

ANNUAL REPORT 2019-2020



School of Cybersecurity
Old Dominion University

Annual Report

School of Cybersecurity



odu.edu/cyber

2019-2020
Editor: Hongyi “Michael” Wu

MISSION STATEMENT

The School of Cybersecurity strives for offering cutting-edge educational experiences to students and professionals in the field of cybersecurity, developing high-impact, cross-disciplinary research initiatives that center on cybersecurity, and being a source of cybersecurity expertise to the community, the Hampton Roads, the Commonwealth of Virginia, and the nation.

Table of Content

- 1. Introduction.....4
- 2. New School of Cybersecurity.....4
- 3. New Cyber Innovation Park.....7
- 4. Cybersecurity Academic Programs8
- 5. Interdisciplinary Cybersecurity Research.....13
- 6. Student Activities and Outreach19
 - 6.1 Cybersecurity Summer Camps19
 - 6.2 The Four Horsemen.....20
 - 6.3 Cybersecurity Student Association.....21
- 7. Goals for the Upcoming Year23
- Appendix. Cybersecurity Faculty and Staff.....24

1. Introduction

It has been a challenging yet exciting year for students, faculty and staff in ODU's cybersecurity program. The coronavirus crisis is forcing us to face major changes and some of the resulting changes could be permanent. Fortunately, the cybersecurity program is able to leverage its strong online capabilities developed over the years to respond swiftly to new challenges in the COVID-19 era. Amid the crisis, the program continues its robust growth.

- Working with Academic Affairs, ODU Online and Information Technology Services, all CYSE courses have been converted for online or hybrid teaching. The Fall'20 enrollment is 33% higher than a year ago, reaching a historical high of 812 students in the BS and MS in Cybersecurity programs.
- The cybersecurity research continues flourishing, with about \$6M externally funded projects and numerous high-quality publications. The faculty and graduate students have continued their research, development and experiments by using ODU's virtual cybersecurity research environment.
- Innovative ways have been created to conduct outreach, including online open house, K-12 workshops, and cybersecurity summer camps, to keep and further expand our connections with the community and engage talented students in cybersecurity to support the President's National Initiative for Cybersecurity Education (NICE).

In response to such growth, the School of Cybersecurity, the first-of-its-kind in the country, is opening on October 1, 2020, the first day of National Cybersecurity Awareness Month. At the same time, a Cyber Innovation Park is being developed, offering about 10,000 ft² space in Monarch Hall, as the future home of the School upon its completion by April, 2021.

2. New School of Cybersecurity

At ODU, the terms "department" and "school" can refer to equivalent administrative structures. Primarily, there are no distinctions between departments and schools in terms of administration or organization. Both schools and departments can be housed within colleges, and they are referred to as "academic units." The new School of Cybersecurity will administer two degree programs (BS in Cybersecurity and MS in Cybersecurity) and a minor in cybersecurity, support cybersecurity undergraduate and graduate students and faculty, develop high-impact, cross-disciplinary research initiatives that center on cybersecurity, and conduct outreach and community engagement, being a source of cybersecurity expertise to the community, the Hampton Roads, the Commonwealth of Virginia, and the nation.

"The School of Cybersecurity is a great example of how committed ODU is to providing educational solutions to address real challenges in our region and the world," President John R.

Broderick said in an ODU news article. “It embraces an interdisciplinary foundation to expand the pipeline for a diverse group of cybersecurity, resilience and engineering professionals who will be responsible for safeguarding our critical infrastructure.”

The new school builds on and expands from the existing Center for Cybersecurity Education and Research (CCSER). Established in March 2015, the Center has experienced tremendous growth over the past four years:

- The National Security Agency has designated ODU a National Center of Academic Excellence in Cyber Operations (CAE-CO). The CAE-CO program is an extremely exclusive group of only 21 universities in the nation, aiming to broaden the pool of skilled workers capable of supporting a cyber-secure nation.
- Two new degrees have been developed and approved by the State Council of Higher Education for Virginia (SCHEV). The MS in Cybersecurity was launched in Fall’18 and has grown to a program with over 120 students within two years; and a new undergraduate degree, i.e., BS in Cybersecurity, was officially launched in Fall’19 to replace the existing IDS major in cybersecurity.
- The enrollment of the BS and MS in Cybersecurity reached a historical high of over 800 students by Fall 2020 — a 70-folds increase since 2015. At the same time, about 150 students are enrolled in the Cybersecurity minor.
- Our cyber faculty has led various outreach activities, including summer cybersecurity camps, middle school and high school visits, and cybersecurity competitions, to attract young talent to study cybersecurity. Over 1,000 middle and high school students have visited ODU for summer camps, competitions or site visits.
- A diversity of research projects have been developed by and housed in CCSER with a total of over \$6 million active research funding from highly competitive programs at National Science Foundation (NSF), Office of Naval Research (ONR), National Security Agency (NSA), and National Institute of Standards and Technology (NIST). The cyber faculty are productive in publication and well recognized by the research community with such honors as best paper award and professional society fellow.

The rapidly growing cybersecurity program requires support beyond the capacity of a university center. A review conducted by the faculty and administrators determined that the current Center for Cybersecurity Education and Research (CCSER) should be renamed to School of Cybersecurity and administratively managed by the Vice Provost for Academic Affairs. “This is the right time and ODU is the right institution to have such a unique school,” said Vice Provost Brian Payne. “To fully realize the growth of tech talent in Virginia, it is imperative that we have a diverse pool of professionals able to help secure the technology. There are more than 54,000 cybersecurity jobs open in the state. We are preparing our students for these jobs.”

Message from the Director

On behalf of our faculty, staff, and students, I would like to welcome you to the School of Cybersecurity at the Old Dominion University.

Cyberattacks have become more common, sophisticated, and harmful in recent years. No organization or individual with an online presence is immune to cyberattacks, and the impact of such attacks can be devastating. The U.S. Bureau of Labor Statistics (BLS) predicts that employment in information security analysts will grow by 31% between 2019 and 2029. That's nearly three times as fast as the average computer and information technology occupations, and eight times as fast as American industry jobs in general.



The School of Cybersecurity is housed under the Office of Academic Affairs, aiming to weave together disparate threads of programmatic and facility resources at the University to create a strong education and research program focusing on cybersecurity. The main missions of the School, scholarship, discovery, education and community services, occur in an interdisciplinary setting characterized by cultural and ethnic diversity. Propelled by the belief that no single discipline can address cybersecurity on their own, the School leads an cross-disciplinary effort bringing together faculty, staff, degree programs, certificates, and research initiatives from four colleges, eight academic departments, ODU's Office of Research, Information Technology Services, Distance Learning, and School of Continuing Education.

The School of Cybersecurity strives for offering cutting-edge educational experiences to students and professionals in the field of cybersecurity, developing high-impact, cross-disciplinary research initiatives that center on cybersecurity, and being a source of cybersecurity expertise to the community, the Hampton Roads, the Commonwealth of Virginia, and the nation.

