



**M** | COMPUTER SCIENCE & ENGINEERING

Climate, Diversity, Equity, and Inclusion  
**AY 2021-2022** Annual Report

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## Introduction

This report is a public record of statistics and activities intended to provide transparency regarding climate, diversity, equity and inclusion in Michigan Computer Science and Engineering. The report is suitable for students and community members and includes brief contextual information and background for nuanced topics.

The 2021-2022 Academic Year featured a number of challenges, stresses and uncertainties. At the University level, [students returned to in-person courses in general](#), despite [ongoing COVID-19 concerns](#). The [President of the University was removed](#) for inappropriate conduct, [bringing misconduct to the forefront of discussions](#). At the global level, concerns about jobs and the economy led to [shifting plans for many students](#). At the same time, [broadening gun violence, including in school settings](#), the [invasion of Ukraine](#), and [the Roe v. Wade decision](#) were all aspects of an academic year that was especially difficult for many community members.

Continuing our renewed commitment to transparency, we make this report, and subsequent annual reports, public. [Other reports are available](#). Diversity, equity and inclusion are [core values](#) of the University, the College of Engineering and Computer Science and Engineering. There are legal (e.g., [equal opportunity and treatment](#)), moral (e.g., [ideology](#)) and pragmatic (e.g., engineering is a [creative activity that benefits from multiple perspectives](#)) reasons, among others, to broaden participation in computing. One goal of this report is to help track progress and identify areas for improvement.

## Issues and Terminology

Because this is a public-facing document intended for a general audience, we provide a brief introduction to some of the issues and terms.

**Diversity, Equity and Inclusion (DEI)** concerns are multi-faceted. While notions such as race, ethnicity and gender are commonly considered, [DEI](#) includes all students and community members.

**Underrepresented minority** racial and/or ethnic backgrounds (**URM**) are context-dependent with respect to computer science in particular or engineering in general. For example, while Asian and Asian American individuals are a minority group in the United States generally, they are not an underrepresented minority in computing. The [Rackham Graduate School URM definition](#) includes African Americans, Hispanic Americans, American Indians/Native Alaskans, Native Hawaiians/Pacific Islanders (excluding Asian Americans), and multi-racial students identifying at least one of previously listed URM categories. The term “underrepresented minority” may be seen as problematic because it defines disparate groups with a homogeneous term, which those groups did not choose (see [Tiffani Williams essay at the CACM website](#)). We use the term because it is the current language of the Rackham Graduate School and the University.

Statistics often distinguish between **sex** (e.g., males, females, etc.) and **gender** (e.g., men, women, etc.), with the latter viewed through the lens of [social construction or identity](#). The latter can be particularly helpful for discussions of LGBTQ+ issues, among other contexts. The National Center for Women & Information Technology provides an accessible summary of the [overall state of gender diversity in computing](#). Historically, the female share of CS undergraduate degrees reached its peak around 40% in the 1970’s, plummeted into the low teens (e.g. 12-15%), and is back up to around 20% in most CS departments. There are outliers, such as Harvey-Mudd College and Carnegie Mellon University, where female participation in the undergraduate computer science degree program is around 50%.

When measuring participation, we often consider individuals at various stages of a program or process. Broadly, the group of people applying for a position or status (e.g., applying to declare the major, applying to join the graduate program, applying for a faculty position) in a particular year is the **applicant pool**. In the case of faculty hiring, a subset of the applicants will be invited to **interview**. Based on a set of criteria, a subset of applicants will be **admitted** or given an **offer** (e.g., only some who apply to join the graduate program are extended an offer of admission). Of those admitted, a subset will **accept** the offer and join or **enter** the program. Eventually, a subset of those will **complete** the program or otherwise reach a particular milestone (e.g., students may complete the major and obtain the degree, junior faculty may be granted tenure, etc.).

Different measurements at these stages can highlight areas for improvement. For example, when few individuals are present in the applicant pool or when individuals withdraw after an interview or visit, it is typically viewed as a **recruitment** problem. By contrast, if fewer individuals complete the program than begin it, it is typically viewed as a **retention** problem. These distinctions are relevant because they often have different causes or remedies. For example, recruitment issues may be partially addressed through outreach to other schools, while retention issues typically implicate weaknesses in our climate, policies and support for those already here.

**Broadening participation in computing** has been an explicit goal of the US National Science Foundation for decades. The NSF funded about a dozen alliances to improve our national ability to diversify computing (see the [AAAS report on BPC alliances](#)). Former US president Barack Obama made it a national goal to provide “CS for All” in US schools, and [the CS for All consortium](#) still continues work towards that goal. Understanding how computer science became so male-dominated, compounded by the underrepresentation of BIPOC (Black, Indigenous, and People of Color) students, remains an open research question today. One of the best empirical studies is [Unlocking the Clubhouse](#) by Jane Margolis and Alan Fisher. A historical treatment is [The Computer Boys Take Over](#) by Nathan Ensmenger.

## Michigan Law and Context

**Affirmative action** broadly refers to [policies designed to help disadvantaged or underrepresented groups](#). In 2006, the [Michigan Civil Rights Initiative \(MCRI\)](#) was adopted by Michigan voters; that initiative, which is codified as Article I, Section 26 of the Michigan Constitution, prohibits public universities from “discriminat[ing] against, or grant[ing] preferential treatment to, any person or group on the basis of race, sex, color, ethnicity, or national origin in the operation of public education, public employment, or public contracting.” The [long-term effects of the law](#) are still being studied.

One implication, phrased informally, is that programs that provide additional help or resources or guide admissions or hiring decisions *cannot* be based on qualities such as race or gender. Programs that help support student success, such as the [M-STEM \(Michigan Science, Technology, Engineering and Mathematics\) Academies](#) or the [Comprehensive Studies Program](#), use alternate criteria. For example, CSP’s mission includes a focus to “provide academic guidance for, and retain undergraduate students from diverse populations with outstanding potential for success at the University of Michigan” and [any student can apply to join CSP](#).

While affirmative action remains controversial (with multiple [pro](#) and [con](#) arguments, and the Michigan Civil Rights Initiative [passing by a 58 to 42](#) margin), the state law does limit targeted actions that can be taken by the University in general and by CSE in particular. Issues regarding the underrepresentation of particular groups cannot legally be addressed through programs limited to individuals of those particular races, ethnicities or genders. Instead, we seek to address underrepresentation by offering programs and initiatives

that focus on issues of diversity or that are intended to improve the experiences of underrepresented groups, but that are open to all without regard to identity. In addition, we recognize that [issues of climate, diversity, equity and inclusion affect us all](#) and that efforts should improve the experiences of, and support the success of, all students and community members.

## Trends and Comparisons

In many places in this report we provide high-level direct comparisons to the previous year with the searchable heading “*Changes from previous year*”. CSE’s annual transparency reports [are published](#) and admit direct, and eventually longer-term, comparisons.

## Undergraduate Program

Information about the CSE undergraduates is available at various points throughout the program.

### Undergraduate Major Enrollment

The [Office of the Registrar’s Enrollment Report](#) for Computer Science Undergraduates provides enrollment information. We consider the [CS Major \(Engineering\)](#), the [CS Major \(Literature, Science and Arts\)](#), the [Data Science Major \(Engineering\)](#), the [Data Science Major \(Literature, Science and Arts\)](#), and the [Computer Engineering Major](#) (shared with [Electrical and Computer Engineering](#)):

	Winter 2022		Fall 2021		Winter 2021		Fall 2020		Winter 2020		Fall 2019	
<b>Total</b>	2966	100%	2752	100%	2739	100%	2567	100%	2586	100%	2346	100%
<b>Female</b>	717	24.2%	651	23.7%	658	24.0%	591	23.0%	590	22.8%	513	21.9%
<b>Male</b>	2249	75.8%	2101	76.3%	2081	76.0%	1976	77.0%	1995	77.2%	1834	78.2%
<b>Asian</b>	859	29%	778	28.3%	739	27.0%	681	26.5%	721	27.9%	641	27.3%
<b>Black</b>	49	1.7%	44	1.6%	49	1.8%	46	1.8%	39	1.5%	37	1.6%
<b>Hispanic</b>	142	4.8%	137	5%	129	4.7%	127	4.9%	122	5.1%	94	4.0%
<b>Two or More</b>	87	2.9%	79	2.9%	71	2.6%	63	2.5%	76	2.9%	68	2.9%
<b>Two or More URM</b>	44	1.5%	39	1.4%	40	1.5%	34	1.3%	32	1.2%	27	1.2%
<b>Unknown</b>	202	6.8%	185	6.7%	170	6.2%	152	5.9%	130	5.0%	120	5.1%
<b>White</b>	976	32.9%	931	33.8%	978	35.7%	914	35.6%	961	37.2%	903	38.5%
<b>Non Resident Alien</b>	605	20.4%	557	20.2%	562	20.5%	549	21.4%	505	19.5%	457	19.5%

To provide a context for these numbers on race, the state of Michigan is 74.7% White, 14.1% Black, 5.3% Hispanic, and 3.4% Asian, according to the [US Census](#).

We note that CSE does not admit undergraduates directly when they enter the University of Michigan. Instead, undergraduates complete a number of semesters of prerequisite courses (e.g., in [Engineering](#) or [Literature, Science and Arts](#)) before applying to declare a computing major.

We continue to note that Engineering and LSA showed different patterns of enrollment with respect – specifically – to ethnicity. For example, in Winter 2022, Engineering undergraduates in Computer Science were 8.1% URM (see Issues and Terminology above for the definition of Underrepresented Minority), while LSA undergraduates in Computer Science were 6.9% URM. In comparison to the previous year, we noted similar enrollment patterns between Engineering and LSA undergraduates with respect to gender. During the Winter 2022 semester, 21.2% of Engineering undergraduates in Computer Science were female and 23.2% of LSA undergraduates in Computer Science were female.

*Changes from previous years:* As with previous years, total undergraduate enrollment has continued to increase. Similarly, enrollment of women students has increased (both proportionately and in absolute amounts) every semester. Although the population of Black students has approximately stayed the same, proportionally it has decreased with the overall increase of enrollment. Other subpopulations, such as Asian, Hispanic, or Non-Resident Alien students, have continued to increase in small increments. The CSE Enrollment and Admissions Team (EAT) has identified new admissions pathways, including considerations for increasing the diversity of our undergraduate population. Pathway one, focusing on preferred admissions for incoming High School students, will be implemented for students who enroll in Fall 2023. Refer to the Strategic Plan section for more information.

## Undergraduate Core Courses

[Computing CARES](#) conducts extensive surveys and interventions in courses associated with the first through third semester of the CSE program. In this presentation, Likert scale responses are presented as 1-5 numerical values (e.g., terms such as “strongly disagree”, “poor” or “not at all” map to 1; “neutral” maps to 3; “strongly agree” or “excellent” map to 5, etc.).

[EECS 183](#), [ENGR 101](#), and [ENGR 151](#) are introductory computing courses. We present *start-of-course* survey data for 1731 EECS 183, 718 ENGR 101 and 160 ENGR 151 consenting AY 2022 students. Note that some students use transfer credit or a proficiency exam instead of taking introductory courses.

[EECS 376](#) is an undergraduate theory of computation course. It is required for the major and is often one of the last non-elective courses taken. We present *end-of-course* survey data for 444 consenting Fall 2021 students and 443 Winter 2022 students.

