646	$174,934	$181,607	$128,720	$136,500	$134,078	$119,031	$92,585	$100,000	$64,473
75	$235,773	$210,000	$191,910	$205,846	$143,597	$152,706	$151,140	$129,600	$108,135	$123,327	$72,517
90	$262,572	$233,765	$224,743	$227,968	$152,138	$165,700	$164,953	$139,202	$128,894	$148,550	$77,114

Table S1a. Nine-month Salaries, 142 Responses of 197 US CS Departments, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	61	58	73	76	104	33	32	45	50	81
Indiv	176	149	213	249	955	80	57	118	195	595
10	$79,387	$77,880	$75,449	$75,000	$76,763	$62,928	$26,733	$50,807	$46,643	$59,309
25	$94,071	$92,142	$86,316	$82,996	$89,485	$70,703	$66,656	$63,748	$65,634	$67,350
50	$109,153	$109,685	$98,753	$95,000	$101,716	$91,490	$81,040	$84,900	$77,500	$79,747
75	$132,314	$122,887	$111,119	$109,925	$119,023	$114,189	$99,312	$96,957	$88,614	$93,781
90	$153,691	$141,724	$132,017	$126,118	$132,101	$148,057	$122,880	$117,200	$108,439	$112,999

The U.S. CS data is stratified in three stratification dimensions: (1) public vs. private educational institution; (2) tenure-track faculty size of the unit offering the computing program; and (3) type of locale of the institution. These have been the dimensions in use since 2011. Box and whisker diagrams for each faculty type and rank, including time in rank for associate and full professors, compare salaries along each of the three dimensions (Figures S1-S9). The strata for tenure-track faculty size were chosen so that each is highly likely to have enough programs reporting; we have been using these strata for several years. Note that the strata overlap, so that most departmental data affect multiple strata. This may be especially useful to a department near the boundary of one stratum. For type of locale, we have three strata for public institutions (large city and associated suburbs [population >= 250,000], mid-size city and associated suburbs [population between 100,000 and 250,000], or small city/rural locale [population less than 100,000]) and two strata for private institutions (large city and suburbs, or not). The classification of an educational institution into a locale stratum was performed using the Carnegie Classification database.

Those departments reporting salary data were provided a summary report earlier this year. In that report, those departments that provided individual salaries were additionally provided more comprehensive distributional information based on these individual salaries.

Overall, we had a response rate of 61 percent, while last year's overall response rate was 55 percent. All department types showed percentage increases. Among U.S. CS departments, the response rate increased to 71 percent from 65 percent last year. The CE response rate was 20 percent versus 11 percent last year. The Canadian response rate increased to 45 percent from 28 percent. The response rate from the U.S. Information departments was 74 percent compared with 70 percent last year, but since 4 fewer I departments received this year's survey, the number of responses from I departments decreased by 2.

Table S2. Nine-month Salaries, 103 Responses of 144 US CS Public (All Public), Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	83	91	94	102	77	94	100	102	97	26	27
Indiv	497	440	451	1,441	269	513	823	1,018	1,095	107	161
10	$144,537	$138,636	$133,302	$135,296	$105,471	$112,298	$111,825	$96,943	$67,104	$71,228	$48,288
25	$165,148	$151,800	$147,125	$155,400	$113,479	$118,055	$117,916	$102,741	$75,663	$77,427	$52,979
50	$187,472	$175,800	$165,243	$174,887	$126,371	$132,620	$130,066	$112,995	$86,498	$93,025	$60,185
75	$225,872	$205,486	$188,102	$199,253	$142,865	$144,637	$142,406	$125,047	$100,731	$122,643	$65,917
90	$250,210	$222,250	$217,890	$216,682	$150,130	$157,273	$155,942	$132,894	$112,164	$144,454	$71,120

Table S2a. Nine-month Salaries, 103 Responses of 144 US CS Public (All Public), Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	41	39	51	54	71	29	26	37	38	64
Indiv	121	102	151	146	629	71	49	101	150	482
10	$75,635	$76,497	$71,707	$72,236	$76,293	$61,481	$35,749	$39,486	$46,229	$59,543
25	$92,501	$91,515	$83,129	$81,673	$84,428	$68,206	$66,219	$62,043	$65,617	$65,775
50	$106,339	$107,944	$95,490	$90,409	$95,717	$86,800	$79,605	$74,600	$77,157	$79,608
75	$128,199	$114,220	$107,811	$102,589	$108,013	$102,812	$96,340	$90,769	$80,977	$90,406
90	$153,691	$136,680	$123,300	$112,067	$128,413	$135,003	$101,159	$99,676	$92,358	$99,841

Of those departments reporting this year, 57 percent provided individual salary data, compared with 62 percent last year.

Salaries at private institutions tend to be higher than those at public institutions for nearly all faculty types (Tables S2 and S3). This pattern is consistent with observations in previous years.

When viewed relative to faculty size, salaries tend to be higher for larger departments at both public and private institutions (perhaps best seen in Figures S1-S9). This pattern holds for all tenure-track ranks except for full professors at private institutions in rank 0-7 years, where the median average salary among departments is about the same across all department sizes, and full professors at public institutions in rank 8-15 years, where the median average salary in departments of size 11-20 exceeds that of departments of size 21-35. As has been the case in the recent past, teaching faculty at larger departments also tend to have higher salaries than those at smaller departments, for both subclasses of teaching faculty. There is not enough data about research faculty and postdocs to do substantive analysis by department size.

It is difficult to discern consistent relationships between salaries and size of locale for tenure-track faculty. For teaching faculty, salaries in departments at public institutions are higher in midsize and large locales than in smaller locales. However, in departments at private institutions there is little difference between the median average salaries of teaching faculty at small vs large locales.

Our analyses of faculty salary changes from one year to the next uses only those departments that reported both years; otherwise, the departments that reported during only one year can skew the comparison. Because some departments that reported both years provided only aggregate salaries for their full and associate professors in one year and in the other year reported them by years in rank, we do not disaggregate salary changes by years in rank for full professors and associate

Table S3. Nine-month Salaries, 39 Responses of 53 US CS Private (All Private), Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	36	34	34	39	27	38	39	39	37	13	18
Indiv	253	196	217	669	95	237	335	423	448	84	234
10	$161,540	$152,640	$147,621	$157,181	$121,255	$124,022	$128,611	$113,846	$89,171	$15,667	$49,845
25	$182,583	$182,803	$164,134	$178,513	$126,752	$136,001	$133,816	$119,854	$93,880	$83,000	$68,773
50	$223,731	$202,169	$179,866	$203,323	$135,000	$153,044	$151,773	$132,500	$112,686	$100,000	$72,459
75	$258,324	$221,497	$208,259	$230,566	$148,288	$167,425	$164,962	$137,813	$129,040	$121,600	$76,280
90	$282,870	$250,900	$255,770	$244,833	$162,315	$179,708	$172,691	$147,999	$137,257	$156,699	$80,966

Table S3a. Nine-month Salaries, 39 Responses of 53 US CS Private (All Private), Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	20	19	22	22	33	5	7	9	13	18
Indiv	55	47	62	103	326	10	11	19	48	122
10	$93,897	$89,564	$86,082	$88,867	$91,466				$52,661	$63,311
25	$96,666	$96,289	$93,235	$96,009	$99,408		$80,950	$95,833	$72,778	$75,774
50	$120,000	$115,787	$109,038	$112,951	$114,694	$130,500	$99,306	$100,000	$92,500	$91,874
75	$135,621	$129,746	$120,081	$122,493	$128,042		$141,880	$120,000	$118,125	$116,076
90	$150,469	$140,483	$133,034	$135,308	$137,265				$147,644	$137,910

Table S4. Nine-month Salaries, 18 Responses of US CS Public With <=15 Tenure-Track Faculty, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	9	12	15	18	12	14	17	17	18	1	0
Indiv	15	35	35	89	26	33	61	59	100		
10		$124,839	$113,465	$120,517	$101,555	$104,299	$102,280	$93,099	$62,046		
25	$121,711	$132,587	$119,305	$129,543	$107,248	$109,312	$105,094	$96,087	$67,006		
50	$145,473	$143,801	$136,493	$148,361	$113,073	$114,061	$112,476	$98,538	$70,804		
75	$162,021	$165,432	$163,167	$163,196	$117,414	$121,839	$122,830	$101,664	$83,204		
90		$192,437	$191,766	$181,354	$143,241	$125,774	$130,710	$105,465	$92,530		

Table S4a. Nine-month Salaries, 18 Responses of US CS Public With <=15 Tenure-Track Faculty, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	5	3	7	8	13	5	5	9	7	13
Indiv	6		16	15	43	9	11	12	16	57
10					$66,771					$57,573
25			$70,810	$73,750	$73,628			$51,553	$45,984	$60,089
50	$75,635		$75,377	$80,924	$81,890	$73,832	$61,800	$61,800	$64,505	$64,165
75			$88,769	$90,461	$91,008			$65,236	$79,244	$77,500
90					$94,942					$82,591

Table S5. Nine-month Salaries, 31 Responses of US CS Public With 10 < Tenure-Track Faculty <=20, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	22	28	27	31	24	28	30	31	30	3	2
Indiv	52	88	67	215	58	86	147	177	181		
10	$140,476	$137,355	$122,124	$134,942	$106,056	$111,631	$113,079	$94,675	$65,754		
25	$150,867	$144,244	$135,247	$144,855	$110,151	$117,068	$115,322	$100,315	$69,837		
50	$166,464	$166,674	$151,074	$165,324	$118,200	$121,958	$123,520	$105,000	$80,655		
75	$188,824	$200,695	$163,724	$177,637	$131,258	$134,814	$132,080	$113,657	$86,412		
90	$214,045	$209,110	$183,443	$187,970	$144,716	$142,816	$141,035	$122,829	$94,188		

Table S5a. Nine-month Salaries, 31 Responses of US CS Public With 10 < Tenure-Track Faculty <=20, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	8	9	13	16	20	7	7	10	11	21
Indiv	10	17	21	28	77	18	12	20	40	104
10			$72,896	$73,137	$74,863			$47,342	$59,000	$59,309
25	$89,262	$89,568	$82,846	$81,200	$81,277	$72,978	$58,666	$60,107	$65,808	$65,768
50	$96,188	$91,863	$87,600	$84,600	$90,860	$84,434	$76,000	$64,701	$73,500	$70,600
75	$105,966	$103,391	$95,282	$92,372	$95,798	$95,229	$82,021	$72,515	$79,682	$80,947
90			$106,469	$98,825	$100,029			$91,210	$84,195	$84,315

Table S6. Nine-month Salaries, 31 Responses of US CS Public With 15 < Tenure-Track Faculty <=25, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	25	28	29	31	23	29	31	31	29	5	4
Indiv	66	88	88	250	65	96	164	200	190	10	12
10	$128,785	$137,241	$132,866	$134,942	$105,735	$104,697	$113,179	$94,675	$64,487		
25	$149,871	$143,095	$138,492	$149,482	$109,829	$117,134	$115,835	$101,804	$70,600		
50	$170,482	$166,190	$151,074	$165,324	$122,440	$129,660	$126,271	$107,000	$80,690	$106,066	$56,062
75	$195,678	$200,525	$161,894	$176,709	$133,308	$135,612	$133,736	$117,923	$86,498		
90	$257,511	$209,110	$176,922	$187,970	$142,481	$142,644	$139,565	$122,829	$93,948		

Table S6a. Nine-month Salaries, 31 Responses of US CS Public With 15 < Tenure-Track Faculty <=25, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	8	8	12	12	16	9	9	10	13	21
Indiv	11	16	18	20	69	19	12	27	50	121
10			$75,964	$75,500	$78,369			$57,231	$57,025	$58,786
25	$87,310	$86,501	$81,635	$81,200	$84,127	$65,370	$68,503	$62,157	$65,616	$65,768
50	$94,461	$101,153	$86,804	$83,000	$91,338	$77,750	$76,000	$70,430	$73,500	$76,000
75	$99,385	$108,426	$93,943	$91,074	$96,664	$84,434	$81,300	$89,434	$78,416	$80,947
90			$106,897	$99,765	$99,229			$95,009	$83,545	$85,294

Table S7. Nine-month Salaries, 22 Responses of US CS Public With 20 < Tenure-Track Faculty <=35, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	20	21	20	21	18	21	21	22	20	6	5
Indiv	67	60	74	214	73	87	166	186	159	10	13
10	$145,206	$140,185	$143,446	$149,475	$105,533	$103,484	$118,219	$101,296	$70,157		
25	$167,753	$147,958	$147,231	$154,297	$115,674	$121,721	$120,929	$105,018	$76,511		
50	$186,653	$158,135	$159,674	$168,291	$125,744	$129,660	$126,698	$110,470	$81,278	$96,993	$60,185
75	$197,834	$169,500	$178,284	$188,715	$130,690	$138,566	$134,055	$121,669	$99,457		
90	$262,890	$234,449	$191,057	$195,605	$141,216	$139,565	$139,012	$122,809	$107,883		

Table S7a. Nine-month Salaries, 22 Responses of US CS Public With 20 < Tenure-Track Faculty <=35, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	10	8	10	12	15	4	4	5	5	10
Indiv	30	23	20	28	117	6	4	13	13	41
10	$78,972		$71,200	$71,514	$75,389					$63,919
25	$89,764	$80,523	$74,849	$74,870	$78,419					$78,570
50	$91,917	$106,234	$84,872	$87,789	$85,273	$68,037	$76,130	$84,900	$80,000	$79,746
75	$106,902	$110,913	$99,511	$95,861	$103,018					$88,962
90	$111,843		$107,512	$102,493	$106,090					$106,060

Table S8. Nine-month Salaries, 45 Responses of US CS Public With Tenure-Track Faculty >30, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	41	42	42	44	33	42	43	45	41	22	24
Indiv	387	289	295	1,012	139	344	519	654	731	95	145
10	$172,297	$159,023	$154,871	$164,623	$113,177	$120,443	$121,855	$108,756	$81,303	$2,400	$13,455
25	$183,359	$171,918	$172,945	$178,004	$118,556	$132,051	$131,011	$115,702	$90,715	$74,409	$49,848
50	$198,342	$198,887	$184,427	$198,701	$136,898	$144,220	$142,589	$125,303	$103,104	$90,317	$59,472
75	$231,422	$212,151	$194,521	$213,724	$149,125	$154,914	$155,685	$132,811	$110,833	$114,200	$65,458
90	$245,287	$227,052	$225,149	$221,829	$160,563	$164,506	$163,991	$140,141	$128,312	$141,693	$71,752

Table S8a. Nine-month Salaries, 45 Responses of US CS Public With Tenure-Track Faculty >30, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	23	25	27	27	34	15	11	17	16	26
Indiv	96	68	103	89	452	43	25	61	82	296
10	$93,615	$80,727	$83,038	$80,588	$90,752	$65,897	$0	$38,249	$32,810	$67,475
25	$104,719	$98,521	$94,945	$86,178	$101,199	$83,261	$73,828	$69,759	$73,795	$79,551
50	$118,146	$112,849	$103,621	$95,171	$107,841	$91,914	$90,584	$90,336	$78,546	$91,499
75	$144,235	$122,667	$113,836	$107,838	$125,889	$110,474	$99,864	$99,015	$83,918	$99,454
90	$171,040	$152,574	$134,233	$126,980	$150,114	$138,853	$101,562	$116,215	$102,019	$118,830

Table S9. Nine-month Salaries, 11 Responses of US CS Private With <=20 Tenure-Track Faculty, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	9	7	8	11	7	10	11	11	10	3	3
Indiv	31	18	19	68	11	39	50	46	57		
10				$149,630		$119,196	$130,000	$107,634	$73,281		
25	$162,908	$138,040	$169,080	$158,655	$123,743	$135,233	$132,536	$115,427	$90,812		
50	$202,997	$152,500	$182,370	$177,653	$130,000	$143,287	$135,615	$121,002	$98,390		
75	$252,580	$205,853	$210,725	$209,142	$133,825	$154,488	$153,975	$126,700	$110,134		
90				$217,341		$159,763	$158,110	$137,000	$122,106		

Table S9a. Nine-month Salaries, 11 Responses of US CS Private With <=20 Tenure-Track Faculty, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	7	4	6	8	10	0	1	1	2	3
Indiv	12	7	14	12	50					
10					$89,602					
25	$96,142			$85,814	$93,133					
50	$104,813	$110,990	$93,420	$95,250	$98,389					
75	$119,733			$101,062	$110,134					
90					$122,106					

Table S10. Nine-month Salaries, 15 Responses of US CS Private With 15 < Tenure-Track Faculty <=30, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	14	14	12	15	12	15	15	15	15	3	6
Indiv	60	59	41	160	24	68	92	98	128		49
10	$168,490	$150,631	$137,896	$150,902	$123,886	$127,348	$131,312	$114,124	$88,132		
25	$183,229	$163,947	$170,429	$169,602	$127,124	$134,324	$134,028	$117,462	$90,007		
50	$217,341	$200,881	$179,367	$202,959	$132,349	$150,800	$143,941	$126,205	$97,040		$74,178
75	$256,674	$210,749	$201,757	$216,819	$145,937	$158,162	$155,438	$132,558	$117,880		
90	$283,001	$237,012	$267,766	$232,132	$158,585	$171,812	$167,664	$137,975	$132,898		

Table S10a. Nine-month Salaries, 15 Responses of US CS Private With 15 < Tenure-Track Faculty <=30, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	10	10	10	10	14	1	4	3	6	8
Indiv	20	18	20	26	91		7		17	37
10	$93,010	$89,798	$84,543	$87,548	$89,187					
25	$96,537	$95,876	$92,113	$97,588	$94,489					$67,159
50	$100,788	$106,442	$98,895	$104,752	$111,357		$80,950		$80,764	$84,974
75	$134,520	$126,785	$115,193	$113,605	$126,636					$92,820
90	$147,239	$128,849	$132,410	$123,955	$133,996					

