

COMPUTER SCIENCE DEPARTMENT

- **1,017** UNDERGRADUATE STUDENTS
- **165** MASTERS STUDENTS
- **40** DOCTORAL STUDENTS
- **30** FACULTY MEMBERS
- 2 NSF CAREER AWARD HOLDERS

PROGRAM HIGHLIGHT: CYBERPDX

CyberPDX is an annual professional development program hosted at Portland State University. Since 2016, over 70 middle and high school teachers have participated in the STREAM program, which offers interdisciplinary instruction in programming, cryptography, personal security, policy, literature, and arts.

Our unique curriculum equips participating teachers to identify connections between cybersecurity and the variety of subjects that they teach (e.g., Biology, Government, Language Arts, Social Studies). By meaningfully integrating cybersecurity in their biology or social studies classroom, these teachers have the chance to spark the interest of a diverse range of students who might never have opted in to a specialized computing elective.

CYBERSECURITY AT PORTLAND STATE

Portland State University offers a comprehensive set of cybersecurity courses as part of its undergraduate and graduate curriculum, including a Cybersecurity Graduate Certificate. As a result of generous support from the National Science Foundation, the vast majority of the security courses are built around Capture-the-Flag exercises and codelabs that allow students to develop valuable skills that are required in practice.

CURRENT AND RECENT SPONSORED RESEARCH PROJECTS

- Wu-chang Feng (PI), NSF SaTC: EDU: Curricula and CTF Exercises for Teaching Smart Fuzzing and Symbolic Execution, NSF 1821841, \$279,448 (2018-20).
- Wu-chang Feng (PI) and Charles Wright (co-PI), NSF SaTC EDU: A Capturethe-Flag Service for Computer Security Courses, NSF 1623400, \$299,795 (2016-20).
- Ellie Harmon (co-PI with Veronica Hotton, University Studies), National Security Agency, NSF: GenCyber Teacher Camp Grant, \$97,529 (2019-20).
- Karen L. Karavanic (PI), NSF TWC: Small: System Infrastructure for SMMbased Runtime Integrity Measurement, \$408,000 (2015-19).
- Fei Xie (PI), NSF CNS Core: Small: Collaborative Research: Scalable Penetration Test Generation for Automotive Systems, \$244,972 (2019-22).
- Fang Song (PI), NSF FET: CAREER: Algorithms, cryptography and complexity meet quantum reductions, \$559,775 (2020-25).
- Fang Song (PI), NSF AF: Medium: Collaborative Research: Quantum-Secure Cryptography and Fine-Grained Quantum Query Complexity, \$274,752 (2018-21).
- Andrew Tolmach (PI), Advanced New Hardware Optimized for Policy Enforcement, DARPA SSITH program, \$428,808 (2017-20).
- Charles V. Wright (PI), Jana: A Practical Client-Server System for Secure, Private, and Flexible Data Access, Galois, Inc / DARPA Brandeis Program, \$168,636 (2017-20).

CYBERSECURITY AT PORTLAND STATE UNIVERSITY



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OUR FACULTY

We have a number of faculty members who conduct research and teach courses related to cybersecurity.





FANG SONG

WU-CHANG FENG

FOUNDATIONS



Wu-chang Feng develops capture-the-flag (CTF) games and codelabs for teaching web application exploitation, cloud security, blockchain vulnerabilities, reverse engineering, fuzzing, and symbolic execution. Fang Song studies post-quantum cryptography (securing existing cryptosystems against quantum attacks) and quantum cryptography (enabling new capabilities by quantum information), quantum algorithms, computational complexity and theoretical computer science. Charles Wright focuses on system security and applied cryptography, including techniques for efficient encrypted databases and for maximizing privacy when law enforcement requires access to encrypted data.

EDUCATION



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ELLIE HARMON

SARAH MOCAS

Ellie Harmon organizes and teaches in the annual CyberPDX summer camp that aims to broaden participation in computing and cybersecurity. Sarah Mocas teaches cryptography as well as computer security and digital forensics courses.



ASSURANCE



MARK JONES

ANDREW TOLMACH

FEI XIE

Mark Jones investigates the role of programming languages and formal methods in the development, evaluation, and analysis of high-assurance, secure, low-level software systems. Andrew Tolmach applies programming language design principles and theorem proving to specify and verity high-assurance secure systems, including both correct-by-construction development and legacy code bases. Fei Xie works on software engineering and on the development of formal method based techniques and tools for building safe, secure, and reliable software and embedded systems.

SYSTEMS







KAREN KARAVANIC

Nirupama Bulusu applies state-of-the-art tools from cryptography, machine learning and trusted hardware to design security and privacy solutions for mobile systems, autonomous vehicles and the Internet of Things. Wu-chi Feng studies techniques for hardening machine learning approaches against adversarial attack; privacy in video-based sensor systems; and multimedia encryption technologies. Karen Karavanic focuses on firmware-based techniques for runtime intrusion detection of rootkits, and system-based persistent threats, in production server environments.

CYBERSECURITY COURSE OFFERINGS

The Department of Computer Science offers a broad range of courses in our undergraduate and graduate programs that are relevant to cybersecurity. Some core classes in this area include:

- Internet, Web, and Cloud Systems
- Cryptography

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- Introduction to Computer Security
- Malware Reverse Engineering
- **Digital Forensics**
- Internetworking Protocols

- Web and Cloud Security
- Network Security
- Top: Blockchain Development & Security
- Top: Topics in Software Validation
- Top: Theorem Proving and Program Verification

The Department also offers a Cybersecurity Graduate Certificate that requires a 6 credit core and an additional 15 credits in approved electives.