CALIFORNIA STATE UNIVERSITY
FULLERTON
CENTER FOR CYBERSECURITY

Center Name	Center for Cybersecurity
College Unit:	College of Engineering and Computer Science
Director:	Dr. Mikhail I. Gofman
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Year of Last Review:	2018

1. Mission and Goals

The ECS Center for Cybersecurity was founded to bolster national security through dedicated efforts in cybersecurity education, research, and community engagement. The center stands as the university's proactive measure against the growing cyber threats that pose risks to people, enterprises, and vital infrastructures. The core goals of the center are delineated below.

Cybersecurity Education: Establish and maintain a top-notch, interdisciplinary designed cybersecurity curriculum based on high-impact pedagogical practices and geared toward training the next generation of security practitioners.

2018—2023 Alignment:

- **Values:** The center's education goals align with values of fostering **"*Student Success*"** and providing **"*Service to the Region*."** This is underscored by the sustained and anticipated increase in demand for cybersecurity experts, both within our region and nationally. In addition, the goal aligns with the value of "Integrity" as integrity is a key aspect of cybersecurity professionalism.
- **Goal:** "Our Commitment to a Transformational Titan Experience"
  - **Objective: "Ensure all undergraduate students participate in at least three HIPs curricular or co-curricular experiences"**: The center's emphasizes on HIPs as part of its curriculum development goals.
  - **Objective: "Develop and broaden nationally recognized signature elements of the Titan experience":** The center strives to have its security concentration nationally accredited by the NSA and the DHS, thus making it CSUF's signature element of Titan experience.
  - **Strategy: "Identify, develop, and highlight university signature programs that provide a transformative experience for students":** The center curriculum development efforts strive to develop a signature cybersecurity program unique to CSUF.
  - **Strategy: "Enhance global competencies through increased access to and participation in immersive learning experiences":** Cybersecurity education is fundamentally about understanding cybersecurity challenges within a global context, as both offensive and defensive measures transcend national boundaries.
  - **Strategy: "Expand faculty-student mentoring opportunities, particularly during the last year of the undergraduate experience":** The center strives to give students working on the senior capstone projects opportunities to work with faculty on cybersecurity projects.

Cybersecurity Research: Pursue novel externally funded security research and engage students in research-based learning experiences.

2018—2023 Alignment:

- **Values:** The center's research goal aligns with value of **"Scholarly and Creative Activities"** as the goal directly emphasizes the commitment to research and scholarly activities.
- **Goal: "Our Commitment to a Transformational Titan Experience"**
  - **Objective: "Ensure all undergraduate students participate in at least three HIPs or curricular or co-curricular experiences":** student involvement in cybersecurity research is a HIP activity.
  - **Strategy: "Identify, develop, and highlight university signature programs that provide a transformative experience for students":** Engaging in cybersecurity research can be a transformative experience in the professional growth of students.

Cybersecurity Outreach: To host public events and workshops aimed at educating security professionals and the broader community in cybersecurity fundamentals, to forge ties with industry to attract funding necessary for supporting center activities, and to collaborate with industry on practical security challenges

2018—2023 Alignment:

- **Values:** The center goal aligns with value of **"Civic Engagement"** as the center seeks to foster public outreach to inform and educate CSUF and the broader public about cybersecurity issues.
- **Goal: "Our Commitment to a Transformational Titan Experience"**
  - **Strategy:** "**Increase existing outreach with community partners and alumni to connect faculty, students, and staff":** The center's community outreach initiatives connect with community by educating the public about cybersecurity and assisting industry partners in identifying solutions to cybersecurity problems.

Alignment with the Missions of the ECS and the Department of Computer Science:

The center's objectives in cybersecurity education, research, and outreach directly align with ECS's mission to develop top-tier engineers and computer scientists, readying them for diverse professional roles or further study. These aims also directly complement the Computer Science Department's commitment to imparting foundational knowledge, practical skills, and adaptability in the face of technological progress.

Activities

The following summarizes the activities toward achieving the center's education goal:

Development and Launch of Computer Science, Cybersecurity Concentration, B.S.: The new cybersecurity concentration in the Computer Science Department, requiring four key courses, aims for NSA/DHS recognition as a Centers of Academic Excellence in Cyber Defense (CAE-CD).

Development and Launch of the Web Security (CPSC-455): The new web security course improves the cybersecurity program by teaching students to create and assess secure web applications, addressing common cyber threats through hands-on learning and adherence to OWASP standards.

Revision of Cybersecurity Curriculum for Incorporation of HIPs and Alignment with CAE-CD: The center has revamped its curricula to bring it more in line with the CAE-CD standards and HIPs by introduction of significant hands-on activities in selected courses and introducing the introductory course CPSC-253 for an early start in cybersecurity, aligning with the CAE-CD's rigorous knowledge units.

Community Colleges Transfer Programs: Establishing a cybersecurity student pipeline from community colleges and other institutions is vital for the program's expansion and diversity. Established cybersecurity course articulation agreements with over 8 community colleges, including Bakersfield and Cerritos, support this initiative. These partnerships are part of the broader CCCEPP Initiative, aiming to forge educational pathways from K12 through college and into the industry.