Table S11. Nine-month Salaries, 28 Responses of US CS Private With Tenure-Track Faculty >20, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	27	27	26	28	20	28	28	28	27	8	15
Indiv	222	178	198	601	84	198	285	377	391	70	227
10	$169,585	$164,694	$157,633	$164,216	$123,532	$124,022	$127,403	$115,656	$90,050		$49,687
25	$188,336	$187,946	$164,134	$193,974	$127,868	$146,875	$141,491	$126,233	$99,669	$98,881	$66,278
50	$231,685	$202,927	$179,632	$210,209	$144,345	$155,267	$152,741	$132,781	$118,075	$105,767	$71,467
75	$261,038	$225,259	$208,259	$231,718	$149,840	$169,526	$166,089	$143,427	$134,583	$125,958	$75,183
90	$283,784	$259,922	$251,104	$266,980	$166,465	$180,938	$173,857	$150,238	$138,472		$76,721

Table S11a. Nine-month Salaries, 28 Responses of US CS Private With Tenure-Track Faculty >20, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	13	15	16	14	23	5	6	8	11	15
Indiv	43	40	48	91	276	10	8	18	45	115
10	$93,158	$87,282	$88,624	$99,145	$95,275				$72,778	$73,923
25	$96,730	$93,632	$102,542	$108,893	$110,882			$96,676	$80,781	$83,291
50	$130,500	$115,787	$112,209	$118,623	$127,186	$130,500	$111,653	$101,481	$101,076	$93,781
75	$146,346	$131,582	$124,371	$126,943	$130,658			$122,389	$131,172	$124,975
90	$153,244	$145,448	$136,820	$139,355	$139,554				$148,500	$143,201

Table S12. Nine-month Salaries, 40 Responses of US CS Public In Large City or Suburbs, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	33	39	35	39	35	37	37	39	37	14	13
Indiv	207	161	178	556	114	231	359	367	458	61	70
10	$148,027	$139,359	$134,136	$138,605	$104,432	$115,569	$114,857	$101,158	$68,596	$7,200	$8,970
25	$163,412	$152,182	$147,406	$156,412	$113,952	$121,568	$119,247	$106,308	$76,443	$65,657	$49,392
50	$183,359	$183,531	$176,833	$179,921	$126,371	$132,904	$129,745	$113,659	$90,085	$98,050	$57,136
75	$202,506	$210,676	$189,741	$199,656	$141,562	$145,157	$144,337	$124,997	$103,104	$126,053	$61,000
90	$234,593	$228,582	$217,538	$216,303	$149,216	$154,053	$152,065	$130,595	$108,491	$159,274	$67,786

Table S12a Nine-month Salaries, 40 Responses of US CS Public In Large City or Suburbs, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	20	19	22	24	30	11	9	13	13	23
Indiv	56	42	65	68	291	36	19	49	62	184
10	$79,012	$81,006	$72,258	$68,826	$74,580	$68,206		$60,197	$71,156	$60,571
25	$101,638	$91,515	$80,177	$82,283	$82,313	$84,195	$66,875	$65,236	$76,500	$68,244
50	$118,086	$103,950	$92,522	$90,922	$94,259	$98,967	$90,584	$90,633	$77,500	$79,722
75	$133,034	$110,010	$105,136	$101,283	$106,180	$119,919	$99,330	$99,000	$84,734	$89,195
90	$155,122	$117,606	$113,847	$110,248	$123,175	$142,703		$100,337	$98,331	$99,355

Table S13. Nine-month Salaries, 25 Responses of US CS Public In Midsize City or Suburbs, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	22	23	24	25	15	24	25	25	24	6	7
Indiv	143	146	124	421	55	150	208	273	247	16	40
10	$168,295	$142,470	$141,338	$153,609	$108,300	$117,698	$117,754	$102,406	$68,325		
25	$173,352	$158,505	$152,404	$162,924	$115,756	$124,247	$120,567	$107,852	$80,348		$60,608
50	$198,522	$178,056	$166,119	$178,609	$122,440	$137,756	$132,381	$117,132	$90,728	$90,435	$63,000
75	$247,376	$206,902	$189,196	$206,609	$139,056	$144,261	$144,204	$125,303	$100,421		$65,258
90	$263,770	$217,328	$220,572	$222,492	$148,539	$161,856	$161,329	$135,295	$114,605		

Table S13a. Nine-month Salaries, 25 Responses of US CS Public In Midsize City or Suburbs, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	12	12	12	14	16	8	7	8	11	16
Indiv	46	36	39	39	160	18	8	23	28	87
10	$81,014	$61,337	$75,772	$83,035	$83,253					$65,078
25	$93,813	$90,889	$91,582	$85,675	$91,000	$68,607	$38,000	$43,500	$57,766	$69,788
50	$101,225	$111,519	$100,960	$97,500	$99,229	$81,092	$78,429	$64,090	$76,000	$80,655
75	$122,427	$125,394	$113,228	$103,065	$109,205	$93,618	$92,152	$93,693	$80,221	$92,605
90	$169,262	$152,761	$151,245	$120,425	$134,549					$101,700

Table S14. Nine-month Salaries, 38 Responses of US CS Public in Small City, Town, or Rural, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	28	29	35	38	27	33	38	38	36	9	10
Indiv	147	133	149	464	100	132	256	378	390	30	51
10	$118,004	$135,582	$127,607	$128,309	$105,768	$104,205	$104,947	$95,245	$63,590		$37,800
25	$149,128	$144,000	$142,011	$144,728	$110,642	$114,121	$114,144	$98,683	$72,008	$76,756	$47,959
50	$183,433	$166,352	$157,260	$165,405	$126,563	$126,445	$130,066	$105,117	$83,076	$82,620	$59,092
75	$212,479	$194,009	$182,087	$189,635	$142,815	$142,957	$138,857	$122,834	$99,086	$125,053	$67,619
90	$240,582	$207,516	$192,693	$206,377	$149,717	$152,829	$156,140	$130,484	$112,259		$71,494

Table S14a. Nine-month Salaries, 38 Responses of US CS Public in Small City, Town, or Rural, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	9	8	17	16	25	10	10	16	14	25
Indiv	19	24	47	39	178	17	22	29	60	211
10			$73,909	$73,093	$76,389	$57,736	$61,629	$50,932	$40,366	$58,319
25	$89,380	$99,218	$82,846	$77,138	$83,332	$65,389	$66,300	$61,982	$58,126	$64,165
50	$93,324	$110,397	$95,490	$82,292	$94,094	$78,001	$71,167	$69,692	$71,266	$79,051
75	$100,148	$116,197	$108,188	$95,861	$112,000	$90,636	$82,765	$83,918	$79,679	$90,499
90			$111,378	$111,558	$127,877	$119,510	$97,092	$87,882	$82,848	$95,502

Table S15. Nine-month Salaries, 27 Responses of US CS Private in Large City or Suburbs, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	24	22	24	27	21	26	27	27	26	9	13
Indiv	154	122	164	443	81	168	250	315	366	80	186
10	$146,288	$153,491	$157,848	$154,816	$120,956	$130,959	$128,431	$111,265	$88,878		$52,475
25	$178,984	$183,092	$164,652	$178,513	$126,032	$138,068	$132,536	$124,222	$92,796	$100,000	$68,082
50	$212,729	$202,101	$182,236	$203,125	$139,911	$152,709	$152,715	$131,542	$111,399	$108,745	$75,000
75	$242,878	$210,749	$215,036	$216,819	$149,049	$168,420	$165,236	$138,244	$127,848	$139,033	$76,888
90	$262,881	$244,560	$255,770	$232,885	$166,320	$180,050	$172,716	$148,532	$136,840		$87,133

Table S15a. Nine-month Salaries, 27 Responses of US CS Private in Large City or Suburbs, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 v	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	15	17	17	18	24	3	5	6	9	13
Indiv	46	43	52	86	273		7	15	33	93
10	$94,651	$88,423	$89,259	$85,235	$91,587					$47,996
25	$96,618	$97,115	$93,050	$95,125	$98,363				$72,000	$76,328
50	$125,000	$115,787	$113,298	$112,951	$116,384		$83,200	$99,960	$92,500	$92,500
75	$140,331	$128,482	$132,346	$122,493	$129,432				$107,363	$100,252
90	$152,451	$142,965	$136,064	$137,561	$137,175					$127,150

Table S16. Nine-month Salaries, 12 Responses of US CS Private in Other than Large City, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	12	12	10	12	6	12	12	12	11	2	5
Indiv	99	74	53	226	14	69	85	108	82		48
10	$174,201	$130,146	$121,405	$158,582		$134,996	$132,343	$114,656	$91,248		
25	$190,240	$178,467	$151,043	$180,943		$152,010	$135,461	$118,084	$101,552		
50	$255,879	$206,891	$179,767	$219,702	$133,825	$156,938	$151,394	$132,596	$112,686		$71,000
75	$283,564	$233,978	$195,628	$237,330		$163,323	$159,998	$135,746	$132,272		
90	$286,607	$251,263	$228,618	$269,123		$176,961	$169,383	$145,189	$150,255		

Table S16a. Nine-month Salaries, 12 Responses of US CS Private in Other than Large City, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	5	2	5	4	9	2	2	3	4	5
Indiv	9		10	17	53				15	29
10										
25					$106,064					
50	$104,813		$101,419	$109,814	$111,490				$118,625	$91,248
75					$127,186					
90										

Table S17. Nine-month Salaries, 7 Responses of 34 US Computer Engineering Departments, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	6	6	6	7	5	6	7	7	6	2	1
Indiv	39	36	56	163	13	30	48	57	47		
10											
25				$173,603			$119,770	$115,223			
50	$183,340	$169,508	$156,860	$192,272	$126,473	$129,607	$127,733	$117,472	$91,608		
75				$193,260			$142,850	$130,795			
90											

Table S17a. Nine-month Salaries, 7 Responses of 34 US Computer Engineering Departments, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	2	2	1	1	6	1	1	0	1	4
Indiv					32					15
10										
25										
50					$101,074					$91,257
75										
90										

Table S18. Nine-month Salaries, 15 Responses of 19 US Information Departments, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	10	14	15	15	13	15	15	15	13	5	5
Indiv	47	54	90	191	41	114	155	178	236	18	33
10	$156,469	$158,085	$131,151	$140,354	$110,784	$107,746	$110,413	$92,343	$75,339		
25	$185,109	$168,371	$150,599	$164,565	$113,778	$118,714	$118,521	$104,051	$87,652		
50	$199,741	$179,032	$168,053	$178,696	$124,207	$127,444	$124,239	$113,685	$98,105	$98,325	$62,556
75	$207,801	$196,672	$192,695	$189,685	$143,800	$145,408	$147,185	$126,385	$104,232		
90	$222,920	$207,435	$204,100	$201,811	$168,973	$154,991	$159,772	$129,189	$111,521		

Table S18a. Nine-month Salaries, 15 Responses of 19 US Information Departments, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	7	3	7	7	12	1	1	2	4	7
Indiv	21		30	33	180				8	56
10					$78,034					
25	$88,418		$80,980	$78,455	$90,804					$72,332
50	$93,621		$93,606	$83,500	$99,018				$72,889	$81,822
75	$105,580		$97,935	$95,614	$106,498					$104,094
90					$112,286					

Table S19. Twelve-month Salaries, 14 Responses of 35 Canadian Departments, Percentiles from Department Averages

	Full Professor				Associate			Assistant	Non-Tenure Track		
	In rank 16+ yrs	In rank 8-15 yrs	In rank 0-7 years	All years in rank	In rank 8+ years	In rank 0-7 years	All years in rank		Teach	Research	Postdoc
Depts	12	12	12	13	12	13	13	13	11	2	6
Indiv	100	77	55	232	42	72	114	127	79		100
10	$180,765	$161,831	$132,801	$163,055	$132,992	$116,954	$124,555	$103,234	$89,121		
25	$195,926	$168,544	$160,778	$172,151	$140,678	$135,246	$137,661	$112,089	$95,046		
50	$200,795	$184,544	$179,370	$188,309	$163,170	$137,579	$152,724	$118,126	$104,363		$60,447
75	$207,145	$211,446	$201,538	$204,712	$185,120	$170,271	$171,594	$153,208	$121,459		
90	$239,317	$246,717	$215,389	$236,497	$199,410	$181,948	$182,156	$157,360	$135,733		

Table S19a. Twelve-month Salaries, 14 Responses of 35 Canadian Departments, Percentiles from Department Averages

	Teaching Professor					Other Instructor				
Non-Tenure Track	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years	Teaching 9+ years	Teaching 6-8 years	Teaching 3-5 years	Teaching <3 years	All years
Depts	6	2	6	6	9	1	0	1	3	5
Indiv	27		10	11	54					25
10										
25					$100,763					
50	$135,268		$114,914	$100,884	$117,313					$100,225
75					$136,854					
90										

Table S20. Nine-month Salaries for New PhDs (Twelve-month for Canadian)

	US (CS, CE, and Info Combined)						Canadian					
	Tenure-Track	Teaching Prof	Other Instructor	Non-ten Teach All	Non-ten Research	Postdoc	Tenure-Track	Teaching Prof	Other Instructor	Non-ten Teach All	Non-ten Research	Postdoc
Depts	73	27	17	41	7	31	4	0	3	3	0	3
Indiv	272	49	29	78	16	127	17					
10	$101,250	$71,334	$36,000	$55,375		$47,881						
25	$115,203	$79,307	$68,500	$70,417	$72,500	$51,924						
50	$128,000	$89,000	$74,625	$86,490	$75,000	$61,845	$116,986					
75	$146,895	$100,000	$96,000	$96,250	$98,744	$70,000						
90	$160,862	$108,955	$127,750	$108,955		$72,650						

Table S21. Change in Salary Median for Departments that Reported in Both 2021 and 2022

	US CS	US CE	US I	Canadian
Departments	123	2	14	6
Full Profs	4.80%		2.10%	10.20%
Assoc. Profs.	5.80%		5.80%	6.30%
Asst. Profs.	6.80%		4.80%	5.10%
Teaching Prof	10.10%		-3.00%	9.90%
Other Instructors	6.70%		0.20%	-0.30%
Research faculty	16.30%		37.80%	10.00%
Post doctorates	2.60%		-0.30%	7.60%

Table S22. Median value for an adjunct teaching a single course.

Group	Median PhD teaching undergrad	N PhD teaching undergrad	Median PhD teaching grad	N PhD teaching grad	Median MS teaching undergrad	N MS teaching undergrad	Median MS teaching grad	N MS teaching grad
US CS	$7,500	98	$7,500	91	$7,388	88	$7,125	75
US CE	--	3	--	3	--	2	--	2
US IN	$6,500	13	$6,250	12	$6,348	10	$6,348	8
Canadian	$10,000	6	$10,000	5	$9,250	6	$9,500	5
US CS Public	$7,125	71	$7,000	65	$7,000	$63	$7,000	53
US CS Private	$10,000	27	$9,602	26	$8,417	$25	$7,958	22
Pub large city	$7,000	33	$7,000	31	$7,000	$29	$7,000	25
Pub mid city	$6,000	15	$6,500	16	$6,500	$14	$6,500	14
Pub small/rurl	$7,732	23	$8,000	18	$7,616	20	$7,375	14
Priv large city	$8,782	18	$9,426	19	$8,138	19	$7,500	17
Private other	$12,000	9	$12,000	7	$12,500	6	$10,000	5

Table S23. Adjunct rate adjustments.

Group	% Adj Time at Dept	% Adj Expertise
US CS	38%	50%
US CE	50%	50%
US IN	54%	54%
CAN	33%	17%
US CS Pub	35%	49%
US CS Priv	43%	53%

professors in the year-to-year comparison. Similarly, we do not disaggregate teaching faculty by years in rank in the year-to-year comparison, though we do distinguish Teaching Professors from Other Instructors.

Table S21 shows, by type of faculty and type of department, the change in the median of the average salaries from departments that reported both years. The number of departments that reported data in both years is indicated in parenthesis at the top of each column. Using the cell showing full professors at U.S. CS departments as an example, the table indicates that the median of the average salaries for full professors at the 123 departments that reported both years was 4.8 per cent higher in 2022 than

was the median of the average full professor salaries in 2021 from these same 123 departments. The median of the average salaries for associate professors in these departments rose by 5.8 percent in 2022, and that for assistant professors rose by 6.8 percent.

When interpreting these changes, it is important to remember the effect that promotions have on the departmental data from one year to the next, since a promotion causes an individual faculty member to move from one rank to another. Thus, a department with a small number of faculty members at a particular rank can have its average salary in that rank change appreciably (in either direction) by a single promotion to or from that rank. Departures via resignation or retirement also impact these figures, particularly in the non-tenure-track categories. Because of the small number of Canadian and Information departments for which we have both last year's and this year's data, the values in those columns are considerably more volatile; this is in evidence in several of the entries in Table S21. There were only two CE departments who reported salaries both years, so we do not show any year-to-year comparison for CE departments.

For new Ph.D.s in tenure-track positions at U.S. computer science, computer engineering, and I-school departments the median of the average 9-month salaries was $128,000, an increase of 7.9 per cent over last year (Table S20). The median of the average 12-month salaries at Canadian institutions was $116,986 CDN. However, only four institutions reported such data and only two did so last year, so it is not clear how representative this value is across the population of Canadian doctoral-granting institutions, and no comparison is made between 2021 and 2022 for Canadian institutions.

