ACM-NDC Study 2019–2020:

Eighth Annual Study of Non-Doctoral-Granting Departments in Computing

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n fall 2019 and winter 2020, ACM collected data about enrollments, degree completions, and faculty demographics and salary in Non-Doctoral-Granting Departments in Computing. Referred to as the ACM NDC Study, the data provides timely information about the state of academic computing in the departments of use to the computing community, academic administrators, and the media. This year's enrollment and degree completions data comes from the National Student Clearinghouse Research Center (NSC), and is quite comprehensive in its coverage of the relevant departments. The NSC data is disaggregated by gender, ethnicity, and class rank to allow further depth of analysis in each of the six computing program areas of computer engineering, computer science, cybersecurity, information systems, information technology, and software engineering.

INTRODUCTION

Since 2011, ACM has conducted an annual study of enrollment, graduation, and faculty in Non-Doctoral-Granting Departments of Computing (NDC). This ACM NDC Study complements the annual Taulbee Survey of doctoral-granting programs performed by the Computing Research Association (CRA) [9]. Together, the two surveys afford the computing community a comprehensive look at the status of key elements of computing programs of study within academia. Of particular interest to the NDC Study is the data about bachelor's programs in each of the areas of computing in which ACM provides curricular guidelines [2] and in which ABET program accreditation criteria exists [1]. Prior to 2018, there were five such areas: computer science (CS), computer engineering (CE), information systems (IS), information technology (IT), and software engineering (SE). In 2018, ACM approved curricular guidelines in the area of cybersecurity (CY) and ABET accredited its first programs in this area.

ACM modified the manner in which the study was conducted this year. Previously, we surveyed academic departments about the various enrollment and graduation statistics from the most recent academic year, and the faculty statistics from the current academic year. However, the response rate was low in each year, and we were concerned about the representativeness of the data we were gathering.

For this year's report, we continued to gather faculty statistics directly from departments, since that is the only means we have to obtain such data. We had 151 departments responding with data on faculty demographics and 89 responding with data on faculty salaries. Both of these numbers are a bit higher than last year, but of course represent only a fairly small fraction of all of the possible NDC departments.

With support from the ACM Education Board, enrollment and graduation statistics were obtained from the National Student Clearinghouse Research Center (NSC), a non-profit organization to which nearly all academic institutions in the United States provide data annually [6]. The data provided to NSC typically is reported by an institution-level data office rather than an academic department-level office. Data is reported at the individual student level and includes the student's current program of study, using the Classification of Instructional Program (CIP) Code [5].

We included data from those institutions not classified as either Doctoral Very-High Research (aka R1) or Doctoral High Research (aka R2) [3]. These "non-R1 or R2" institutions do not provide data to the CRA Taulbee Survey; therefore they would have been candidates for the annual ACM NDC Study. There also are several R2 institutions that do not grant doctoral degrees in computing and therefore do not report to the CRA Taulbee Survey. However, the level of granularity of the data obtained from the NSC did not allow us to further break down the R2 institutions into those that grant computing doctoral degrees and those that do not. From past experience, we estimate that about one-third to one-half of the R2 institutions grant doctoral degrees in computing. The CRA Taulbee Survey provides good coverage of the doctoral programs from both R1 and appropriate R2 institutions.

A CIP code was assigned to the six computing areas according to the mapping in Table 1. The selection of CIP codes for CS is consistent with the codes used in a recent study by the Computing Research Association of the CS enrollment surge [4]. Identifying codes for CE and SE are relatively straightforward from the engineering set of CIP codes. For the other areas, we consulted persons who have been involved on behalf of ACM and CSAB in computing curriculum and accreditation activities in order to get recommendations for appropriate codes. The resulting code mapping is similar to that used in an earlier study of the representation of women in academic computing programs [8].

Table 1: Mapping of CIP Codes to Computing Areas

AREA	CIP CODES
CS	11.0101, 11.0701
CE	14.0901, 14.0902
IS	11.0401, 11.0501, 52.1201, 52.1206, 52.1299
IT	11.0103, 11.0201, 11.0202, 11.0301, 11.0801, 11.0802, 11.0804, 11.0899, 11.0901, 11.1001, 11.1002, 11.1004, 11.1005
SE	14.0903
CY	11.1003, 43.0116

To illustrate the increase in coverage using data from NSC when compared to data from the former NDC departmental survey, Figure 1 shows the number of participating institutions using each approach for the academic year 2017-18. Enrollment and graduation data from academic year 2017-18 was published previously in the 2018-19 ACM NDC Study in all areas except CY [7].
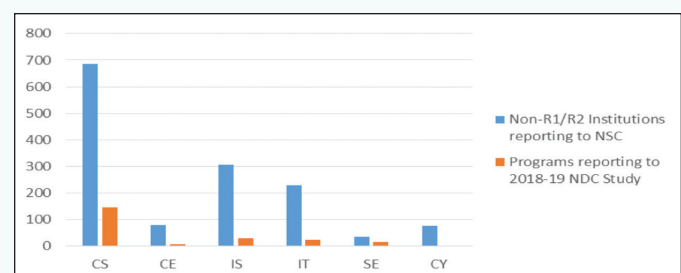

Figure 1: Comparison in Coverage of 2017-18 Data Between NSC and Most Recent NDC Study.

In the remainder of this report, we provide the NSC enrollment and graduation data from non-R1 or R2 institutions for both 2017-18 and 2018-19. This allows us to provide the community with vastly improved 2017-18 data over what was reported last year, and also allows us to compare results over a two-year period from this comprehensive set of institutions offering programs in non-doctoral-granting departments of computing. We also report the faculty results obtained from the much smaller set of departments who responded to this year's survey. These faculty data cover the previous, 2019-20, academic year.