Select sentiment and climate questions:

Start of EECS 183, ENGR 101, ENGR 151			End of EECS 376		
AY 2022	AY 2021	AY 2020	AY 2022	AY 2021	AY 2022

After graduation, there are equal opportunities for a career in Computer Science for males and females alike.	3.55	3.56	3.50	3.60	3.48	3.48
I find Computer Science intimidating.	3.44	3.38	3.40	3.23	3.26	3.14
I can see myself in a computing-related career in the future.	3.63	3.55	3.64	4.25	4.27	4.28
I believe that other students in Computer Science will be welcoming of me.	3.79	3.82	3.80	3.85	3.85	3.92
I feel included in the groups that I want to belong to.	3.70	3.73	3.78	3.80	3.79	3.90
How would you describe your current mental health?	3.09	3.06	3.29	2.88	2.70	2.89

*Changes from previous year.* There was an increase in the feeling of equal opportunity for careers in CS for males and females by the end of EECS 376. We also note a slight increase in students seeing themselves in computing-related careers as they begin the curriculum. However, over the past three years, there has been a downward trend regarding students reporting feeling included in the groups they belong to and that other students in CS will be welcoming to them.

We also present canonicalized gender and ethnicity self-reporting, as a percentage of students who reported their gender and ethnicity at each stage. Differences between the presence of various groups at these two stages provides one lens for examining retention or pipeline issues. In EECS 183, ENGR 101 and ENGR 151, 2569 out of 2609 respondents (98.5%) reported their gender, and 2550 (97.7%) reported their ethnicity. In EECS 376, 722 out of 887 respondents (81.4%) reported their gender, and 715 (80.6%) reported their ethnicity.

	Start of EECS 183, ENGR 101, ENGR 151			End of EECS 376		
	AY 2022	AY 2021	AY 2020	AY 2022	AY 2021	AY 2020
<b>Man</b>	57.49%	59.76%	61.62%	71.19%	67.89%	75.50%
<b>Woman</b>	40.6%	39.45%	37.58%	27.15%	31.41%	24.06%
<b>Non-binary</b>	1.6%	0.53%	0.54%	1.66%	0.42%	0.00%
<b>Trans</b>	.32%	0.26%	0.27%	0%	0.28%	0.44%
<b>Asian</b>	37.65%	36.86%	36.62%	57.62%	55.08%	52.85%
<b>Black</b>	2.63%	2.79%	2.70%	.84%	1.43%	0.44%
<b>Hawaiian or Pacific Islander</b>	.08%	0.00%	0.04%	0%	0.00%	0.00%
<b>Hispanic or Latino</b>	3.25%	3.05%	3.66%	1.96%	1.72%	1.97%

<b>Native American or Alaska Native</b>	.16%	0.00%	0.08%	.42%	0.14%	0.00%
<b>Two or More</b>	3.88%	3.32%	3.12%	3.92%	3.29%	2.63%
<b>Two or More URM</b>	5.65%	3.76%	4.63%	3.36%	2.43%	2.19%
<b>White, Caucasian, Middle Eastern, North African, Arab</b>	46.71%	50.22%	49.15%	31.89%	35.91%	39.91%

*Changes from previous year.* We continue to see an increased enrollment of women at the beginning of the curriculum. Assuming, roughly, that 1st years in AY20 are now completing EECS 376 in AY22, we found a 28% decrease in women for this group (1 in 3 women will leave by 376). We also saw a large decrease in Black student enrollment, but an increase in multiracial (URM) population and continued increase of Hispanic or Latino students. Finally, for the first time since AY20, there is a slight increase in Native American or Alaska Native and Hawaiian Pacific Islander populations (as with Black and Latino populations, we encourage caution in the interpretation of changes to smaller numbers).

### Undergraduate Degree Conferral

The Office of Student Affairs (Lisa Villarreal, 6/6/2022) provides the following information about selected undergraduate degree conferral rates. We consider the CS Major (Engineering), the CS Major (Literature, Science and Arts), the CS Minor, the Data Science Major (Engineering), the Data Science Major (Literature, Science and Arts), and the Computer Engineering Major (shared with Electrical and Computer Engineering).

	2021-22		2020-21		2019-20	
<b>Total</b>	1548	100%	1285	100%	1243	100%
<b>CS Eng Total</b>	598	38.63%	538	41.87%	517	41.59%
<b>CS LSA Total</b>	460	29.72%	404	31.44%	398	32.02%
<b>CS Minor Total</b>	211	13.63%	182	14.16%	188	15.12%
<b>CE Total</b>	116	7.49%	110	8.56%	97	7.80%
<b>DS Eng Total</b>	54	3.49%	51	3.97%	43	3.46%
<b>DS LSA Total</b>	109	7.04%	92	6.65%	N/A	N/A
<b>CS Eng Female</b>	109	18.23%	96	17.84%	106	20.50%
<b>CS LSA Female</b>	129	28.04%	130	32.18%	111	27.89%
<b>CS Minor Female</b>	70	33.18%	48	26.37%	53	28.19%
<b>CE Female</b>	23	19.83%	21	19.09%	16	16.49%
<b>DS Eng Female</b>	13	24.07%	8	15.69%	10	23.26%
<b>DS LSA Female</b>	44	40.37%	26	28.26%	N/A	N/A



<b>CS Eng URM</b>	47	7.86%	36	6.69%	28	5.42%
<b>CS LSA URM</b>	36	7.83%	26	6.44%	18	4.52%
<b>CS Minor URM</b>	24	11.37%	13	7.14%	10	5.32%
<b>CE URM</b>	12	10.34%	8	7.27%	5	5.15%
<b>DS Eng URM</b>	5	9.26%	1	1.96%	1	2.32%
<b>DS LSA URM</b>	4	3.67%	2	2.17%	N/A	N/A

*Changes from previous year.* Major degree conferral rates for CS Eng and CS minor increased for female students. Also, there is an increase in URM degree conferral across all majors and the minor. Again, total degree conferral (e.g., for graduating seniors) held steady, while enrollment (including students early in the program) rose, highlighting and class size pressure for students currently in the pipeline.

The [Michigan Engineering Career Resource Center](#) provides salary data on average salaries by major. [For 2018-2019](#), the latest report available as of this writing, the reported Computer Science salaries for students graduating with bachelor's degrees were median \$101,000, average \$99,248, and range \$52,000 – \$170,000. The Engineering Career Resource Center does not tie their data to ethnicity breakdowns.

### Undergraduate Program Context and Discussion

As a broad point of comparison, the 2021 [Computing Research Association Taulbee Survey](#) of 147 of PhD-conferring CS departments documents the continued increase of CS enrollment and degree conferral at all levels. The 2021 report specifically mentioned an increase in gender diversity amongst undergraduate degree conferrals; amongst CS graduates whose gender was known in 2020-2021, 22.3% were female in comparison to 20.6% in 2019-2020. Enrollment of females in CS stayed the same at around 21% between 2020-2021 and 2019-2020.

In comparison to 2019-2020, the Taulbee survey also found a decrease in Black or African American and Hispanic undergraduates enrolled in CS for 2020-2021. 4.2% of undergraduates reported identifying as Black or African American (as opposed to 6%) and 8.3% of undergraduates reported identifying as Hispanic (as opposed to 13%).

CSE's undergraduate enrollment of female students (24.2% female) now exceeds the national average represented by the Taulbee Survey. The survey also found that 22.3% of CS Bachelor's degrees and 17% of CE Bachelor's degrees were awarded to female students. CSE's CS Bachelor's degree conferral rates (combining CS Eng and CS LSA) for females are comparable to the national average and CE Bachelor's Degree conferral rate exceeds the national average.

However, CSE's undergraduate enrollment of Black students continues to be significantly below the national average and percentage of the population in the state. CSE Hispanic undergraduate enrollment is approaching the percentage of the population in the state, but still falls below the national average. Taken together, the degree conferral rates for all URM student majors this year is 8%, while an increase from last year (5.5%), is still below the national average. Representation of both female and URM students continues to be higher in the minor than in the major. When enrollment or admission rates for a group are lower than degree conferral rates

for that group, it highlights a pipeline or retention issue. Self-perceptions of mental health deteriorate throughout the major.

## Graduate Program

Information about the CSE graduate program is available at various points throughout the program. Note that because the graduate program is associated with the [Rackham Graduate School](#), some data reporting follows a different format.

Note that race/ethnicity information (e.g., such as being Black, Hispanic or Native American) is typically only associated with domestic students and is usually not tracked for international students.

## Graduate Admissions Process

Broadly, students [apply to CSE's graduate program](#) seeking a Master's Degree or a Doctor of Philosophy (Ph.D.). **Master's** students are typically self-funded and pursue a two-year degree based on coursework. (Some master's students are more research-focused and may transition to the Ph.D. program after completing the Master's degree.) Our Sequential Undergraduate/Graduate Study (**SUGS**) program allows Michigan students to complete an undergraduate degree and Master's degree, often in a total of five years. While **Ph.D.** completion times vary, it is common for a student to spend four years on doctoral research after completing a Master's degree. Some students apply for the Ph.D. program after completing a Master's degree elsewhere; others may apply after a bachelor's degree and then obtain a Master's degree and Ph.D. sequentially.

While graduate degrees share many similarities, because the Master's degree typically places more of an emphasis on coursework and the Ph.D. degree typically places more of an emphasis on research, graduate admissions often treats applicants separately. While strong graduate applicants are distinguished by initiative and a mastery of undergraduate material generally, strong Ph.D. applicants typically additionally demonstrate experience with independent research.

All CSE faculty members can review all CSE graduate applicants. The **graduate admissions committee** reviews all applicants, regardless of focus area, and brings strong applicants to the attention of appropriate faculty. This involves a holistic consideration of individual application materials, including direct applicant mentions of particular faculty members as well as perceived research interest or overlap based on application essays and previous experience.

Faculty often follow up with admitted students to encourage them to **accept** the offer. This is often done through a combination of email, phone calls, and awarding scholarships or fellowships, such as the [Rackham Merit Fellowship](#). In addition, CSE hosts a formal visit day. In AY 2022, the visit day activities were in person after a two-year break due to COVID. In general, it can be more difficult for some students to attend a visit day (e.g., based on international or socioeconomic status). CSE provides full support for domestic students and \$500 for international students for visit day travel.

In 2022, CSE sponsored 16 students for graduate **fellowships**: each student had at least one CSE faculty recommender. The fellowships included the [Michigan Rackham Merit Fellowship](#) as well as the Ada Lovelace, Beyster, CRA, Google, Facebook, IBM, JP Morgan, Lipschutz, Microsoft, ProQuest, Rackham Outstanding Graduate Student Instructor, Towner, and Two Sigma fellowships, among others. Of those students for which gender information is available (via the [UGrab database](#)), 25% were female and 75% were male. Of those for which ethnicity information is available, 18.8% were Asian, 12.5% were White, and 6.3% were Hispanic.

*Changes from previous year.* CSE sponsored fewer students for fellowships compared to the previous year (16 vs. 20), with a lower proportion of female students (25% vs. 55%) and Hispanic students (6.3% vs. 15%). Factors such as COVID and the availability of faculty funding and advising capacity influence admissions and fellowship considerations. We encourage caution in the interpretation of measurements for small numbers. At the University level, Rackham announced that it will **no longer use the GRE** general test in its Ph.D. admissions beginning with the 2022-2023 admissions cycle. While not directly a CSE initiative, this was something many CSE Faculty and students advocated for.

## Graduate Recruiting

CSE does not currently have a program of faculty or staff visits to other schools for recruiting purposes. In recent years current Ph.D. students have returned to their alma maters to deliver recruitment talks. In addition, CSE makes heavy use of advertising through social media and mailing lists, including lists targeted at specific audiences, such as URM students.