Adjunct salaries again were higher at private institutions than at public institutions, similar to the situation for other faculty salaries. Within public institutions, large and mid-sized cities tended to have lower salaries than smaller cities or rural locations, with mid-sized locales having the lowest median average salary. Also of note is that, at U.S. CS departments, the median of the average salaries among adjuncts with master's degrees was higher for teaching an undergraduate course than for teaching a graduate course. However, both median average salaries for those with master's degrees were below the

Figure S1. US CS Department Average Salary, Full Professor in Rank 16+ Years

CRA Taulbee Survey 2022

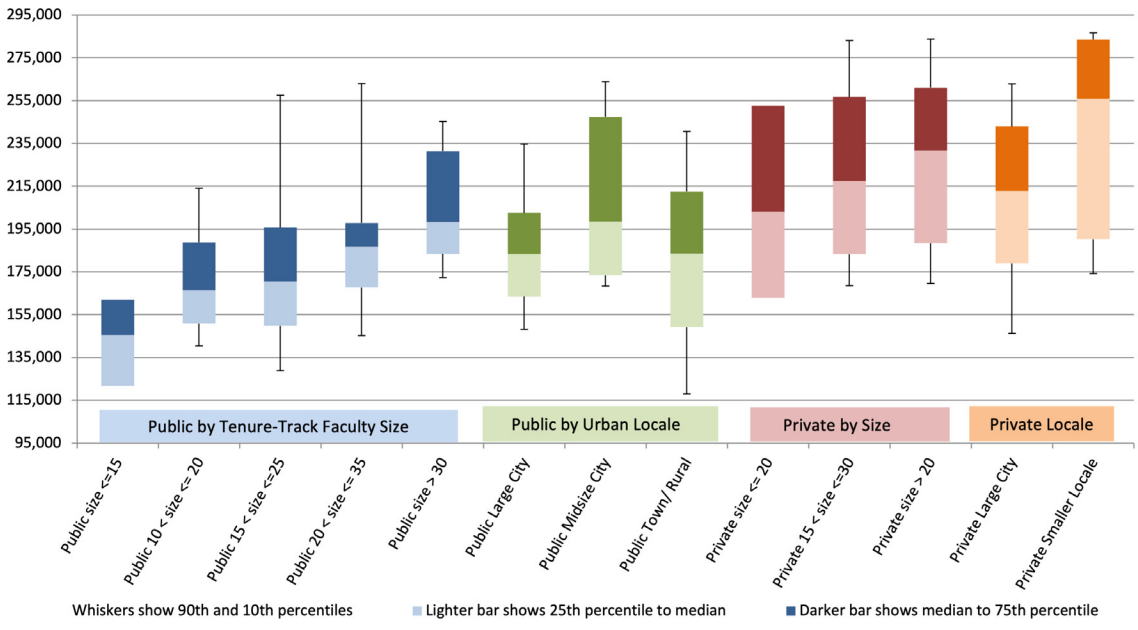


Figure S2. US CS Department Average Salary, Full Professor in Rank 8-15 Years

CRA Taulbee Survey 2022

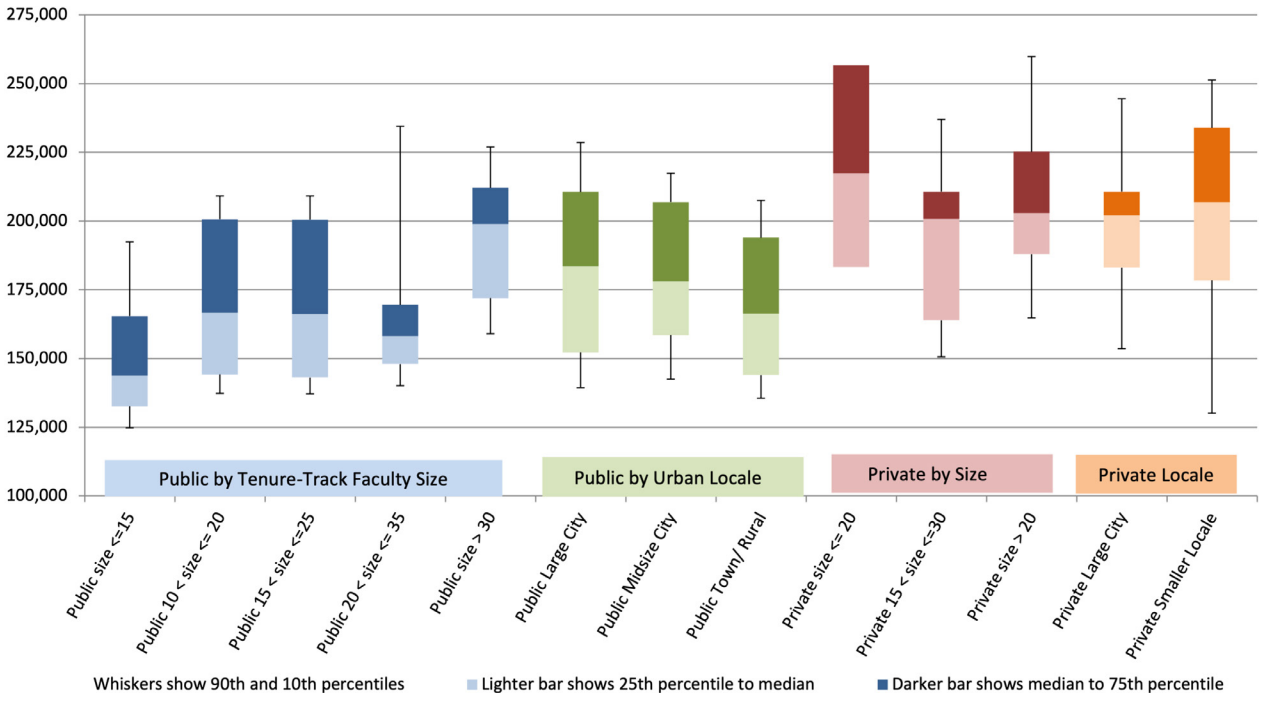


Figure S3. US CS Department Average Salary, Full Professor in Rank 0-7 Years

CRA Taulbee Survey 2022

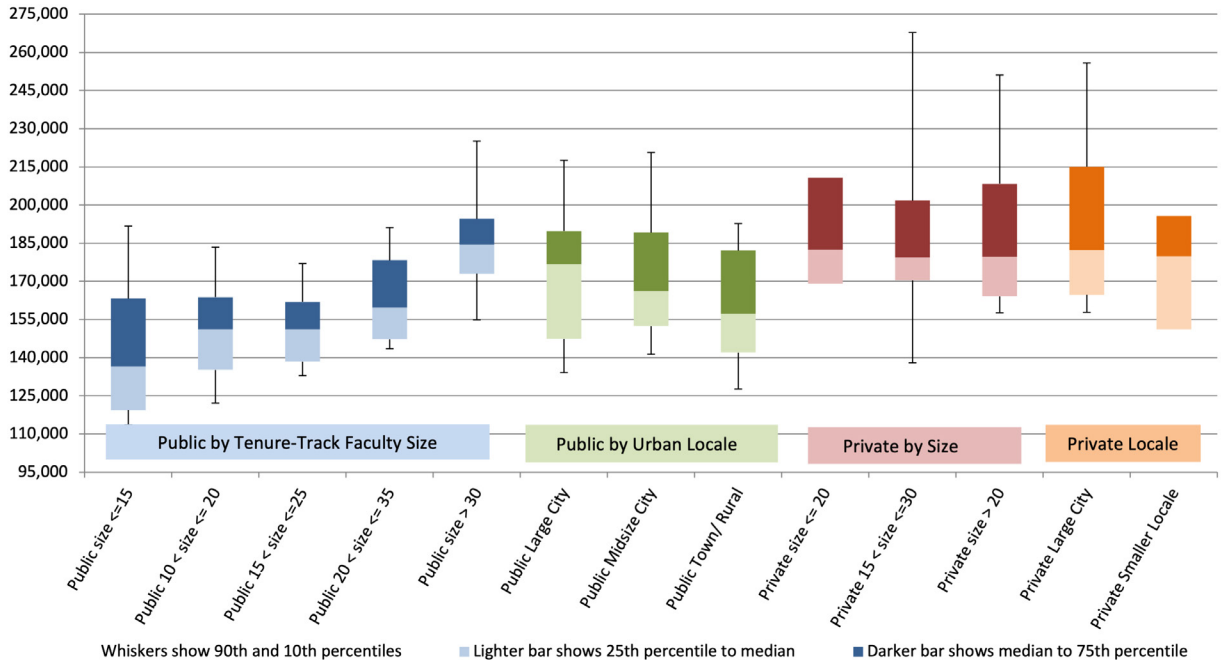


Figure S4. US CS Department Average Salary, Associate Professor in Rank 8+ Years

CRA Taulbee Survey 2022

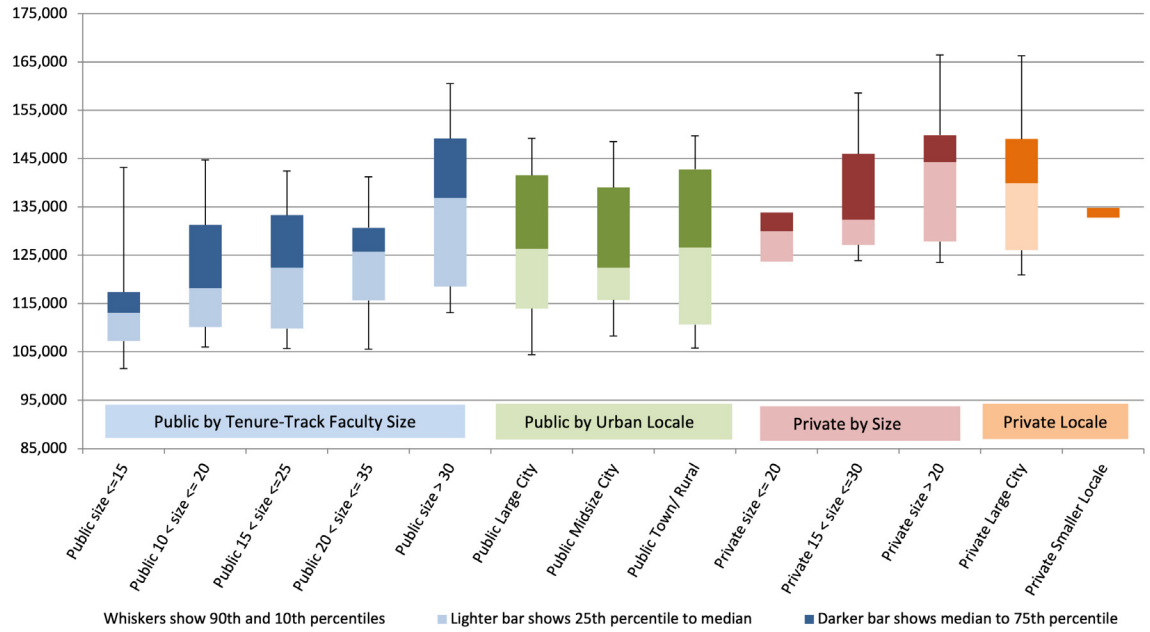


Figure S5. US CS Department Average Salary, Associate Professor in Rank 0-7 Years