Since its inception, the ODU's cybersecurity program has experienced exciting growth. The National Security Agency has designated ODU a National Center of Academic Excellence in Cyber Operations (CAE-CO). The CAE-CO program is an extremely exclusive group of only 21 universities in the nation, aiming to support the President's National Initiative for Cybersecurity Education (NICE). Two new degrees (BS and MS in Cybersecurity) have been developed and approved by the State Council of Higher Education for Virginia (SCHEV). The enrollment has grown from its initial cohort of 11 students to over 800 students currently in cybersecurity majors. At the same time, about 150 students choose cybersecurity as their minor. A diversity of research projects have been developed by and housed in the School of Cybersecurity with a total of over \$6 million active research funding. The projects are funded by highly competitive grants from National Science Foundation (NSF), Office of Naval Research (ONR), National Security Agency (NSA), National Institute of Standards and Technology (NIST), the State of Virginia and private sectors. The School faculty are productive in publication and scholarly activities. They are well recognized in their research communities with such honors as best paper awards and society fellows.

The School of Cybersecurity also takes great pride in providing unparalleled, comprehensive and innovative outreach and community services. The school's faculty has led various outreach activities, including summer cybersecurity camps, middle school and high school visits, and cybersecurity competitions, to attract young talent to study cybersecurity. Over 1,000 middle and high school students have visited ODU for summer camps, competitions or campus tours.

We invite you to learn more about our outstanding programs in the School of Cybersecurity. Please visit our school website and campus and join the ODU CYBER community!

Best regards,
Hongyi Wu, Batten Chair Professor & IEEE Fellow
Director, School of Cybersecurity, Old Dominion University

3. New Cyber Innovation Park

Hands-on experience is critical to cybersecurity education and workforce development. Teaming with the Office of Information Technology Services (ITS), we have developed a unique Cybersecurity Research Environment (CRE) — an infrastructure that provides the flexibility, performance and resiliency needed for effective cybersecurity education and research while preserving the security model for enterprise network and services. It is deployed outside the enterprise perimeter boundary, but at the same time allows secure use of existing network switching infrastructure to carry cybersecurity research traffic in a way that ensures the integrity and confidentiality of enterprise data and services. Students can access CRE from the cybersecurity laboratories at the Visual Art Building.



The current lab space is heavily utilized for teaching and research. There is pressing need for expanding the space to keep up with the rapid growth of cybersecurity degree programs and research initiatives. To this end, the ODU Cyber Innovation

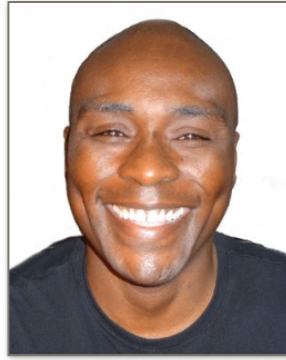
Park is being developed, offering about 10,000 ft² space in Monarch Hall, as the future home of the School of Cybersecurity. Coastal Virginia Center for Cyber Innovation (CoVA CCI) will also be housed in the Cyber Innovation Park. CoVA CCI (discussed in detail below) is a regional unit of the Commonwealth Cyber Initiative (CCI). Funding for the Cyber Innovation Park was provided by the university and CCI. The expanded space will become a hub where cybersecurity faculty, researchers, students, and industrial practitioners from various disciplines to work together, interact, and brainstorm new ideas. It will house multiple specialized cybersecurity labs and a state-of-the-art server room to support undergraduate and graduate teaching, as well as cutting-edge research, innovation and commercialization efforts. It will include the cybersecurity commons, collaboration space, meeting rooms and office space to support seminars, competitions, research collaboration, advising, student association activities, open house for prospective students and their families, K-12 school visits, cybersecurity summer camps, and



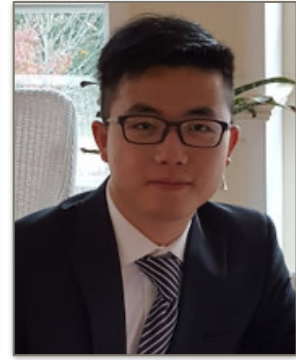
Lenora Thorbjornsen
Coordinator
First Year Student Success



Saltuk Karahan
Program Coordinator
BS Cybersecurity



Roderick Graham
Program Coordinator
BS Cybercrime



Peng Jiang
Program Coordinator
BS Cyber Operations

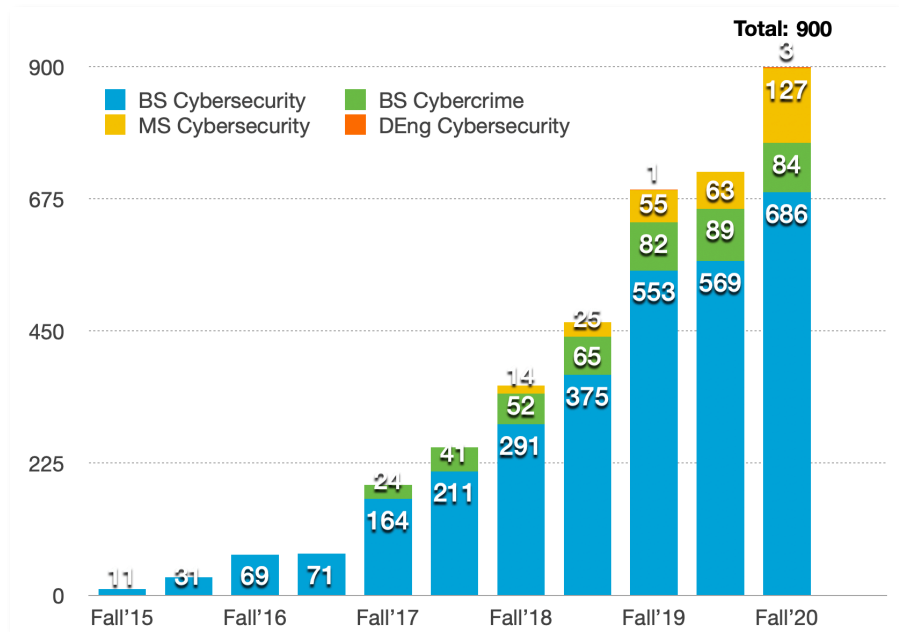
various cybersecurity events, workshops and conferences. Led by the Chief Information Security Officer, Doug Streit, the COVA SHARE collaborative computing research/instructional lab is being established to support cyber faculty and students. The development of the Cyber Innovation Park will be completed by April, 2021. It will be a critical piece of the puzzle to realize a leading cybersecurity program in the Commonwealth of Virginia and the nation.

4. Cybersecurity Academic Programs

Amid the coronavirus crisis, our academic programs have continued robust growth. ODU currently offers several cybersecurity degrees at both undergraduate and graduate levels. The *BS in Cybersecurity* degree offers two majors: cybersecurity and cyber operations. The former provides students with a strong understanding of cyber systems, threats, and defense technologies, necessary to protect critical cyber infrastructure and assets. The latter is a complementary discipline to the cybersecurity major, and places a particular emphasis on skills and competencies in cyber system attack, infiltration, exploitation, mitigation, and recovery. Besides the BS in Cybersecurity degree, ODU also offers a cyber crime major under the BS in Interdisciplinary Studies. This major is oriented towards students who are interested in integrating social science methods and theories to cybercrime.