In the 2021-2022 Academic Year, in conjunction with [CSE Explore Grad Studies](#), we sent targeted recruitment emails to over 152 faculty at 82 institutions:

- Amherst College, Arizona State University, Boston University, Brown, Cal Tech, Carleton College, Case Western, CMU, Columbia University, Cornell, Dartmouth, Dearborn, Duke, Florida State University, Georgia State University, Georgia Tech, Harvard University, Harvey Mudd College, Howard University, Johns Hopkins, Miami University, Michigan State, Michigan Tech, University of Minnesota, MIT, North Carolina, North Carolina A&T State University, North Eastern, Northeastern, Northwestern, NYU, Ohio State, Penn State, Princeton, Purdue, Rice, Rutgers, Southeastern Oklahoma State University, Southern Methodist University, Stanford, Stevens Institute of Technology, Stonybrook, Swarthmore College, Syracuse University, Texas A&M, Toronto, Tufts University, UC Berkeley, UC Irvine, UC Santa Cruz, UCLA, UCSD, UIUC, UIUC, UMass Amherst, UNC, University of Chicago, University of Alaska Fairbanks, University of Arizona, University of Colorado, Boulder, University of Hawaii at Manoa, University of Illinois, Chicago, University of Maryland, College Park, University of Michigan, Flint, University of Notre Dame, University of Texas at El Paso, University of Utah, University of Virginia, University of Washington, University of Wisconsin, Madison, UPenn, USC, UT Austin, Virginia Tech, Washington University, St. Louis, Waterloo, Wayne State, Wellesley College, Western, Williams College, Wisconsin, and Yale.

In addition, CSE sends broader recruitment materials to over 20 mailing lists associated with multiple universities and organizations:

- Boston University, Brown, Michigan State University, Michigan, MIT, New York University, Princeton, SIAM Data Mining and Analytics, UC Berkeley, UCLA, UMass Amherst, University of Pennsylvania, UT Austin, and Washington University St. Louis;

including some associated with women:

- Harvard WICS, MIT EECS Women, Northeastern Women in CS, Society of Women Engineers, UIUC Women in Engineering, and Women in Computing.

CSE sent recruiting emails to over 170 National Society of Black Engineers students and over 130 previous participants in the Explore Grad Studies program.

Over 120 participants attended the virtual CSE Explore Grad Studies 2021 workshop, which helps prepare students for graduate applications. Out of those, 26 participants submitted and received faculty feedback about their draft graduate application materials. *Changes from previous year.* A number of outreach activities were slightly curtailed as a result of COVID. This cycle saw slightly increased participation in Explore Grad Studies and a substantial increase in the number of NSBE students emailed directly.

### Graduate Applications: Race/Ethnicity Statistics By Degree

In AY 2022, CSE tracked 1073 applicants to the Ph.D. program (via the Graduate Admissions dashboard system). Of those applicants, 114 were given offers of admission and 47 accepted. Their self-reported races/ethnicities were:

	Applied (Ph.D.)		Admitted (Ph.D.)		Accepted (Ph.D.)	
	2022	2021	2022	2021	2022	2021
<b>Total</b>	1073	1187	114	112	47	36
<b>2 or More</b>	13	2	3	2	0	0
<b>Asian</b>	102	96	13	13	5	3
<b>Black</b>	10	11	0	2	0	0
<b>Hispanic</b>	16	15	1	6	1	2
<b>Native American</b>	0	0	0	0	0	0
<b>Did Not Indicate</b>	806	917	76	70	32	27
<b>White</b>	126	146	21	19	9	4

*Changes from previous year.* Overall, Ph.D applications decreased by 9% over the previous year. There was an increase in multiracial and Asian applicants, and a continued decrease in applicants who identified as White. CSE extended a similar amount of offers of admissions, and we note that admissions are guided by faculty advisor availability and research funding. Among students accepting our offers, we note an increase of individuals who self-reported as Asian and White. Similarly to previous years, many more applicants did not indicate a race or ethnicity.

In AY 2022, CSE tracked 2276 applicants to the MS program. Of those, 321 were given offers of admission (including admissions to the [SUGS program](#), etc.) and 92 accepted. Their self-reported ethnicities were:

	Applied (MS)		Admitted (MS)		Accepted (MS)	
	2022	2021	2022	2021	2022	2021
<b>Total</b>	2276	1879	321	276	92	79
<b>2 or More</b>	10	7	4	1	2	1
<b>Asian</b>	160	157	49	48	11	9

<b>Black</b>	7	7	3	4	1	2
<b>Hispanic</b>	12	15	8	9	2	4
<b>Did Not Indicate</b>	2000	1615	226	191	60	56
<b>White</b>	87	78	31	23	16	7

*Changes from previous year.* Masters applications increased by 20% over the previous year. Most demographics stayed consistent with previous year, with the largest change being an increase of applicants who did not report ethnicity. Again, the Master’s program shows a slight increase in the number of Black and Hispanic students applying, admitted, and accepting our offers (but we encourage caution when interpreting smaller numbers).

### Graduate Applications: Undergraduate Institution Statistics

In AY 2022, CSE received applicants from a number of undergraduate institutions. The undergraduate institutions of applicants are one lens to evaluate the breadth of the applicant pool and our recruitment outreach efforts. Applicants who did not indicate one of the three most frequent ethnicities (i.e., “Did Not Indicate”, “White” or “Asian”) came from 36 undergraduate institutions:

- Birmingham Southern College, Bowdoin College, Brigham Young University Utah, California Institute of Technology, California Polytechnic State University, California State University – Los Angeles, Carleton College, City University of New York – City College, City University of New York – Lehman College, Colorado School of Mines, Harvard College, Harvey Mudd College, Howard University, Lehigh University, Northern Kentucky University, Northwestern University, Pomona College, Princeton University, Stanford University, Texas Tech University, University of Alaska Anchorage, University of Chicago, University of Colorado Boulder, University of Dubuque, University of Florida, University of Illinois Urbana-Champaign, University of Massachusetts Amherst, University of Minnesota Morris, University of North Texas, University of Puerto Rico Rio Piedras, University Texas at Arlington, University Texas at Austin, University of Virginia, Wayne State University, Western Governors University, Xavier University of Louisiana.

For Fall 2022, CSE admitted applicants who did not indicate one of the three most frequent ethnicities came from the below 5 institutions. Regarding matriculation, 1 student accepted our offer from Carleton College.

- California Institute of Technology, Carleton College, Colorado School of Mines, Harvey Mudd College, and Howard University.

Focusing specifically on Master’s students, CSE internal tracking reports that the accepted, incoming Master’s degree students for Fall 2022 come from 14 different colleges including:

- American University in Beirut, Carleton College, Michigan State University, Purdue University, State University of New York Canton, Texas Southern University, University of California Irvine, University of Central Florida, Federal University of Minas Gerais, University of Florida, University of Michigan, University of Texas at Dallas, University of Texas El Paso, and Villanova University.

Their undergraduate institutions range from smaller liberal arts colleges (e.g., with enrollments of 800 undergraduates) to larger universities, including the Univ of Michigan itself (30,000 undergraduates).

### Graduate Applications: Other Demographic Statistics

We also distinguish between domestic and international (non-resident) applicants and between male and female applicants. (In current tracking, both are reported as binary categories.)

	Applied		Admitted		Accepted	
	2022	2021	2022	2021	2022	2021
<b>Total</b>	3426	3143	496	457	188	158
<b>Domestic</b>	617	643	175	182	80	65
<b>Domestic Female</b>	110	122	43	48	13	12
<b>Domestic Male</b>	507	521	132	134	67	53
<b>International</b>	2809	2500	321	275	108	93
<b>International Female</b>	700	578	97	82	26	29
<b>International Male</b>	2109	1922	224	193	82	64

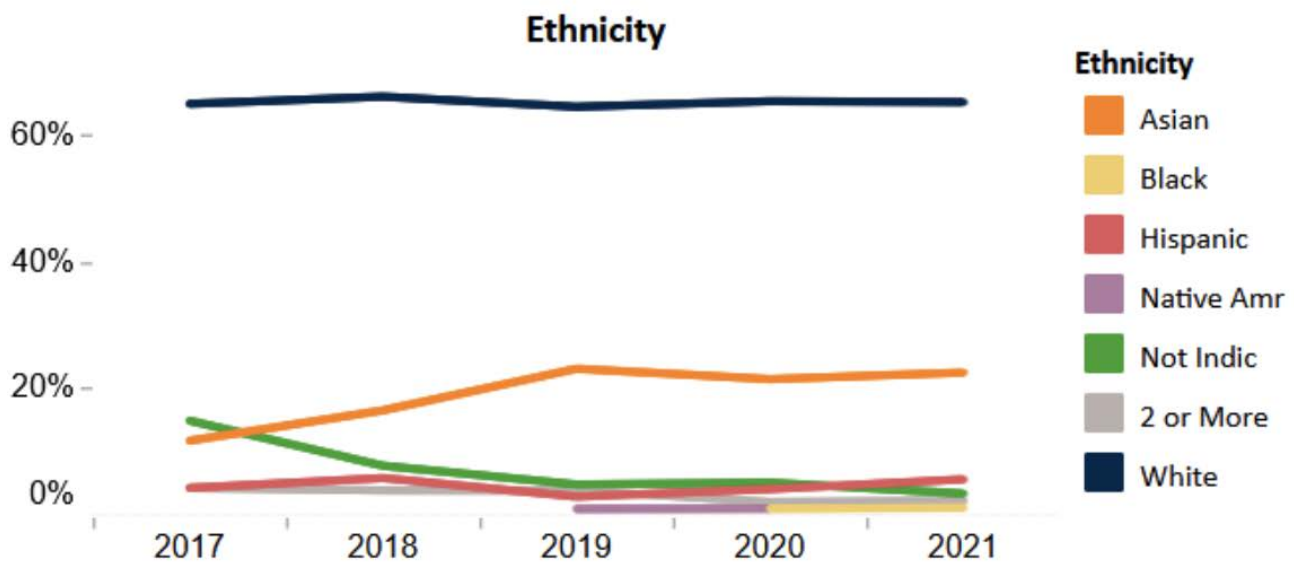
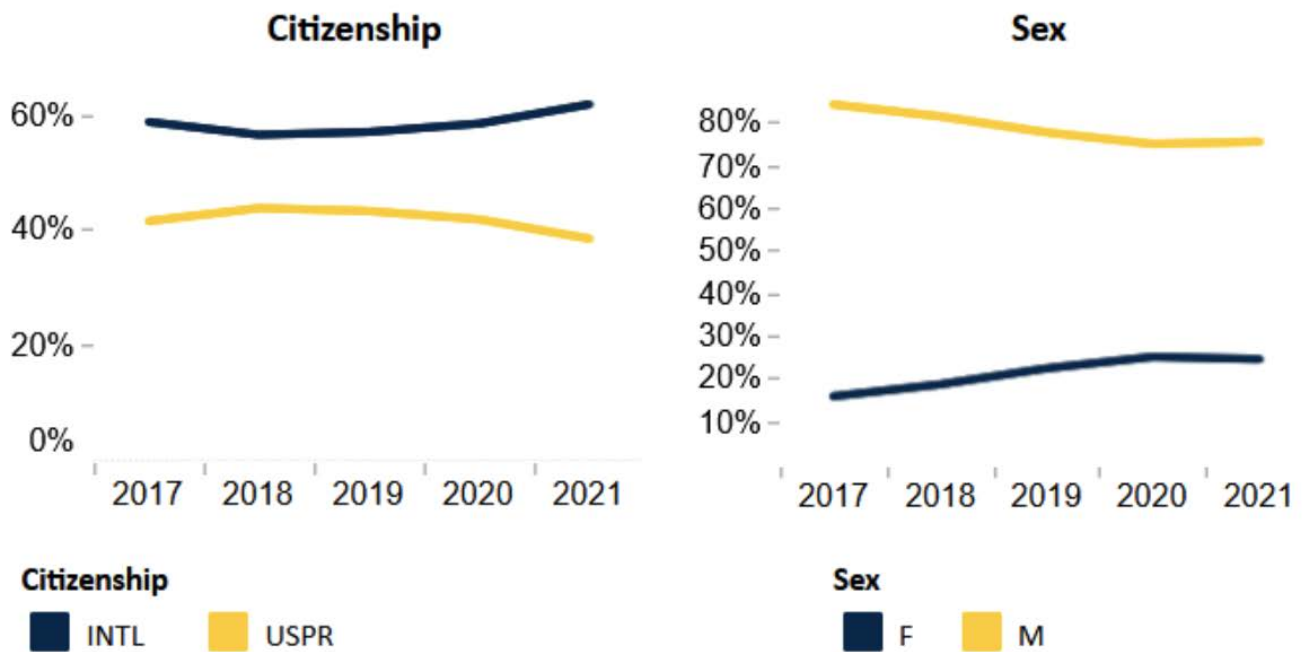
*Changes from previous year.* Graduate applications as a whole continue to increase. However, we note a slight (4%) decrease in domestic applications and a 12% increase in international applications. Despite the decrease in domestic applicants, the amount of domestic women and men admitted were comparable to previous years, and the amount of admitted international men and women increased slightly.