CRA Taulbee Survey 2022

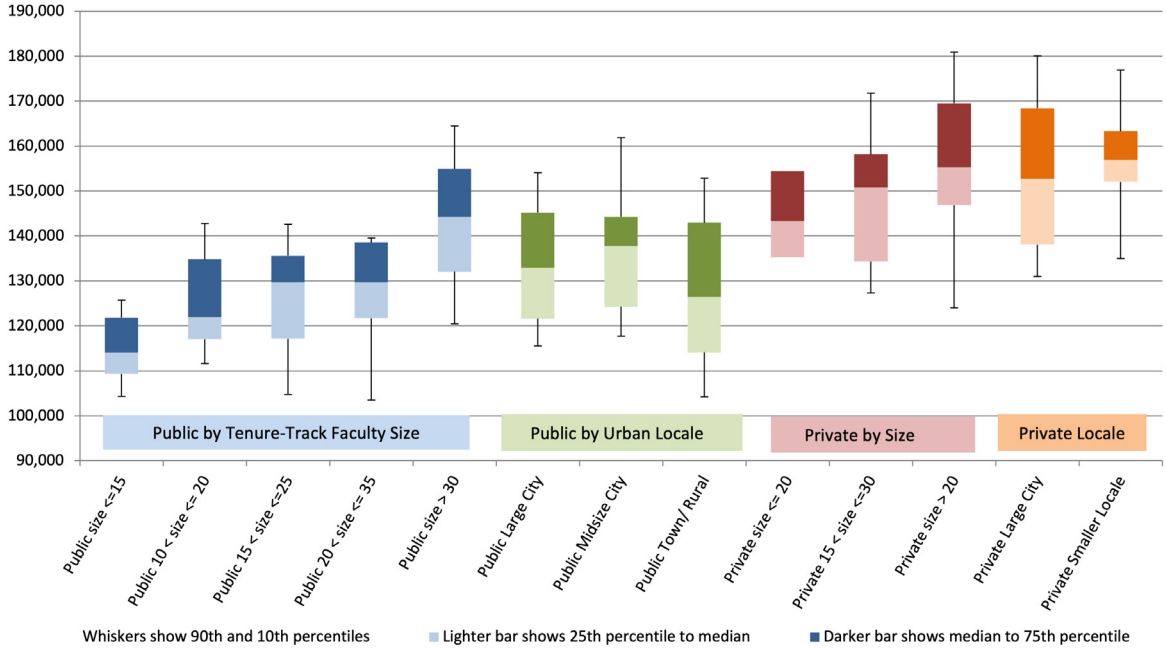


Figure S6. US CS Department Average Salary, Assistant Professor

CRA Taulbee Survey 2022

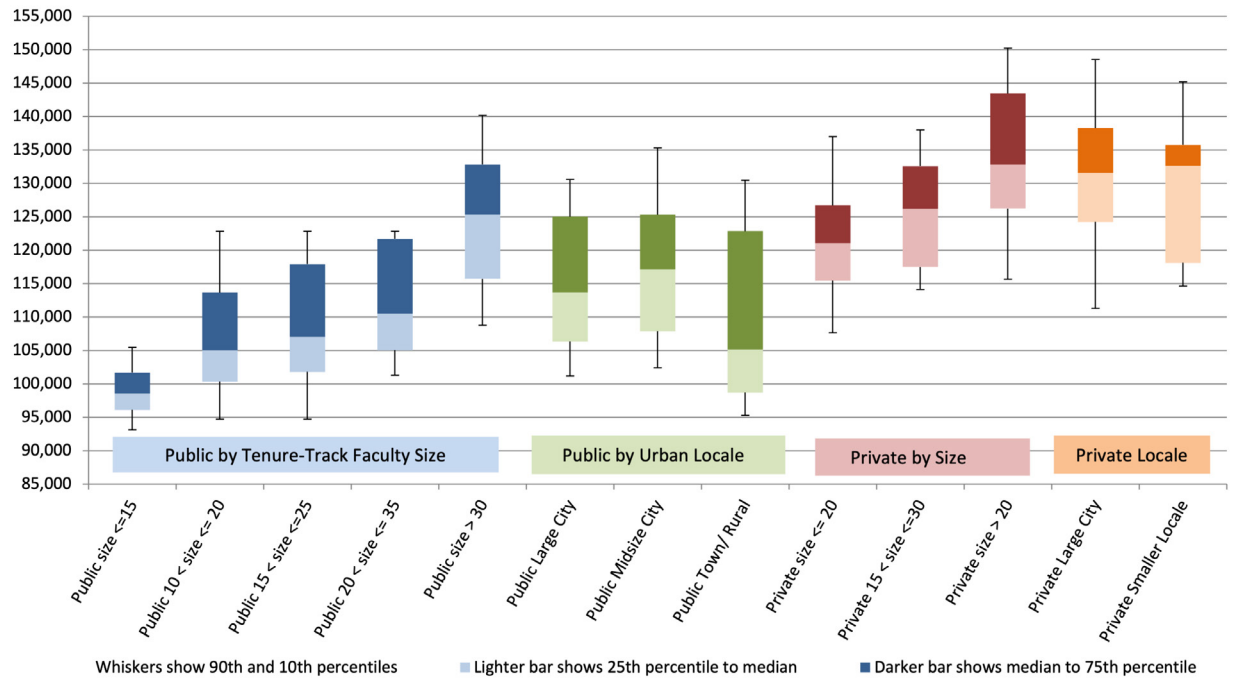


Figure S7. US CS Department Average Salary, Non-Tenure Track Teaching Faculty

CRA Taulbee Survey 2022

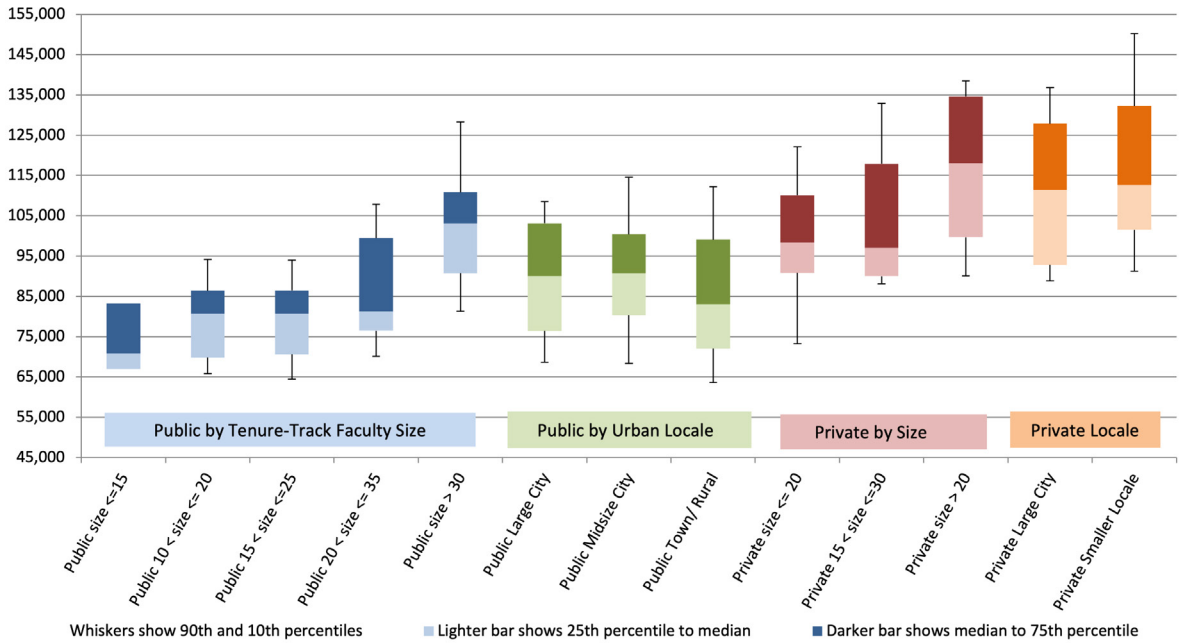


Figure S8. US CS Department Average Salary, Non-Tenure Track Research Faculty

CRA Taulbee Survey 2022

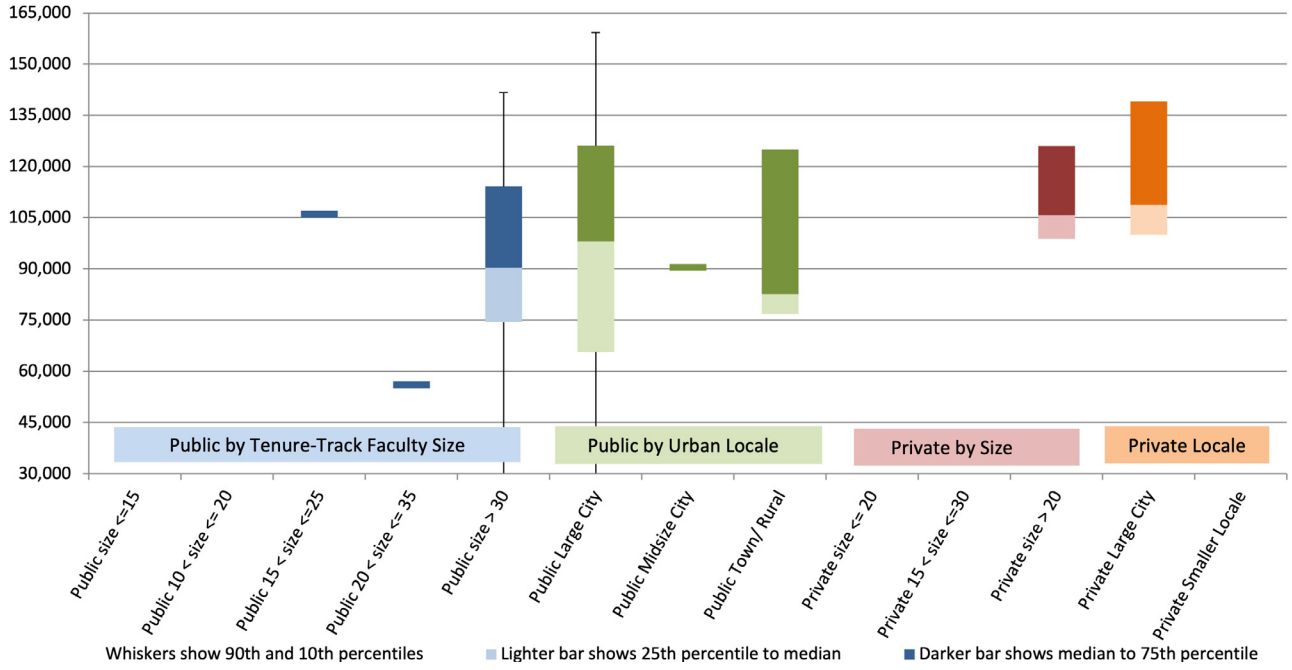
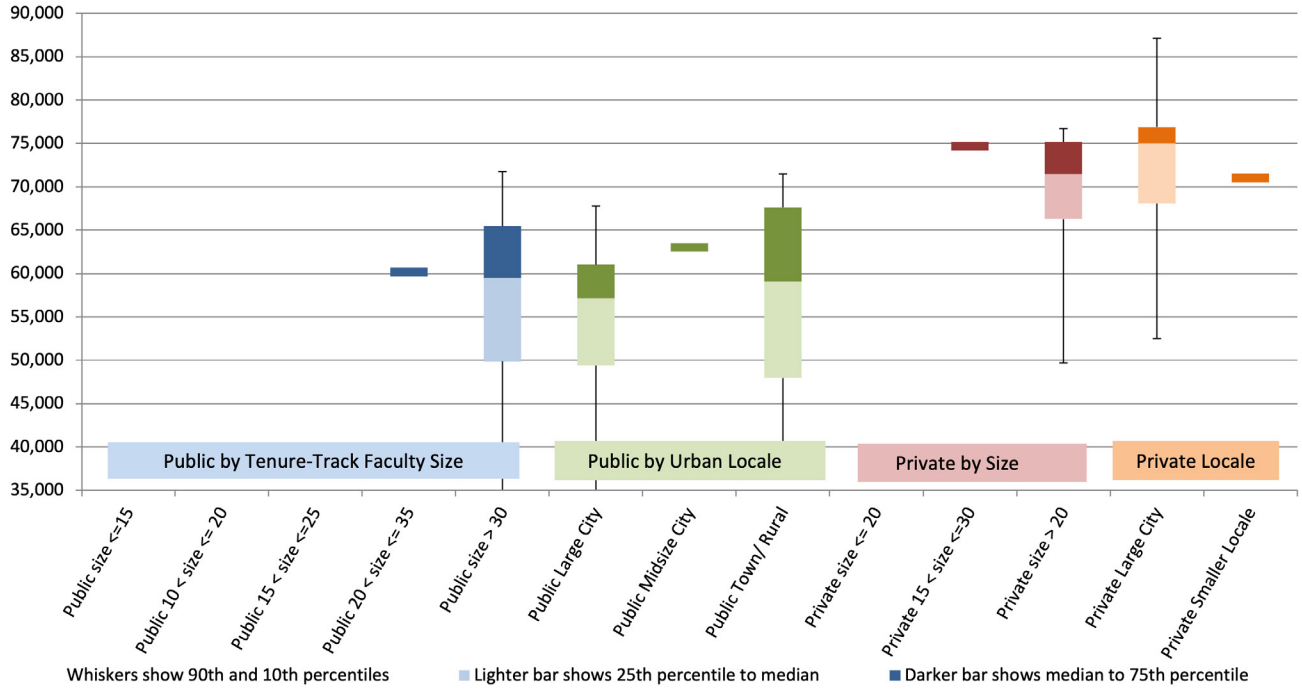


Figure S9. US CS Department Average Salary, Postdoctorates

CRA Taulbee Survey 2022



respective median averages for adjuncts with Ph.D.s. This also was the case last year (Table S22). These results are mainly due to the structure of these salaries at private institutions.

At U.S. CS departments, expertise is more likely than longevity in the department to impact adjunct faculty salary. However, this is not the case at U.S. I departments this year, while it was the case last year. In U.S. CS departments, both longevity and expertise are more likely to impact salaries at private institutions than at public institutions. This also held true last year (Table S23).

Concluding Observations

Productivity in the doctoral-granting departments that reported to the Taulbee Survey is strong. This year's results include record-setting degree production at both the doctoral and bachelor's levels. Enrollment increases were present at all degree levels, and the enrollment at pre-pandemic levels of new Non-resident Alien graduate students, who comprise most of our graduate enrollments, continued this year. Average number of bachelor's majors in U.S. CS departments has risen for 15 consecutive years, even as these departments produce record numbers of graduates.

Teaching faculty growth kept pace with enrollment growth again this year, which is helpful in trying to balance undergraduate teaching supply with course demand. However, there still is a wide gap between growth in demand and growth in faculty supply since the enrollment surge began. With industry taking an even greater slice of the doctoral production pie this year continued challenges will exist for academic departments in meeting student demand for computing education.

Participating CS, CE, I and Canadian Departments

(Departments marked with * have participated in all 5 of the most recent Taulbee surveys)

U.S. CS Public (107):

Arizona State*, Auburn*, Augusta, Binghamton, Boise State, Clemson*, College of William & Mary*, Colorado School of Mines*, Colorado State*, Florida International*, Florida State, George Mason*, Georgia Tech*, Georgia State*, Indiana University Purdue University Indianapolis*, Indiana*, Iowa State*, Kansas State*, Kent State*, Michigan State*, Michigan Technological University*, Mississippi State, Missouri University of Science and Technology*, Montana State*, Naval Postgraduate School*, New Jersey Institute of Technology*, New Mexico State*, New Mexico Tech, North Carolina State*, North Dakota State*, Ohio State*, Old Dominion*, Oregon State*, Portland State*, Purdue*, Rutgers*, Stony Brook (SUNY)*, Texas A&M*, Texas State, Texas Tech*, University at Buffalo*, Universities of: Alabama (Tuscaloosa), Arizona*, Arkansas*, Arkansas at Little Rock*, California (Berkeley*, Davis*, Irvine*, Los Angeles*, Merced, Riverside*, San Diego*, Santa Barbara*, and Santa Cruz*), Central Florida, Cincinnati, Colorado (Boulder)*, Connecticut*, Delaware*, Florida*, Houston*, Illinois (Chicago* and Urbana-Champaign*), Iowa*, Kentucky*, Louisiana at Lafayette*, Maryland (College Park* and Baltimore County*), Massachusetts (Amherst* and Lowell), Memphis*, Michigan, Minnesota*, Mississippi, Missouri (Columbia), Nebraska (Omaha and Lincoln*), Nevada (Las Vegas* and Reno*), New Hampshire*, New Mexico*, North Carolina (Chapel Hill* and Charlotte*), Oklahoma*, Oregon*, Pittsburgh*, Rhode Island*, South Carolina*, South Florida*, Southern Mississippi, Tennessee (Knoxville)*, Texas (Arlington*, Austin*, Dallas*, and El Paso*), Utah*, Vermont*, Virginia*, Washington*, Wisconsin (Madison* and Milwaukee), Utah State, Virginia Commonwealth, Virginia Tech*, Washington State*, and Wright State*.

U.S. CS Private (41):

Boston University*, Brandeis*, Brown*, Carnegie Mellon*, Case Western Reserve*, Columbia*, Cornell*, DePaul*, Drexel*, Duke*, Emory*, Florida Institute of Technology, George Washington*, Harvard*, Illinois Institute of Technology, Johns Hopkins*, Lehigh*, MIT*, New York University*, Northeastern*, Northwestern*, NYU Tandon School*, Pace, Princeton*, Rensselaer*, Rice*, Rochester Institute of Technology*, Stanford*, Stevens Institute of Technology*, Toyota Technological Institute at Chicago*, Tufts*, Tulane, Universities of: Chicago*, Notre Dame*, Pennsylvania*, Rochester*, Southern California*, and Tulsa, Washington in St. Louis*, Worcester Polytechnic Institute*, and Yale*.

U.S. CE (6):

Boston University, Carnegie Mellon, Case Western Reserve, Iowa State, North Carolina State, University of Texas (Austin).

U.S. Information (16):
Cornell*, Drexel*, Indiana*, Penn State*, Syracuse*, Universities of: Arizona, California (Berkeley)*, Cincinnati, Colorado (Boulder)*, Illinois (Urbana-Champaign)*, Maryland (College Park ISchool* and Baltimore County*), Michigan*, North Carolina (Chapel Hill)*, Pittsburgh*, and Washington*.

Canadian (14):
Concordia, Memorial, Queen's, Simon Fraser*, Toronto Metropolitan, Universities of: Alberta, British Columbia, Guelph, Manitoba*, Montreal, Saskatchewan, Toronto*, Victoria, Waterloo*.

[1] The title of the survey honors Orrin E. Taulbee of the University of Pittsburgh, who conducted these surveys for the Computer Science Board until 1984, with retrospective annual data going back to 1970.

[2] Information (I) programs included here are Information Science, Information Systems, Information Technology, Informatics, and related disciplines with a strong computing component. Surveys were sent to CRA members, the CRA Deans group members, and participants in the iSchools Caucus (www.ischools.org) who met the criteria of granting Ph.D.s and being located in North America. Other I programs who meet these criteria and would like to participate in the survey in future years are invited to contact survey@cra.org for inclusion.

[3] Classification of the population of an institution's locale is in accordance with the Carnegie Classification database. Large cities are those with population >= 250,000. Mid-size cities have population between 100,000 and 250,000. Town/rural populations are less than 100,000.

[4] All faculty tables: The survey makes no distinction between faculty specializing in CS vs. CE programs. Every effort is made to minimize the inclusion of faculty in electrical engineering who are not computer engineers.

CRA Update: Keeping you in the know

Each year, the CRA Board launches a number of working groups that focus on timely topics of interest to the computing research community. Sometimes a working group is launched for just a short time (a year or less), while other times a working group meets regularly for much longer. In this month's CRA Update, we provide the current status (written by the chair(s)) of all six of CRA's current working groups. All CRA committees and working groups (and their membership) are available here: https://cra.org/committees/.

CRA's Career Engagement Working Group has been working to determine how CRA can better engage different members of the computing research community. The goal of the working group is to develop a concrete set of new steps that CRA could undertake, which would help ensure all members of the computing research community are better served by CRA's programs and activities.

The committee consists of CRA Board members Lori Pollock (U Delaware), Diana Franklin (U Chicago) and Gillian Hayes (UC Irvine); volunteers Kirk Cameron (VA Tech), Jose Moreira (IBM), Meng Yu (Roosevelt U), ChengXiang Zhai (U Illinois), and is chaired by Tracy Camp (CRA) and Rachel Pottinger (U British Columbia).

The working group has systematically worked through CRA's current activities to consider where other communities could be engaged. The working group then worked through various constituent groups, from high school students to senior researchers to the general public, in order to consider how different group members could be engaged.

A full report will be made to the CRA Board this July, but two example ideas include:

- High school students are getting more interested in research early; how can we help them?
- An advisory board of more junior people to inform the CRA Board what interests them.

If you have ideas that you would like to contribute, please share them on this form.

CRA's Communications Working Group is focused this year on developing a communications plan that aligns with the overall CRA Strategic Plan. For this process, we formulated several question prompts for the CRA Board, facilitated discussions using the prompts at the CRA Board meeting in February, and then summarized the recommendations and comments. These discussions with the CRA Board helped the working group understand CRA communication needs, opportunities, and challenges. The working group includes CRA Board members Lori Pollock (U Delaware) and Gillian Hayes (UC Irvine) along with Peter Harsha and Shar Steed (now departed) from CRA.

The CRA Communications plan describes a number of activities designed to increase awareness of CRA's initiatives and engagement from the computing community. It outlines steps needed to build a stronger communications structure, improve community engagement, and build a culture of communications at CRA. Before expanding communications, we first need to establish overarching communications goals and build the capacity needed to achieve and maintain them. The plan established three primary goals:

1. Develop a culture of valuing communications at CRA;
2. Institutionalize systemic, continuous, and targeted communications; and
3. Enhance value proposition to current and potential member organizations.

CRA's Governance Working Group was charged with reconsidering the CRA Board and Bylaws that govern CRA and provide the framework for the organization's volunteer leadership. The group has approached this work as a twin charge of (a) propose by-laws updates that better reflect modern practice and, more interestingly, (b) take a serious look at the role of the Board, the composition of the Board, election procedures, and more to see how CRA could have a leadership structure that better reflects and includes the full diversity of the North American computing-research community.

CRA Update *(continued)*

How big should the CRA Board be? Should election and appointment procedures change to bring a wider array of institutional and individual perspectives to the Board? Is there another structure where the agenda-setting role of the CRA Board should transition to a larger group? How has the leadership structure not responded to the significant growth of our community and mission? What data would inform our understanding of current shortcomings and what data would indicate a change was successful? These are the big questions we are wrestling with as we aim to make CRA better.

The Governance Working Group comprises Elizabeth Bradley (CU Boulder), Tracy Camp (CRA), Dan Grossman (Chair; UW), Raquel Hill (Spelman), Hridesh Rajan (Iowa State), Penny Rheingans (U Maine), and Chris Ramming (VMWare). It has been meeting every-other-week and aims to produce options for the CRA Board to consider in the coming months.

CRA's Misconduct Issues Working Group is collaborating with CERP and CRA-WP to assess how respected and safe colleagues feel in our technical communities. The goal of the working group is to develop best practices and potential solutions to decrease sexual harassment, bullying, abuse of power imbalances, and other related issues.

The working group includes CRA Board members James Allan (U Massachusetts), Kim Hazelwood (Meta), Erik Russell (CRA), Amanda Stent (Colby College), and Alex Wolf (UC Santa Cruz); volunteer Sarita Schoenebeck (U Michigan); and is chaired by Katie Siek (Indiana U).

The committee worked with CRA's CERP to develop pilot questions that assess how safe one feels; how confident they are to raise concerns and have them addressed; their feelings about intervening if they witness inappropriate behavior; and if they are treated with dignity when interacting with peers. The questions are currently being piloted with Grad Cohort for Women participants and then, based on feedback, will be iterated on before a larger deployment.

CRA's Research Integrity Working Group was formed this year in response to ongoing concerns in the computing research community that the number of violations of research integrity has been increasing and the nature of the most common offenses is changing. The charge to the working group is to enumerate the current threats to research integrity in computing and to make recommendations on best practices to mitigate those threats as well as highlight any areas that require further investigation.

The working group has been meeting every other week for the last several months and has heard from a wide variety of stakeholders, including program chairs of major conferences, the providers of conference management systems, the computing professional societies, university research integrity officers, and funding agencies.

The working group will produce a report this summer. While the group has not yet decided on recommendations, some salient facts have emerged from the meetings so far:

- While traditional problems (such as plagiarism and self-plagiarism) are still present, reviewer collusion rings that seek to undermine the peer review process in CS conferences have become a much bigger issue in recent years.
- The scale of the largest CS conferences, which require tens of thousands of reviews, means that solutions must be at least partially automated - fully manual detection and enforcement isn't realistic.
- Privacy laws are creating siloes where organizations cannot, in most cases, share information about who they have sanctioned for violations of research integrity.

The members of the working group are mostly current CRA Board members but also include representation from the ACM, IEEE and SIAM, the National Science Foundation, industry, and volunteers. If you have comments or suggestions for the working group, please send an email to researchintegrity@cra.org.

CRA's Socially Responsible Computing Working Group was charged with exploring ways that CRA can support the computing community in efforts in this domain. The working group, chaired by Ellen Zegura (GATech) and Ran Libeskind-Hadas (Claremont-McKenna), decided to begin by exploring three areas: (1) ethics curricular, especially at the graduate level, (2) opportunities for computing conferences in advancing scholarship that has direct benefits to society, and (3) the role of computing in climate and sustainability. Notably, these three areas span major activities of the computing community, from research to education to community gatherings. Each of these subgroups is meeting regularly and will contribute to a report that will be submitted to the CRA Board in June 2023 summarizing their recommendations for next steps as well as resources and other organizations and groups that are natural partners for these efforts.

The ethics group comprises Anind Dey (UW), Rachel Bellamy (IBM), and Ellen Zegura (GATech). The computing conferences group comprises Kim Hazelwood (Meta), Amanda Stent (Colby College), Dan Lopresti (Lehigh), and Lorrie Cranor (CMU). The Computing, Climate, and Sustainability comprises Stephanie Forrest (ASU), Eve Schooler (Intel), Shashi Shekhar (U Minnesota), and Ran Libeskind-Hadas (Claremont-McKenna). Ann Schwartz Drobnis (CRA) is supporting these efforts as well.