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ENROLLMENT AND GRADUATION RESULTS

The NDC report historically included analysis of student data (demographics, degrees earned, enrollment) in both the bachelor's and master's programs of survey respondents. As the report shifts to the NSC data source, some changes to NDC reporting are necessary. Most notable are the following:

- As described above, the number of institutions for which data is available is greatly increased, resulting in a more reliable understanding of the state of enrollment and graduation.
- A profile of degree offerings at institutions for which data is included is provided. This profile includes minority serving institutions, a categorization not previously available in NDC. However, enrollment and graduation data for the non-R1 or R2 institutions could not be broken down by institutional control (public vs. private), by highest degree offered (bachelor's vs. master's) or for MSIs.
- The set of institutions that report data to NSC includes private, for-profit institutions, a group not previously included in the NDC survey.
- NSC enrollment and graduation data is for bachelor's programs only.
- Enrollment data supports the inclusion of gender, ethnicity, and class rank statistics not previously available in NDC reports.
- Although there is some data about freshmen, NSC data does not specifically identify first-year majors, eliminating the reporting of this leading indicator of enrollment trends.

The goal of this section is to present a foundation of NSC data for the two-year period spanning academic years 2017-2018 and 2018-2019. Reference to prior NDC reporting is only made when a substantial difference in previously reported trends occurs.

For all institutions reporting data in 2017-2018 and 2018-2019, Table 2 and accompanying Figure 2 summarize program offerings within the six curricular areas of computing broken down by institutional control. Notable trends over all institution types, with the exception of for-profit, private institutions, include computer science as the most common degree offering and the growth of cybersecurity programs.

The number and percentage change of degrees granted in each program area are presented in Table 3. Over all disciplines, there was a 4.7% increase in degree production, with largest increases occurring in software engineering (9.0%), computer science (7.5%), and information systems (5.3%). Computer engineering was the only discipline to experience a decline in degree production (-0.3%).

Tables 4a and 4b present the gender representation in degrees awarded broken out by discipline for 2017-2018 and 2018-2019 respectively. There were increases in the percentage of females aggregated over all program types (+0.1%), in computer science (+0.3%), and in information systems (+0.5%). Information technology remained steady in its representation of females among graduates while decreases were seen in com-

Table 2: Two-Year Summary of Program Offerings by Institution Type and Program Area

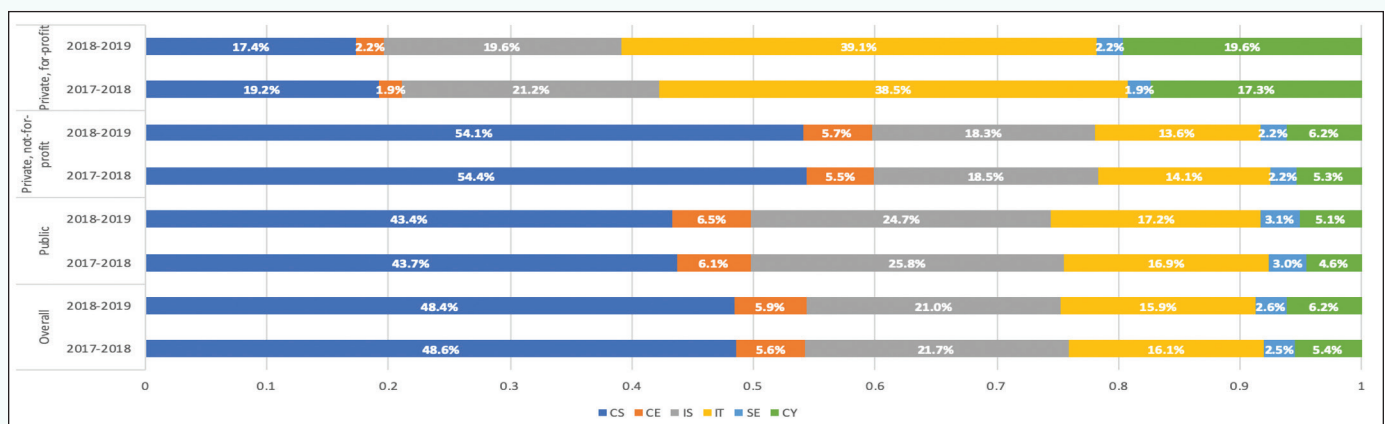|	Overall		Public		"Private		"Private		MSI	
	2017-2018	2018-2019	2017-2018	2018-2019	2017-2018	2018-2019	2017-2018	2018-2019	2017-2018	2018-2019
CS	687	696	259		418	426	10	8	138	137
CE	79	85	36	39	42	45	1	1	22	23
IS	306	302	153	149	142	144	11	9	60	58
IT	228	229	100	104	108	107	20	18	42	43
SE	36	37	18	19	17	17	1	1	3	3
CY	77	89	27	31	41	49	9	9	12	13
Totals	1,413	1,438	593	342	768	788	52	46	277	277

Figure 2: Percentage of Program Offerings within Each Category of Institutional Control that are Contributed by Each Computing Area.

puter engineering (-0.5%), software engineering (-0.6%), and cybersecurity (-0.6%).

Figure 3 compares the representation of women over all NDC programs, in NDC CS programs, and in CS programs reporting to the CRA Taulbee Survey (hereinafter Taulbee CS programs). Previously, NDC consistently reported a higher representation of women in NDC CS programs than in Taublee CS programs. The expanded data set from NSC reveals a contrary situation, however, with Taulbee CS programs outpacing NDC CS programs in female representation over the past two years by 2.9% and 2.7%, respectively. However, the trend is upward in both NDC overall and NDC CS programs.

The breakdown of degrees awarded by ethnicity for 2017-2018 and 2018-2019 is presented in Tables 5a and 5b. In comparison to Taulbee CS programs and consistent with prior NDC
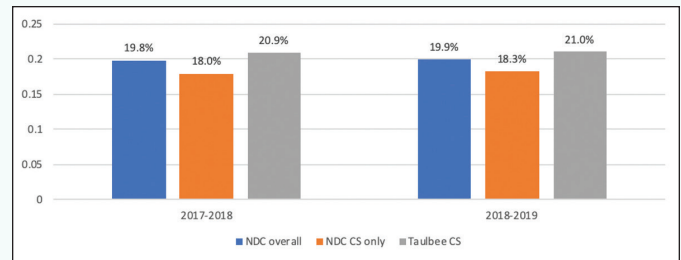

Figure 3: Gender Representation Among Graduates.

surveys, a higher percentage of degrees is awarded to Black/African-Americans, Hispanic/Latino, and White students. The percentages of degrees awarded to U.S. residents that are considered underrepresented (i.e., non-White, non-Asian) are presented in Figure 4. Over all NDC programs, the percentage is