The *MS in Cybersecurity* is a 30-credit hour graduate program, offering an opportunity for working professionals and new college graduates to pursue advanced degree in cybersecurity. It is designed to prepare cybersecurity technology leaders. Graduates will develop skills and competencies in technical aspects of cybersecurity and will be prepared to assume responsibility for the management of cybersecurity projects and coordination of cyber operation teams. It also provides preparation for students desiring to pursue doctoral studies or teach cybersecurity courses in colleges and universities. ODU also offers a *Doctor of Engineering in Cybersecurity*. The program requires a minimum of 48 hours of graduate work beyond the master's degree. It provides the

Commonwealth and the nation with exceptionally educated engineering practitioners. These individuals will have developed the highest possible capability to provide innovative solutions in cybersecurity engineering endeavors. The graduates of the program will meet the highest standards for advanced level engineering and



leadership positions in industry and government. The cybersecurity enrollment has continued its strong growth. As illustrated in the figure, the BS in Cybersecurity enrollment reached a historical high of 686 students by Fall 2020 and the enrollment of the MS in Cybersecurity is doubled compared with a year ago. At the same time, over 150 students are enrolled in the cybersecurity minor.

ODU was designated by the National Security Agency (NSA) as a National Center of Academic Excellence in Cyber Operations (CAE-CO) in May 2019. It not only brings national recognition to our cyber program but also creates new opportunity to support our faculty and students. The CAE-CO program is a deeply technical, inter-disciplinary, with extensive opportunities for hands-on applications via labs and exercises. It provides a particular emphasis on technologies and techniques related to specialized cyber

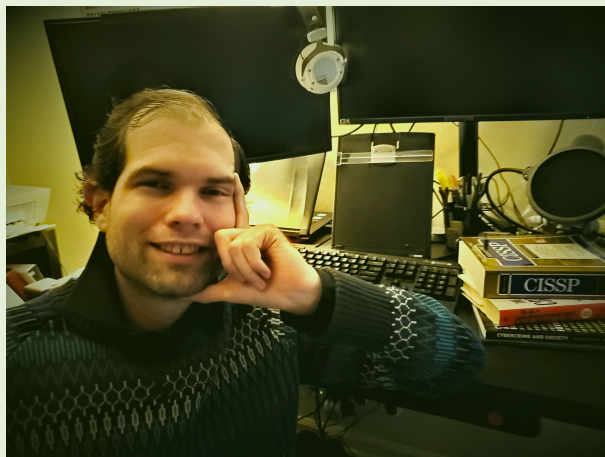


operations (e.g., collection, exploitation, and response), to enhance the national security posture of our Nation. These technologies and techniques are critical to intelligence, military and law enforcement organizations authorized to perform these specialized operations. Through CAE-CO, ODU student Jordan Quinn who is completing MS in Cybersecurity and being admitted to D. Eng in Cybersecurity, has recently received the Department of Defense (DoD) Cybersecurity Scholarship (CySP) . His CySP faculty mentor is Dr. Chunsheng Xin.

Jordan Quinn — Recipient of DoD Cybersecurity Scholarship (CySP)

My name is Jordan and I, like many other Old Dominion University students, enjoy interacting with like-minded fellow learners, who also enjoy skiing, chess, traveling, classical music, attending operas, as well as reading celebrated books.

I grew up in a strong Irish American family where I was given all the tools that I would need to live a respectable and decent life. Some of those tools instilled was having good work ethics (as displayed every day at my home), trustworthiness, as well as having a strong moral compass. As far back as I can remember, I have always had a strong interest in computers, yet restless as to what I wanted to study in this area. So, I moved on and graduated with a degree; still I knew that I hungered for more. It was not until after, yet another graduation did, I discover that ODU was now offering degrees in Cybersecurity not just C.S. degrees. I jumped headfirst into yet another degree and began a new life in the actual field I knew I wanted. Without ever looking back, I knew I had found my calling. Needless to say, I graduated with a degree in Cybersecurity, then continued onto the Master's program where I was fortunate to apply for the Department of Defense (DoD) Cybersecurity Scholarship program (CySP).



During my time with ODU, I've been lucky enough to work with many exceptional professor's, such as Dr. H. Wu and Dr. S. Karahan who both demonstrated outstanding guidance and really understood the direction I wanted to take, thus guiding me down the path that would eventually lead me to the destination I could only have dreamt of years prior. I was fortunate to have a choice of different universities to select from and was smart enough to have chosen ODU for the major I needed, which was Cybersecurity. I can say that ODU became a life changing experience for me due to the exceptional curriculums, outstanding professor's and advisors, who came to recognize, understand and appreciate exactly what I needed , and where I wanted to land come graduation. Without exception, the professors, advisors, and the many others I encountered during my academic journey were outstanding and beyond reproach when it came to my desires and aspirations. These professionals provided their opinions and viewpoints which were welcomed. One of these exceptional advisors was Ms. Lenora Thorbjornsen, who exhibited kindness, consideration, as well as professionalism. No matter my request or concerns, she was always there to assist me when I seem to run into a brick wall.

I am honored beyond words, to have been awarded this prestigious scholarship. This grant will allow me to focus more on my studies without the constant worry of full-time employment. One of my "long time" dreams has always been to work for one of our top government agencies, and now, it is no longer a dream; but instead, I now have my chance to live that dream and to make Old Dominion University proud!

With funding of total \$1 million from the NSF S-STEM program, the “Improving the Success of Low-Income Students in a Cybersecurity Program” project is led by Chunsheng Xin, Hongyi Wu, Brian Payne from the Center for Cybersecurity Education and Research, and Shana Pribesh from College of Education. The project supports high-achieving, low-income students with demonstrated financial need. It targets students in the Cybersecurity program at Old Dominion University, and funds 18 scholarship students for 4 years, starting from freshmen to senior. In addition to the highly needed financial aid, this program provides academic supports to help scholarship students to succeed in the college education and become qualified cybersecurity professionals to meet the nation’s demand for cybersecurity workforce.



Meet the Monarch Cyber Scholars!



“The cybersecurity scholarship is helping me by allowing me to reach my goal in life which is to live in a world where we do not fear cyber threats. A world where new technology creates harmony instead of dissonance.”

Jaydon Johnson



“The scholarship program provides me with the resources and the community to grow within the field of Cybersecurity.”

Kayla Curtis



“I would have been heavily in debt and probably wouldn’t be able to attend college if it wasn’t for the Cyber Scholarship”

Keniel Hay



“The cybersecurity scholar program and scholarship has given me so much more than financial peace of mind; it has brought me closer with my peers, exposed me to more than the university offers, and is motivating me to graduate with my bachelor's degree a year early. I could not be more thankful for this award and opportunity!”

Brooke White



“At first, when I started this program I knew that I wanted to study cyber security but I still wasn’t sure where I should focus on, thanks to this program I was able to discover what I really love about cyber, and thanks to the wide variety of classes offered in this program I can better by skills and be ready for a good career after graduation.”

Kevin Rossi



"As a Monarch Cyber Scholar today, I am making invaluable connections with other learners to lead in securing technology tomorrow."

Terrance Wilson



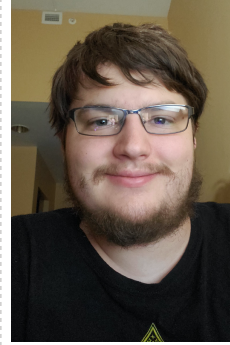
"The ODU Cyber Scholarship helps me significantly by providing me with the means to afford an education. It has enabled me to continue the path of technology learning that I started in high school and I am glad to feel like I have found a home with ODU and its cyber department."