### Graduate Enrollment Trends

The [Rackham Graduate School's Doctoral Program Statistics for Computer Science and Engineering](#) include information about enrollment trends:

## Total Enrollment

232



Insights into the citizenship, gender, and ethnicity of students enrolled in Computer Science and Engineering for 2021. Ethnicity is reported only for domestic students (US Citizens or Permanent Residents). Hispanic students are excluded from the Two or More category. Categories with fewer than 5 students are not shown.

Note that ethnicity information is only available for domestic students (US Citizens or Permanent Residents). Note that slight differences in how CSE and Rackham present the data result in slightly different totals. This can be relevant for groups with low total numbers, such as underrepresented minorities.

### Graduate Degree Completion

CSE's Graduate Program Office provided data around graduate degree completion rates. CSE conferred 126 graduate degrees in Fall 2021 and Winter 2022, including MS, SUGS and Ph.D. Note that students receiving degrees in AY 2021-2022 entered the program in previous years. Their self-reported ethnicities were:

	Completed (All)		Completed (MS, SUGS)		Completed (Ph.D.)	
	F21/W22	F20/W21	F21/W22	F20/W21	F21/W22	F20/W21
<b>Total</b>	126	125	111	114	15	11
<b>2 or More</b>	2	2	2	2	0	0
<b>Asian</b>	49	44	47	44	2	0
<b>Black</b>	1	1	1	1	0	0
<b>Hispanic</b>	2	1	2	0	0	1
<b>Native American</b>	0	1	0	1	0	0
<b>Did Not Indicate</b>	44	40	35	34	9	6
<b>White</b>	28	36	24	32	4	4

The [Michigan Engineering Career Resource Center](#) provides salary data on average salaries by area. [For 2018-2019](#), the latest available as of this writing, the reported Computer Science and Engineering salaries for students graduating with master’s degrees were median \$120,000, average \$119,794, and range \$71,148 – \$175,000.

*Changes from previous year.* We continue to note an increase in degree completion, driven largely by more master’s students completing the program. Overall Ph.D conferral has increased, potentially recovering from COVID-19 impact noted last year. We will continue to monitor this trend.

### Graduate Degree Completion Trends

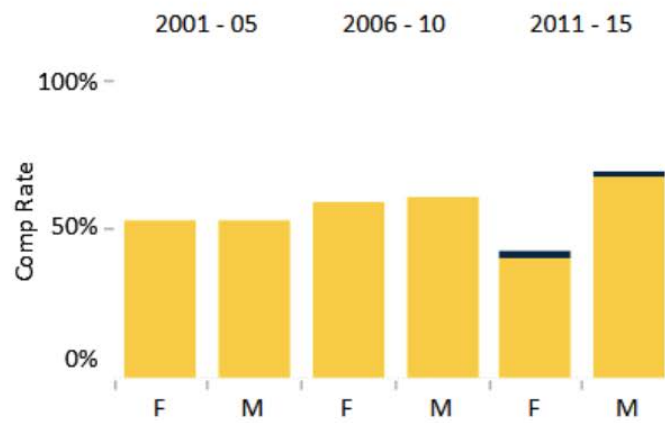
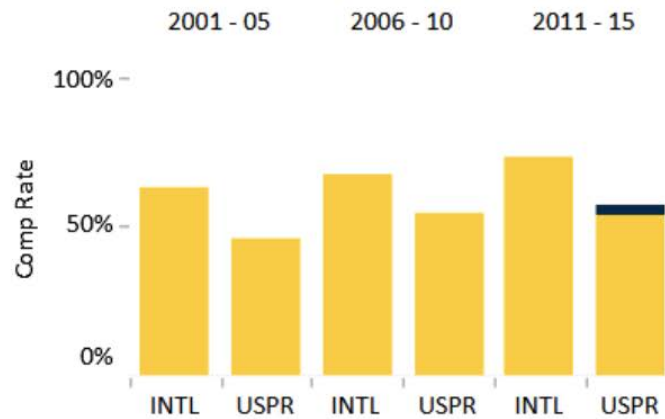
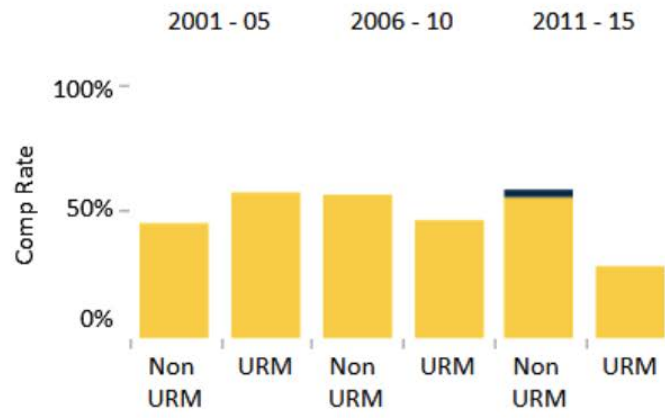
The [Rackham Graduate School’s Doctoral Program Statistics for Computer Science and Engineering](#) include information about degree completion trends:





### Completion by Entering Cohort

The percentage of students that have completed their degree as of September 2021. Students are grouped by entering years. Categories with fewer than three students are not shown.



### Graduate Degree Post-Completion Outcomes

John Gonzalez of [Rackham Institutional Research](#) tracks the “Rackham Career Outcomes Collection” (cf. the [Exit Survey](#) of all Rackham graduating doctoral students). Among CSE students graduating in 2021, 36 provided data. Among domestic students (13), 10 self-identified as white, 1 as asian, 1 as hispanic, and 1 as multi-racial (two or more races). The rest of the students are considered international and thus no ethnicity information is available for them. Post-graduation data is available for 6 graduates. Among these graduates, 2 reported jobs at Universities, 4 reported jobs at companies (e.g., Google, etc.), and 30 did not report information. Since this represents only 6/36 students graduating from CSE in 2021, an additional focus on encouraging participation in graduate outcomes data collection remains merited. Efforts are underway to do so going forward, aligned with the Graduate Committee’s additional focus on exit interviews.

*Changes from previous year.* The amount of post-graduation data is less than previous years, and there does not appear to be a significant change between the ratio of those reporting academic vs. industrial jobs. We urge caution in the interpretation of results with smaller numbers.

## Graduate Program Context and Discussion

As a broad point of comparison, the 2021 [CRA Taulbee Survey](#) of hundreds of departments found that 24.4% of enrolled CS Ph.D. students were female and 75.5% were male. Hispanic students received 2.1% of CS Ph.D. degrees and Black or African American students received 1.6% of CS Ph.D. degrees.

CSE's graduate recruiting efforts currently show a strong focus on [Research 1 Universities](#) and highly-ranked programs and a smaller, but growing, emphasis on community colleges, [Historically Black Colleges and Universities](#), or other [Minority-Serving Institutions](#).

CSE's enrollment rate for female Ph.D. students continues to align with the national average. Demographic data regarding degree conferral should be interpreted with care due to small numbers. However, this year CSE did not confer any Ph.Ds to Hispanic or Black students. CSE produced two Hispanic Master's students and one Black Master's student being consistent with Fall 19/Winter 21. This continues to be a significant area for improvement for CSE. The Taulbee survey again suggests that this is an issue system to the field (only 19 out of 1,024 graduating CS Ph.D students identified as Black or African American in their survey). CSE Master's degree enrollment and production trends paint a similar picture when compared to national averages. CSE's graduate application institution data suggests that many of our minority applicants come from the same small set of undergraduate institutions.

## Faculty Recruiting

This section provides additional transparency on the processes associated with faculty recruiting. This information may clarify the context under which CSE strives to elicit a broad pool of applicants and make decisions to interview, recruit and retain high-quality candidates.

CSE faculty recruiting activities are conducted and tracked internally, within the CSE division. While some candidates are interdisciplinary, ECE and CSE faculty recruiting and hiring within EECS are effectively separate and parallel.

CSE faculty hiring is overseen by **Faculty Search Committees**. While education and research are priorities for all faculty members, there is typically one committee each year for hiring research-focused faculty members and a separate committee for hiring teaching-focused faculty members (lecturers). This distinction is made because those faculty tracks involve slightly different activities (e.g., lecturers are typically tasked with teaching core undergraduate classes) and thus candidates demonstrate the qualifications in slightly different ways.

While details vary from year to year and school to school, hiring a new faculty member requires support from higher levels of the University administration. Resources must be provided (e.g., space, salary), and as a result a faculty search is often given a finite number of **positions** to fill. Sometimes these are given over a longer period: a department might be given permission to fill three faculty positions over the next two years, for example. When a faculty member leaves or retires, permission is typically given to hire a new faculty member, often called a "replacement hire". Alternatively, when there is a strategic desire to grow a department (e.g., perhaps because many undergraduates are enrolling in its classes, or because its research is particularly

successful), a department might be given permission to fill new positions. In some cases a department might focus hiring on a particular subject matter **area** (e.g., to hire someone in Machine Learning), in other cases a department might look to hire the best candidates on the market that year. In addition to the departmental positions that may be tied to priority subject areas, the College of Engineering always entertains additional hires, including “Target of Opportunity” candidates that fall outside priority areas of allocated positions. These can be considered special opportunities for various reasons, including (and most commonly) contributions to diversity. Per state law this cannot be based on identity, but can be based on other factors, for example demonstrated commitment to broadening the field.

The search committee drafts an official job description and notice which is posted publicly. Candidates typically apply in a November to December timeframe. The search committee reviews their application materials, which include essays, evidence of teaching, research and service success, and letters of recommendation. All faculty applications must include a DEI statement, in which candidates explain their record of activity and achievement in support of diversity, equity, and inclusion. A small number of candidates are invited to **interview**. Interview invitation decisions are based on a combination of considerations, including targeted subject matter areas and candidate qualifications. The CSE faculty as a whole are involved in the process. For example, while the Search Committee is responsible for reading through all applications and bringing promising candidates to the forefront, all applications are visible to all faculty members. In addition, the various CSE [Labs and Centers](#) are explicitly consulted on, and meet to discuss and review applications from, candidates in their subject matter areas. A key constraint regarding interview selection is time. It is typically not possible to host more than two, or in extreme cases three, interviews per week. Each interview is about a day and a half long, and includes a seminar presentation, meetings with individual faculty, meetings with student groups, and meetings with department chairs and deans. In addition, not all candidates are available at all times (e.g., they are often also interviewing at other schools), and thus interview time slots must be coordinated.

Once interview information is available, the search committees, labs, and the faculty as a whole meet to consider whether or not to extend offers. Key considerations include target hiring subject matter areas (if any), candidate qualifications, the number of positions available, and whether or not the candidate meets department collegiality, climate and professionalism standards. Interviews often have a significant impact compared to a candidate’s record “on paper”. While CSE-level hiring authority ultimately resides with the CSE Executive Committee, the chair contacts candidates and handles any negotiations, any faculty member can evaluate any candidate, and faculty **discuss and vote** on candidates in [Lab](#) (i.e., subject matter area) meetings. A number of logistical nuances and uncertainties complicate the situation. For example, because the interview season spans multiple months, it may be necessary to decide whether or not to extend an offer to one candidate before another candidate has interviewed. Similarly, not all offers are accepted, so a department hoping to hire one faculty member might negotiate with the administration to have two outstanding offers simultaneously with the expectation that only one will be accepted. While this incurs the slight risk that more candidates might accept offers than expected, it mitigates the risk that a search cycle might produce no new hires. Conversely, a department will sometimes decide that no available candidate in a particular hiring cycle was above threshold.