Table 3: Degree Production Change by Discipline

	2017-2018 N Inst	2017-2018 degrees	2017-2018 degrees per Program	2018-2019 N Inst	2018-2019 degrees	2018-2019 degrees per Program	% change degrees per program
NDC Overall	1,413	32,845	23.2	1,438	35,000	24.3	4.7%
CS	687	14,627	21.3	696	15,924	22.9	7.5%
CE	79	1,242	15.7	85	1,332	15.7	-0.3%
IS	306	6,623	21.6	302	6,886	22.8	5.3%
IT	228	7,869	34.5	229	7,970	34.8	0.8%
SE	36	498	13.8	37	558	15.1	9.0%
CY	77	1,986	25.8	89	2,330	26.2	1.5%

Table 4a: Bachelor's Degrees Awarded by Gender and Discipline (2017-2018)

	Male		Female		Total Known Gender	Gender Unknown	Grand Total
CS	11,387	82.0%	2,492	18.0%	13,879	748	14,627
CE	1,009	87.3%	147	12.7%	1,156	86	1,242
IS	4,783	76.0%	1,508	24.0%	6,291	332	6,623
IT	5,945	78.5%	1,624	21.5%	7,569	300	7,869
SE	387	84.5%	71	15.5%	458	40	498
CY	1,602	81.7%	360	18.3%	1,962	24	1,986
NDC Overall	25,113	80.2%	6,202	19.8%	31,315	1,530	32,845
Taulbee CS	19,488	79.1%	5,162	20.9%	24,650	2,059	26709

Table 4b: Bachelor's Degrees Awarded by Gender and Discipline (2018-2019)

	Male		Female		Total Known Gender	Gender Unknown	Grand Total
CS	12,425	81.7%	2,780	18.3%	15,205	719	15,924
CE	1,104	87.8%	153	12.2%	1,257	75	1,332
IS	4,985	75.5%	1,619	24.5%	6,604	282	6,886
IT	5,999	78.5%	1,644	21.5%	7,643	327	7,970
SE	441	85.1%	77	14.9%	518	40	558
CY	1,896	82.3%	409	17.7%	2,305	25	2,330
NDC Overall	26,850	80.1%	6,682	19.9%	33,532	1,468	35,000
Taulbee CS	20,991	79.0%	5,572	21.0%	26,563	1,964	28,527

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higher in 2018-2019 than 2017-2018 (27.0% vs. 25.4%). NDC CS programs have higher percentages than those reported by Taulbee CS programs in both 2017-2018 (+8.5%) and 2018-2019 (+9.3%). Note that, in the IT area, more than 1/3 of the graduates' ethnicity was unreported or unknown. Comparisons

may be affected by this unknown data and should be interpreted with this understanding.

Enrollment change from 2017-2018 to 2018-2019 is shown in Table 6. Over all programs, a 2.2% increase in enrollment was seen at NDC institutions. Increases occurred in software

Table 5a: Bachelor's Degrees Awarded by Ethnicity (2017-2018)

	US Residents							Others			Total
	Hispanic/ Latino	American Indian/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Black/ African- American	White	2 or more races, non- Hispanic	Non- Resident	Total Ethnicity, Residency Known	Residency/ Race Unknown	Total
NDC Overall	2,728	104	3,445	50	2,582	14,260	821	560	24,715	8,130	32,845
	11.0%	0.4%	13.9%	0.2%	10.4%	57.7%	3.3%	2.3%			
CS	1,343	58	1,899	39	885	7,222	446	333	12,225	2,402	14,627
	11.0%	0.5%	15.5%	0.3%	7.2%	59.1%	3.6%	2.7%			
CE	186		267		40	480	40	20	1,039	203	1,242
	17.9%		25.7%		3.8%	46.2%	3.8%	1.9%			
IS	457	46	582	11	755	2,637	153	105	4,746	1,877	6,623
	9.6%	1.0%	12.3%	0.2%	15.9%	55.6%	3.2%	2.2%			
IT	562		515		655	2,721	182	102	4,784	3,085	7,869
	11.7%		10.8%		13.7%	56.9%	3.8%	2.1%			
SE	43		74		16	276			429	69	498
	10.0%		17.2%		3.7%	64.3%					
CY	137		108		231	924			1,492	494	1,986
	9.2%		7.2%		15.5%	61.9%					
Taulbee CS	1,725	47	5,899	63	692	10,117	637	3,086	22,266	4,498	26,709
	7.7%	0.2%	26.5%	0.3%	3.1%	45.4%	2.9%	13.9%			

Table 5b: Bachelor's Degrees Awarded by Ethnicity (2018-2019)