Call for Nominations! -- 2023 CRA-CCC Leadership in Science Policy Institute

CCC
Computing Community Consortium
Catalyst

CRA
Computing Research Association

As part of its mission to develop the next generation of leaders in the computing research community, the Computing Research Association's Computing Community Consortium (CCC) announces the sixth offering of the CCC Leadership in Science Policy Institute (LiSPI). The workshop is intended to educate computing researchers on how science policy in the U.S. is formulated and how our government works. We seek nominations for participants.

LiSPI will be centered around a two-day workshop to be held November 16–17 2023, in Washington, DC. (Full details of LiSPI are available here.)

LiSPI will feature presentations and discussions with science policy experts, current and former Congressional staff, and relevant agency and Administration personnel about mechanics of the legislative process, interacting with agencies, advisory committees, and the federal case for computing. A tentative agenda is viewable from the link above. LiSPI participants are expected to:

- Complete a reading assignment and a short written homework prior to attending the workshop, so that time spent at the workshop can focus on more advanced content,
- Attend the November 16–17 workshop, which includes breakfast both days, lunch, and a reception with the speakers and invited guests at the conclusion of the first day, and
- Complete an assignment afterwards that puts to use the workshop content on a policy problem that has significant projection onto computing and information.

LiSPI is not intended for individuals who wish to undertake research on science policy, become science policy fellows, or take permanent positions in Washington, DC. Rather, we are trying to reach work-a-day academics who appreciate that our field must be engaged in helping government.

The CCC will provide funds for hotel accommodations for two nights of local expenses (hotel, meals) for the November 16–17 workshop. Nominees are expected to pay their own travel expenses, though there will be a limited fund available for participants who cannot attend unless travel funding is provided.

Eligibility and Nomination Process

LiSPI participants are expected to have the experience and flexibility in their current positions to engage with government. University faculty members should be from a computing department; industrial researchers should have comparable seniority. Participants should be adept at communicating. They must be nominated by their chair or department head and must have demonstrated an interest in science policy, especially as it relates to computer science (and closely allied fields).

Specifically, the nomination process is as follows:

- A chair or department head proposes a LiSPI candidate by visiting the nomination page and providing the name and institution of the nominee, along with a letter of recommendation.
- The candidate will then be contacted by the workshop organizers and asked to submit a CV, a short essay detailing their interests in science policy, and an indication of whether they would require financial aid to attend.

All nominations and material from nominators and nominees must be received by June 16, 2023.

Selection Process:

The LiSPI selection committee will evaluate each nomination based on record of accomplishment, proven ability to communicate, and promise. Selections will be announced by the week of August 4, 2023. We plan to open the workshop to about 35 participants.

Please discuss this opportunity with your colleagues, identify those you believe would be interested in participating, and submit nominations!

Expanding the Pipeline: The CRA-WP 2023 IDEALS

CRA-WP
Computing Research Association
Widening Participation

By Patty Lopez, Ayanna Howard, Lori Clarke, and Ramón Cáceres

The CRA-WP 2023 Grad Cohort Workshop for Inclusion, Diversity, Equity, Accessibility, and Leadership Skills (IDEALS) was held in Honolulu, Hawaii March 23-25. The workshop is part of an effort to widen the participation, access, opportunities, and experience of individuals in computing research by building and mentoring nationwide communities throughout their graduate studies. The workshop has three main tracks that focus on professional development for students at the early, mid, and later stages of their research programs. One hundred and twenty five students from 86 MS and PhD graduate programs spent two days interacting with 30 senior computing researchers and professionals – 22 from academia, 6 from industry and 2 from government – who shared valuable information and guidance on graduate school survival skills, as well as more personal stories and insights about their own experiences.

The IDEALS Workshop began with a Welcome Reception Thursday evening, where participants were able to meet and interact in an informal setting. Friday's full day of events began with a Welcome session that guided participants through the flow of the two-day program. Friday's agenda offered three morning sessions and three afternoon sessions, with lunchtime conversations organized by research areas ranging from Artificial Intelligence and Robotics to Speech and Natural Language Processing.

Figure 1: The 2023 IDEALS Program Co-Chairs Hakim Weatherspoon, Ayanna Howard, Lori Clarke, and Ramón Cáceres welcome participants

For participants early in their research program, the session "Perspectives from Grad Cohort Alumni," brought together researchers Dr. Heriberto Acosta-Maestre, Dr. Pamela Gibbs, and Marilyn Iriarte to share their experiences. Dr. Acosta-Maestre is a Technical Program Manager with the Puerto Rico National Guard. Dr. Gibbs is a Strategic Research/Leadership Fellow at Anita B.org and Iriarte is a PhD student at the University of Maryland. This session was designed to provide the opportunity for participants to hear from past Grad Cohort participants about their experiences, lessons learned, and how the program has influenced them throughout their careers. The panelists provided insightful on how to get the most out of the workshop and their graduate school experience. Other early-year topics included "Finding an Advisor and Developing an Effective Working Relationship," "Overcoming Insufficient Academic Preparation: Perceived and Real," and "Networking."

For mid-stage graduate student participants, the session "Finding a Research Topic & Interdisciplinary Research" presented by Dr. Melanie Moses and Dr. Armando Solar-Lezama was invaluable. The presenters shared their own winding paths, full of "twists and turns, false starts, new beginnings, and crossing paths". Dr. Solar-Lezama, a Professor and the Associate Director and COO of the MIT Computer Science and Artificial Intelligence Laboratory works in the area of program synthesis, which combines programming systems and artificial intelligence. He shared examples of successful papers in research areas that others had overlooked or had assumed would not be productive. Dr. Moses, who holds joint appointments as a Professor in Computer Science and Associate Professor of Biology at the University of New Mexico, shared her experience studying ants in Costa Rica and pondering "How do we get cooperation?" in her study of autonomous robots, and discussed how she uses her study of complex biological systems to inform diverse research topics such as the scaling properties of how blood moves through the body, how volcanic eruptions impact climate change, and how we encourage algorithms that create more justice in the world.

Expanding the Pipeline *(continued)*

In the session "Building Resiliency & Overcoming Failure," Dr. Raja Kushalnagar and Dr. Gloria Washington shared their own challenges of navigating academic institutions that were not designed for them. The presenters defined resilience as "the capacity to recover quickly from difficulties". Dr. Kushalnagar, professor and director of the Information Technology program in the school of Science, Technology, Accessibility, Mathematics, and Public Health (STAMP) at Gallaudet University is deaf. He shared his challenges in finding access to services in academic environments, building connections with peers, teachers, faculty, and mentors, and the difficulty of finding employment after finishing his PhD. He began his academic career at a large research university, but quickly found that the connections that he built during his elementary and secondary education did not apply, and switched to a smaller university where he could establish a stronger rapport with faculty, staff, and other students. During his PhD program, the technology he relied on broke, and the company that designed it went out of business, causing him to lose three years of progress. This led him to work in assistive technology and providing access to that technology for a variety of individuals. Dr. Washington, an associate professor in computer science at Howard University, received her undergraduate education at a small historically Black university with expectations that she would get a job in government, and shared her journey of reinvention. She moved to Washington, DC, and got a security clearance while working for the National Security Agency. Dr. Washington completed her MS and PhD at George Washington University, while working full-time by day as a contractor and taking courses at night because fellowships at the time did not pay enough to live on. This made her journey to the PhD longer than most, but she leveraged her network of people to do research at a variety of government agencies. Because all her work was classified, it was a challenge finding a job post-PhD, so she began a 3-year post-doc position in South Carolina. She found support through fabulous mentors at Clemson University, where Dr. Juan Gilbert gave her the opportunity to hone her research and publish. She applied to and received an academic faculty position in the computer science department at Howard University, where she runs the Biometrics Lab and performs research with her students on affective computing and biometrics and enjoys the opportunity to help others find their path via undergraduate research.

In the session "Empowerment of People with Disabilities", panel moderator Ather Sharif introduced panelists Shaun Kane, Susan Rodger, and Raja Kushalnagar, who shared why empowerment in higher education is important for people with disabilities, addressing empowerment in academic settings, the challenges of invisible disabilities and disclosure, and access to and use of assistive and accessible technologies for students with disabilities.

In the Later Years track, sessions covered an array of topics such as what students can expect when they follow either academic or non-academic career paths beyond their graduate degrees. The session "Building Your Professional Persona" was presented by Dr. Pamela Gibbs, Strategic Research/Leadership Fellow at Anita B.org , and Dr. Rosemary Shumba, Chair of the Department of Computer Science at Bowie State University. They stressed the importance of making intentional choices about how to present yourself in professional contexts. They also discussed the need to maintain an effective online presence.

Figure 2: Empowerment of People with Disabilities Panel with Shaun Kane, Moderator Ather Sharif, Susan Rodger, and Raja Kushalnagar

Friday late afternoon closed with the presentation of 50 Lightning Talks covering a

Expanding the Pipeline *(continued)*

Figure 3: IDEALS participants, speakers, and staff enjoy the Friday evening outdoor reception

broad set of topics: Accessible Computing, AI, Bio and Medical Informatics, CS Education, Data Science, Distributed Computing, Economics and Computation, Machine Learning and Data Mining, Natural Language Processing, Quantum Computing, Robotics, Human Computer Interaction, Security and Privacy, and Speech and Natural Language Processing. Participants were able to provide a quick overview of their research and answer one or two questions from the audience. The day closed with a reception and another opportunity for participants to meet, network, and dive deeper into some of the day's discussions.

Saturday offered three morning sessions, with final and closing remarks thanking Dr. Lori Clarke for her years of dedication to the CRA-WP Board and advocacy and leadership in developing and nurturing the IDEALS Workshop program to its present form. A second day of lunch with table topics was provided over a variety of diverse topics ranging from Publishing Research to Prioritizing Mental/Physical Health in Graduate School. The afternoon offered 1-1 mentoring on both individual academic and career advising and individual resume and CV advising. The late afternoon closed with an AccessComputing Community Meetup.

Warm thanks to all the speakers, panelists, and participants for making the workshop a resounding success, and to the CRA staff, who put in countless hours planning and organizing the venue and facilitating its smooth operation, ensuring the safety, comfort, and accessibility of participants.

About the authors:

Dr. Patty Lopez is currently a consultant for New Mexico State University (NMSU), a Hispanic Serving Institution where she is a distinguished alumna. Prior to her role at NMSU, she spent 13 years as a Senior Platform Application Engineer at Intel and 19 years as an imaging scientist and software developer at Hewlett-Packard. Patty has seven patents and over 20 years of experience in diversity and inclusion work. She is a member of the CRA-WP Board, the Computing Alliance for Minority Participation Board, and the National Academy of Sciences, Engineering, and Medicine's Roundtable on Systemic Change in Undergraduate STEM Education.

Dr. Ayanna Howard is the Dean of Engineering at The Ohio State University. Previously she was the Chair of the School of Interactive Computing at the Georgia Institute of Technology. Dr. Howard's research encompasses advancements in artificial intelligence (AI), assistive technologies, and robotics, and has resulted in over 275 peer-reviewed publications. She is a Fellow of IEEE, AAAI, AAAS, the National Academy of Inventors, and elected member of the American Academy of Arts and Sciences. Prior to Georgia Tech, Dr. Howard was at NASA's Jet Propulsion Laboratory where she held the title of Senior Robotics Researcher and Deputy Manager in the Office of the Chief Scientist. She is a member of the CRA-WP Board and a co-lead of the CRA-WP IDEALS Workshop.

Expanding the Pipeline *(continued)*

Dr. Lori A. Clarke is an emerita professor in the College of Information and Computer Sciences, University of Massachusetts Amherst, after serving on the computer science faculty for forty years and as chair from 2011-2015. She is a Fellow of the ACM and IEEE, and a board member of the Computing Research Association's Committee on the Status of Women in Computing Research (CRA-W). She is a former vice-chair of the Computing Research Association (CRA), co-chair of CRA-W, IEEE Publication Board member, associate editor of ACM TOPLAS and IEEE TSE, member of the CCR NSF advisory board, and ACM SIGSOFT chair. Awards include the 2012 SIGSOFT Outstanding Research Award, 2011 University of Massachusetts Outstanding Accomplishments in Research and Creative Activity Award, the 2009 College of Natural Sciences and Mathematics Outstanding Faculty Service Award, the 2004 University of Colorado, Boulder Distinguished Engineering Alumni Award, and the 2002 SIGSOFT Distinguished Service Award. Dr. Clarke's research is in the area of software engineering. She is one of the initial developers of symbolic execution and developed one of the first model checking systems applicable to software systems. She has also worked in requirements engineering and object management. Recently she has been investigating applying software engineering technologies to detect errors and vulnerabilities in complex, human-intensive processes in domains such as healthcare and digital government. She is also involved in efforts to increase the participation of underrepresented groups in computing research.

Dr. Ramón Cáceres is a software engineer at Google, where he has built privacy infrastructure that serves more than a billion people every day. He was previously a computer science researcher at Bell Labs, AT&T Labs, and IBM Research. He has also held leadership positions in several startup companies. His areas of focus include computer systems and networks, mobile computing, human mobility, security, and privacy. He is an IEEE Fellow, an ACM Distinguished Scientist, and a recipient of the SIGMOBILE Test-of-Time Award. He is a member of the CRA-WP Board and a co-lead of the CRA-WP IDEALS Workshop.

Learn About the Many Flavors of CS-Related Master's Programs

CRA-E
Computing Research Association
Education

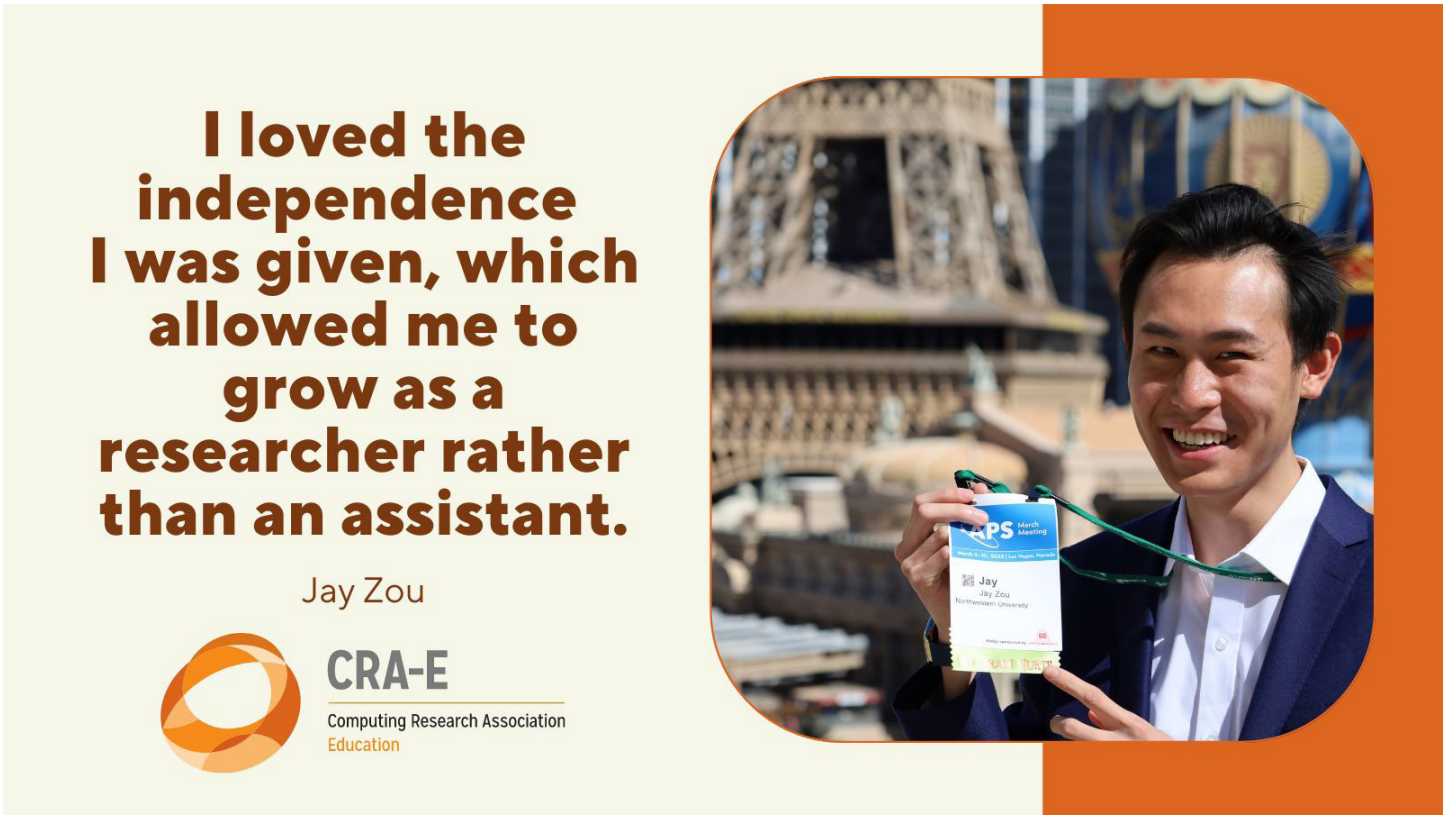
By Susanne Hambrusch (Purdue), Victoria Interrante (Minnesota), Borja Sotomayor (U of Chicago)

Today, anyone exploring graduate programs at the MS level - from the BS graduate with a CS degree to the computing professional in the workforce - finds a wide range of graduate program options and choices. The question "Which program is right for me?" is often not easy to answer.

CRA's Education Committee (CRA-E) has published answers to Frequently Asked Questions on the types of MS programs and their relation to PhD programs. The programs discussed include Academic, Professional, Non-terminal, and Online MS programs. The answers contrast and try to clarify differences in the application process, competitiveness of the admission process, characteristics of a successful applicant, financial support options, research opportunities, teaching careers for MS graduates, possible pathways to a PhD program in a computing field, and new career options.

We hope departments will share the FAQ resource with undergraduate advisors and interested faculty. We welcome comments and suggestions on additional questions to address. Please email Grad.Programs.FAQs@cra.org.

CRA-E Research Highlight: Undergrad talks about mentorship and Quantum research



Jay Zou, Physics and Astronomy, Integrated Science Program, combined M.S. in Electrical Engineering, Northwestern University.