Finally, sometimes faculty candidates intentionally choose not to report particular specific information or even the general fact that they are applying. Some candidates may not report ethnicity information, for example. In addition, while most faculty candidates just completed graduate degrees or postdoctoral research positions, a small number are more senior faculty or researchers at other schools or labs. A senior candidate, such as one

who already has tenure at another institution, may not to reveal that an application is being made (e.g., to avoid friction at the current institution until and unless the application results in an offer) and may ask that the visit be publicly recorded as a general seminar, rather than a job interview.

These issues complicate **reporting**. Questions that might appear direct, such as “how many positions were available this cycle and how many minority candidates were invited to interview?”, may be difficult to make precise. For example, if the administration offered a department three positions over two years, there may not be a definite answer for how many positions were available the first year alone, and if a senior candidate applied, the number of interviews may contain private information.

## Faculty Recruiting and Diversity

Faculty hiring and employment are governed by applicable laws relating to civil rights and workplace discrimination, such as Michigan’s [Elliot-Larsen Civil Rights Act](#) (at the state level) and Title VII of the [Civil Rights Act of 1964](#) and [Executive Order 11246](#) (both at the federal level). Like the Michigan constitutional provision discussed above, these state and federal laws prohibit discriminatory hiring processes (e.g., based on race or gender). Instead, there is a focus on producing a broad applicant pool that has as many excellent candidates as possible from all backgrounds.

To that end, search committee members are required to complete special training, namely the [STRIDE Workshops](#) offered by the ADVANCE Program, which “provides information and advice about practices that will maximize the likelihood that diverse, well-qualified candidates for faculty positions will be identified, and, if selected for offers, recruited, retained, and promoted at the University of Michigan”.

The committee actively recruits candidates who increase the diversity of our application pool and/or have made strong contributions to DEI, e.g., through programs such as the AI Symposium (which highlights rising stars in AI from underrepresented backgrounds), Berkeley’s Rising Stars program for women in EECS (where CSE faculty Reetu Das was an invited speaker), MIT’s EECS Academic Career Fair, and Michigan’s NextProf workshops. In addition, there was a recruitment campaign via Twitter.

*Changes from previous year.* This cycle, CSE introduced a pre-screen step in our evaluation process for all candidates. Since pre-screen is lower cost relative to a full interview, this was intended to help us consider more candidates who might otherwise have been overlooked, including especially candidates from underrepresented groups and institutions.

This cycle, CSE did not actively participate in the [President’s Postdoctoral Fellowship Program](#) (PPFP), a postdoctoral fellowship intended to lead to a tenure-track offer after two years, assuming that candidates continue on a promising trajectory and conditional on a tenure-track interview. The program is particularly interested in scholars with the potential to bring to their research and undergraduate teaching the critical perspective that comes from their non-traditional educational background or understanding of the experiences of groups historically underrepresented in higher education. The department continues to monitor the program, but there is a perception that the PPFP is less attractive than an up-front tenure-track offer. With the competitive hiring environment for computer science faculty, the focus was on direct recruitment to a tenure-track position.

This cycle CSE continued to refine processes introduced last cycle to help ensure a focused consideration of climate and diversity as a critical part of each application. The Faculty Search and Executive committees

carefully reviewed the candidates' DEI statements and activities as a first-class consideration (on par with research and teaching). Student feedback from student-only meetings, which often involve discussion of advising and DEI issues, were also solicited via a new student-facing portal and taken seriously in hiring discussions. Student engagement was significant. In several cases, this review as well as student feedback led to significantly different rankings of candidates, relative to a counterfactual where we did not have or make use of DEI statements or student feedback. In some cases, faculty reached out and engaged in deeper discussions with students in order to reach a consensus.

Additionally, during this cycle, members from the DEI committee met with two interested faculty candidates to talk more in depth about climate in CSE and potential initiatives they would be passionate about moving forward. The DEI Committee anticipates connecting with the Faculty Search Committee before their process starts to discuss how they can offer this opportunity more widely to candidates.

### **Faculty Recruiting Statistics**

In this Academic Year, CSE received 471 applications for faculty positions (tenure-track and lecturer, but not including PFPF), up 20% from the previous year. Only 173 of those 471 applicants (37%) chose to provide self-reported demographic information. Of those, 75% (130/173) reported as male and 25% (43/173) reported as female. (The College of Engineering currently tracks biological sex rather than gender in this context.) We invited 40 of those 471 applicants (8%) to interview. Of the 40 interviewees, 35% (14/40) identified as female. CSE extended job offers to 25 candidates: 64% (16/25) male and 36% (9/25) female.

As of this writing (early June), 3 candidates accepted offers (1 self-identified as female). Not all candidates with offers in hand have made final decisions as of this writing.

For this Academic Year, of the 173 of 471 applicants reporting demographic information, 64% (110/173) identified as Asian, 27% (47/173) as White, 6% (10/173) as Hispanic, and 1% (2/173) as Black. Some applicants listed multiple races or ethnicities. No applicants reported other races or ethnicities (e.g., American Indian).

*Changes from previous year.* The total number of applicants increased by 20% this academic year, due in part to broader trends in hiring this season (e.g. COVID restrictions on hiring being lifted).

Self-reporting of demographic data remained similar after an increase last year (from 18% to 38%) after we clarified why we are requesting it. In addition, the proportion of female applicants remained similar this year after a sharp increase (from 15% to 28%) in the previous year, as did the racial breakdown of applicants. A number of considerations, from the public perception of CSE's climate and allegations of faculty sexual misconduct, might continue to be having a negative impact on our ability to recruit strong candidates across demographic groups, but we are not able to determine the relative impact of this factor over other factors, e.g. an overall competitive hiring environment. We encourage caution when interpreting small numbers, but note that CSE must carefully consider similar information to determine if next year represents a potential negative trend.

### **Faculty Recruiting Context and Discussion**

Some have suggested that CSE might implement something akin to the "[Rooney Rule](#)" for faculty hiring, in which at least one minority candidate must be selected to be interviewed during each faculty search cycle. This approach [may not be legally permissible](#), but the situation is also complicated by low total numbers and low

ethnicity reporting rates. Given the low total numbers of interview candidates with reported ethnicities, providing evidence that at least one individual from each of various underrepresented groups was interviewed could be misinterpreted as [tokenism](#). Instead, search committees can take steps to broaden their outreach efforts to promote greater diversity in their applicant pools. In addition, job postings can require a commitment to DEI, as reflected in scholarship, teaching or service, and for search committees to use the strength of a candidate's rating on that criterion as a factor.

As a broad point of comparison, the 2021 CRA Taulbee Survey reports that 23.3% of CS Ph.D. degrees granted were received by female students. While not all faculty candidates are new Ph.D.s, 25% of CSE's applicants and 35% of CSE's interviewees for faculty positions identified as female, which is above the national average.

Care must be taken when interpreting minority ethnicity information. If 1.3% of Ph.D.'s produced nationally were awarded to Black or African American students (19 such degrees from hundreds of schools in 2021), hiring cycles in which Black candidates were interviewed (such as the 2020-2021 Academic Year) would appear significantly above that average, while cycles in which no Black candidates were interviewed would appear below that average. Pipeline concerns and small-number reporting difficulty do not eliminate responsibility: it remains incumbent on CSE to ensure that the applicant and interview pools are as broad as possible.

Efforts to actively cultivate several candidates from underrepresented groups (prior to the application/interview/hiring periods) were perceived as somewhat effective in increasing the diversity of our applicant pool, interviews, and offers for this AY, but more remains to be done.

## CSE Sentiment

In addition to town halls and other community gatherings and engagement described later, CSE was also the subject of an external climate assessment and organized two different approaches to determining sentiment: an analysis of course surveys and a check-in process with graduate students.

## Climate Assessment Committee

The [Climate Assessment Committee](#) (CLASS), chartered with overseeing an independent review of the overall culture and climate in the Computer Science and Engineering Division, hosted two virtual community events in September to share results and recommendations of an external firm. The "Towards the Future" survey findings were also published [in a public report](#).

[Issues including](#) oversubscribed courses, the need for more support and participation for underrepresented students, and allegations of sexual misconduct involving CSE Division faculty were cited as factors for examining CSE's climate more closely. Recommendations from the assessment, presented at the community meetings, fell into three categories: steps to improve diversity, equity, and inclusion; steps to heal past sexual misconduct issues and rebuild trust; and steps to address concerns regarding the student academic experience.

Some of the [specific recommendations](#), such as "Further develop mentoring programs", "Have the University offices responsible for compliance with policies and conducting investigations appear on campus to answer questions", or "Training on "imposter syndrome" and other ways to encourage people to speak up" have associated efforts already underway (see later in this report). Others, such as "Improve recruiting of Underrepresented individuals for all Faculty and Staff Positions", "Make training on misuse of power

imbalance a requirement for Faculty and Staff” and “Foster group work among Students and in so doing, review the Code of Honor and determine if any changes are required to help foster proper and appropriate group work among Students” remain longer-term processes. Finally, some recommendations, such as “Leadership should identify and concisely set forth the goals as to Student-to-Faculty ratio at the various Student levels and evaluate what is needed to achieve the ideal ratio“ are explicitly addressed as part of the Strategic Action Plan efforts undertaken by CSE and summarized later in this report. In that regard, the results of the assessment are helping to shape CSE policy going forward.

### Climate Questions on Course Surveys

In Winter 2020, the DEI committee added climate- and inclusion-focused questions to the end-of-semester course evaluations for all CSE classes. This included three quantitative (Likert scale 1-5) questions and one qualitative (free response) question. For AY21-22, the responses were fairly positive:

#### Fall 2021

- 4.72 The instructor treated students with respect.
- 4.29 I felt included and valued when working with other students.
- 4.23 I felt comfortable asking questions in class.

#### Winter 2022

- 4.74 The instructor treated students with respect.
- 4.29 I felt included and valued when working with other students.
- 4.25 I felt comfortable asking questions in class.

When answering “How might the class climate be made more inclusive of diverse students?”, responses followed this general breakdown:

Fall 2021	Winter 2022	Student Response
32%	32%	Not applicable, no response, don’t know, etc.
29%	21%	Course is already inclusive
27%	29%	Student provides a suggestion for improvement
9%	16%	The student has no issue with the course
2%	2%	The course is already inclusive, but the student provides a suggestion as well

Across both semesters, the most common suggestion types were:

AY	N	Student Response
21-22		

16%	149	Encourage multiple forms of participation/provide more opportunities to speak
15%	141	Support students who are new to the material (slower pace, more accommodating of non-CS majors, etc)
14%	132	Improve representation (across students, teaching staff, and faculty members)
10%	96	Foster community
10%	95	Increase group work
10%	93	Improve upon climate issues (including instances of microaggressions or other prejudice) and/or remove bias within the structure and policies of the course
9%	86	More office hours opportunities, sharing office hours resources
8%	83	Support diverse students, especially URM
7%	70	Increase accessibility

*Changes from previous year.* Many of the suggestions are quite similar to those of the previous year, with a greater focus on supporting diverse students, increasing accessibility, and improving upon how climate issues are handled in courses (including instances of microaggressions as well as how these issues show up in course structure/policies). Given these similarities, we are planning to hold a more in-depth discussion with faculty and teaching staff to review and implement these strategies where possible.