|	US Residents							Others			Total
	Hispanic/ Latino	American Indian/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Black/ African- American	White	2 or more races, non- Hispanic	Non- Resident	Total Ethnicity, Residency Known	Residency/ Race Unknown	Total
NDC Overall	3,136	165	3,606	59	2,851	15,339	1,070	632	26,945	8,055	35,000
	11.6%	0.6%	13.4%	0.2%	10.6%	56.9%	4.0%	2.3%			
CS	1,547	72	1,991	33	1,041	7,846	576	389	13,495	2,429	15,924
	11.5%	0.5%	14.8%	0.2%	7.7%	58.1%	4.3%	2.9%			
CE	216		276		47	509	47	36	1,137	195	1,332
	19.0%		24.3%		4.1%	44.8%	4.1%	3.2%			
IS	522	54	532	14	818	2,880	198	103	5,121	1,765	6,886
	10.2%	1.1%	10.4%	0.3%	16.0%	56.2%	3.9%	2.0%			
IT	655	39	586	12	656	2,752	191	104	4,995	2,975	7,970
	13.1%	0.8%	11.7%	0.2%	13.1%	55.1%	3.8%	2.1%			
SE	54		102		19	258			462	96	558
	11.7%		22.1%		4.1%	55.8%					
CY	142		119		270	1,094	58		1,735	595	2,330
	8.2%		6.9%		15.6%	63.1%	3.3%				
Taulbee CS	1,800	51	6,128	36	755	9,939	715	3,307	22,731	5,796	28,527
	7.9%	0.2%	27.0%	0.2%	3.3%	43.7%	3.1%	14.5%			
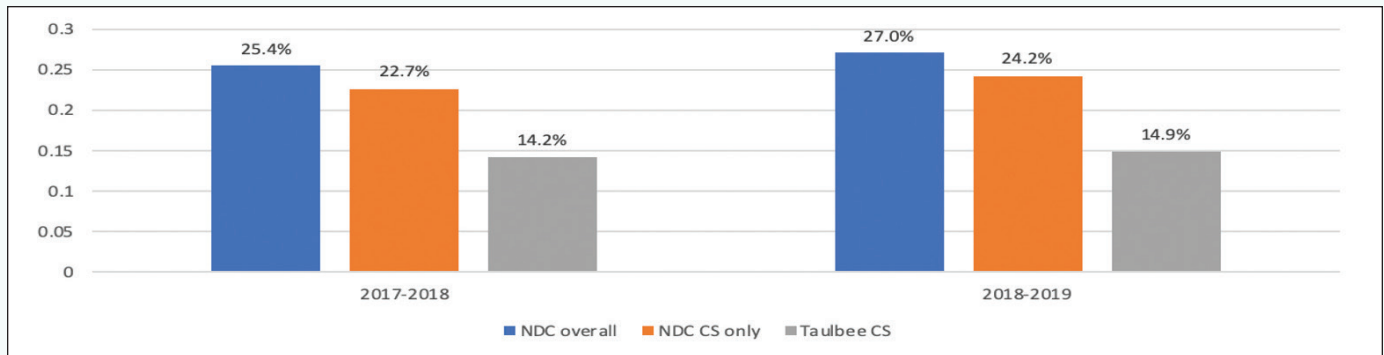
Figure 4: Representation of Underrepresented Minorities Among Graduates.

engineering (5.1%), cybersecurity (4.9%), computer science (3.2%), and information technology (1.6%). Computer engineering and information systems enrollments experienced declines of 5.4% and 0.6%, respectively.

In NDC programs overall, representation of females is 0.6% higher in 2018-2019 than in 2017-2018 (Tables 7a and 7b). Largest increases were in information technology (+1.8%), computer science (+0.6%), and software engineering (+0.6%). Only cybersecurity experienced a decline (-0.5%) in female representation in the two-year period. Taulbee CS programs had higher representation of females among enrolled students than NDC CS programs in both 2017-2018 (+0.7%) and 2018-2019 (+1.9%).

Table 6: Per Program Enrollment Change from Previous Year by Discipline

	2017-2018 N Inst	2017-2018 Enrollment	2017-2018 Enrollment per Program	2018-2019 N Inst	2018-2019 Enrollment	2018-2019 Enrollment per Program	% Change in Enrollment per Program
NDC Overall	1,413	290,250	205.4	1,438	302,000	210.0	2.2%
CS	687	123,345	179.5	696	128,907	185.2	3.2%
CE	79	11,249	142.4	85	11,449	134.7	-5.4%
IS	306	52,519	171.6	302	51,532	170.6	-0.6%
IT	228	75,270	330.1	229	76,811	335.4	1.6%
SE	36	3,645	101.3	37	3,938	106.4	5.1%
CY	77	24,222	314.6	89	29,363	329.9	4.9%

Table 7a: Bachelor's Enrollment by Gender and Discipline (2017-2018)

	Male		Female		Total Known Gender	Gender Unknown	Grand Total
CS	96,369	81.8%	21,474	18.2%	117,843	5,502	123,345
CE	9,166	86.7%	1,402	13.3%	10,568	681	11,249
IS	37,994	75.2%	12,504	24.8%	50,498	2,021	52,519
IT	57,072	78.5%	15,657	21.5%	72,729	2,541	75,270
SE	2,897	84.2%	544	15.8%	3,441	204	3,645
CY	19,532	81.5%	4,447	18.5%	23,979	243	24,222
NDC Overall	223,030	79.9%	56,028	20.1%	279,058	11,192	290,250
Taulbee CS	102,026	80.5%	24,709	19.5%	126,735	4,268	131,003

Table 7b: Bachelor's Enrollment by Gender and Discipline (2018-2019)

	Male		Female		Total Known Gender	Gender Unknown	Grand Total
CS	100,138	81.2%	23,220	18.8%	123,358	5,549	128,907
CE	9,306	86.3%	1,479	13.7%	10,785	664	11,449
IS	37,202	74.9%	12,496	25.1%	49,698	1,834	51,532
IT	56,846	76.7%	17,261	23.3%	74,107	2,704	76,811
SE	3,126	84.0%	596	16.0%	3,722	216	3,938
CY	23,955	82.3%	5,156	17.7%	29,111	252	29,363
NDC Overall	230,573	79.3%	60,208	20.7%	290,781	11,219	302,000
Taulbee CS	104,063	79.2%	27,397	20.8%	131,460	11,827	143,287

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The breakdown of enrollment with respect to ethnicity is presented in Tables 8a and 8b. Over all NDC programs, representation of all ethnic groups outside of Asian and White representation has increased between 2017-2018 and 2018-2019. As shown in Figure 5, NDC CS programs had higher representation of underrepresented minorities among US residents (i.e., non-white, non-Asian) than Taulbee CS programs in both 2017-2018 (+12.0%) and 2018-2019 (+13.9%). As was the case for the ethcnity breakdown of graduates, the enrollment break-down.also has disciplines (IT and CY) with more than 1/3 of unreported or unknown ethnicities. Interpretation of ethnicity data should bear this in mind.