This Q&A highlight features Jay Zou, an Honorable Mention in the 2022 CRA Outstanding Undergraduate Researchers award program. Jay is a senior in a combined B.A. and M.S. program at Northwestern University. He recently finished a term at Apple and is now working as a visiting researcher at Stanford University. He will be returning to Apple this summer as a camera architecture intern, and then beginning his PhD in Applied Physics at Yale University in the fall, focusing on unconventional computing architecture and quantum nonlinear optics. This interview has been edited for length and clarity.

How did you discover research and what led you to pursue it?

In high school, I attended the Summer Science Program (SSP) at the University of Colorado Boulder. There, I tracked asteroids using research grade telescopes and Python, generating data that I eventually published with the International Astronomical Union. The excitement of sharing my work prompted me to pursue research immediately after arriving at college. There were also external pressures, as my parents lost their jobs during COVID, and as a Canadian international student, I was left with no funds. Working in industry and research labs funded a large part of my degree. I worked in several labs and it was only after trying a wide variety of topics that I stuck with a project for the long term.

What project did you settle on?

I started working with Professor Kovács at Northwestern University in November 2020. We aimed to quantify quantum entanglement using a particular model called the quantum Ising model. Quantum entanglement is, roughly, "an invisible link between distant quantum objects that allows one to instantly affect the other" (Ferrie, 2023). We showed that entanglement can be universally maintained across even large distances in a way that deviates from previous results from simpler quantum models.

Research Highlights *(continued)*

Our paper was presented at the 2021 Fall Meeting of the APS Prairie Section and the 2023 APS March Meeting, and published in Physics Review B.

How did you originally get involved in this project?

At Northwestern, if there's something you're interested in and you reach out to a faculty member, I've found that they will likely at least consider you. Before I joined Professor Kovács's lab, I was already working in a machine learning lab. However, despite very supportive mentors and extraordinarily interesting research topics, the mentorship did not match what I needed. A friend of mine had worked in Professor Kovács's lab and had a very positive experience specifically in terms of mentorship and support for undergraduate students. I reached out to Professor Kovács and he gave me the opportunity to work on this project. This experience allowed me to discover what I enjoy and what my needs are, while normalizing that it is okay to move on when the fit is not great.

How have these experiences shaped your professional path?

I was especially impressed with Professor Kovács's ability to give great mentorship to undergraduates. Everybody in academia does cool research, but how many can actually foster a supportive environment for undergraduates, and further, to those who are historically underrepresented in the field? Inspired by these experiences, I hope to do the same. I have a couple of personal projects that I'm working on with first-year undergrads. One way I support new researchers is by giving them creative freedom.

Can you tell us a bit more about why you think that mentorship work is so important?

Scientific research is unlike any other occupation. Unlike studying for a test, where one would be learning from existing knowledge, research requires first mastering this knowledge and pushing beyond that. This is difficult for most undergraduates, as we still have much to learn, never mind generating new knowledge. It is a completely different process of thinking to become acquainted with.

Successful undergraduates should be fostered in an environment where their contributions, no matter how minute, are valued. Frankly, most labs don't have the bandwidth as they are focused on research output, rather than education. I am privileged to have a supportive mentor invested in my learning and well-being, and he is one of the most fundamental reasons for my progress and passion toward further research!

What do you feel is the impact of bringing students into research?

Of course, sharing our findings with the scientific community already pushes the progress of human knowledge. Personally, I benefit from being a better problem-solver on a day-to-day basis. Research has allowed me to develop tenacity to persevere through difficult obstacles, and most importantly, it has shown me the lack of resources and initiatives to develop young scientists. The latter has pushed me to actively mentor young undergraduates; seeing them develop as a result of my efforts has been priceless.

Do you have any advice for other students looking to get into research?

Explore the fields that interest you, but keep an open mind to explore; something new might be your next big thing! At the same time, it is okay to drop a project and pursue something else. Give yourself permission to give up your dreams to pursue something you love in the present.

— Edited by Yasra Chandio and Nadia Ady

CCC Releases Mechanism Design for Improving Hardware Security Workshop Report

By Maddy Hunter, CCC Program Associate

The Computing Community Consortium (CCC) is pleased to release the Mechanism Design for Improving Hardware Security Workshop Report. On August 24-25, 2022, the CCC held a visioning workshop on Mechanism Design for Improving Hardware Security in Washington, D.C. Led by Simha Sethumadhavan and Tim Sherwood, the workshop brought together experts in hardware and software security, economics, and government policy to investigate ways to improve the design and uptake of hardware security mechanisms.

With the increasing pervasiveness of hardware in society, comes a parallel increase in hardware security concerns. Recent hardware attacks such as Spectre and Meltdown demonstrate just how devastating and dangerous these attacks can be. With the availability of free hardware designs and tools, the prevalence and discovery of these types of design/security problems are likely to accelerate. While these problems are well known in society, very little is being done to prevent these types of catastrophes.

Through a combination of interdisciplinary discussions and speeches from experts in the space, participants considered mechanisms to incentivize designers, system integrators, and users to create and maintain the security of their systems. The report emphasizes how important hardware security is and outlines key recommendations and findings from the participant discussions at the workshop. The recommendations are the following:

1. Foster Diverse Educational, Professional, and Industrial Communities in Hardware Security
2. Lay the Scientific Foundations for Work that Combines Incentives and Technology
3. Make Security Accountable and Explainable
4. Co-Develop Emerging Technologies with the Understanding of their Hardware Security Ramifications
5. Prioritize the Human Impact of Hardware Security

Read the report to find out more about why hardware security matters and how to incentivize the creation of secure systems.

The CCC Releases Mid-cycle Update to the US National Robotics Roadmap

By Maddy Hunter, CCC Program Associate

In honor of National Robotics Week, the Computing Community Consortium is releasing a mid-cycle update to the US National Robotics Roadmap. The US National Robotics Roadmap is updated every four years. Since the last update in September 2020, the world has changed significantly. The COVID pandemic has slowed, there is another administration in Washington, the National Robotics Initiative has officially ended, and the political climate for international trade is constantly changing. Given all these aspects, the Computing Community Consortium (CCC) is publishing a minor revision of the roadmap before the next regular update in 2024.

In November, the CCC published a call for contributions and input from the community. In addition, a discussion session was organized at AAAI in Washington, DC on February 7th to collect input from the AI/Robotics community. All inputs have been considered in the preparation of the present document.

The CCC Releases Mid-cycle Update *(continued)*

Over the past decade, national support for basic research in robotics has been significantly reduced. Recent developments and resulting gaps include the following:

- The recent sunset of the National Robotics Initiative (NRI) in May 2022 has resulted in a lack of cross-agency programs focused on robotics. A few agencies have their own program with limited cross coordination, but overall the emphasis has shifted more towards a National AI program.
- The NRI program has been replaced by the NSF Foundational Research in Robotics (FRR) program, which is focused on robot systems that include both computational and physical complexity. The new FRR program lacks direct support for component technologies within each of the areas of embodiment, perception, and planning. Consequently, many researchers in robotics and component disciplines do not have a natural program within NSF (CISE or ENG) to consider for their basic research.
- The Department of Defense (DoD) houses a number of robotics programs. The Army Research Lab (ARL) and Office of Naval Research (ONR) have programs, but mainly with clear mission objectives rather than curiosity-driven objectives. In addition, the number of performers is still modest.
- The National Institute of Health (NIH) also has programs with clear clinical objectives. In general, acceptance rates for NIH are very low. There is significant progress on design of medical devices, support for elderly people and for medical procedures. However, during the process from idea to a certified product/method, the risk of losing support is significant.

While the US has seen a reduction in support for robotics, Europe (EU-Horizon), China (Robotics+), South Korea (RRI), and India (Manufacturing in India) are all investing heavily in the technology. Already today, the US is falling behind other nations in terms of basic research and utilization of robot technology for next-generation manufacturing, logistics, and smart infrastructure. When the NRI was launched in 2011, the US was a top 5 consumer of robots for manufacturing and China was not in the top 10. Today China is the largest consumer of robots for manufacturing, and the US is now 7th according to the International Federation of Robotics (IFR, 2022). Without a concerted investment across basic research, translation and utilization, more ground will be lost.

This mid-cycle update to the US Robotics Roadmap identifies and explores recent megatrends and key research challenges in the robotics field, as well as, implementation considerations and recommendations to further robotics research and propel the US back to the forefront of robotics research. You can read the full report here.

CCC Releases the Artificial Intelligence/Operations Research Workshop II Report Out

By Catherine Gill, CCC Program Associate

The CCC just released the 2nd Report Out in the three part Artificial Intelligence/Operations Research Visioning Workshop series. In September of 2021, the CCC along with the Institute for Operations Research and the Management Sciences (INFORMS) and ACM SIGAI, held the first AI/OR workshop virtually, during which they reviewed the current state of AI/OR research and developed a strategic vision for increased collaboration between the two fields. You can view the Report Out from the first workshop here.

In August of 2022, the second AI/OR workshop was held in Atlanta, GA. This workshop, also supported by INFORMS and ACM SIGAI, was organized by John Dickerson (University of Maryland), Bistra Dilkina (University of Southern California), Yu Ding (Texas

A&M), Swati Gupta (Georgia Institute of Technology), Pascal Van Hentenryck (Georgia Institute of Technology), Sven Koenig (University of Southern California), Ramayya Krishnan (Carnegie Mellon University), and Radhika Kulkarni (SAS Institute, Inc. (retired)).

This workshop focused on the foundational elements of trustworthy AI and OR technology, and how to ensure all AI and OR systems implement these elements in their system designs. Four sessions on various topics within Trustworthy AI were held, these being Fairness, Explainable AI/Causality, Robustness/Privacy, and Human Alignment and Human-Computer Interaction. Following discussions of each of these topics, workshop participants also brainstormed challenge problems which require the collaboration of AI and OR researchers and will result in the integration of basic techniques from both fields to eventually benefit societal needs. If you would like to contribute to our challenge problems or suggest additional ones, please email your ideas to ccc@cra.org. The Report Out summarizes the presentations, the challenge problems that were outlined and the discussions held during the workshop. Please view the final Report Out here, and stay tuned for information about the third and final AI/OR workshop. In this third workshop, we will aim to lay out a blueprint for collaboration between the AI and OR communities including the strategic vision and challenge problems discussed in the first two workshops.

Who has participated in an NSF CISE REU in the last ten years?

CERP
Computing Research Association
Evaluation

By Ama Nyame-Mensah, Research Associate

During the Spring of 2022, the Computing Research Association's (CRA) Center for Evaluating the Research Pipeline (CERP) surveyed former participants and mentors in the National Science Foundation Computer and Information Science and Engineering (CISE) Directorate's Research Experiences for Undergraduates (REU) program. This data collection effort was undertaken as a part of CERP's CISE REU Evaluation Contract as an ad-hoc project to understand the experiences of former participants and mentors of the NSF CISE REU Program. The project's main goal was to provide information about the structure and content of REU programs and assess the impact of REU participation on career pathways.

Recently, CERP staff summarized the project's demographic data to understand better who has participated in a CISE REU program within the last ten years. What follows is a summary of the demographic makeup of CISE REU Past Participants.

Who has participated in an NSF CISE REU in the last ten years? *(continued)*

CERP
Computing Research Association
Evaluation

Of those surveyed:

- More than half (51%) self-identified as male.
- 28% reported having one or more disabilities.
- Nearly three out of four (73%) have a parent or guardian with a graduate degree.
- 59% attended or are currently attending an R1 university (i.e., universities that offer doctoral universities with the highest level of research activity).
- 74% majored, or are majoring, in a computing field.
- Most (83%) reported that their NSF REU was their first formal research experience.

Over the last decade, NSF's CISE REU program has reached a diverse population of computing, information science, and engineering students. In the coming months, we will highlight students' experiences and outcomes from participation in an NSF REU and explore these students' educational and career pathways.

Key Facts about **REU Past Participants**

3 in 10 participants reported having **one or more disabilities**.

More than half of participants identified as **Male**

49% of participants are employed either part-time or full-time.

74% of participants majored, or are majoring, in a computing field.

59% of participants **attended, or are attending, an R1 University**.

83% of participants reported that their **NSF REU was their first formal REU**.

73% of participants **had a parent with a graduate degree**.

Source: CRA CISE REU Evaluation Contract Ad-Hoc Project. Center for Evaluating The Research Pipeline. Computing Research Association. See the article for additional information.

Notes:

The survey data analyzed for this infographic were collected by the Center for Evaluating the Research Pipeline via the CISE REU Evaluation Contract Ad-Hoc Project. The sample includes approximately 600 Former NSF REU students who participated in REU Site and Supplement projects between 2013 and 2021.

This analysis is brought to you by the CRA's Center for Evaluating the Research Pipeline (CERP). CERP provides social science research and comparative evaluation for the computing community. Subscribe to the CERP newsletter. Do you have an REU Site or REU Supplement? Sign up to work with CERP to evaluate your project by completing our interest form.

The CISE REU Evaluation Contract Ad-Hoc Project was conducted via a contract with National Science Foundation and was approved by the Office of Management and Budget (OMB control number 3145-0265). Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

CRA-I Announces New Council Members

The Computing Research Association-Industry Committee (CRA-I) is happy to announce the start of a new group of CRA-I visionary leaders charged with propelling the committee forward. This new Council of individuals will work closely with the Steering Committee to identify future committee directions, connect with the community, and achieve the goals of CRA-I.

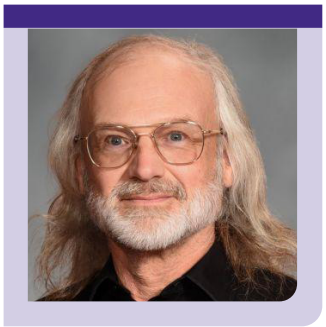
CRA-I welcomes the following five new Council members, nominated by colleagues in the computing research community:

Ron Brachman, Cornell Tech

Ron Brachman is the Director of the Jacobs Technion-Cornell Institute and a Professor of Computer Science at Cornell University. Ron received his B.S.E.E. from Princeton University (1971), from which he graduated Summa Cum Laude and Phi Beta Kappa. He received his S.M. (1972) and Ph.D. (1977) degrees in Applied Mathematics from Harvard University. Before coming to Cornell Tech, Ron had an outstanding career in research and research leadership at world-leading institutions like Bell Labs, AT&T Labs, DARPA, and Yahoo Labs – at these institutions he was responsible for recruiting world-class research teams and creating and leading innovative research and academic relationship programs. Ron has served as President of AAAI and currently serves on the Board of Directors of the Computing Research Association. He is a Fellow of ACM, IEEE, and AAAI.

Elizabeth Bruce, Microsoft

Ms. Elizabeth Bruce is University Relations Director at Microsoft focusing on Microsoft's strategic relationships with key universities and facilitating collaboration across business units. Elizabeth provides direction on partnerships and investments in new collaborations. Prior to Microsoft, Elizabeth spent over a decade at MIT leading research initiatives and developing strategic partnerships with industry in data science, big data, privacy, cloud computing, biomedical, and telecommunications. Elizabeth served as Executive Director at the Institute for Data, Systems, and Society (IDSS) and co-founded the MIT Big Data Initiative at the Computer Science and AI Lab (CSAIL). She holds a Joint Program Master's degree from MIT and Woods Hole Oceanographic Institute in Ocean Engineering and a BS in Electrical Engineering from the University of Washington. Elizabeth currently serves on the Board of AnswerALS and is a member of the U.S. National Committee for CODATA (Committee on Data of the International Science Council)



Hank Korth, Lehigh University

Henry F. (Hank) Korth is a Professor of Computer Science and Engineering with a courtesy appointment in the Data and Technology Analytics Department at Lehigh University. He is a member of the Scalable Software Systems Research Group and directs the Blockchain Lab in the Center for Financial Services. Prior to joining Lehigh, he was director of Database Principles Research at Bell Labs, a vice president of Panasonic Technologies, an associate professor at the University of Texas at Austin, and a research staff member at IBM Research. Korth is a fellow of the ACM and of the IEEE and a winner of the 10-Year Award at the VLDB Conference. He received the Bell Labs President's Silver Award for the QTM™ aggregation engine and for the DataBlitz™ main-memory storage manager. His numerous research publications span a wide range of aspects of database systems, including transaction management in parallel and distributed systems, real-time systems, query processing, and the influence on these areas by modern computing architectures. Most recently, his research has addressed a variety of issues in blockchain systems and applications, including acceleration of zero-knowledge proofs on parallel architectures, benchmarking, central-bank digital currencies, and private yet provable accounting systems. Details of his current work are online at blockchain.cse.lehigh.edu.

New Council Members *(continued)*

Eve Schooler, formerly Intel

Eve M. Schooler is a recognized expert in Networking and Distributed Systems. Her current work focuses on evolving the Internet toward a Sustainable edge-cloud infrastructure and Carbon-aware networking. After 18 years, she recently left Intel to embark on new adventures and to pursue an academic sabbatical in Sustainable Computing. At Intel, she was a Principal Engineer and Director, responsible for setting technical direction for Emerging Internet of Things (IoT) networks, standards and innovation. Prior to Intel, she held positions at AT&T Labs-Research, USC's Information Sciences Institute (ISI), Apollo Computers, and Pollere. Throughout her career, Dr. Schooler has served in leadership positions in various international standards bodies, including the IETF and NIST. She serves on the Board of Directors of the Computing Research Association in the US, the EU's SPATIONAL H2020 Project, and on the Advisory council of the University of Delaware's Computing and Information Sciences department. She holds a BS from Yale, MS from UCLA, and PhD from Caltech, all in Computer Science. She has published extensively and is an inventor on over 35 patents. She is an IEEE Fellow and the co-recipient of the IEEE Internet Award for her work on control protocols for Internet telephony and multimedia teleconferencing.

Tammy Toscos, Parkview Health

Tammy Toscos is the founder (2014) and Director of the Health Services and Informatics Research lab at Parkview Health, a large not-for-profit health system serving Northeast Indiana and Northwest Ohio. At the Parkview Mirro Center for Research and Innovation, she leads an embedded interdisciplinary scientific team focused on supporting the health system with translational research at the intersection of human computer interaction, computing, and health services research. Dr. Toscos holds a BS in Nutrition & Dietetics from Indiana University, an MS in Applied Computer Science from Purdue University, a PhD in Informatics from Indiana University, and completed a Postdoctoral Health Services Research Fellowship at the Regenstrief Institute. Dr. Toscos has held academic appointments in computer science, nursing and health informatics. Her research has been acknowledged with several awards and funded by AHRQ, PCORI, the Robert Wood Johnson Foundation and several industry partners.