Olivia Hoernlein



"The NSF S-STEM Scholarship not only financially supported my journey of higher education, but also provided me with multiple opportunities to grow as a student, employee, and future cybersecurity professional."

Ruhi Patel



"I love being apart of the cybersecurity scholarship program! It's allowed me to branch out into new areas and be with similar minded individuals. I even gave a presentation to the cybersecurity club!"

Riley Pfister



"ODU Cyber Scholarship has helped me to focus more on my studies and give me the opportunity to maximize my college experience through volunteer opportunities and internships".

Zobair Wali



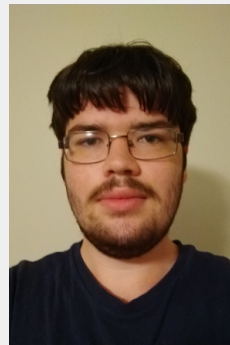
"This scholarship bridged the gap between my financial need and my financial capacity. It also introduced me to some wonderful individuals who have helped me further my potential more than I thought possible."

Robert Gourley



"With the scholarship program, it provides me the opportunity to attend ODU. It also gave me great friends in a lot of my classes."

Bianca Simmons



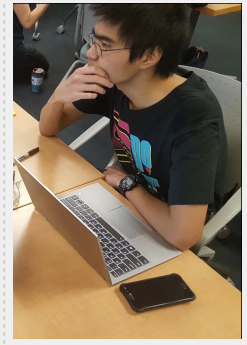
"The program has allowed me to go to the school I really wanted to, ODU. Without it I don't think I would have made it here and the scholarship program also comes with some amazing support not just financially."

Damion Withrow



"It has allowed me to connect with other students a part of the field in ways that have contributed to both my technical and professional skills. It has exposed me to various opportunities that I would have lacked without the program such as becoming an officer of the Cybersecurity Student Association"

Cayla Young



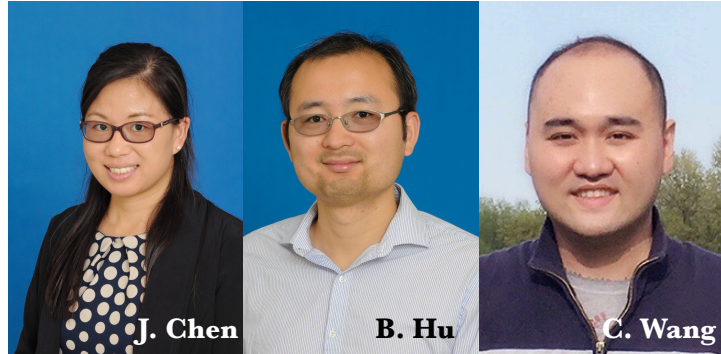
"The scholarship program has allowed me to meet and network with wonderful people! I have also been very involved in cyber activities which eventually led me to become the president for our cyber club, the CS2A."

Melvin Orienza

5. Interdisciplinary Cybersecurity Research

The School of Cybersecurity houses over three dozens of affiliated faculty and staff, with a wide range of expertise in computer science, electrical and computer engineering, information technology, modeling and simulation, criminal justice, psychology, and philosophy. The interdisciplinary team enables a holistic approach to cybersecurity problems, supporting the mission of developing high-impact, cross-disciplinary research initiatives that center on cybersecurity and being a source of cyber expertise to the University, the Hampton Roads region, and the Commonwealth of Virginia.

A diversity of research projects have been developed by the cybersecurity faculty. From 2016 to 2020, the federal research funding has increased from \$0 to over \$6 million. Most active projects



are funded by highly competitive grants from National Science Foundation (NSF) as well as Office of Naval Research (ONR), National Security Agency (NSA), National Institute of Standards and Technology (NIST), and state and private sectors. Many of the funded projects are interdisciplinary. For example, Dr. Jing Chen from Psychology, Dr. Bin Hu from Engineering Technology, and Dr. Cong Wang from Computer Science have been awarded a three-year, \$500,000 grant by the National Science Foundation (IIS-Core programs). This multi-disciplinary team is composed of three junior faculty affiliated with the School for Cybersecurity, aiming to address safety-critical challenges due to weaknesses of the AI system and human driver in autonomous driving systems. By keeping the human driver in the loop, the research will develop an AI-human collaboration mechanism that leverages strengths of both the AI system and the human to maintain safety and security of the autonomous driving systems.

ODU's cybersecurity faculty is playing a critical role in the Commonwealth Cyber Initiative (CCI). The CCI initiative "is a \$25-million effort funded in the 2018-20 Virginia budget. It calls on higher education institutions and industry to build an ecosystem of cyber-related research, education, and engagement. The goal is to position Virginia as a world leader where cybersecurity meets data analytics, machine learning, and autonomous systems." Led by ODU, the Coastal Virginia Center for Cyber Innovation (COVA) has been certified as a node of CCI. It includes academic partners ECPI University, Christopher Newport University, Norfolk State University, Paul D.



Camp Community College, Regent University, Thomas Nelson Community College, Tidewater Community College, and William and Mary, as well as regional industrial partners and consortia. Vice Provost Brian Payne serves as the node director. A key focus of COVA CCI is to facilitate academia and industry collaboration. Dr. Jeremiah Still, an assistant professor in the Department

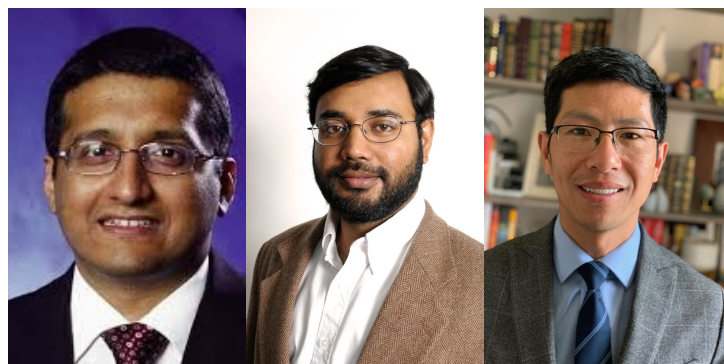


of Psychology, has received funding from COVA CCI to address the problem of poor cyber hygiene, especially in the military - where breaches in cybersecurity could compromise missions. Partnering with MI Technical Solutions (MITS), a leader in cybersecurity technology, the \$170,000 grant “aims to increase users' awareness of their cyber risk to harden our systems against attacks by encouraging protective cyber behaviors, facilitating reporting of suspicious activity improving overall policy compliance,” Still said. “We believe that by identifying risky cyber behavior and educating users on various aspects of cybersecurity in a human-centered process, MITS and

ODU will enhance the mid- and long-term, big-picture security program maturity for the DoD,” said Rachel Jarvis, project manager at MITS.

Howard University and ODU have been awarded a DoD HBCU/MSI Research and Education Program (REP) Center of Excellence Award, to establish a Center of Excellence in Artificial Intelligence and Machine Learning. The center will address research and engineering challenges to build safe, robust, and trustworthy AI to support DoD's modernization priorities. The specific use cases that the Center would focus on are AI for battlefield internet of things, electronic warfare, counterterrorism, cybersecurity and machine vision. The center will receive a total \$7.5 million funding. ODU, led by Dr. Sachin Shetty, Khan Iftekharuddin, and Hongyi Wu will receive a subcontract of \$1.75 million to support their research.