### Graduate Student Check-Ins

Starting in 2020, CSE reached out to graduate students to conduct one-on-one check-ins. This year, the check-in process included collecting qualitative data via 15-minute Zoom interviews with value-neutral questions, and quantitative data through a 25-question on-line survey from about 100 Master’s students and 180 PhD students. Goals included continuing to learn about graduate-level concerns, identifying students who might benefit from additional support, and hearing from all students (including those, such as first-generation students or non native English speakers, who might not reach out to us). These interviews were conducted from September, 2021 to April 2022.

Overall, most graduate students continue to report that they are doing well on average and are having generally positive experiences with CSE staff, professors, teaching staff, and fellow students. Most graduate students rate student/faculty relationships and the clarity of program expectations as “good”, and most report knowing who to talk to about procedures. However, only a little over half reported that they felt a sense of community among fellow graduate students.

The top five expressed concerns shared by all graduate students are:

1. No Sense of Community
2. Struggling with Work-Life Balance
3. Lack of Collaboration
4. Lack of Access to Faculty



## 5. Lack of Awareness of Mental Health Resources

Beyond those common concerns, the most-mentioned concerns for Ph.D. students were:

1. Advisor Treatment
2. Switching Advisors
3. Struggling to make Research Progress
4. Faculty Sexual Misconduct

The most-mentioned concerns for Master's students were:

1. Lack of Knowledge of Course Requirements and Expectations
2. Lack of Onboarding regarding Program Structure
3. Getting into Courses
4. Lack of Access to Advising

Over 70% of students reported that stress was either a major or minor barrier to their own success. Feeling overwhelmed, time management, self-confidence, social isolation, and mental health concerns were also top barriers to their own success.

A separate, full report on this activity is currently being developed and is planned to be released publicly to the community ([last cycle's report is already available](#)). The public-facing report will elaborate on the concerns above (both by abstraction and through select anonymized student quotes), highlights issues of department communication and transparency, and gives constructive feedback to advisors about activities that correlate with positive student satisfaction (advisor communication, collaboration, and work-life balance) as well as activities that correlate negatively with student satisfaction (micromanagement, apathetic communication, and lack of a second supporting faculty member). The information was released late in the academic year, but some CSE faculty have begun changes in response to this data, for example holding open office hours that Ph.D. students of other advisors can use to help create such bridges.

*Changes from previous year.* Overall, the reported issues and their relative priorities are very similar to last year. This year, more students (especially those in their third year and later) reported that they would favor less-frequent check-ins. Informally, now that we have a two-year picture of graduate student views, we can focus attention on addressing the issues raised. In response to this, next year the DEI committee will only check in with new students and students who have been in crisis. We will continue to focus on tackling the barriers and difficulties that students have reported.

## Climate and Diversity Activities

CSE students, faculty, staff and community members organize a number of DEI, climate and outreach activities. These include both grass-roots activities that grew organically as well as CSE-wide or -sponsored actions.

## Community-Wide Engagement

During this academic year, CSE's DEI Committee published a report detailing their activities during the Fall Semester as well as priorities for the Winter Semester. The full report can be found [here](#) and three new activities of note are summarized below:

### **Increasing Investment in Community College Transfer Experience**

As part of efforts to increase outreach to Community College students, Committee members have met with students at Washtenaw Community college (10/22) and attended two Engineering's transfer sessions with WCC (10/27 and 3/31). The DEI Committee also analyzed transfer student outcome data (obtained from Julia Jackson in the Office of Student Affairs) and presented it at a CSE Faculty meeting to increase awareness for retention and pipeline issues for this group of students. Focus for the next AY will be increasing relationships with more Community Colleges and piloting support programs.

### **Undergraduate Mentoring Program**

During Fall Semester, a proposal was drafted and funding was secured to implement an Undergraduate Mentoring Program during Fall 22. The goal of this program is to provide more support for students (particularly from underrepresented groups) as they transition into the major and take 203, 280, and/or 281. Currently 4 mentors have been recruited and planning is underway to recruit undergraduates during September 2022.

### **Conference Graduate Student Recruitment Efforts**

Traditionally, CSE financially sponsors and facilitates student registration at Grace Hopper and Richard Tapia Conferences. Staff from the DEI Committee and Graduate Program Office created content and staffed virtual booths at both of these conferences to recruit students for CSE's Graduate Programs. New this year, the DEI Committee summarized the impact that these recruitment efforts had in this [document](#).

A dynamic we noted during Town Halls last year was that concerns regarding the experiences of students of color and women were oftentimes not addressed. Therefore, a priority for Winter 22 was **direct outreach** to student organizations in order to have focused conversations regarding climate with their constituents. Three members of the DEI committee and two CSE faculty members facilitated climate conversations at NSBE (National Society of Black Engineers) and SHPE (Society of Hispanic Professional Engineers) general body meetings. One DEI member was invited by GEECS to talk about support systems for women in STEM in the College of Engineering. There were around 20-30 participants at each of these sessions. Themes that arose from these conversations were captured and beginning action steps to address them were identified in this [document](#).

In addition to specific climate conversations with NSBE, SHPE, and GEECS, the DEI committee continued outreach efforts to **meet with student organizations**. These typically lasted an hour and included introductory remarks followed by listening to concerns and brainstorming ways CSE can offer support. This year, meetings and outreach included G/oSTEM, GSBES, HKN, SWE and GradSWE, ColorCoded, ECSEL+, and CSEG. Some of these meetings led to further collaboration with CSE, for example one DEI Committee member participated in a LGBT+ in Stem Panel hosted by oSTEM and later helped coordinate the OUTDoors @ CSE event.

CSE's DEI Committee also planned two Climate and Diversity Town Halls during the Winter semester. One Town Hall was focused on Undergraduate student experiences while the other was focused on Graduate student experiences.

### **Undergraduate-Focused Town Hall** (March 2022)

Four panelists were invited to address concerns, including Shelby Eddy (Undergraduate Advising Office), Elizabeth Kinney (Wolverine Wellness), and CSE faculty Amir Kamil and Wes Weimer. The Town Hall lasted 90 minutes and approximately 22 community members joined the conversation. Themes included: course availability and electives, resources for non-traditional students, Honor Code Impact on CSE Culture, Enrollment and Impact on Office Hours, and Student Health and Wellness.

### **Graduate-Focused Town Hall** (March 2022)

Four panelists were invited to address concerns, including Brigid Hart-Molloy ([ECRT](#)), Elizabeth Seney ([ECRT](#)), and CSE faculty Emily Mower Provost and Wes Weimer. The Town Hall lasted 90 minutes and 28 community members joined the conversation. Based on feedback from CSEG and ECSEL+, the final 45 minutes were dedicated towards having small group discussions between faculty and students. There was a positive reception towards these small groups, suggesting that we build on this format for future Graduate (and potentially Undergraduate) Town Halls. **Update from Town Hall:** One actionable item from this Town Hall was increasing clarity on who is an "individual with reporting obligations" (IRO, sometimes called a mandatory reporter) in CSE. At the Faculty level, workshops are being planned to increase Faculty's awareness of their responsibilities as IROs. Conversations are occurring over the summer regarding the best way to communicate Faculty IRO status to the community as a whole. ECRT created this [flowchart](#) to help community members identify their IRO status.

Previously, CSE created and coordinated a number of [working groups](#) in response to 2020's [Climate Activities Survey](#). The working groups targeted *Effective Office Hours*, *Overwork & Mental Health*, *Lab Culture*, and *Inclusive Environment* and included participants from the graduate, undergraduate, staff, and faculty populations. In Fall 2021, the DEI Committee sent out a survey to participants and based on the results decided to conclude the working groups. Most of the group's work culminated into a document of recommendations that were sent to CSE Chair Mike Wellman. Additionally, notes from these meetings were used to inform priorities and goals of the Strategic Action Plan.

CSE's Undergraduate Advising Office partnered with the DEI Committee to present to Faculty key challenges undergraduate students navigate with advisors. Overall, collaboration between faculty and UAO is critical for students' success. UAO created a Faculty Resource Guide to house many relevant policies, such as:

- There are policies related to late add/drop, grading, and Incompletes that are essential for Faculty to be familiar with.
- During registration, it is important that faculty be aware of UAO processes so that they can provide consistent instructions for students. Overrides, for example, depend on specific situations and sometimes require input from instructors.
- UAO shared with faculty a variety of instructional, student, and tutoring resources that Faculty should be aware of.

EECS held a third annual [Juneteenth Celebration](#) to observe the [Juneteenth holiday](#) marking the end of chattel slavery. The event was sponsored by CSE and ECE and organized with the [Graduate Society of Black Student Engineers and Scientists](#) (GSBES). This year, the EECS celebration was invited to be incorporated into the larger [University celebration](#) planned by the [Office of Academic Multicultural Initiatives](#). GSBES hosted an additional community building event, “Freedom Festival: 2022 Juneteenth Celebration”, which was sponsored by CSE and ECE. As of this writing, attendance information is not yet available for the **Juneteenth Celebration or Freedom Festival**. The Juneteenth Celebration included a welcome from EECS alum and Michigan Lt. Governor, singing of the Black National Anthem, reading the Emancipation Proclamation, and a panel discussion of four EECS alumni.

## CSE Program Activities

In AY 2021-22, CSE expanded its [inclusive teaching training](#) for instructional assistants and graduate student instructors. **Inclusive teaching training** efforts were expanded to be held in both the Fall and Winter semesters, and to target all teaching assistants from multiple classes, including EECS 183, 203, 280, 281, 370, 376, 390, 445, 481, 485, 493. The ninety-minute sessions include information on topics such as implicit bias, stereotype threat and imposter syndrome and include hands-on discussions. The advanced workshop reviews the content of the introductory workshops but also focuses on difficult scenarios that might come up in teaching. In Fall 2021, the standard workshop was offered to teaching assistants who had not previously completed the training and 71 teaching assistants participated. In Winter 2022, both options were offered: 123 teaching assistants attended the standard workshop and 74 participated in the advanced.

Waiting lists for upper-level computer science classes are a critical [undergraduate climate concern](#). Last year, CSE expanded its upper-level CS technical elective and capstone course Spring and Summer offerings based on the anticipated demand. This included **course offerings** of EECS 441, 481, 482, 484, 485 and 495. CSE added sections in several high-demand courses including EECS 481, 485, and 493 based on availability of instructors and prioritizing courses with high demand. This year continued that staff allocation for most courses.

**Office hour queues** and waiting times for access to staff remain a key concern, and in 2021-2022 CSE adopted a policy of adapting to issues that arise during the semester by allocating additional staff and strategizing class structure approaches to reduce waiting times (e.g., encouraging more group activity and peer-to-peer support). In addition, CSE is investigating ways to better monitor progress: many CSE courses use office hour software that do not currently have good mechanisms for tracking office hour queue times or bottlenecks.

Despite some increased offerings in some upper-level electives, large **waiting lists** are unfortunately likely to persist in very popular courses because the number of CSE majors appears to be increasing. For example, enrollment in EECS 280 increased by 12% between W21 and W22 (1204 vs. 1345 students). Enrollment in all upper-level CSE elective and major design experiences courses increased by 17% between W21 and W22 (4069 vs. 4779). In response, CSE has: (1) increased section sizes and added virtual lecture sections to some courses (with a proportional increase in the number of IAs/GSIs), and (2) increased the number of GSIs, postdocs, and research scientists who teach as primary instructors (13 in W22, in EECS 110, 183, 201, 280, 281, 367, 370, 376, 467, 484, 582, 592). In addition, CSE is speculatively considering longer-term reforms, such as changes to the CS major requirements to allow some non-CSE courses to be taken as upper-level electives, or changes to the CS-Eng major to reduce the number of upper-level CSE courses taken as flexible technical electives.

Enrollment in EECS 376, for instance, went up by 22% in one year, which corresponds to approximately 250 additional students who are likely to seek upper-level CSE courses. In very popular courses such as EECS 485, demand has outstrip available instructional capacity, despite increased offerings. In other classes, unavailability of larger classrooms is posing a challenge. Some form of enrollment management is likely to be required in future years to better match enrollment to available instructional capacity, as a step towards reducing waitlists and making student experience less stressful and rewarding.

