

Broadening Participation in Computing Plan

We plan a large number of broadening participation in computing (BPC) activities, described in this “stand-alone” BPC plan. Across all of these efforts, we will take advantage of team organizations Morgan State (an HBCU), University of Texas at El Paso (an MSI), and Barnard (a women’s college) in order to provide specific opportunities for students in these under-represented groups. The UCLA team will aggressively recruit Hispanic students in compliance with UCLA’s strategic plan to become a Hispanic-serving university by 2025 [257]. All project students, including students from these organizations, will have the opportunity to participate in project research both with faculty at their own institutions and at other project institutions. In keeping with question #12 of NSF 21-118, *Frequently Asked Questions (FAQs) for CISE Broadening Participation in Computing (BPC) PILOT*, we provide below an estimated supplementary budgetary cost associated with these BPC activities in this supplement; these costs are *not* included in the submitted proposal budget.

PIs **Osuagwu** and **Wright** will coordinate the BPC efforts and associated reporting, and are well prepared to do so. Osuagwu is currently an assistant director at the Cybersecurity Assurance and Policy Center at Morgan State University, an NSA Center of Academic Excellence; he has worked to grow representation from underrepresented populations throughout his career at Johns Hopkins University Applied Physics Laboratory and Morgan State University, an HBCU. Wright is leading the creation of a Computer Science department at Barnard, a women’s college; she is also a member of the board of the Computing Research Association’s Committee on Widening Participation in Computing Research (CRA-WP). All PIs and senior personnel will participate in at least one identified BPC activity each year. Many members of our team already have experience with BPC. We will also ensure sufficient preparation of the team by including a session devoted to broadening participation in computing and how it connects to the project at each of our annual PI meetings. These sessions will include discussion of evidence-based practices for BPC, information sharing about success stories or promising programs at our own institutions, and interactive workshops on topics such as inclusive pedagogy.

Measurement (cross-cutting) For each BPC activity, each project annual report will include the specific description of the activity, which PIs were involved and how, the number and demographics of participants, and any available relevant outcomes. In cases where we partner with existing programs that already conduct thorough measurement and evaluation, we will make use of these data. For new programs or programs that do not currently collect such data, we will work with our external evaluator to determine appropriate measurement methods. Resulting measurements and analysis will be presented each year to the project’s Advisory Board as well as discussed at the annual PI meeting. (In the interest of space, we do not repeat this information in this document separately for each activity.).

Evaluation (cross-cutting) As noted in Section 4 of the project description, we will employ an external evaluator to evaluate the broader impacts of the project, including the BPC efforts. Each year’s evaluation report will provide formative and summative evaluation in order to assess our BPC efforts, benchmarking them against project goals. We will use the results of the evaluation to modify our approach for future years if necessary.

AI4All Columbia’s AI4ALL is a three-week summer program for 20–25 high school students from racial/ethnic groups under-represented in AI and tech (Black, Latinx, and indigenous). It provides students with interdisciplinary exposure to the field of artificial intelligence, including tangible research skills used to impact social change in their own communities through creative arts, social science, and technology. We will partner with AI4All to add cybersecurity topics to the program, including

both security issues associated with the design and application of AI and the use of AI to improve cybersecurity. In Summer 2021, the program included 92% who self-identified as students of color, 66% as Black/African American, Hispanic/Latinx, or Native American/Indigenous/First Nations, 80% as female, 20% as LGBTQIA+, and 95% as first generation or low income; over 600 students applied to the program in 2021. Our project will expand the program, funding the participation of an additional 10 students each summer. PIs **Gu, Jana, Kaiser, Kemerlis, Ray, Wright**, and **Yang** will contribute to the development of new lectures and interactive sessions; **Wright** will contribute to program organization.

GEN Cyber Program Morgan. The Cybersecurity Assurance and Policy (CAP) Center offers a no-cost summer camp for Baltimore middle-school girls. The camp focuses on securing Internet-of-Things (IoT) devices for smart home applications. The program will encompass two half-day virtual camps and exposure to fundamental cybersecurity concepts. The students get to work with graduate students and Electrical and Computer Engineering faculty from the CAP center on real life projects in the area. **Wandji** helps lead the program and will continue to do so. **Onyema, Kaiser, Ray**, and **Wright** will all give talks in the program.