ODU's cybersecurity faculty have been productive in publication and well recognized by the research community. Dr. Cong Wang has been selected to receive the Cheng Fund for Innovative Research, including funds of \$11,000 to support his research. This is the third



S. Shetty

K. Iftekharuddin

H. Wu

year since Dr. Wang joined ODU. He has secured multiple competitive NSF grants and published in the most prestigious conferences and journals in this field. Dr. Hongyi Wu has been elected to the rank of IEEE Fellow. The citation of this honor is “for Contributions to Resilient



Mobile Computing Systems”. Institute of Electrical and Electronics Engineers (IEEE) is the world’s largest technical professional organization dedicated to advancing technology for the benefit of humanity. IEEE Fellow is a distinction reserved for selected IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation. It is recognized by the technical community as a prestigious honor and an important career milestone.

The following is a list of cybersecurity publications produced by cybersecurity faculty and students during 2019-2020:

- Chen, J. (2020; invited paper). Risk communication in cyberspace: A brief review of the information-processing and mental models approaches. *Current Opinion in Psychology*, 36, 135-140.
- Parker*, C. & Chen, J. (2020). The Effects of Security Framing, Time Pressure, and Brand Familiarity on Risky Mobile Application Downloads. To appear in *Proceedings of the Human Factors and Ergonomics Society 64rd International Annual Meeting*. Washington DC: HFES.
- Mishler*, S., Jeffcoat*, C., & Chen, J. (2019). Effects of Anthropomorphic Phishing Detection Aids, Transparency Information, and Feedback on User Trust, Performance, and Aid Retention. In *Proceedings of the Human Factors and Ergonomics Society 63rd International Annual Meeting*. Washington DC: HFES.
- McManus*, W. & Chen, J. (2019). The Effects of Vehicle Automation Level and Warning Type on Responses to Vehicle Hacking. In *Proceedings of the Human Factors and Ergonomics Society 63rd International Annual Meeting*. Washington DC: HFES.
- Cain, A. A. & Still, J. D. (2019). Graphical authentication passcode memorability: Context, length, and number. *Proceedings of the International Conference of Human Factors and Ergonomics Society*, 63, 447-451.
- Still, J. D. & Cain, A. A. (2019). Over-the-Shoulder attack resistant graphical authentication schemes impact on working memory. *Proceedings of the 5th International Conference on Human Factors in Cybersecurity*, 79-86.
- Tiller, L., Angelini, C., Leibner, S., & Still, J. D. (2019). Explore-a-Nation: Combining graphical and alphanumeric authentication. *Proceedings of the 1st International Conference on HCI for Cybersecurity, Privacy, and Trust*, 81-95.



- Tiller, L., Angelini, C., Leibner, S., & Still, J. D. (Aug., 2019). Explore-a-Nation (EaN): Combining graphical and alphanumeric authentication. United States Patent and Trademark Office, Nonprovisional Application number: US 16/550,450.
- Cong Wang, Yuanyuan Yang and Pengzhan Zhou, Towards Efficient Scheduling of Federated Mobile Devices under Computational and Statistical Heterogeneity, Accepted to Appear in the IEEE Transactions on Parallel and Distributed Systems.
- Jiadi Liu, Songtao Guo, Yawei Shi, Liang Feng, Cong Wang, Decentralized Caching Framework Towards Edge Network Based on Blockchain, IEEE Internet of Things Journal, Accepted to appear. (Impact Factor: 9.5).
- Yanru Xiao, Cong Wang and Xing Gao, Evade Deep Image Retrieval by Stashing Private Images in the Hash Space, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Seattle, WA, 2020. (Acceptance Rate: 22%)
- Cong Wang, Xin Wei, Pengzhan Zhou, Optimize Scheduling of Federated Learning on Battery-powered Mobile Devices, IEEE International Parallel & Distributed Processing Symposium (IPDPS), New Orleans, LA, 2020.
- Charles Kamhoua, Alexander Kott, Laurent Njilla, Sachin Shetty, "Modeling and Design of Secure Internet of Things", John Wiley & Sons, 1 edition, 2020, ISBN 978-1-119-59336-2
- Sarada Prasad, Sachin Shetty, Ravi Mukkamalla, Laurent Njilla, "Measuring Decentrality in Blockchain based Systems", IEEE Access 2020.
- Muhammad Saad, Jeffrey Spaulding, Laurent Njilla, Charles Kamhoua, Sachin Shetty, DaeHun Nyang, and David Mohaisen, "Exploring the Attack Surface of Blockchain: A Comprehensive Survey", IEEE Communications Surveys & Tutorials, 2020 (Impact Factor – 23.7)
- Kjartan Pálsson, Steinn Guðmundsson, Sachin Shetty, "Analysis of the impact of cyber events for cyber insurance," in The Geneva Papers on Risk and Insurance - Issues and Practice, 2020 (Impact Factor – 0.867)
- M. Wazid, A.K. Das, Sachin Shetty, M. Jo, "A Tutorial and Future Research for Building a Blockchain-Based Secure Communication Scheme for Internet of Intelligent Things," in IEEE Access, Vol. 8, pp. 1-17, 2020 (Impact Factor – 3.745)
- Deepak Tosh, Sachin Shetty, Xueping Liang, Charles Kamhoua, Laurent Njilla, "Data Provenance in the Cloud: A Blockchain-Based Approach," in IEEE Consumer Electronics Magazine, vol. 8, no. 4, pp. 38-44, July 2019. (Impact Factor – 3.373)
- Mohammad Wazid, P. Bagga, Ashok Kumar Das, Sachin Shetty, Joel J. P. C. Rodrigues, and Yongho Park. "AKM-IoV: Authenticated Key Management Protocol in Fog Computing-Based Internet of Vehicles Deployment," in IEEE Internet of Things Journal, 2019 (Impact Factor 9.515)