Please help the industry research community by continuing nominating outstanding colleagues for the CRA-I Council. Read more here and send nominations to industryinfo@cra.org.

Professional Opportunities

Arizona State University

Teaching Professor (all ranks) or Instructor

The School of Computing and Augmented Intelligence (SCAI) in the Ira A. Fulton Schools of Engineering at Arizona State University (ASU) seeks energetic individuals for multiple full-time positions of Teaching Professor (all ranks considered) or Instructor beginning August 2023. These teaching faculty positions support primarily the Computer Science and Engineering programs, but teaching faculty are expected to support the instructional mission of all SCAI programs. SCAI has locations on the Tempe and Polytechnic Campuses and the programs are expanding to the West Campus, and thus some travel among campuses should be expected. In addition, SCAI offers multiple online degree programs and faculty participate in the creation of curriculum and delivery of instruction in the online modality. All teaching faculty positions are non-tenure track appointments with a fixed term academic year contract. Appointments will be made at the rank of Teaching Professor, Associate Teaching Professor, Assistant Teaching Professor, or Instructor commensurate with the candidate's experience and accomplishments. Opportunities exist to augment the academic year salary by assisting with summer instruction.

Review of applications will commence on April 28, 2023. Applications will continue to be accepted on a rolling basis for a reserve pool. Applications in the reserve pool may then be reviewed in the order in which they were received until all positions are filled.

For complete qualifications/application information, see *https://hiring.engineering.asu.edu/*.

A background check is required for employment. Arizona State University is a VEVRAA Federal Contractor and an Equal Opportunity/Affirmative Action Employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, protected veteran status, or any other basis protected by law.

(See *https://www.asu.edu/aad/manuals/acd/acd401.html* and *https://www.asu.edu/titleIX/*.)

In compliance with federal law, ASU prepares an annual report on campus security and fire safety programs and resources. ASU's Annual Security and Fire Safety Report is available online at *https://www.asu.edu/police/PDFs/ASU-Clery-Report.pdf*. Candidates may request a hard copy of the report by contacting the ASU Police Department at 480-965-3456.

COVID-19 Vaccination - Arizona State University is a federal contractor and subject to federal regulations which may require you to produce a record of a COVID-19 vaccination. For questions about medical or religious accommodations, please visit the Office of Diversity, Equity and Inclusion's webpage.

Boise State University

Tenure-Track Faculty (Assistant/Associate Professor)

The *Department of Computer Science* at Boise State University invites applications for a tenure-track/tenured faculty position at Assistant/Associate rank. Seeking an applicant in cybersecurity (especially candidates in the area of cybersecurity for cloud computing, operating systems, networking, etc.). Strong candidates in other areas of Computer Science will also be considered.

Responsibilities include teaching undergraduate and graduate courses, developing a strong research program funded by external sources, supporting and mentoring undergraduate and graduate students, and providing service to the University and the profession along with other activities typical for a tenure-track faculty. Candidates will start fall 2023.

A PhD in computer science, or a closely related field, is required by the date of hire. Applicants for the associate professor rank should have an established record of excellence in teaching, significant contributions in research, and experience in collaborating with faculty or industry to develop and sustain funded research programs. Applicants for the assistant professor rank should have a demonstrated potential for establishing such a record.

Review of applications will begin on April 24 and will continue until the position is filled.

Boise State has made significant investments in the growth of the

department, which is a critical part of the software and high-tech industry in Boise. Eighteen new faculty hires, a new building downtown, and new undergraduate and graduate programs have been added as the department has more than tripled in size. Faculty have active funded research programs, with several large funded grants and six active NSF CAREER awards.

Application Procedure Instructions:

Please visit *jobs.boisestate.edu/en-us/job/497552/assistant-or-associate-professor-computer-science* to submit a cover letter addressed to the CS Search Committee indicating your interests and qualifications for this position, a CV that includes employment history, and statements of research and teaching interests. Provide three professional references with contact information.

Brandeis University

Computer Science Department

Full-time teaching faculty Positions

The Computer Science Department at Brandeis University invites applications for up to two full-time teaching faculty positions. Faculty rank is open, and will depend on experience and qualifications; both positions are outside the tenure structure and start in the Fall 2023 semester. The positions will have an initial appointment of up to three years and the potential for renewal.

We seek candidates who are able to teach a wide range of core computer science courses, as well as occasional upper-level and graduate electives. The successful candidate must be committed to excellence in undergraduate teaching and is expected to participate fully in the academic life of the department, including advising, participating in faculty meetings, supporting undergraduate research and other activities relevant to our teaching mission. Candidates are expected to have strong foundational knowledge in one or more areas of our core curriculum.

A Ph.D. is preferred but not required. Candidates should be able to demonstrate excellence in teaching computer science at the university level. Salary is commensurate with qualifications.

For more information see:
https://academicjobsonline.org/ajo?joblist---2691-23170

College of William & Mary

Visiting Instructor/Assistant Professor of Computer Science

The Department of Computer Science at William & Mary, a public university of the Commonwealth of Virginia, invites applications for a non-tenure eligible Visiting Instructor/Assistant Professor position for a two year appointment term that will begin August 10, 2023. We seek an individual with expertise in computer science. The successful applicant will be expected to be an effective teacher and will have a 3-3 teaching load.

Located in the center of historic Williamsburg and known as a public Ivy, William & Mary is consistently ranked in the elite group for best undergraduate teaching by U.S. News and World Report and is committed to a multi-year effort to strengthen and expand its computer science program. More information about the department can be found at *https://www.cs.wm.edu*.

A Master's degree is required.
A Ph.D. or ABD in Computer Science or a related field at the time the appointment begins or professional experience in computing is preferred. Previous teaching experience is also preferred.

William & Mary values diversity and invites applications from underrepresented groups who will enrich the research, teaching and service missions of the university. The university is an Equal Opportunity/Affirmative Action employer and encourages applications from women, minorities, protected veterans, and individuals with disabilities. William & Mary conducts background checks on applicants being considered for employment.

Special applicant Instructions:

Applicants must apply online at *https://jobs.wm.edu*. Please submit a curriculum vitae, a cover letter, a statement of teaching interests, and a statement describing previous professional experience or future plans (or both) that demonstrate a commitment to diversity and inclusion. Applicants will be prompted to submit online the names and email addresses of three references who will be contacted by the system with instructions for how to submit a letter of reference.

For full consideration, submit application materials by the review date, [May 1, 2023] Applications received after the review date will be considered till the position is filled.

Professional Opportunities

Visiting Instructor of Information Technology

Georgia Southern University's Department of Information Technology invites applications for a Visiting Instructor. The full text advertisement, including information about the department, faculty, and the complete position announcement with all qualifications and application instructions, is available at:

https://apptrkr.com/4067353

Screening of applications begins April 17, 2023 and continues until the position is filled. Georgia is an open records state. Georgia Southern University provides equal employment opportunities to all employees and applicants for employment without regard to race, color, sex, sexual orientation, gender identity or expression, national origin, religion, age, veteran status, political affiliation, or disability. Individuals who need reasonable accommodations under the Americans with Disabilities Act to participate in the search process should notify Human Resources at 912-478-6947.

Hampden-Sydney College

Visiting Assistant Professor, Visiting Instructor, or Lecturer in Computer Science

Hampden-Sydney College is seeking applicants for a Visiting Assistant Professor, Visiting Instructor, or Lecturer position for academic year 2023-24. The courseload is negotiable, with up to four undergraduate computer science classes per semester.

Applicants must have a Master's degree or Ph.D. in Computer Science or a related field by the time of appointment. Candidates should have at least 18 credit hours of graduate course work in Computer Science or similar experience.

Hampden-Sydney College values diversity, prohibits discrimination, and is committed to equal opportunity for all employees and applicants for employment.

For more information and to submit application materials, visit *http://apply.interfolio.com/123920*.

Harvey Mudd College

One-year/Two-year Visiting Professor Positions in Computer Science (open rank)

The *Computer Science Department at Harvey Mudd College (HMC)* invites applications for one-year and two-year Visiting Professor positions in computer science starting in the 2023-24 academic year. Candidates in all areas of computer science and at all ranks, including Associate or Full Professors planning a sabbatical or retirement visit, will be considered.

HMC is a highly selective undergraduate liberal arts college (900 students) emphasizing science, mathematics, and engineering. HMC is part of the Claremont Colleges consortium, which includes five colleges and two graduate schools. The Computer Science Department currently has sixteen tenure-track faculty members and anticipates searching for additional tenure-track faculty during the 2023-24 academic year. The department and the college place a high value on effectively engaging students from traditionally underrepresented groups, and candidates from these groups are especially encouraged to apply.

Learn more/Apply at: *https://academicjobsonline.org/ajo/jobs/24333*

Harvey Mudd College is an equal opportunity and affirmative action employer committed to providing a workplace free of discrimination, harassment, and disrespectful or other unprofessional conduct (*HMC EEO/Nondiscrimination Statement*).

Iowa State University

Researcher and Engineer Positions in Advanced Wireless

The Center for Wireless, Communities and Innovation (*https://wici.iastate.edu/*) at Iowa State University has several Researcher and Engineer positions for research, development, innovation, and entrepreneurship in advanced wireless (e.g., URLLC in 5G-and-beyond systems), Open RAN, rural broadband, and applications.

The positions offer opportunities of contributing to exciting projects such as the $16M ARA PAWR project (*https://arawireless.org*), $20M ICICLE AI Institute project (*https://icicle.ai*), OPERA open-source ecosystem project (*https://wici.iastate.edu/opera*), and other projects of the WiCI Center (*https://wici.iastate.edu/projects*).

For details, please check out *https://wici.iastate.edu/career/*.

Iowa State University

Tenure-Track Faculty Position in Computer Science – Bioinformatics and Computational Biology, Theoretical Computer Science

The Department of Computer Science in the College of Liberal Arts and Sciences at Iowa State University in Ames, Iowa, seeks outstanding applicants for a tenure-track faculty position at the rank of Assistant Professor. We are specifically looking for candidates in bioinformatics, computational biology and theoretical computer science.

The successful candidate will be expected to develop and sustain a strong

Professional Opportunities

Computer Science research program; develop collaborative and interdisciplinary research; publish in top venues; provide outstanding graduate student supervision; teach undergraduate and graduate Computer Science courses; and enhance ISU through professional and institutional service. We are interested in exceptional candidates who can expand our research profile in new areas.

Iowa State University strives to be the university that cultivates a diverse, equitable and inclusive environment where students, faculty and staff flourish. To that end, we welcome candidates from diverse and underrepresented backgrounds to apply. We are dedicated to work-life balance through an array of flexible policies. We are responsive to the needs of dual-career couples.

The Department of Computer Science resides in the College of Liberal Arts and Sciences offering B.S., B.A., M.S., and Ph.D. degrees in Computer Science and a brand-new M.S. degree in Artificial Intelligence. The department is proud to be one of the founding departments for the B.S. in Software Engineering, B.S. in Data Science, Data Science Minor and Certificate along with the B.S. and Ph.D. degrees in Bioinformatics and Computational Biology. We are active in interdepartmental graduate programs in Bioinformatics and Computational Biology, Human-Computer Interactions, and Information Assurance.

The department participates in many interdisciplinary research collaborations, including partnerships with faculty in bio-sciences, mathematical sciences, and engineering. The Department of Computer Science has 38 faculty professionals, 150 Ph.D. students, 71 M.S. students, and approximately 900 B.S. students. All admitted Ph.D. students are offered a two-year teaching assistantship from the department, and almost all are supported by research or teaching assistantships after that. We have strong research and educational programs in Artificial Intelligence, Machine Learning and Data Science, Bioinformatics and Computational Biology, Human Computer Interaction, Robotics and Autonomous Systems, Software Engineering and Programming Languages, Systems and Networking, and Theoretical Foundations. Our department has over $16 million in active research grants, including the interdisciplinary activities mentioned, and we contribute to active research and training grants totaling approximately $25 million.

All interested, qualified persons can find more information, including required and preferred qualifications and where to apply, at *https://isu.wd1.myworkdayjobs.com/IowaStateJobs/job/Ames-IA/Assistant-Professor-of-Computer-Science_R9772*. To ensure full consideration, applications should be received by ***April 4, 2023***, but will be accepted until the position is filled.

Iowa State University is an Equal Opportunity/Affirmative Action employer. All qualified applicants will receive consideration for employment without regard to race, color, age, religion, sex, sexual orientation, gender identity, genetic information, national origin, marital status, disability, or protected veteran status and will not be discriminated against. Inquiries can be directed to the Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, 515 294-7612, email *eooffice@iastate.edu*.

Milwaukee School of Engineering

Computer Science (CS) / Software Engineering (SE) Faculty

The Electrical Engineering and Computer Science (EECS) department at the Milwaukee School of Engineering (MSOE) seeks applicants to fill multiple Computer Science (CS) / Software Engineering (SE) Faculty positions at any rank to support a new master's program in Machine Learning as well as established undergraduate Computer Science and Software Engineering programs. MSOE expects, rewards, and supports a strong primary commitment to excellence in teaching. Faculty enjoy small class sizes and hands-on labs as well as continuous improvement and sustained professional development. Among the department's strengths are strong partnerships with numerous businesses and academic institutes, which guide applied projects, undergraduate research, and curriculum development.

For a detailed position description and to apply, please visit *http://jobs.localjobnetwork.com/j/70334489*

MSOE is an Equal Opportunity Employer & Educator.

Professional Opportunities

North Carolina School of Science and Mathematics

Computer Science Instructor

Instructor of Computer Science to join an Amazing Team at NCSSM-Durham in Fall 2023! Experience with and enthusiasm for teaching high achieving high school or undergraduate students with a strong emphasis on technology is desired. Required: A degree in a technology field related to computer science and a Masters degree or higher in a related field or education.

North Carolina School of Science and Mathematics is a world-class residential public high school with national reach. Specializing in STEM, it challenges talented high school juniors and seniors through a two-campus residential program and an online campus. Founded in 1980, NCSSM is a member of the 17-institution UNC System.

Apply Here: *http://bit.ly/3MAPLkJ*

Northwestern University

Assistant/Associate Professor (Team Science Track)

Qualified candidates will hold a doctoral degree in a relevant field, have substantial experience in digital health, and have a strong track record of scientific achievement demonstrated by peer-reviewed publications, preferably grant funding, and contributions as part of a multidisciplinary team. Candidates will be expected to establish and maintain an externally funded research program. Both independent and collaborative research are valued. Team Science Faculty hold full faculty privileges, are eligible for promotion, able to mentor students/fellows, able to submit grants as PI or Co-I, and have numerous opportunities for team science collaborations. Successful candidates will play a role in a growing multi-disciplinary program of research on building evidence-based technology-supported preventive interventions in the health care delivery system and the community.

For more information and to apply, visit: *https://facultyrecruiting.northwestern.edu/apply/MTgwMQ==*

Postdoctoral Scholar - Computational Biology

The Uzun Lab at the Penn State College of Medicine, Department of Pediatrics, is seeking a postdoctoral scholar in computational biology.

Candidates holding a PhD degree in Computer Science, Math, Statistics and Life sciences PhDs with computational experience are also eligible for this position. Bioinformatics experience is preferred but not required. PhD candidates who submitted their doctoral thesis and expecting to graduate no later than 2023 Summer, can also apply.

Prior hands-on experience in R and Unix/Linux shell scripting is required with demonstration in past projects.

Position details, application instructions and link are available at:
https://apptrkr.com/4046237

Shanghai Jiao Tong University

Faculty Positions at the John Hopcroft Center for Computer Science

Shanghai Jiao Tong University (SJTU) is one of the oldest and most prestigious universities in China, which enjoys a long history and a world-renowned reputation. The John Hopcroft Center for Computer Science at SJTU seek candidates for faculty positions starting on a mutually agreed date. Appointment will be at all levels of tenure-track (Assistant/Associate Professor) positions. Faculty duties include teaching at the undergraduate and graduate levels, research, and supervision of student research. Candidates should hold a Ph.D. in computer science or a related field by the start of employment.

The John Hopcroft Center for Computer Science at SJTU, founded in January 2017, focuses on the fundamental problems in computer science, exploring new theories and efficient algorithms for the future, and fostering talents in computer science. The center will provide a favorable international academic environment for faculty members. Professor John Hopcroft who is the director of the Center, 1986 Turing Award winner, has been working at SJTU since 2011. (*https://jhc.sjtu.edu.cn/*)

To apply, please submit a cover letter, curriculum vita (CV), a research statement and a teaching statement to *jhc@sjtu.edu.cn*.

To ensure full consideration, please apply by December 30, 2023, although applications will be accepted until all positions are filled.

Stony Brook University



Assistant Professor - Computer Science, College of Engineering and Applied Sciences

Location: Stony Brook, NY
Open Date: Mar 15, 2023
Deadline: Apr 16, 2023 at 11:59 PM Eastern Time

Description
Stony Brook University's Department of Computer Science invites applications for a tenure-track assistant professor position with an expected starting date of Fall 2023. We are interested in candidates with background in all areas of computer systems, broadly defined. We are specifically interested in hearing from candidates with expertise in any aspect of data management and in software engineering. The Assistant Professor will be responsible for teaching undergraduate and/or graduate courses and conducting scholarly research.

Applicants should hold a Ph.D. in Computer Science or a closely related discipline, have outstanding scholarly records and stellar potential in their field of study, and demonstrate a sincere commitment to teaching and mentoring. The department values diversity and seeks candidates who can contribute to a welcoming climate for all students. We strongly encourage applications from women and underrepresented groups.

Qualifications

Required Qualifications:
Ph.D. in Computer Science or a closely related discipline. Outstanding scholarly records and stellar potential in their field of study. Demonstrated a sincere commitment to teaching and mentoring.

Preferred Qualifications:
Previous experience or background in all areas of computer systems, such as operating systems, programming languages, networking, data management, and software engineering. Research background in data management or software engineering.