Cybersecurity Minor: The center is planning on introducing a cybersecurity minor in 2024, initially tailored for engineering majors. The longer-term goal is to extend its reach to students across various fields, enhancing the program's inclusivity and attracting underrepresented groups to the cybersecurity domain.

Offensive Security Society Club Support: Participation in extracurricular activities is paramount for students pursuing cybersecurity. The center has been a dedicated mentor and supporter of the Offensive Security Society (OSS), a student club focused on security. The club's members have consistently participated in competitions such as the Collegiate Penetration Testing Competition (CPTC), Collegiate Cyber Defense Competition (CCDC), and Information Technology Competition (ITC). Notably, the team secured the national CPTC title in 2018, and has achieved regional victories, placing first in 2022, second in 2023, and third in 2021, while also competing at the national level annually. Additionally, OSS triumphed at the HackerOne event in 2019 and scored in the CyberSeed challenge in 2024.

The following summarizes the activities toward achieving the center's research goals:

Collaboration with Black & Decker CAM Division (2020): A collaborative student project with Black & Decker's CAM division. A team of students and mentors from both the center and Black & Decker, focusing on researching, developing and implementing a secure file server migration solution.

Collaboration with Disney Inc. (2020—present): The partnership is dedicated to guiding student-led research and development initiatives in cybersecurity. Center's faculty and Disney's cybersecurity engineers provided mentorship to students engaging in the research, design, and execution of a mobile Security Operations Center and an AI-driven system for setting up virtual environments adhering to CIS security standards. The project involved more than 20 students including 5 female students.

Collaborative Project with DigiClips (2022—present): The partnership engages students in researching and developing efficient secure solutions for media recording for the DigiClips company. The relationship has provided more than 10 students with opportunities for independent study and graduate projects.

Intramural/RSCA/IRA Grants 2018-19 Junior Intramural Grant Awards: ($5,000), 2019-2020 RSCA Grant (15,000), IRA Grant (2024, $20,480).

Submission of Grant Proposals (not funded): SONY award 2020 ($93,574), CA Dept of Corrections and Rehabilitation Grant 2020 ($71,038.25), California Cybersecurity Career Education Pipeline and Pathway Project (CCCEPP) Grant 2021 (~$700,000), PACE Innovation Grant 2020 ($62,493)

Research Publications: The center's faculty and students co-authored 12 significant papers and chapters on cybersecurity topics (e.g., biometrics and AI), achieving 145 citations and interdisciplinary partnerships.

The following summarizes the activities that contributed toward achieving Goal 3:

Cypress Cyberpatriot (fall 2022): the center, in collaboration with the Cypress College and OSS, organized and hosted a full-day, on-campus offensive security event, which included a capture-the-flag competition and hacking challenges. This event was specifically designed for Magnolia Middle School students participating in Cypress College's Cyberpatriot program.

Talks: Although the center has held many speaking engagements, these are the highlights: In Fall 2019, the center partnered with campus IT for a talk on personal cybersecurity. Subsequently, Drs. Gofman and Mitra discussed biometrics in 2020 during the Library Noontime Talks. In 2021, Dr. Gofman addressed senior citizens' digital security at OLLI. The following year, he spoke on women in cybersecurity at PCUBED event. In 2023, Dr. Gofman promoted CSUF's cybersecurity program at Irvine Valley College.

CCCEPP 2021: The Center has hosted a webinar featuring Dr. Keith Clement from CSU Fresno who is a leader of the California Cybersecurity Career Education Pipeline and Pathway Project (CCCEPP) who presented about the initiative to build a cybersecurity education pipeline from K12, to four-year institutions, to employment. The talk was attended by more than a hundred members of academia and industry.

Cybersecurity Interviews: Throughout the review period the center faculty have given interviews to and were featured in media including the OC Register, CGTN, KTLA, and TechCrunch, Due, and Nasdaq. The center also launched a Titans of Security article series featuring the CSUF cybersecurity alumni.

2. Organizational Structure and Governance

The center is steered by a director and three assistant directors, each tasked with guiding curriculum development, research, and outreach initiatives. Consultations between the director and assistant directors occur as necessary, typically three to four times each semester. An industry advisory board, composed of cybersecurity professionals, also provides input on an as-needed basis, particularly for

curriculum review and industry alignment. Board members are recommended by the director and are appointed by the ECS Dean, reflecting the center's strategic needs. From 2018 to 2024, the board has played a consultative role in shaping the cybersecurity concentration and minor and contributing to the CAE-CD accreditation efforts. Currently, the center is working toward expanding its advisory board with experts from Disney Inc, Southwest Airlines, and VMware.