- Sharif Ullah, Sachin Shetty, Amin Hassanzadeh, Anup Nayak and Kamrul Hasan, "On the Effectiveness of Intrusion Response Systems against Persistent Threats", IEEE ICNC, Hawaii, 2020
- Ariful Haque, Sachin Shetty, Bheshaj Krishnappa, "Modeling Cyber Resilience for Energy Delivery Systems Using Critical System Functionality," Resilience Week, 2019
- Kamrul Hasan, Sachin Shetty; Sharif Ullah, Amin Hassanzadeh, Ethan Hadar, "Towards Optimal Cyber Defense Remediation in Energy Delivery Systems", IEEE Globecom, Hawaii, 2019
- M. Gamarra, Sachin Shetty, Oscar Gonzalez, David Nicol, Laurent Njilla, "Modeling Stepping Stone Attacks with Constraints in Cyber Infrastructure", IEEE Globecom, 2019
- Sarada Prasad Gochhayat; Eranga Herath; Sachin Shetty; Peter Foytik "Yugala: Blockchain based Encrypted Cloud Storage for IoT Data", IEEE Blockchain, 2019
- Md Ali Reza Al Amin, Sachin Shetty, Laurent Njilla, Deepak Tosh and Charles Kamhoua "Online Cyber Deception System using Partially Observable Monte-Carlo Planning Framework", Securecomm, Orlando, 2019
- Sharif Ullah, Sachin Shetty, Anup Nayak, Amin Hassanzadeh and Kamrul Hasan "Cyber Threat Analysis based on Characterizing Adversarial Behavior for Energy Deliver System", Securecomm , Orlando, 2019
- Rui Ning, Cong Wang, Chunsheng Xin, Jiang Li, Liuwan Zhu, Hongyi Wu: CapJack: Capture In-Browser Crypto-jacking by Deep Capsule Network through Behavioral Analysis. INFOCOM 2019: 1873-1881
- Wirawan Purwanto, Hongyi Wu, Masha Sosonkina, Karina Arcaute: DeapSECURE: Empowering Students for Data- and Compute-Intensive Research in Cybersecurity through Training. PEARC 2019: 81
- R. Ning, C. Wang, C. Xin, J. Li, H. Wu: DeepMag+: Sniffing mobile apps in magnetic field through deep learning. Pervasive Mob. Comput. 61: 101106 (2020)
- X. Kong, J. Cao, H. Wu, C.-H. Robert Hsu: Mobile Crowdsourcing and Pervasive Computing for Smart Cities. Pervasive Mob. Comput. 61: 101114 (2020)
- L. Bedogni, S. S. Kanhere, H. Wu, L. Bononi: Special issue on "Crowd-sensed Big Data for Internet of Things Services". Pervasive Mob. Comput. 65: 101110 (2020)
- P. Paul, H. Wu, C. Xin, M. Song: Beamforming Oriented Topology Control for mmWave Networks. IEEE Trans. Mob. Comput. 19(7): 1519-1531 (2020)
- Guangjie Han, Jiaxin Du, Chuan Lin, Hongyi Wu, Mohsen Guizani: An Energy-Balanced Trust Cloud Migration Scheme for Underwater Acoustic Sensor Networks. IEEE Trans. Wirel. Commun. 19(3): 1636-1649 (2020)
- Tang Liu, Baijun Wu, Wenzheng Xu, Xianbo Cao, Jian Peng, Hongyi Wu: Learning an Effective Charging Scheme for Mobile Devices. IPDPS 2020: 202-211

- Y. Wen and W. Yu, "Combining thermal maps with Inception neural networks for hardware Trojan detection," *IEEE Embedded Systems Letters*, accepted in June 2020.
- W. Yu, "Optimization of Combined Power and Modeling Attacks on VR PUFs with Lagrange Multipliers," *IEEE Transactions on Circuits and Systems II: Express Briefs*, accepted in March 2020.
- Y. Wen and W. Yu, "Boosting the efficacy of power attacks on cryptographic circuits with autoencoder," *IET Electronics Letters*, vol. 55, no. 23, pp. 1221-1224, November 2019.
- W. Yu, Y. Wen, and X. Huang, "ResNet-based Trojan detection methodology for protected ICs," *IET Electronics Letters*, vol. 55, no. 21, pp. 1116-1118, October 2019.
- W. Yu and Y. Wen, "Efficient hybrid side-channel/machine learning attack on XOR PUFs," *IET Electronics Letters*, vol. 55, no. 20, pp. 1080-1082, October 2019.
- Y. Wen and W. Yu, "Machine learning-resistant pseudo-random number generator," *IET Electronics Letters*, vol. 55, no. 9, pp. 515-517, May 2019. (feature article)
- W. Yu, "Hardware Trojan attacks on voltage scaling-based side-channel attack countermeasure," *IET Circuits, Devices & Systems*, vol. 13, no. 3, pp. 321-326, 2019.
- W. Yu, "Convolutional neural network attack on cryptographic circuits," *IET Electronics Letters*, vol. 55, no. 5, pp. 246-248, March 2019.
- Z. Liang, S. Huang, X. Huang, R. Cao, and W. Yu, "Post-Click Behaviors Enhanced Recommendation System," in *Proc. The 2020 Workshop on Data Analytics and User Behavior (DARB)*, accepted in June 2020.
- Y. Wen, S. F. Ahamed, and W. Yu, "A Novel PUF Architecture Against Non-Invasive Attacks," in *Proc. IEEE/ACM System Level Interconnect Prediction (SLIP) Workshop*, June 2019, pp. 1-5.
- Y. Wen and W. Yu, "Convolutional Neural Networks (CNNs)-Assisted Voltage Regulation: A New Power Delivery Scheme," in *Proc. IEEE North Atlantic Test Workshop (NATW)*, May 2019, pp. 206-211.
- W. Yu and Y. Wen, "Malicious Attacks on Physical Unclonable Function Sensors of Internet of Things," in *Proc. IEEE North Atlantic Test Workshop*, 2019, pp. 206-211.
- Poyraz, O.I., Canan, M., McShane, M.I., Pinto, C.A., (2020). Cotter, S., Cyber assets at risk: monetary impact of U.S. personally identifiable information mega data breaches. *Geneva Pap Risk Insur Issues Pract.* <https://doi.org/10.1057/s41288-020-00185-4>
- Roman, A., Pinto, C.A., (2020) "Systemic Analysis of the use of Artificial Intelligence (AI) In Regulating Terrorist Content on Social Media Ecosystem Using Functional Dependency Network Analysis (FDNA)," *OUR Journal: ODU Undergraduate Research Journal: Vol. 7 , Article 7.*
- Zahedi, Z., Mahmud, M. Pinto, C.A., (2020). Systemic Risk Management Plan for Electronic Medical Records (EMR): Why and How?, *Studies in Health Technology and Informatics*, 1 - 19.

- Pinto, C.A., Zurasky, M., (2020) "Systemic Methodology for Cyber Offense and Defense." 15th International Conference on Cyber Warfare and Security, 2020.
- Poyraz, O., Bouazzaoui, S., Keskin, O., McShane, M., Pinto, C.A., "Cyber-assets at Risk (CAR): The Cost of Personally Identifiable Information Data Breaches", 15th International Conference on Cyber Warfare and Security, 2020.
- Tatar, U., Keskin, O., Bahsi, H., Pinto, C.A., Quantification of Cyber Risk for Actuaries An Economic-Functional Approach (Technical report), for Casualty Actuarial Society, Canadian Institute of Actuaries, and Society of Actuaries, Schaumburg, Illinois, USA.
- Yu, L., Li, H., He, W., Wang, F. K., & Jiao, S. (2020). A meta-analysis to explore privacy cognition and information disclosure of internet users. *International Journal of Information Management*, 51, 102015.
- He, W., Ash, I., Anwar, M., Li, L., Yuan, X., Xu, L., & Tian, X. (2019). Improving employees' intellectual capacity for cybersecurity through evidence-based malware training. *Journal of Intellectual Capital*, Vol. 21 No. 2, pp. 203-213.
- Rita Meraz and Linda Vahala, "Application of Quantum Cryptography to Cybersecurity and Critical Infrastructures in Space Communications," *OUR Journal: ODU Undergraduate Research Journal*, 2020.
- Linda Vahala, George Vahala, and Min Soe, "Critical Space Infrastructures and Quantum Computing," Ebook: *Space Infrastructures: From Risk to Resilience Governance*, 2020.