Application Instructions

To apply, visit: **https://apptrkr.com/4009913**

Applications received by **April 16, 2023** will receive full consideration. Candidates who apply on or after **April 17, 2023** will be considered on a rolling basis until the position is filled. Please apply here with the requested documents: **https://apptrkr.com/4009913.**

- Cover Letter
- Curriculum Vitae
- Teaching Statement
- Research Statement
- Three letters of recommendation or evaluation

All application materials must be submitted online. Please use the Apply Now button to begin your application. For technical support, please visit Interfolio's Support Site (https://support.interfolio.com/) or reach out to their Scholar Service Team at help@interfollio.com or (877) 997-8807.

Applicant inquiries can be emailed to: **recruit@cs.stonybrook.edu**

Special Notes:
This is a tenure-track position. FLSA Exempt position, not eligible for overtime. Internal and external search to occur simultaneously.

Anticipated Start Date: Fall 2023

THE FOLLOWING PARAGRAPH ONLY APPLIES TO POSITIONS THAT MAY COME IN CONTACT WITH PATIENTS OR PATIENT CARE EMPLOYEES.

In accordance with federal and state regulations that all hospitals and nursing homes require personnel to be vaccinated against COVID-19, candidates who are not already fully vaccinated must obtain the first dose of a COVID-19 vaccine within three (3) calendar days of acceptance of a conditional job offer and must obtain any subsequent doses in accordance with that particular vaccine manufacturer's protocol. Candidates who are partially vaccinated, but not yet fully vaccinated, must complete their vaccination series within three (3) calendar days of a job offer or in accordance with that particular vaccine manufacturer's protocol, whichever comes later.

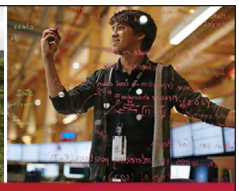
The state regulation also includes those who may be affiliated with or interact with employees of a hospital or nursing home. The regulations allow for limited exemptions with reasonable accommodations, consistent with applicable law.

The selected candidate must successfully clear a background investigation.

In accordance with the Title II Crime Awareness and Security Act, a copy of our crime statistics is available upon request . It can also be viewed online at the University Police website athttp://www.stonybrook.edu/police.
Stony Brook University is committed to excellence in diversity and the creation of an inclusive learning, and working environment. All qualified applicants will receive consideration for employment without regard to race, color, national origin, religion, sex, pregnancy, familial status, sexual orientation, gender identity or expression, age, disability, genetic information,veteran status and all other protected classes under federal or state laws.

Stony Brook University





Lecturer, Assistant/Associate/Full Professor of Practice

Department of Computer Science - Stony Brook University

Stony Brook University's Department of Computer Science invites applicants for a **Teaching Faculty Position** with an expected start date of Fall 2023. The candidate will hold the position of lecturer or assistant/associate/full professor of practice depending on qualification.

The selected candidate should hold an MS or Ph.D. in Computer Science or a closely related discipline and should have a strong commitment to teaching.

The candidate is expected to teach introductory and advanced undergraduate courses in Computer Science, and possibly graduate courses, depending on experience and interests. We are specifically interested in hearing from candidates with expertise and teaching interest in introductory or advanced programming, systems programming, web, software engineering or networking. Engaging in scholarly research and mentorship of graduate students are encouraged but not mandatory. The department values diversity and seeks candidates who can contribute to a welcoming climate for all students. We strongly encourage qualified women and minority candidates to apply.

Stony Brook University is located 60 miles from New York City on Long Island's scenic North Shore. Home to many highly ranked programs, it is a member of the prestigious Association of American Universities (AAU).

The Department of Computer Science is one of the largest departments in campus and offers BS, MS and PhD degrees in Computer Science and BS degree in Information Systems. The BS program in Computer Science is ABET accredited. The department currently has over 50 faculty members and is undergoing a period of rapid growth. The department is housed in a new state-of-the-art 70,000 sq ft building. The department is either home to or has significant collaborations with several interdisciplinary centers on campus, including the Institute for AI-Driven Discovery and Innovation, National Security Institute (NSI), Center for Visual Computing (CVC), Center of Excellence in Wireless and Information Technology (CEWIT) and Institute of Advanced Computational Science (IACS). Detailed information on the department can be found on the Department website: http://www.cs.stonybrook.edu.

Applicants need to electronically submit a curriculum vitae, statements of teaching and research, and three letters of recommendation or evaluation.

Please apply here with the requested documents: https://apptrkr.com/4009909

Texas A&M University/ College Station

Tenure-Track Assistant Professor in Visual Computing

The School of Performance, Visualization & Fine Arts (PVFA), Texas A&M University, invites applications for a tenure track Assistant Professor position in the Visual Computing and Computational Media (VCCM) Section. We are looking for candidates with research directions in all areas of visual computing, such as 3D modeling and animation, visual effects, human-computer interaction, data visualization, computer vision, extended reality, robotics, acoustics in virtual environments, and fabrication. VCCM is the focus for scientific and technical research and teaching in PVFA. The school's strength is in the merging of art and science across a broad range of creative pursuits. This position will be a nine-month, full-time, academic appointment, with an expected start date of Fall 2023.

The successful applicant will develop an independent, externally funded research program, teach courses at the undergraduate and graduate levels, advise and mentor graduate students, participate in all aspects of the school's activities, and serve the professional community.

The School of Performance, Visualization & Fine Arts is a new school within the Texas A&M University System and has a diverse and dynamic mission with 60 faculty and over 15 staff members and a projected exponential growth in the next five years. The school was formed from three departments/programs spread across the university: the Department of Visualization, the Department of Performance Studies, and the Dance Science Program. The mission of PVFA places a heavy emphasis on faculty and student collaboration and interdisciplinary work in both scholarly and creative research. Texas A&M University leadership has charged the school with developing innovative research and creative works, public performances, and degree offerings at the undergraduate, graduate, and doctoral levels that build upon our strength in merging art and science, as well as the traditional fields of music, dance, art, and theater. The new school is projected to move into a new, $175m state-of-the-art visual and performing arts center. Construction is

slated to begin in 2024. Applicants should consult the school's website to review our academic and research programs (*https://pvfa.tamu.edu/*).

Qualifications

A Ph.D. in Computer Science or a related field is required. Strong written and verbal communication skills are required as is an enthusiasm for applying technical, mathematical, and scientific expertise in collaboration across the range of artistic, technical, and humanistic disciplines represented in the school.

Application Instructions

Interested individuals should apply through Interfolio: (*apply.interfolio.com/122092*) and submit the following materials:

- Cover letter
- Curriculum vitae
- Personal Statement: Your statement should include your philosophy and plans for research, teaching, and service as applicable.
- Names and contact information of five professional references

Review of applications will begin 30 days after posting and continue until the position is filled. For additional application information, please contact the search committee chair Dr. Ergun Akleman, *ergun.akleman@tamu.edu*.

Equal Employment Opportunity Statement

Equal Opportunity/Affirmative Action/ Veterans/Disability Employer committed to diversity.

Union College

Visiting Assistant Professor of Computer Science

Union College invites applications for a two-year faculty position in Computer Science at the rank of Visiting Assistant Professor, beginning September 2023. The area of expertise is open. We are interested in candidates who can teach core CS classes and also courses in their areas of expertise, especially at the interface of CS and other fields, such as computational biology or digital humanities.

Interested candidates should electronically submit a cover letter, curriculum vitae, statement of teaching philosophy, statement of current research interests, and, optionally, any teaching evaluations from the past three years. Candidates who are selected for an interview will be asked to also provide letters of reference. Candidates are invited to describe explicitly the nature of their commitment and experience with underrepresented groups, and their ability to teach and retain a broadly diverse student body including groups underrepresented in computer science.

See *cs.union.edu/jobs* for instructions about how to submit the relevant materials.

We will begin reviewing applications starting April 15, 2023 and will continue until the position is filled.

University of Arizona

Director, Center for Biomedical Informatics and Biostatistics

The *University of Arizona* invites applications and nominations for the role of Director of the *Center for Biomedical Informatics and Biostatistics* (CB2).

Reporting to the *Senior Vice President for Health Sciences*, who in turn reports to the University's president, CB2's Director oversees core informatics services for *UArizona Health Sciences*. CB2 currently supports faculty and researchers with *electronic data capture*, *health informatics*, *biospecimen management*, and *statistical consultation*. The Director is a key member of the UArizona Health Sciences senior leadership team, which includes Health Sciences Vice Presidents, College Deans, and other Center Directors. For a full description of the role, including qualifications, please see *here*.

The University of Arizona has engaged Opus Search Partners to support the recruitment of this position. Craig Smith, Partner, and Chris Stadler, Associate, are leading the search. Inquiries, applications, and nominations should be sent by email to Chris (*chris.stadler@opuspartners.net*). The search process will unfold with the greatest possible attention to candidate confidentiality. Required application materials include a CV and a cover letter that addresses the required and preferred qualifications of the role, its responsibilities, and the University's expectations of CB2 and its Director including with regard to diversity, equity, and inclusion.

Professional Opportunities

University of Arizona

Tenure or Tenure-track Assistant or Associate Professor – Quantum

The Department of Electrical and Computer Engineering, University of Arizona invites applicants for a tenure/tenure-track faculty position at an Assistant/Associate Professor level to advance the deparment's research activities in experimental quantum information science and engineering.

Candidates in experimental QISE research are encouraged to apply. The specific areas of interest include but are not limited to quantum communications, quantum networking, quantum sensing, photonic quantum information processing, quantum interconnects, intermediate-scale and large-scale quantum processors, quantum repeaters, quantum nanophotonics and silicon photonics, quantum machine learning, and quantum security.

The position start date is August 2023. For more information and to apply visit *https://arizona.csod.com/ux/ats/careersite/4/home/requisition/1259?c=arizona*

University of Delaware

Temporary Instructor or Assistant Professor, Game Design and Development

The Game Studies and eSports (GAME) program at the University of Delaware (*https://www.dllc.udel.edu/undergrad-study/languages/game-studies*) seeks an exceptional candidate for the position of Instructor or Assistant Professor of Game Design and Development. The position is a terminal appointment that is renewable for up to 3 years, with a start date of August 16, 2023. It includes full benefits.

The successful candidate will have a Master's Degree in hand (Ph.D. preferred) in Computer Science or a related field, and/or a minimum of four years' professional or pedagogical experience in game design and development using platforms like Unity3D and/or the Unreal Engine.

FULL DETAILS: *https://careers.udel.edu/cw/en-us/job/499884/temporary-instructor-or-assistant-professor-game-design-and-development*.

Review of applications will begin on April 17, 2023. Applicants should upload: a letter of

UNLV

Assistant Professor of Cybersecurity
Computer Science Department
Howard R Hughes College of Engineering

The University of Nevada, Las Vegas invites applications for Assistant Professor of Cybersecurity, Computer Science Department, Howard R Hughes College of Engineering [R0133071].

ROLE of the POSITION
The Department of Computer Science (CS) at the University of Nevada, Las Vegas (UNLV) invites applications for a full time, tenure-track, Assistant Professor of Cybersecurity commencing Fall 2023. The areas include but not limited to application security, cloud security, digital forensics, web security, identity and access management, and AI/ML-based methods. CS department is home to the UNLV's National Center of Academic Excellence in Cyber Defense (CAE - CD) designated by National Security Agency (NSA). Applicants must demonstrate superior research and scholarship potential as well as excellent teaching ability. The successful candidate will be expected to develop and maintain extramurally funded research projects, provide outstanding teaching at the undergraduate and graduate levels, mentor graduate students, contribute to professional and university services, and participate broadly in the computer science curriculum.

PROFILE of the DEPARTMENT/COLLEGE
The Department of Computer Science is one of the fastest growing departments at UNLV. Comprising just under half of the Howard R. Hughes College of Engineering total enrollment, the department's focus is on providing a well-rounded education with a solid basis in the fundamentals of computer science. Our students and alumni are well-represented in the field, with many taking on employment locally and nationally.

MINIMUM QUALIFICATIONS
This position requires a PhD in Computer Science from an accredited college or university as recognized by the United States Department of Education and/or the Council on Higher Education Accreditation (CHEA). All But Dissertation Status (ABDs) may be considered but credentials must be obtained prior to the start of employment.

The successful candidate will have a strong research program in Cybersecurity, as evidenced by publications in premier journals and conferences and/or a successful history of receiving/submitting grants.

For more information, please visit **https://www.unlv.edu/jobs**

For assistance with the application process, please contact UNLV Human Resources at (702) 895-3504 or **unlvjobs@unlv.edu**

EEO/AA/Vet/Disability Employer

application; a curriculum vitae; and contact information for three references willing to provide letters of recommendation.

For additional information, please contact Dr. Phillip Penix-Tadsen, Chair of the Search Committee, at *ptpt@udel.edu*.

University of Nevada, Reno

Assistant or Associate Professor in AI/ML/ Data Science

Come join an energetic department at an up and coming university in an amazing location. The Department of Computer Science and Engineering at the University of Nevada, Reno (R1 university) invites applicants for a tenure-track faculty position at the Assistant or Associate Professor level, expected to begin in Fall 2023 or beyond. Preference will be given to candidates who have demonstrated a strong publication record and/or a record of obtaining external funding for their research. Salary and startup package will be determined by the candidate's qualifications and experience, but they will be competitive, particularly for those applying for the associate professor rank. The Department places a high value on diversity and welcomes candidates who can foster an inclusive environment for all students. We strongly encourage eligible women and minority candidates to submit their applications.

More information at
http://www.cse.unr.edu/R0136112

University of New Orleans

One Postdoctoral Research Position

The Canizaro Livingston Gulf States Center for Environmental Informatics (GulfSCEI) at the Computer Science department of the University of New Orleans has one postdoctoral position open in machine learning, digital twins, cloud computing and environmental informatics. These research positions will primarily focus on a new GulfSCEI project aimed at AI Automation to detect Flood Deficiencies in Flood Water Control Structures. Selected candidates are expected to participate in the design, plan, coordination, and implementation of tasks in support of the project. The position's start date is in May 2023 or sooner.

See further details and apply at:

https://ulsuno.wd1.myworkdayjobs.com/en-US/UniversityOfNewOrleans/details/Postdoctoral-Research-Associate---POA_R-000877-1?locations=2c405185165b01919372af8fb40251d2

University of Notre Dame

Assistant Professor of the Practice: Video Game Development

The Department of Computer Science and Engineering at the University of Notre Dame invites applications for a non-tenured instructor of Video Game Development at the Assistant Professor of the Practice rank. The department is especially interested in candidates who are well-versed in technical game development and have a specialization in programming video game engines or graphics, optimizing software performance, and building complex and scalable applications.

The primary responsibility for this position is to develop and teach a new two course video game development sequence, focusing on the technical aspects of developing video games across a variety of platforms (PC, mobile, console, AR/VR, etc.). Additionally, this position will also have the opportunity to develop complementary electives in the areas of computer graphics, software optimization, scalable or high performance applications, and other topics related to video game development.

The Department of Computer Science and Engineering offers Ph.D., MS, and undergraduate degrees. Professors of Practice are expected to excel in classroom teaching related to their area of specialization, engage in development of students outside the classroom, such as advising student clubs, providing individual mentoring, and serve the profession and the University. More information about the Department can be found at *https://cse.nd.edu/*.

Candidates should have at least a Master's degree in Computer Science or related field, or have at least 3 years of experience designing and developing video games. To apply for this position, applicants must submit a cover letter, a curriculum vitae, a teaching statement, a portfolio of creative work, a statement that summarizes their planned

contributions to diversity, equity, and inclusion, and contact information for three professional references.

Applications must be received by April 30, 2023, to guarantee full consideration; however, the review of applications will continue until the position is filled.

The University is an Equal Opportunity and Affirmative Action employer; we strongly encourage applications from women, minorities, veterans, individuals with a disability and those candidates attracted to a university with a Catholic identity.

Apply Here: *https://apply.interfolio.com/123398*

Wake Forest University

Visiting Assistant Professor

The Department of Computer Science at Wake Forest University invites applications for a one-year visiting faculty position to begin in July 2023. We are seeking candidates with strong interest in engaged undergraduate teaching.

Completion of a PhD in Computer Science or a closely related field prior to or within 6 months of the date of hire is preferred, although candidates with an MS in Computer Science or a related field may be considered. The teaching load is three courses per semester, with the primary responsibility of the post being teaching of introductory and core courses.

For detailed information about the position and application process, visit: *https://go.wfu.edu/csvap23*

Whitman College

Visiting Professor, Associate, Assistant or Instructor of Computer Science

The Computer Science Department at Whitman College is seeking candidates for a one-year position beginning August 2023 at the rank of visiting professor, visiting assistant professor, or visiting instructor as appropriate to the candidate's qualifications. M.S. and teaching experience in Computer Science or a related discipline is required, Ph.D. strongly preferred.

The successful candidate will teach multiple sections of Discrete Mathematics, Introductory Programming in Python, or Data Structures in C++ or Java, plus at least one further Computer Science course at an intermediate or advanced level. The teaching load is five course sections per year; our largest sections include about 30 students.

Whitman College is committed to cultivating a diverse learning community. Applicants should be able to demonstrate their commitment to diversity, equity, and inclusion and articulate how their classroom and scholarly practices work to advance antiracism in the learning environment. This statement can be included in the cover letter or the teaching statement. In their cover letter, candidates should address their interest in working at a liberal arts college with undergraduates, majors as well as non-majors, at all levels of instruction.

To apply, go to *http://apply.interfolio.com/124002*. The online application will prompt you to upload all of the required materials: a letter of application; curriculum vitae; statement of teaching philosophy; and evidence of demonstrated or potential excellence in undergraduate instruction. The committee will solicit three letters of recommendation from applicants who reach the interview stage.

Review of applications will begin on May 8, 2023 and continue until the position is filled.

Salary Range: $68,000-$85,000, commensurate with education and experience.

Whitman College offers a competitive benefits package that is designed to attract qualified candidates and retain talented employees. Full-time employees enjoy the following benefits: Medical/Dental/Vision Insurances; basic life, accidental death and dismemberment and long term disability insurances with the capability to elect additional voluntary coverage; 403(b) Defined Contribution Retirement Plan with a 10% matching contribution after eligibility requirements are met; employee tuition waiver for one Whitman course per semester; and an Employee Assistance Program. New faculty receive reimbursement for moving expenses based on the distance of relocation and are compensated $1,500 for attending a required New Faculty Orientation.