Resources and Sustainability

Revenue: The operating budget and revenues during the 2018--2023 period was as follows:

- **Philanthropic support:** $20,000
- **Instructional Resource Grant (IRA):** $20,480
- **2019—2020 RSCA Grant:** $15,000
- **2018-2019 Junior/Senior Intramural Grant:** $5,000
- **Value of Equipment on Indefinite Loan from NUCC Inc.:** $5,000
- **Total:** **$65,480**

Faculty and Staff Times: The center director, allotted three units of release time per semester, dedicates 20-25 hours weekly to tasks like curriculum oversight, leading research, fundraising collaboration, and mentoring the OSS club. Assistant directors aid in these areas for 1-3 hours weekly without release time. A volunteer alum contributes 1-2 hours weekly to social network/website maintenance, while the Dean's office assists with event logistics and financial administration.

Space: The center's cybersecurity research lab is in room CS-302 of the Computer Science building, utilized for research, training, and OSS club competition prep.

Sustainability: The center maintains partnerships with entities like Disney Inc, enhancing funding for research, student employment, and operations. These collaborations bring financial aid and professional mentorship. The director collaborates with the development director to obtain continuous and in-kind donations, showcased at events to support OSS competitions and curriculum. The team pursues grants, utilizing campus programs such as Intramural and RSCA for external funding, and IRA grants for education. A developing alliance with The National Upcycled Computing Collective (NUCC) will supply computing hardware for immediate use and the upcoming ECS Innovation Hub's security cyber range.

Highlights and Accomplishments 2018--2024

The center has made milestone achievements in curriculum development, research, and outreach. Educationally, it launched a Cybersecurity Concentration within the Computer Science Major, now enrolling around 100 students, and launched a web security course. These measures help align the security curriculum with the CAE-CD standards. It also established a credit transfer program with more than 8 local community colleges to foster diversity and create a talent pipeline, that is also in line with CCCEPP goals. The center is also progressing towards CAE-CD accreditation with guidance from Dr. Dan Manson from CSU CPP and is developing a Cybersecurity Minor and an Online MS in Cybersecurity program.

In research, the center's faculty published 12 influential papers and book chapters in reputable conferences, journals and books, receiving 145 citations. These papers, many co-authored by students, include coverage of biometric security and AI applications in cybersecurity. Collaborations span across disciplines, involving Drs. Yu Bai and Yoonsuk Choi from computer engineering, Dr. Sinjini Mitra from the School of Business, Dr. Ajita Rattani from the University of North Texas, and a joint publication with the CSUF IT Department. The center has also secured funding from Intramural and RSCA grants and has

seen 26 students, including 6 female students, engage in research projects with industry partners like Black & Decker CAM division, Disney Inc, and DigiClips, with the Disney team winning 2nd place at the ECS Showcase in 2023.

Outreach has been robust, with the OSS club achieving significant competition wins: 2nd place nationally at CPTC in 2018, 1st regionally in 2023, 3rd regionally in 2021, and 2nd regionally in 2024. The center also placed 4th nationally at the CyberSeed 2024 challenge out of 96 teams and triumphed in the HackerOne competition in 2019. The center has hosted numerous talks and community engagements, educating a wide audience about cybersecurity, and in 2022, held an all-day offensive security event for middle school students from the Cypress Cyberpatriot program.

Planning and Strategic Outlook

The center director develops yearly strategic plans that are approved by the ECS Dean. The key plans for the 2024--2027 are outlined below.

Education

Focus efforts on NSA/DHS National Center of Academic Excellence in Cyber Defense Education. To achieve its strategic educational goals, the center is focused on obtaining CAE-CD accreditation to nationally recognize CSUF's cybersecurity program. Faculty, in collaboration with Dr. Manson and NUCC, are diligently aligning the curriculum with accreditation standards and securing support for necessary equipment. The center will also work to establish credit transfer agreements with more community colleges. The center is also channeling efforts into the ECS Innovation Hub to establish a cyber range and a student-run data center, offering hands-on experiences rare in universities nationwide. The goal is to submit the CAE-CD accreditation proposal within two years. To expedite this process, the center is actively seeking additional resources through internal and external grants, such as FEID, Intramural, and NSF EDU (to support efforts to prepare our security curriculum for the post-AI era), as well as philanthropic support. Concurrently, the center is developing an Online MS in Cybersecurity program to meet increasing demand, with plans to submit the proposal within a year, backed by the ECS Dean's office. The center will also work to make the newly developed cybersecurity minor more accessible to students outside of ECS.

Research

The center is committed to maintaining strong ties with industry partners to support and fund research and development initiatives. This includes ongoing student involvement in collaborative research with faculty, leading to co-authored publications and practical industry projects. These endeavors, engaging both graduate and undergraduate students, aim to generate an estimated annual revenue of $30K for the center. Directed by the center's leadership and faculty, these projects also contribute to the center's continuous output of conference papers, journal articles, and grant proposals. There will also be a focus on procuring additional support for faculty and student research projects.

Outreach

The center is committed to maintaining its engagement with the OSS by offering ongoing mentorship for competitive events. Furthermore, the center aims to persist in its public speaking initiatives, which serve to inform the community about cybersecurity and disseminate the center's specialized knowledge for communal advantage. Strategically, the center is looking to involve external industry experts to better equip students for competitions, thereby enabling the center's faculty to dedicate increased attention to the educational and investigative facets of their mission.