Table 8a: Bachelor's Enrollment by Ethnicity (2017-2018)

| | US Residents | | | | | | | Others | | | |
	Hispanic/ Latino	American Indian/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Black/ African-American	White	2 or more races, non-Hispanic	Non-Resident	Total Ethnicity, Residency Known	Residency/ Race Unknown	Total
NDC Overall	27,754	1,371	21,276	765	31,452	107,141	8,631	4,054	202,638	87,612	290,250
	13.7%	0.7%	10.5%	0.4%	15.5%	52.9%	4.3%	2.0%			
CS	13,929	636	11,903	395	12,083	53,554	4,064	2,262	98,826	24,519	123,345
	14.1%	0.6%	12.0%	0.4%	12.2%	54.2%	4.1%	2.3%			
CE	2,238	32	1,839	37	613	3,559	341	268	8,927	2,322	11,249
	25.1%	0.4%	20.6%	0.4%	6.9%	39.9%	3.8%	3.0%			
IS	4,212	393	3,149	152	8,097	18,524	1,764	486	36,777	15,742	52,519
	11.5%	1.1%	8.6%	0.4%	22.0%	50.4%	4.8%	1.3%			
IT	5,309	310	3,113	181	7,880	21,240	1,627	651	40,311	34,959	75,270
	13.2%	0.8%	7.7%	0.4%	19.5%	52.7%	4.0%	1.6%			
SE	422		451		159	1,681	109	76	2,921	724	3,645
	14.4%		15.4%		5.4%	57.5%	3.7%	2.6%			
CY	1,644		821		2,620	8,583	726	311	14,876	9,346	24,222
	11.1%		5.5%		17.6%	57.7%	4.9%	2.1%			
Taulbee CS	11,283	310	25,091	181	4,751	47,568	4,182	13,042	106,408	24,595	131,003
	10.6%	0.3%	23.6%	0.2%	4.5%	44.7%	3.9%	12.3%			

Table 8b: Bachelor's Enrollment by Ethnicity (2018-2019)

| | US Residents | | | | | | | Others | | | |
	Hispanic/ Latino	American Indian/ Alaska Native	Asian	Native Hawaiian/ Pacific Islander	Black/ African-American	White	2 or more races, non-Hispanic	Non-Resident	Total Ethnicity, Residency Known	Residency/ Race Unknown	Total
NDC Overall	30,060	1,473	21,879	773	32,344	107,052	9,667	4,028	207,478	94,522	302,000
	14.5%	0.7%	10.5%	0.4%	15.6%	51.6%	4.7%	1.9%			
CS	14,928	595	11,803	395	12,178	52,100	4,382	2,217	98,598	30,309	128,907
	15.1%	0.6%	12.0%	0.4%	12.4%	52.8%	4.4%	2.2%			
CE	2,335	55	1,843	42	662	3,479	334	249	8,999	2,450	11,449
	25.9%	0.6%	20.5%	0.5%	7.4%	38.7%	3.7%	2.8%			
IS	4,518	367	3,173	161	8,130	18,176	2,197	407	37,129	14,403	51,532
	12.2%	1.0%	8.5%	0.4%	21.9%	49.0%	5.9%	1.1%			
IT	5,982	456	3,704	175	8,277	22,131	1,721	683	43,129	33,682	76,811
	13.9%	1.1%	8.6%	0.4%	19.2%	51.3%	4.0%	1.6%			
SE	447		459		150	1,742	115	91	3,020	918	3,938
	14.8%		15.2%		5.0%	57.7%	3.8%	3.0%			
CY	1,850		897		2,947	9,424	918	381	16,603	12,760	29,363
	11.1%		5.4%		17.7%	56.8%	5.5%	2.3%			
Taulbee CS	10,642	271	26,570	132	5,063	45,735	4,180	14,344	106,937	36,350	143,287
	10.0%	0.3%	24.8%	0.1%	4.7%	42.8%	3.9%	13.4%			
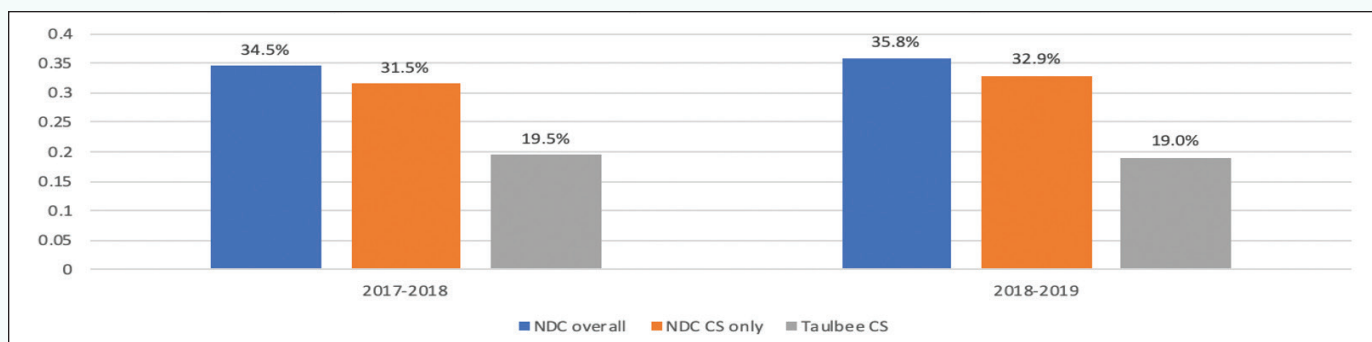
Figure 5: Representation of Underrepresented Minorities Among Enrolled Students.

Tables 9a and 9b summarize the breakdown of bachelor's enrollment by computing discipline and class rank for both the 2017-2018 and 2018-2019 academic years. Figure 6 depicts the change in percentage of enrollment over this two-year period at each class rank, broken out by computing discipline. Care must be taken in drawing conclusions based on this data; class rank was unreported for about 50% of the IT students and, in 2018-2019, for more than 1/3 of the CY students.