Student Affinity Groups in Computer Science, STEM, and Engineering. Several of our participating institutions have student clubs or other student-organized groups for women and other groups under-represented in CS, STEM, and engineering. Project faculty work with and will continue to work with these groups. At Columbia/Barnard, WiCS hosts DivHacks, a diversity-focused hackathon, each year, and **Wright** works with Barnard to provide space and funding sponsorship for it, and will continue to do so. At Stevens, **Portokalidis** will work with the SWiCS club to run a semi-annual seminar on the topics of this project with the aim to attract women undergraduate researchers. At Yale, **Shao** will work with WiCS to host external distinguished speakers and role models and help recruit more women to work in the area of trustworthy computing. At UCLA, **Xu** will continue to work with the UCLA Society of Women Engineers (SWE) [258] to run undergraduate mentoring sessions that host talks by female leaders in CS. At Brown, **Kemerlis** will work with WiCS, Mosaic+ (for CS students who are members of an under-represented population), and oSTEM (for LGBTQIA+ folks at Brown studying or working in STEM), giving talks and informing them of project opportunities.

Barnard College's Summer Research Institute (SRI). At Barnard, a women's college, SRI connects Barnard students with faculty or industry mentors to carry out research in a 10-week program that includes one-on-one research mentoring, opportunities to build skills, faculty lectures, alumnae panel discussions, and information about applying for graduate school and fellowships. It concludes with a capstone poster session, where students present their research to the broader Barnard/Columbia community. One goal of SRI is to encourage participants to consider pursuing graduate education and to have the experiences needed to succeed. As part of this project, the project team commits to mentoring eight Barnard students each summer in SRI. **Wright** will coordinate, and **all project PIs and senior personnel** from across all project institutions have agreed to mentor or co-mentor at least one student during the course of the project. Both mentors and students will be provided with guidance about responsibilities and expectations in the program, and mentors will have the opportunity for additional participation in sessions about how to be a good research mentor, including attention to diversity, equity, and inclusion.

Scholarship for Service Program. University of Texas at El Paso (UTEP), an MSI, and Morgan State (MSU), an HCBU, are designated as DHS CyberCorps universities through the DHS/NSF Scholarship for Service (SFS) program, which provides significant financial support to students enrolled in a

cybersecurity-focused educational program. The UTEP SFS program will support up to 35 students during the next 5 years who are primarily accepted to the program during their undergraduate studies and will complete an advanced degree in the areas of software engineering and cybersecurity. The MSU SFS program prepares students by combining an innovative curriculum in secure embedded systems, challenging research opportunities, active and experiential learning opportunities, and peer and professional mentoring. Leveraging the multi-institutional nature of the SaTC project, we will invite undergraduate SFS students from these institutions to participate in project activities suitable for undergraduates and to consider graduate programs at project institutions. Graduate SFS students will have opportunities to participate in project research, visit other project institutions, and participate in other project activities. **Tizpaz-Niari** will coordinate UTEP SFS student participation in OASIS, and **Onyema** will coordinate MSU SFS participation.

Participation in BPC Mentoring and Professional Development Workshops and Conferences.

We will encourage and fund an estimated 12 project students per year from under-represented groups to participate in activities such as the Grace Hopper Celebration, Richard Tapia Celebration, Women in Computer Security (WiCyS), the CRA-WP Graduate Cohort programs, and women's workshops such as N2Women co-located with the scholarly conferences. **Kemerlis**, **Wandji**, and **Wright** will coordinate student participation across all project institutions, and will develop an application process and decision guidelines to ensure that resources are distributed transparently and equitably.

Educational Talent Search (ETS). The Educational Talent Search (ETS) program, which is federally funded and sponsored locally by the University of Texas at El Paso, provides college, career, and financial aid information to hundreds of students each year (currently, 619 students are participating in the program). ETS identifies students who demonstrate an interest or desire to attend college and provides them with the motivation and support to enroll in a program of post-secondary education (college, university, technical or vocational school) after high school graduation. Currently, the program has been offered to student in Jefferson and Bowie High Schools in El Paso. These programs have significantly improved the enrollment of Hispanic minority and low-income students in post-secondary education in prestigious schools. **Tizpaz-Niari** will coordinate efforts to prepare and present educational modules from the results of this project to motivate students to enroll in STEM and CS fields.

UCLA Center for Excellence in Engineering and Diversity (CEED). **Xu** will continue to work with the Center for Excellence in Engineering and Diversity (CEED) office [259] at UCLA to host a group of incoming undergraduate students in his research lab and provide hands-on research experience. The goal of this program is to ensure equity and parity in the K-20 pathways that lead to engineering and computing degrees and develop leaders for California's diverse technical workforce. Through CEED, Xu has recruited five undergraduate students, three of whom are female students. Each of these students works in Xu's lab on one project for as long as the project lasts. Xu will make efforts to recruit students from under-represented groups through this program and train them using the proposed research.

Budget. We provide an estimate of the Year 1 budget for these BPC activities. Costs in additional years would increase by an expected 3%.

- AI4All \$30K
- Barnard SRI \$10K per student, \$80K per year
- BPC PD workshops and conferences \$18K per year
- Additional budget for external evaluator (5–10% of new BPC budget)

(No additional budget is required for the other BPC activities.)