6. Student Activities and Outreach

ODU's cybersecurity program supports various student activities, ranging from K-12 cybersecurity summer camps to cybersecurity learning communities, student association and competition events, as well as research camps and workshops for undergraduate and graduate students. The coronavirus pandemic has posted challenges, but at the same time also increased the need for outreach and community engagement. During the COVID-19 era, our faculty have developed creative ways to continue their tradition to support student activities and outreach events.

6.1 Cybersecurity Summer Camps

ODU has hosted NSA GenCeyber summer camps since 2016. However this is the first year to run the camp online. The biggest challenges are to engage students in learning, make the materials more accessible to students, and connect campers in an



Mr. Costanzo (left) and Dr. Karahan (right) at the NICE conference promoting ODU's cybersecurity programs.

inclusive community. Led by Dr. Danella Zhao, Chunsheng Xin, Tammi Dice and Hongyi Wu, along with a group of ODU student assistants, the virtual summer camp was a big success.

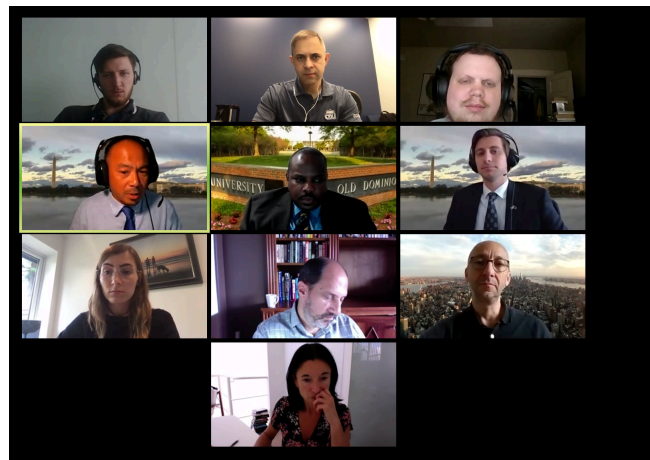
A total of over 40 high school students participated in two camp sessions, each spanning one week. Lectures were completed in a large group format and labs and games were completed in small groups facilitated through Zoom breakout room. To help students access the virtual-machine based hands-on labs, how-to videos and lab manuals were provided throughout the camp where campers could follow step-by-step instructions to accomplish tasks. To engage students during the virtual camp, many breakout activities were designed with a diverse collection of online quizzes, games and small groups discussions. Instructors and counselors were recruited



to interact with campers during online breakout sessions. Students are required to turn on their videos. The video requirement was an important tool to provide staff with the ability to engage with participants in a face-to-face setting. Participant engagement was also monitored through polling, discussion, submitted assignments and screen sharing. The successful camp was recognized by the NSA site visitors. The team was invited to the NSA GenCyber conference in Sept. 2020 to share their experience.

6.2 The Four Horsemen

In earlier this year, ODU formed a team, the Four Horsemen, for an international competition, called the Cyber 9/12 Strategy Challenge in Geneva, Switzerland. This event attracted participants from across the world. The ODU Four Horsemen team members include Warren Marcelino (MS Cybersecurity), Vincent Mitchel (MS Cybersecurity), Alex Korb (GPIS), and Nicolai Cockerill (MS Cybersecurity). The team was mentored by Dr. Saltuk Karahan. The competition consists of three rounds with a duration of 1 month, 20 hours, and finally less than 20 minutes. ODU's team competed with other cyber policy professionals from industry, military, and



government. The judges were international cyber policy experts from NATO and government groups. Out of the hundreds of participants, ODU was placed 11th - a remarkable achievement!

6.3 Cybersecurity Student Association

Sponsored by School of Cybersecurity, ODU's cybersecurity student association has been very active in organizing and participating in various cyber-related events, from lectures and CompTIA Security+ workshops to competitions and conferences. [Reporter: Matthew Umphlet]

2019 Hampton Roads Regional Cybersecurity Conference: Defining Cutting Edge Cyber Defense Challenges @ TNCC (10/11/2019)

Students attended a Conference at Thomas Nelson Community College sponsored by the Virginia Cyber Alliance. The conference featured speakers from Dominion Virginia Energy, Verizon, and more industry professionals, along with government agencies. Rousing discussions about emerging cyber defense issues were conducted with a panel of industry professionals.



Melvin Orienza and Matthew Umphlet in front of the 2019 Hampton Roads Regional Cybersecurity Conference.

Security+ Workshops @ ODU (Fall 2019)

Each Fall the CS2A hosts Comptia Securiry+ workshops to prepare students for this entry-level Cybersecurity certification. Sponsored by the School, workshops were held weekly and provided at no cost to the ODU Cybersecurity Community.

Great Computer Challenge @ ODU (March 7, 2020)

Led by the University's Chief Information Security Officer, Doug Streit, ODU hosts the annual Cyber Security Challenge as part of Great Computer Challenge. It is a competitive opportunity for students in grades K-12 to demonstrate their skills in various computer applications and computer programming. CS2A students designed challenges for a High School CTF Competition in partnership with WHRO. Cybersecurity students from CS2A and cybersecurity courses designed the challenges for the competition. CS2A officers were judges and student mentors for the competition.



Gene Garland, Melvin Orienza, and Matthew Umphlet pose in front of the Big Blue after judging the GCC competition.

MetaCTF @ UVA (11/2/2019)

Students had the opportunity to attend MetaCTF at UVA, funded by School of Cybersecurity. At the conference, students were addressed by several keynote speakers. In addition, students were able to network with industry partners and government offices. Students were able to apply for potential internship and employment opportunities. A Capture the Flag was also held. ODU fielded three teams for this competition.



From Left to Right Matthew Umphlet, Jason Jennings, Skylar Powell, Gene Garland, Brandon Kamdoun, Trevor Pultz, Melvin Orienza, Skylar Power, Ruhi Patel, Emily Lopez, and Cayla Young outside of the MetaCTF Conference.

International Conference on Cyber Warfare @ ODU (March 12, 2020 - March 13, 2020)

Students were able to attend the International Conference on Cyber Warfare (ICCW) held at ODU. Students were able to attend talks on Cyber Warfare from leading professionals across the world. ICCW created a global perspective for our students.

CyberFusion @ VMI (2/21/20 - 2/22/2020)

CyberFusion at Virginia Military Institute was a Two-day conference and CTF. Students stayed overnight to partake in this conference hosted by Virginia Senator Mark Warner's office and the Virginia Cyber Range. Students were able to network with companies at a job fair, where they learned about potential internships and job opportunities. Students were also able to attend several keynotes and a panel discussion with cybersecurity industry professionals where they were able to ask questions about the field. The second day contained a CTF, where students were able to attempt real-world cybersecurity problems.



From Left to Right: Melvin Orienza, Jason Jennings, Trevor Pultz, Cayla Young, Ruhi Patel, Jordan Cottrell, Trevor Simmons

7. Goals for the Upcoming Year

In the upcoming year the School of Cybersecurity will continue its mission to offer cutting-edge cybersecurity educational experiences to students, develop high-impact, cross-disciplinary cybersecurity research initiatives, and be a source of cybersecurity expertise to our community.