Table 9a: Bachelor's Enrollment by Class Rank

	2017-2018										
	Freshman		Sophomore		Junior		Senior		Total known rank	Unreported rank	Total
	Enrollment	% of known total	Enrollment	% of known total	Enrollment	% of known total	Enrollment	% of known total			
CS	23,814	24.5%	20,439	21.1%	23,351	24.1%	29,456	30.3%	97,060	26,285	123,345
CE	2,745	27.9%	1,983	20.2%	1,964	20.0%	3,138	31.9%	9,830	1,419	11,249
IS	6,512	17.8%	6,572	18.0%	10,955	29.9%	12,567	34.3%	36,606	15,913	52,519
IT	8,419	22.6%	7,333	19.7%	8,963	24.0%	12,554	33.7%	37,269	38,001	75,270
SE	669	22.3%	680	22.7%	643	21.5%	1,004	33.5%	2,996	649	3,645
CY	4,324	25.4%	4,090	24.0%	4,023	23.6%	4,611	27.0%	17,048	7,174	24,222
Overall	46,483	23.1%	41,097	20.5%	49,899	24.8%	63,330	31.5%	200,809	89,441	290,250

Table 9b: Bachelor's Enrollment by Class Rank *(continued)*

	2018-2019													
	Freshman			Sophomore			Junior			Senior			Total known rank	Unreported rank	Total
	Enrollment	% of known total	Freshmen % change	Enrollment	% of known total	Sophomore % change	Enrollment	% of known total	Junior % change	Enrollment	% of known total	Senior % change			
CS	23,986	24.1%	-0.5%	20,765	20.8%	-0.2%	24,166	24.2%	0.2%	30,784	30.9%	0.5%	99,701	29,206	128,907
CE	2,433	25.4%	-2.5%	2,103	21.9%	1.8%	1,803	18.8%	-1.2%	3,244	33.9%	1.9%	9,583	1,866	11,449
IS	5,922	15.8%	-2.0%	6,558	17.5%	-0.5%	11,362	30.3%	0.3%	13,697	36.5%	2.2%	37,539	13,993	51,532
IT	9,397	24.1%	1.5%	7,620	19.5%	-0.2%	9,306	23.8%	-0.2%	12,708	32.6%	-1.1%	39,031	37,780	76,811
SE	651	20.2%	-2.1%	664	20.6%	-2.1%	751	23.4%	1.9%	1,150	35.8%	2.2%	3,216	722	3,938
CY	4,532	25.0%	-0.3%	4,058	22.4%	-1.6%	4,320	23.9%	0.3%	5,194	28.7%	1.6%	18,104	11,259	29,363
Overall	46,921	22.6%	-0.5%	41,768	20.2%	-0.3%	51,708	25.0%	0.1%	66,777	32.2%	0.7%	207,174	94,826	302,000

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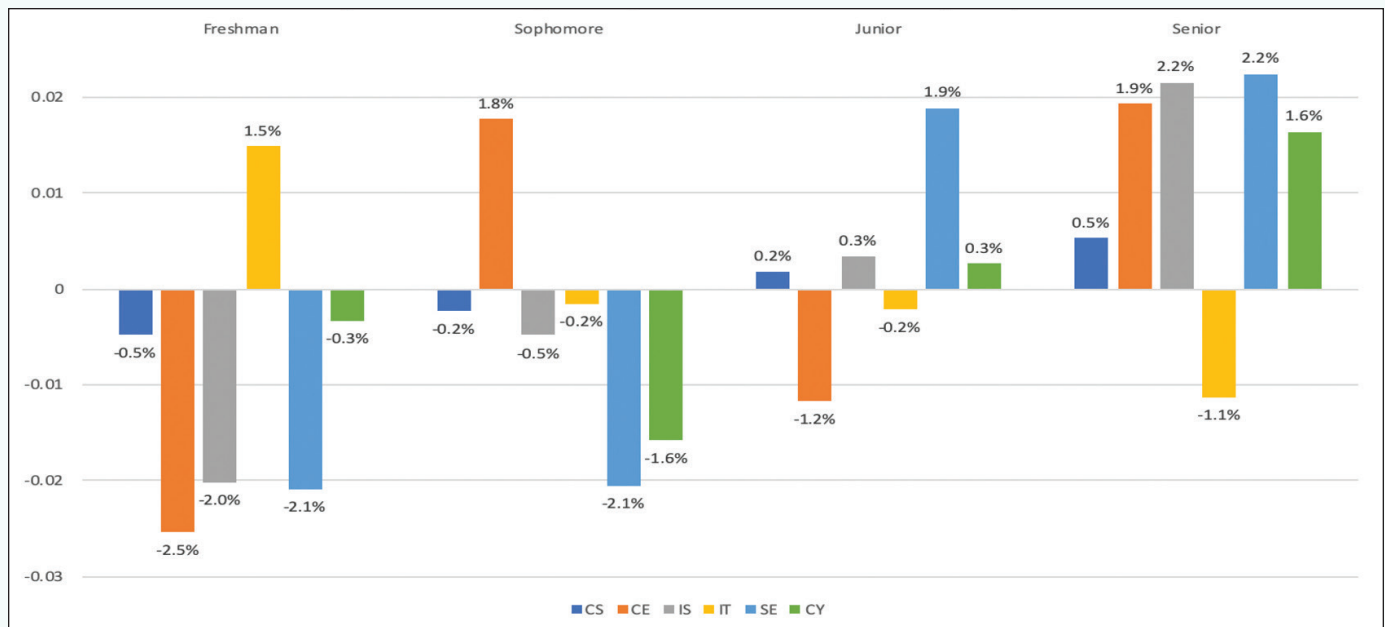

Figure 6: Percentage Change in Enrollment at Rank by Discipline.

FACULTY RESULTS

As noted in the introduction, we conducted our usual survey of non-doctoral-granting departments for the purpose of obtaining data about faculty demographics and salaries. Responses were received from 151 departments, four more than responded last year. Nearly two-thirds of the respondents were from private institutions, and nearly two-thirds were from departments that do not grant master's degrees in computing. The public-private split is similar to that last year, but this year there is a larger percentage of master's granting institutions among the respondents (Table 10).

The average faculty size this year was 13.9 in headcount, and 12.1 FTE, both slightly higher than the respective 13.1 and 11.3 reported last year. Increases were seen in both tenure-track and full-time non-tenure-track faculty, while the average number of part-time/adjunct faculty and visiting faculty remained the same. As was the case last year, departments at public institutions tended to rely more heavily on tenure-track and full-time non-tenure-track faculty than did departments at private institutions, while private institutions had a greater fraction of part-time/adjunct faculty members. Also similar to last year,

non-master's-granting departments had a greater percentage of their faculty as tenure-track and smaller percentages as full-time non-tenure-track and part-time/adjunct (Table 11). Within each category of institutions, and overall, there is a fairly even distribution of tenure-track faculty members at each of the three faculty ranks (Table 11).