CSE also teaches a significant number of non-majors in courses such as EECS 183, 280, and 281 and considers it important to serve students who want to get exposure to computing to help broaden participation in computing-related fields. Many of these students may be undecided about computing fields as a major, may come from diverse backgrounds, and come with different levels of preparation. EECS 183, 203, and 280 are collaborating with the [Comprehensive Studies Program](#) (CSP) to provide dedicated lab sections, office hours, and other resources to students in the CSP and [M-STEM](#) programs. These spaces are designed to create community among students and foster strong connections between instructors and students.

CSE eliminated the GPA requirement for declaring the CS-LSA major. Previously, students were required to achieve a 2.5 GPA over the prerequisite courses (Math 115, Math 116, EECS 203, EECS 280) taken at U-M to be eligible to declare CS-LSA. While students who meet the GPA requirement do tend to be better prepared for upper-level Computer Science courses, the policy required students who do not meet the threshold to retake courses, which negatively affected those on financial aid or who do not have time in their schedule to retake a course. The CSE faculty determined that the negative consequences outweigh the benefits of this policy, so they voted to eliminate the GPA requirement as of Fall 2022.

CSE uses physical and cryptographic **anonymous dropboxes** for community members to leave feedback or discuss climate concerns. Between 1 June 2021 and 1 June 2022, 38 comments were submitted via the dropbox (of which 4 included sender follow-up information and 34 were wholly anonymous). This represents a flat trend compared to the previous academic year when 37 comments were submitted in a June-June period. Students and community members are welcome to use these [anonymous mechanisms](#) for any topic. In AY 2020, CSE expanded the number of questions related to climate and DEI activities in **faculty annual reports**. Currently, 46 of the 54 faculty with reports available elected to respond with detailed summaries of their DEI activities. Faculty annual report data is used by CSE when considering certain raises and awards. In addition, CSE continues to consider ways in which faculty can voluntarily include certain structured DEI activities (such as attendance at [STRIDE workshops](#) and [CRLT Engineering workshops](#)) in **promotion and tenure casebook materials**. CSE continues to offer new faculty members monetary research award incentives to attend extended training. One medium-term goal is to see if faculty are applying what they are learning in such workshops in the classroom and to consider alternative ways to evaluate teaching.

### **CSE Associated Groups, Programs and Activities**

Many programs, groups and activities have a large number of student and faculty organizers; for brevity, we list a few contacts for each program and include links for more information.

The [AI4All program](#) features a two-week summer camp for high school students and open learning with a focus on Detroit. David Fouhey, among others, organizes the program.

The [African Undergraduate Research Adventure](#) (AURA) program is a research exchange for undergraduate students at the Addis Ababa Institute of Technology who [come to Ann Arbor for 12 weeks during the summer](#).

Todd Austin and Valeria Bertacco, among others, organize the program.

The [Computing CARES](#) program aims to broaden participation in computing, particularly for women, through fundamental changes to how classes are taught. It organizes inclusive teaching training, community-building and survey activities. Valeria Bertacco and Amir Kamil, among others, organize the program.

The [CS KickStart](#) program is a [week-long introduction to computer science](#) for Michigan students with little to no experience. It includes hand-on coding instruction, meeting other students and career exploration. Audrey Ladd, Ania Dlugosz, Marina Askar, Rachel Holmes, Divya Ramamoorthy and Sydney Swider, among others, organize the program.

[Discover Computer Science \(EECS 198 now EECS 110\)](#) is a two-credit course designed for any student interested in exploring computer science but doesn't have formal programming experience, and is particularly designed to support women and underrepresented minorities. Students in the course learn to write code, learn core computing concepts, explore interdisciplinary computer science applications, attend upper-level students, graduate students, and CS industry professionals panels, and interview CS graduate students. Laura Biester, Laura Burdick, and Rada Mihalcea, among others, have organized and taught this course.

[EECS 598 "Intro to CSE Graduate Studies"](#) is a one credit seminar series designed to introduce new Ph.D. and Master's graduate students to the skills needed to be a successful graduate student researcher in computer science and engineering. Rotating speakers give perspective on the research process, time management, publishing in CS, managing the highs and lows of grad school, working with your advisor, career paths, etc. The goal is to give students the background knowledge and perspective needed to be successful in grad school, as well as to help develop non-technical skills such as presenting and self-promotion. Additionally, this course offers an opportunity for incoming students to meet their cohort and connect with the wider CSE research community. Lauren Biernacki introduced the course and taught it with Quentin Stout. Alanson Sample and David Fouhey taught the class in Fall 2021. This year the course was upgraded from a "special topic" to a permanent designation: "EECS 601 – Intro to CSE Graduate Research".

The [Explore Computer Science Graduate Studies](#) program helps undergraduate students understand and prepare for graduate school through an annual day-long workshop that includes application writing clinics and faculty panels. Nikola Banovic and Danai Koutra, among others, organize the program.

The [Explore Computer Science Research](#) program helped involve 20 students, including women and underrepresented minorities, in the research process. Students give project presentations at the end of each year and attend CS research panels where they connect with CS research professionals and learn about interdisciplinary opportunities to apply CS research. Laura Burdick, Allie Lahnala, Danai Koutra, and Rada Mihalcea, among others, organize the program.

The [Girls Encoded program](#), which was designed to address gender underrepresentation in computer science and engineering, provides outreach and research mentorship for all interested students. Laura Burdick, Rada Mihalcea and others organize the program.

This year, CSE ran a series of [Graduate Fellowship Workshops](#). The workshops provided application preparation to help students seek fellowship funding. David Fouhey organizes the program.

CSE faculty are involved in the [M-STEM Academies](#), a summer program with co-curricular support to support students as they transition from high school to the first two years of college.

The Undergraduate Mentoring Program is a new program being offered for students in Fall 22. This program seeks to offer social support to students (especially from underrepresented groups) as they transition into the major and are taking 203, 280, and/or 281.

[Women in Computing](#) is a CSE seminar series that brings in distinguished women researchers to discuss their work and meet with faculty and students. The series was initiated and is frequently organized by Rada Mihalcea. It traditionally includes a round-table with interested students.

In addition, CSE sponsors, mentors or otherwise supports and recognizes a number of student groups or programs that participate in climate- and DEI-related activities. These include, in brief summary:

- [Color Coded](#) – Student Org focused on community, experience, and learning opportunities for student from underrepresented populations in CS, CE, and Information
- [CSEG](#) – Computer Science and Engineering Graduate Students
- [ECSEL+](#) – Ensemble of CS Ladies+
- [EECS DEI Student Action Committee](#) – Undergraduates to Improve Diversity, Equity and Inclusion
- [ETC](#) – Engineering Teaching Consultant Program
- [GEECS](#) – Girls in Electrical Engineering and Computer Science
- [HKN](#) – Eta Kappa Nau, International Honor Society of the Institute of Electrical and Electronics Engineers
- [KTP](#) – Kappa Theta Pi, Co-Educational Technology Fraternity founded at U-M
- [NSBE](#) – National Society of Black Engineers
- [oSTEM & GoSTEM](#) – (Graduates) Out in Science, Technology, Engineering and Mathematics
- [SHPE](#) – Society of Hispanic Professional Engineers
- [SWE & GradSWE](#) – Society of Women Engineers

CSE also coordinates with College of Engineering-level DEI activities, including the [COE DEI Committee](#) and Dean Alec Gallimore's [Eating and Talking Sessions](#) for students. Finally, while not a focus of this transparency report, CSE also conducts a number of longer-term DEI investigations. One example focus is identifying barriers to the success of transfer students, including lower socioeconomic status students and international students, who pursue computing majors. This includes both the [University of Michigan-Shanghai Jiao Tong University Joint Institute](#) transfer program and [transfer students from other backgrounds](#), such as local community colleges via the [Michigan Transfer Agreement](#). Harsha Madhyastha, among others, organizes this investigation. During AY22 effort was dedicated towards increasing outreach to transfer students. Two CSE faculty members and one DEI staff met with Washtenaw Community College STEM Scholars to share information about CSE's undergraduate programs. CSE's DEI Project Manager also attended both of the College's WCC application information sessions to answer questions and serve as an early point of contact for any students interested in CSE. The DEI Committee is also planning on facilitating a session on "Careers in Engineering" for WCC and Mott Community College students in July 2022. We anticipate broadening these efforts to reach more Community College students during the next academic year.

## Financial Commitments

We also report resources allocated at the CSE level to climate and DEI activities. The following list includes initiatives CSE has fiscally supported during the 2021-2022 academic year.

- Conference Sponsorship of [Richard Tapia Celebration of Diversity in Computing Conference](#) and the [Grace Hopper Celebration](#) highlighting women in computing. Registration passes are often included in sponsorship packages; for example, CSE supported the registration for 28 (GEECS and ECSEL+ members) students for Grace Hopper and 2 GSBES students for Richard Tapia. Both Grace Hopper and Richard Tapia were virtual this year – we anticipate supporting student travel to these conferences when they return to in-person next year.
- As part of the sponsorship package, CSE sends faculty and staff to the conferences to represent UM and to recruit students into our programs. The College of Engineering specifically sponsored the [Society of Hispanic Professional Engineers](#) and the [National Society of Black Engineers](#) convention. CSE staff participated in recruiting prospective students at these conferences as well.
- Direct financial support for UM students organizations (NSBE and SHPE) to participate in national conferences. 7 NSBE Graduate students (across the CoE), 16 NSBE Undergraduates (all of which were CE,CS, or Data Science majors), and 10 SHPE Undergraduate students (all CS majors) were funded.
- Additional financial support for student groups. This year we provided additional funding to the [Graduate Society of Black Engineers and Scientists](#), and [Out in Science Technology Engineering and Mathematics](#). This additional funding often took the form of CSE sponsoring student organization programs (Freedom Festival & OUTDoors @CSE).
- CSE hosted our second annual [Service Award for Excellence in Diversity, Equity, and Inclusion](#). The award was one way that CSE aims to support Graduate students who put uncompensated time into improving the climate and culture in CSE. 4 Graduate students were selected to receive the award.
- Due to the virtual nature of Town Halls this year, no funding was needed for food. However, we plan to dedicate funding for these community gatherings when they return to in-person.
- CSE also organized 6 “study halls” for students in EECS 203, 280, and 281. We financially supported 8 IAs who volunteered their time to work with students during those sessions.
- CSE was approved to pilot an Undergraduate Mentoring Program for Fall 2022. Four mentors will be compensated for their work over the course of Fall Semester.

Raw numbers can be difficult to interpret because they vary with the size of the department. For context, we use CSE Faculty Search as a point of comparison. Faculty Search includes travel and hosting reimbursements, staff time, seminar organization and similar activities, and is viewed as a core CSE activity typically involving 30-40 interviews each year. Each year CSE spends approximately **twice as much** on the climate and diversity activities listed above as it does on Faculty Search (compared to Faculty Search the year before COVID, to avoid conflating its reduction in travel). Spending money on processes does not guarantee desired outcomes, but this does indicate the relative fiscal importance of DEI activities to CSE.