The specific goals include:

- Support Sustainable Growth of Academic Program: While the cybersecurity program continues flourishing, the faculty and staff will focus on recruiting high-quality students, improving student diversity, and employing high-impact practices to increase student engagement and success. Efforts will be made to create more scholarship opportunities, leverage the transfer articulations with community colleges and actively reach out to local high schools via summer camps and field trips. The faculty will review and streamline the cybersecurity curricula to improve students' learning experience.
- Expand Cybersecurity Laboratories: Experiments are critical to cybersecurity education and research. With the recent growth of both academic and research programs, there is an urgent need to expand the laboratories. It is a priority of the School of Cybersecurity to ensure sufficient lab spaces and facilities to support undergraduate and graduate education, research, and innovation.
- Facilitate Cybersecurity Research: The School of Cybersecurity will continue the mission to facilitate interdisciplinary collaboration of faculty from across the university to address real-world problems through innovative and cutting edge research, generate research publications with high impact, and develop competitive, externally funded research projects. The school will actively support the Commonwealth Cyber Initiative (CCI) and contribute to the Coastal Virginia Center for Cyber Innovation (COVA CCI).
- Strengthen Outreach and Community Services: The School of Cybersecurity will continue its effort on outreach and community services. It will host workshops and summer camps for middle school and high school teachers and students. The faculty, staff and students will develop up-to-date publicity materials to promote ODU's cybersecurity program, including introductory videos, brochures, posters, social media, and website. Efforts will be made to promote cyber awareness under an interdisciplinary framework and strengthen cybersecurity learning community and living learning communities.

Appendix. Cybersecurity Faculty and Staff

Over three dozens of faculty and staff are affiliated with the School of Cybersecurity conducting cybersecurity research, teaching cybersecurity courses, and advising cybersecurity students.

- Bechard, Bryan, bbechard@odu.edu, Center for Cybersecurity Education and Research
- Chen, Chung-Hao, cxchen@odu.edu, <http://ww2.odu.edu/~cxchen/>, Engineering/Electrical & Computer Engineering
- Chen, Jing, j1chen@odu.edu, <https://sites.google.com/site/jingchen416/>, Sciences/Psychology
- Chernikov, Andrey, achernik@odu.edu, <http://www.cs.odu.edu/~achernik/>, Sciences/Computer Science
- Ezell, Barry, bezell@odu.edu, <http://www.vmasc.odu.edu/ezell.html>, VA Modeling, Analysis and Simulation Center
- Flanagan, David, dflanagan@odu.edu, <http://www.vmasc.odu.edu/flanagan.html>, VA Modeling, Analysis and Simulation Center
- Gheorgh, Adrian, agheorgh@odu.edu, <https://www.odu.edu/directory/people/a/agheorgh>, Engineering/Batten Chair of Systems Engineering
- Gonzalez, Oscar, ogonzale@odu.edu, <https://www.odu.edu/directory/people/o/ogonzale>, Engineering/Electrical & Computer Engineering
- Graham, Roderick S., rgraham@odu.edu, <http://roderickgraham.com/>, Arts&Letters/Sociology & Criminal Justice
- Haines, Russell, rhaines@odu.edu, <http://ww2.odu.edu/~rhaines/>, Business/Information Technology & Decision Sciences
- He, Wu, WHe@odu.edu, <https://www.odu.edu/directory/people/w/whe#profiletab=3>, Business/Information Technology & Decision Science
- Huang, Jingwei, j2huang@odu.edu, <https://fs.wp.odu.edu/j2huang/>, Engineering/Engineering Management and Systems Engineering
- Jiang, Peng, pjiang@odu.edu, Engineering/Electrical & Computer Engineering
- Karahan, Saltuk, skarahan@odu.edu, <https://fs.wp.odu.edu/skarahan/>, Arts&Letters/Political Science & Geography
- Kirkpatrick, Charles, ckirkpat@odu.edu, <https://fs.wp.odu.edu/ckirkpat/>, Business/Information Technology & Decision Science
- Kovacic, Joseph, jkovacic@odu.edu, Center for Cybersecurity Education and Research
- Mann, Philip, pmann@odu.edu, <https://www.odu.edu/directory/people/p/pmann007>, Arts&Letters/Sociology & Criminal Justice
- Mukkama, Ravi, mukka@cs.odu.edu, <http://www.cs.odu.edu/~mukka/>, College of Sciences/Computer Science
- Ning, Rui, rning001@odu.edu, School of Cybersecurity

- Olariu, Stephan, solariu@odu.edu, <http://www.cs.odu.edu/~olariu/olariu-bio-may-2013.pdf>, Sciences/Computer Science
- Payne, Brian, bpayne@odu.edu, Vice Provost for Academic Affairs
- Pinto, Cesar, cpinto@odu.edu, <https://sites.wp.odu.edu/cyberrisk/>, Engineering/Management & Systems Engineering
- Popescu, Dimitrie, dpopescu@odu.edu, <https://www.odu.edu/directory/people/d/dpopescu>, Engineering/Electrical & Computer Engineering
- Ranjan, Desh, dranjan@odu.edu, <http://www.cs.odu.edu/dranjan.shtml>, Sciences/Computer Science
- Shetty, Sachin, sshetty@odu.edu, <http://ww2.odu.edu/~sshetty/>, Engineering/Modeling, Simulation and Visualization Engineering and VMASC
- Sokolowski, John, jsokolow@odu.edu, <http://www.vmasc.odu.edu/sokolowski.html>, Engineering/Modeling, Simulation and Visualization Engineering and VMASC
- Smith, Liz, exsmith@odu.edu, <https://www.odu.edu/directory/people/e/exsmith>, Climate Change, Interdisciplinary Initiatives
- Still, Jeremiah, jstill@odu.edu, <http://www.psychofdesign.com/jeremiah/>, Sciences/Psychology
- Streit, Doug, jstreit@odu.edu, Information Technology Services
- Thorbjornsen, Lenora, ljenning@odu.edu, <https://www.odu.edu/directory/people/l/ljenn006>, Center for Advising Administration & Academic Partnerships
- Vahala, Linda, lvahala@odu.edu, <https://www.odu.edu/directory/people/l/lvahala>, Engineering/Electrical & Computer Engineering
- Wang, Cong, cwang@cs.odu.edu, <https://www.lions.odu.edu/~c1wang/>, Sciences/Computer Science
- Weigle, Michele, mweigle@cs.odu.edu, <http://www.cs.odu.edu/~mweigle/>, Sciences/Computer Science
- Wittkower, D. E., dwittkow@odu.edu, <https://odu.academia.edu/DEWittkower>, Arts & Letters/Philosophy & Religious Studies
- Wu, Harris, hwu@odu.edu, <https://www.odu.edu/directory/people/h/hwu>, Business/IT & Decision Science
- Wu, Hongyi (Michael), H1wu@odu.edu, <http://www.lions.odu.edu/~h1wu/>, Batten Chair of Cybersecurity, Engineering/Electrical & Computer Engineering
- Xin, Chunsheng, cxin@odu.edu, <http://www.odu.edu/eng/programs/ccni>, Engineering/Electrical & Computer Engineering
- Xu, Li, lxu@odu.edu, <https://www.odu.edu/directory/people/l/lxu>, Business/IT & Decision Science
- Zubair, Mohammed, zubair@odu.edu, <http://www.cs.odu.edu/~zubair>, Sciences/Computer Science