Table 11: Tenure-Track Faculty Average Headcount Breakdown by Rank

Faculty Type	Overall	Overall %	Public	Private	Non-Master's	Master's
# respondents	146		52	94	94	52
Full Professor	2.1	34.0%	34.9%	33.2%	31.7%	35.9%
Associate Professor	2.1	32.9%	32.6%	33.2%	34.3%	31.8%
Assistant Professor	2	32.4%	31.9%	32.8%	33.1%	31.8%
Other	0	0.8%	0.7%	0.8%	1.0%	0.6%

Gender diversity was slightly lower this year than last year, with 24.5% female of those whose gender was reported. Last year's percentage was 26.6. Reduction in percentage versus last

Table 10: Actual Faculty Size 2019-2020

Faculty Type	Overall Avg HC	Overall % of HC Total	Overall Avg FTE	Overall % of FTE Total	Public FTE	Private FTE	Non-Master's FTE	Master's FTE
# respondents	151		151		55	96	98	53
Tenure-track	6.6	47.9%	6.5	53.9%	61.0%	48.2%	66.5%	47.1%
Visiting	0.4	2.8%	0.4	3.2%	3.8%	2.7%	4.2%	2.6%
FT Non-TT	1.5	10.8%	1.5	12.1%	16.5%	8.6%	7.0%	14.9%
PT/Adjunct	5.4	38.6%	3.7	30.7%	18.7%	40.5%	22.2%	35.4%
Total	13.9		12.1					

year was present at the full professor and assistant professor levels (Table 12). There also was a higher percentage of Asian and lower percentage of Hispanic faculty reported this year compared with last year. Only 5.9% of the entire tenure-track faculty was Black, Hispanic, Native American, Native Hawaiian/Pacific Islander, or two or more races. This is lower than last year's 6.8% (Table 13).

Table 12: Tenure-Track Faculty Headcount Breakdown by Gender (149 Units)

Gender	Full Prof	Assoc Prof	Asst Prof	Other T-T	Total T-T
Total Faculty	316	314	303	12	945
Male	76.9%	72.0%	72.3%	75.0%	73.8%
Female	20.6%	26.1%	25.1%	25.0%	23.9%
Not Reported	2.5%	1.9%	2.6%	0.0%	2.3%
percent female *	21.1%	26.6%	25.8%	25.0%	24.5%

* as a percentage of those for whom gender was reported

Table 13: Tenure-Track Faculty Headcount Breakdown by Ethnicity (149 Units)

Ethnicity	Full Prof	Assoc Prof	Asst Prof	Other T-T	Total T-T
Total faculty	316	314	303	12	945
Nonresident Alien	0.9%	0.6%	8.3%	0.0%	3.2%
American Indian/ Alaska Native	0.0%	0.3%	0.7%	0.0%	0.3%
Asian	20.6%	24.5%	21.8%	8.3%	22.1%
Black or African-American	1.3%	2.9%	3.0%	0.0%	2.3%
Native Hawaiian/ Pacific Islander	0.0%	0.3%	0.0%	0.0%	0.1%
White	69.3%	64.6%	56.4%	50.0%	63.4%
Multiracial, not Hispanic/Latino	0.3%	0.3%	1.0%	0.0%	0.5%
Hispanic/Latino, any race	3.5%	2.5%	1.7%	0.0%	2.5%
Resident, race/ethnicity unknown	1.6%	2.5%	5.3%	41.7%	3.6%
Total Residency known	97.5%	98.7%	98.0%	100.0%	98.1%
Residency unknown	2.5%	1.3%	2.0%	0.0%	1.9%
Black+Hisp+ NatAm+NatHaw+ Multi*	5.2%	6.5%	6.4%	0.0%	5.9%

* as a percentage of those for whom residency is known

There was less recruiting among this year's respondents although fewer departments reported about recruiting than did so last year. Departments that sought new tenure-track faculty were successful about ¾ of the time, similar to last year. Though the numbers are very small, there were more new tenure-track faculty members hired at senior ranks this year than last year. Full-time non-tenure-track faculty recruiting was more successful this year than last year, with only one slot going unfilled. As was the case last year, part-time/adjunct faculty members were also recruited with very high success, in fact 100% success this year (Table 14). Among the newly hired tenure-track faculty, a smaller percentage were women this year (20.0% vs 27.3%), while there was a bit more diversity in this year's recruiting class (6.8% aggregate across Black, Hispanic, Native American, Native Hawaiian/Pacific Islander, and two or more races, vs 3.9% last year). However, with such small numbers in these categories, a difference of one can change the year-to-year comparison in a meaningful way (Table 15).

Table 14: Faculty Recruiting During 2018-2019 (76 Respondents)

Faculty Type	Number Sought	Avg/Unit	Number Filled	Success Rate
Tenure-track	82	1.09	61	74.4%
Full Professor			2	
Associate Professor			6	
Assistant Professor			50	
Other			3	
Visiting	28	0.37	29	103.6%
FT Non-TT	28	0.37	27	96.4%
PT/Adjunct	40	0.53	40	100.0%

Table 15: Gender and Ethnicity of Newly Hired Faculty (75 Units)

Gender	Ten-Track	% of Total
Male	48	78.7%
Female	12	20.0%
Unknown	1	1.6%
Ethnicity	**Ten-Track**	**% of Total**
Nonresident Alien	5	8.2%
American Indian/Alaska Native	0	0.0%
Asian	15	24.6%
Black or African-American	3	4.9%
Native Hawaiian/Pacific Islander	0	0.0%
White	28	45.9%
Multiracial, not Hispanic/Latino	0	0.0%
Hispanic/Latino, any race	1	1.6%
Resident, race/ethnicity unknown	7	11.5%
Total Residency known	59	96.7%
Residency unknown	2	3.3%
Black+Hisp+NatAm+NatHaw+Multi	4	6.8%

Table 16 contains information about the extent to which different types of responding departments require a specific level of degree in order to hire, tenure, or promote tenure-track faculty. These fractions do not change much from year to year. Except for hiring full-time non-tenure-track faculty, the vast majority of departments require the doctoral degree for any of these types of actions; however, hiring of assistant professors without doctoral degrees appears to be more common at private institutions than at public institutions. This also was the case last year.