CSE’s DEI Project Manager started in June 2021, providing around 2,080 dedicated hours toward DEI efforts in CSE. In the past, CSE has provided DEI-related **staffing support** as needed. For example, during AY20, specific salary budget lines were established to provide salary for both faculty and staff time devoted to DEI activities (corresponding to approximately 1,720 hours per year of paid faculty/staff time for DEI-related activities in the department). With a full-time dedicated staff this has not been as necessary as in previous years. The Project



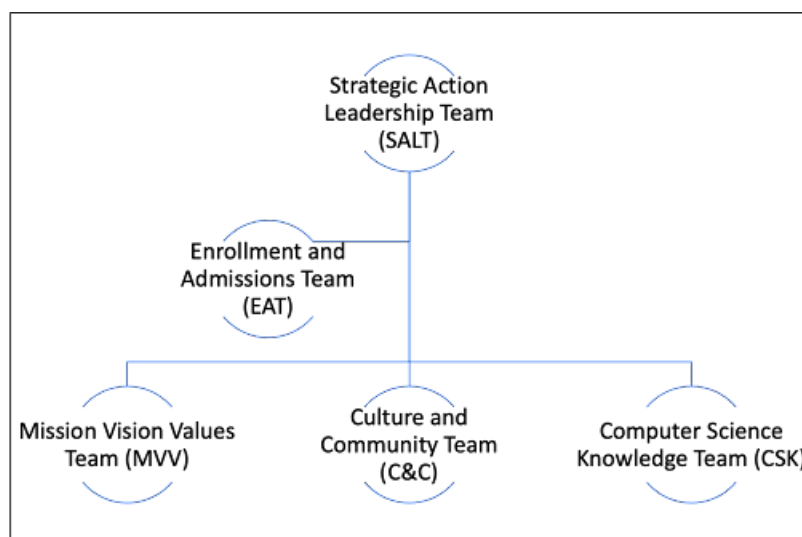
Manager’s role is focused on coordinating and leading out efforts at the students, staff, and faculty level. A new full-time DEI Project Coordinator has been approved and will begin in July 2022. This individual will focus on data analysis and outreach efforts. The next section will describe CSE’ Strategic Action Plan. Part of the impetus of creating a second DEI staff position was to ensure that there was capacity for both to take ownership of critical strategies and goals to improve the culture in CSE. It should be noted that these hours do not include the unpaid effort that is put forward by many in the CSE community on a regular basis.

## Strategic Action Plan

**Strategic planning** is a process of defining our values and goals and then making decisions (including resource allocation) to attain them. Aspects related to climate and DEI, such as culture and community, are integral to CSE’s strategic planning.

Anecdotally, the term “strategic planning” may feel opaque to some students or community members. At the same time, there is significant interest in transparency regarding our follow-through: given the statistical information presented throughout this report, what does CSE plan to do about it? When taken together with the Climate and Diversity Activities already listed (which focus on a more current time frame), **the Strategic Action Plan directly answers that transparency question** by elaborating on CSE values and which actions we will prioritize (including with resource allocations) going forward.

To shape CSE as a thriving division for students, faculty, and staff, we commenced a Strategic Action Plan process on September 3, 2021 with leadership from 23 faculty and staff members. This group engaged in activities such as a SOAR analysis – strengths, opportunities, aspirations, and results – designed to elicit ideas and discussion about prospects for the plan and the future of CSE. Five committees were formed to carry out the work of developing CSE’s mission, vision, and values, along with priorities, goals, strategies, and outcomes. Input was provided by members of an overarching leadership team, with representatives from each lab, teaching faculty, and staff. Overall strategic planning leadership team members include Wellman, Mihalcea, Mahlke, Sample, Halderman, Bansal, Chesney, Bender and Cormier.



## Mission, Vision and Values

The **Mission, Vision and Values** Team considered examples from peer institutions, and formulated our mission, vision, and values to complement, but not duplicate, those of the College of Engineering and

University of Michigan. It was our intention to speak directly to the nature of our field and the particular culture of CSE. We solicited input from faculty, staff, and students and adopted the following to capture why we exist (mission), how we hope to achieve it (vision), and ways in which we strive to conduct ourselves as we learn and work.

- CSE's **mission** is to shape the future of computing and benefit the world through excellence in education and research.
- Our **vision** is to *lead* in computing, *support* a welcoming community, and *empower* every individual to reach their full potential.

In addition, CSE agreed on five guiding values:

- **Honesty:** Conduct ourselves with integrity and communicate with transparency and authenticity.
- **Achievement:** Strive for academic excellence and celebrate personal and collective efforts and accomplishments.
- **Cooperation:** Collaborate in work and learning, promote inclusion and mutual respect, encourage diverse perspectives, and look after each other.
- **Knowledge:** Protect academic freedom, advance learning and scientific progress, and cultivate wisdom.
- **Service:** Contribute to the well-being of our community and global society.

The MVV team included Cheraghchi, Bender, Kuipers, Champion, Cormier and Halderman.

## **Culture and Community**

The **Culture and Community** (C&C) Team articulates how we can collaborate together, in all realms of our activities, to actualize our values, move toward our vision, and strive for CSE members' respect, fulfillment, growth, and belonging. The C&C Team considered sources of information already compiled on issues of culture and climate, such as previous DEI reports, the CLASS report, and results of deliberations by CSE work groups who examined various issues including lab culture and well-being. We also engaged a wide variety of stakeholders in providing us with their perspectives on what is needed to make CSE a supportive and vibrant place to learn and work. Over the 2021-22 academic year, these stakeholders participated in discussions with the C&C team, provided ideas on our Open Call survey, and suggested priorities and goals that would improve the culture and community of CSE over the next five years. The common and recurring themes woven throughout stakeholder feedback formed into a clear unifying narrative:

- Students flourish in CSE when they have a sense of connection to teams, organizations, and cohorts that support their well-being;
- Staff enable CSE to prosper when channels of communication are timely and effective;
- Faculty excel when the field of computing rewards collaboration and growth, and;
- CSE and the computing community has the potential to realize a responsible and powerful impact on society if it can cultivate contributions of a diverse community of scholars.

Building on this overarching narrative, the following recommendations, as priorities and goals, reflect our team's synthesis of the rich array of input we received and their expression into commonly-held objectives for the next stage of the CSE culture and community.

- Priority 1: **Develop and evolve systems and programs to promote student, faculty, and staff success and well-being.**
  - Goal 1.A: Enhanced community members' engagement in CSE and sense of connection with one another
  - Goal 1.B: Improved student learning experiences through support and attention to health and well-being
  - Goal 1.C: Harassment-free workplace and environments for learning
  - Goal 1.D: Impactful promulgation of CSE values
- Priority 2: **Increase diversity across the Division (students, staff, IAs/GSIs, faculty).**
  - Goal 2.A: Growth in the number of members of underrepresented groups amongst undergraduate and graduate students, faculty, and staff
  - Goal 2.B: Initiatives for support and retention of members of underrepresented groups
- Priority 3: **Improve CSE communications to enhance the quality of interactions and better meet the needs of students, staff, and faculty.**
  - Goal 3.A: Communications in a diverse world skills for faculty, staff, IAs/GSIs and students
  - Goal 3.B: Increased communication and feedback pertaining to the creation, refinement, clarity, and distribution of information about formal policies and procedures
- Priority 4: **Lead in improving the culture and community of computing as a field.**
  - Goal 4.A: Creation of best practices for industry-academia engagement for healthy and collaborative exploration of post-graduate opportunities and outcomes for continued participation in computing
  - Goal 4.B: Recognition and reward of contributions for shaping the culture and community of the computing profession

The C&C team included Jenkins, Dreslinski, Bender, Harper, Merrill, Prakash, Saleem, Chesney, and Mihalcea.

## Enrollment and Admissions

The **Enrollment and Admissions Team (EAT)** was convened in February 2021 (prior to the initiation of the comprehensive Strategic Action Plan process) and charged with producing recommendations for addressing the soaring population of undergraduate CS students. The conclusions of the Team's investigations were presented at the May 2021 retreat of the CSE faculty, who endorsed the Division taking action. EAT then worked through Fall 2021, consulting with relevant peer institutions, to produce a model that aims to instantiate the principles and priorities used to guide the development process. CSE faculty learned about the details of the new model in December 2021, and appropriate members of the Deans' teams of the College of Engineering and LSA were also briefed on the proposal and signaled their support to proceed. The following priorities and goals outline the various dimensions of the EAT approach that will be cultivated over the coming years.

- Priority 5: **Create a new multi-pathway admissions model that caps the number of CS majors but allows for control over class composition and promotion of more diversity.**
  - Goal 5.A: Preferred major admissions process for first-year U-M applicants
  - Goal 5.B: Admissions process for current U-M students who discover interest in CS

- Goal 5.C: Effective pathway for external transfer students from community colleges and partner institutions
- Goal 5.D: Targeted access pathway admissions for students from bridge programs
- Priority 6: **Engage in enrollment management practices to balance student demand for courses with available space and teaching capacity.**
  - Goal 6.A: Systematic approach to course access management according to major status and other parameters

The Enrollment and Admissions Team included Noble, Bender, Arthur, Bruns, Guzdial, Sherry and Bansal.

## Computer Science Knowledge

The purpose of the **Computer Science Knowledge** Team was to examine U-M CSE in the context of the evolving computer science field. The Team's approach has been to identify some of the essential steps that need to be taken over the next five years to ensure we are competently striding forward as a cutting-edge computing education enterprise. We aim to engage the whole community in securing well-functioning systems for empowering learners and explorers.

- Priority 7: **Review, and revise if needed, the CSE curriculum and program structure (undergraduate and Master's) to ensure effective provision of the skills, knowledge, and teaching strategies appropriate for different user groups and ongoing course and program integrity.**
  - Goal 7.A: Exploration of the role of CSE in the broader area of computer education at U-M
  - Goal 7.B: Curriculum structure for CS/CE that offers appropriate undergraduate paths and pedagogy for: a) majors; b) those who may want certain CS skills but not the major; and c) those who would like to enter the major as enrolled discoverers, external transforms, or participants in specialized bridge programs, such as M-STEM and M-Sci
  - Goal 7.C: Assessment of the structure and functioning of the Master's programs
  - Goal 7.D: Engagement of the whole faculty in understanding and developing programs, curricula, courses, and teaching approaches
  - Goal 7.E: Implementation of a continuous quality improvement process surpassing previous ABET (Accreditation Board for Engineering and Technology) accreditation effectiveness
- Priority 8: **Cultivate leadership, professionalism, and mentoring skills and mindsets through the life cycle of students, staff, and faculty.**
  - Goal 8.A: Improved orientation and mentorship programs sustained across time
- Priority 9: **Develop an open and vibrant culture of cross-disciplinary research in CSE.**
  - Goal 9.A: High-impact, interdisciplinary research as a means of keeping U-M CSE at the forefront of computing innovation
  - Goal 9.B: Increased integration in the doctoral program of research and learning opportunities focused on innovation and boldness
  - Goal 9.C: A CSE-wide undergraduate research program that engages well-motivated students early in their studies

The CSK team included Austin, Chai, Bender, Brehob, Crang, Stout, Mahlke, and Sample.

## **Strategic Action Plan Summary and Next Steps**

On May 20, 2022, a staff and faculty retreat was conducted to facilitate discussion and receive further feedback on the above priorities and goals. In early Summer 2022, a comprehensive Action Plan document will be published, including details of the Teams' processes, their priorities, goals, strategies, and outcomes, along with over one hundred pages reporting the input we received from our stakeholders (e.g., students, staff, community members, etc.). We will move into the implementation phase beginning Fall 2022, with key CSE committees tasked with accomplishing the goals relevant to their responsibilities. Donna Bender, CSE's Director of Strategic Initiatives, will coordinate oversight of the progress of these various activities to ensure the Plan's intentions come to fruition over the next five years.

## **Report summary**

This report provides context, statistics, and discussions regarding Computer Science and Engineering in the Academic Year 2021-2022. The report covers undergraduate programs, graduate programs, faculty hiring, sentiment, larger- and smaller-scale activities and organizations, commitments, and strategic planning.

We continue our commitment to release this report annually. This academic year marks the third year in which CSE has published climate, diversity, equity, and inclusion data. Information from these reports are used to inform future initiatives and divisional planning (as shown directly in the Strategic Action Plan). Additionally, CSE Faculty have presented this report at seminars to encourage other Universities to follow a similar process of transparent reporting. Climate, diversity, equity and inclusion are important to everyone in our community, and a combination of measurement and sustained, collective effort are necessary for improvement.

## **Acknowledgements**

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