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Table 16: Degree Required for Faculty Personnel Decisions

Required Degree	Hiring Full Prof	Hiring Assoc Prof	Hiring Asst Prof	Hiring FT Non-TT	Tenure	Promotion to Full Prof	Promotion to Assoc Prof
Overall (133)							
Doctoral	97.6%	92.7%	77.7%	12.1%	85.9%	96.9%	87.5%
Masters	2.4%	7.3%	22.3%	83.3%	13.3%	3.1%	12.5%
Bachelors	0.0%	0.0%	0.0%	4.5%	0.8%	0.0%	0.0%
Public (49)							
Doctoral	97.7%	95.6%	85.4%	14.3%	87.5%	95.8%	89.6%
Masters	2.3%	4.4%	14.6%	83.7%	10.4%	4.2%	10.4%
Bachelors	0.0%	0.0%	0.0%	2.0%	2.1%	0.0%	0.0%
Private (84)							
Doctoral	97.5%	91.1%	73.2%	10.8%	85.0%	97.5%	86.3%
Masters	2.5%	8.9%	26.8%	83.1%	15.0%	2.5%	13.8%
Bachelors	0.0%	0.0%	0.0%	6.0%	0.0%	0.0%	0.0%
Non-Master's (85)							
Doctoral	96.2%	88.6%	71.4%	13.1%	81.7%	95.1%	85.4%
Masters	3.8%	11.4%	28.6%	79.8%	17.1%	4.9%	14.6%
Bachelors	0.0%	0.0%	0.0%	7.1%	1.2%	0.0%	0.0%
Master's (48)							
Doctoral	100.0%	100.0%	89.1%	10.4%	93.5%	100.0%	91.3%
Masters	0.0%	0.0%	10.9%	89.6%	6.5%	0.0%	8.7%
Bachelors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

More faculty departures were reported among this year's respondents, with forty departments reporting a total of 56 departures, compared with 33 departments reporting a total of 41 departures last year. There were faculty this year who left for non-academic positions, while there were none reported last year. However, retirement and departure for other academic positions continue to be the primary reasons that faculty members leave (Table 17).

Table 17: Tenure-Track Faculty Departures (94 Respondents)

DEPARTURES	
Responding units with departures	40
Total number of departures	56
Reason for Departure (percent)	
Retired	46.4%
Deceased	8.9%
Other ac position	26.8%
Non-ac position	10.7%
Changed to PT	1.8%
Other reason	5.4%
Reason unknown	0.0%

Tenure-track faculty salary data is reported in Tables 18 and 19. The former table reports those departments that provided data about individual faculty members. The median values reported in these tables are true medians of the collection of individual faculty from these units. The latter table reports all departments that provided salary information, both those providing individual salaries and those that reported only aggregated averages by faculty rank. For Table 19, the medians are medians of these department averages, so they are not in general true medians, nor true averages. Unfortunately, many fewer departments reported individual salaries than reported aggregated salaries (30 vs 59). This is similar to last year. However, this year we have 89 units in total for whom we have some salary data, versus 81 last year.

Table 18: Median Faculty Salaries (From Individual Salary Data)

	Overall	Public	Private	Non-Master's	Master's
Units responding	32	15	17	23	9
Full Professor					
Number of individual faculty	34	21	13	16	18
Median Salary	$110,469	$113,000	$95,000	$96,500	$114,566
Associate Professor					
Number of individual faculty	58	35	23	27	31
Median Salary	$90,838	$95,900	$83,428	$84,246	$100,500
Assistant Professor					
Number of individual faculty	66	45	21	35	31
Median Salary	$86,983	$88,700	$74,648	$82,000	$88,600
Other					
Number of individual faculty	55	37	18	17	38
Median Salary	$65,000	$64,505	$67,807	$67,000	$63,203

Table 19: Faculty Salaries (From Aggregate Salary Data)

	Overall	Public	Private	Non-Master's	Master's
Units responding	89	40	49	56	33
Full Professor					
Units responding	67	31	36	36	31
Average of Median Salary	$109,424	$110,447	$108,514	$100,941	$119,548
Associate Professor					
Units responding	70	35	35	41	29
Average of Median Salary	$87,937	$88,598	$87,258	$85,144	$91,723
Assistant Professor					
Units responding	69	34	35	40	29
Average of Median Salary	$78,409	$77,038	$79,780	$76,566	$80,847
Other					
Units responding	45	24	21	16	29
Average of Median Salary	$65,709	$60,524	$71,570	$61,316	$68,491

Among this year's respondents, median individual salaries were higher at public and at master's-granting departments than, respectively, at private and non-master's-granting. While medians of the aggregated salaries showed the same direction of difference between master's and non-master's-granting respondents, there was a lot of similarity between public and private departments. Last year's salary data showed a similar comparison between master's and non-master's departments, while there was more similarity between public and private departments for individual salaries, and higher salaries at private departments for aggregated salaries.

CONCLUDING REMARKS

The data from the National Student Clearinghouse used in this report affords a comprehensive view of enrollment and degree production in bachelor's programs at non-doctoral-granting computing programs. The results, with data from approximately 300,000 students in each of 2017-18 and 2018-19, demonstrate overall growth in both enrollment and degree production, but at a slower rate than has been reported in past years using less comprehensive data. The results also demonstrate clear differences across the different computing disciplines, with computer engineering showing declines over this two year period while computer science, software engineering, and cybersecurity show increases. The data also illustrates the growth in the number of institutions with cybersecurity programs.

Data on gender and ethnicity also illustrate differences across the various computing disciplines, with NDC enrollment data being disaggregated by gender and ethnicity for the first time. The representation of women in the information systems and information technology areas is much higher than it is in areas like computer engineering and software engineering, and representation by underrepresented ethnicities is highest among Blacks in IS but highest among Hispanics in CE.

Data on faculty demographics and salaries revealed no major changes from the previous year. There was some growth in faculty size, in both tenure-track and full-time non-tenure-track faculty.

It is our intent to use the NSC data in future NDC reporting of enrollment and graduates data. As reported in the section on Enrollment and Graduation Results, there is some data that used to be reported but that was not obtained from NSC. But the data we can and do report provides a much more complete picture of non-doctoral-granting programs than we were able to do previously. ❖

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