

Isaac L. Auerbach Cybersecurity Institute

Overview

Steven Weber, Director
Jiho Yoo, Student Coordinator

September 22, 2017



DREXEL UNIVERSITY

Isaac L. Auerbach
Cybersecurity Institute

Isaac L. Auerbach Cybersecurity Institute Mission Statement

To establish Drexel University as a leading institution with regard to cybersecurity research, education, and community engagement.

1 Governance

Members council

External advisory council

2 Faculty affiliates

3 Research

4 Business development

5 Education

6 Community engagement

7 In the news

8 Contact Us

Members council: representatives from Business, CCI, CoAS, CoE, Law



Aleister Saunders
Senior Vice Provost for Research



Murugan Anandarejan
Department Head of Management,
Decision Science & MIS
LeBow College of Business



Kapil R. Dandekar
Associate Dean of Research
and Graduate Studies
College of Engineering



Rob D'Ovidio
Associate Dean for Humanities & Social
Science Research & Graduate Education
College of College of Arts and Sciences



Daniel Filler
Dean
Thomas R. Kline School of Law



Spiros Mancoridis
Technical Fellow
**Isaac L. Auerbach Cybersecurity
Institute**



Ali Shokrioufandeh
Senior Associate Dean of Research
College of Computing and Informatics



Steven Weber
Director
**Isaac L. Auerbach Cybersecurity
Institute**

External advisory council: in September, 2017



Austin Branch
Director
National Counter
Terrorism Center



Dennis Demolet
President
Global Telesat
Cop.



Janice Glannini
Board Member
Ben Franklin Tech.
Partners of Southeast PA



Mark Greisiger
(Drexel Alumnus)
President
NetDiligence



Ronald Hahn
(LTC USMC Ret.)
*Executive Vice
President*
AECOM/URS



Aaron Hermann
Chief of Staff
Lockheed Martin
Corp. Information
Systems & Global
Solutions



Kirk Hunigan
*Director of
Cybersecurity*
Northrop
Grumman Corp.



Keith Morales
*Chief Information
Security Officer*
Federal Reserve
Bank of Phila.



James Poss
(Maj. Gen. USAF Ret.)
Executive Director
ASSURE
Federal Aviation
Administration



Darin Powers
(Drexel Alumnus)
*Chief Operations
Officer*
Toffler Group



RoseAnn Rosenthal
President and CEO
Ben Franklin Tech.
Partners of
Southeast PA



Jack Tomarchio
*Former Deputy Under
Secretary for Intelligence
& Analysis Operations*
U.S. Dept. of Homeland
Security

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19+ Drexel faculty active in cybersecurity research and teaching



Murugan Anadaraajan
(LeBow)



Kapil Dandekar
(CoE)



Rob D'Ovidio
(CoAS)



David Gefen
(LeBow)



Christopher Geib
(CCI)



Rachel Greenstadt
(CCI)



Naga Kandasamy
(CoE)



Constantine Katsinis
(CCI)



Geoffrey Mainland
(CCI)



Spiros Mancoridis
(CCI)



Gaurav Naik
(CCI)



Ioannis Savidis
(CoE)



Harish Sethu
(CoE)



James Shackleford
(CoE)



Matthew Stamm
(CoE)



Baris Taskin
(CoE)



Kristene Unsworth
(CCI)



Steven Weber
(CoE)



Chris Yang (CCI)

Faculty cybersecurity keywords

Murugan Anandarajan	<i>data mining and identity theft; text mining; predictive modeling; cyber deviant behavior</i>
Kapil Dandekar	<i>wireless security; reactive jamming; wireless penetration testing; visualization</i>
Rob D'Ovidio	<i>intersection of computer technology, crime, and the criminal justice system</i>
David Gefen	<i>trust management systems; behavioral effects of fraud; privacy management</i>
Christopher Geib	<i>computer network security</i>
Rachel Greenstadt	<i>privacy & security of multi-agent systems; economics of electronic privacy & information security</i>
Nagarajan Kandasamy	<i>network anomaly detection</i>
Constantine Katsinis	<i>computer security; network security; information assurance</i>
Geoffrey Mainland	<i>program analysis; anomaly detection</i>
Spiros Mancoridis	<i>malware detection, classification, and mitigation; software security; reverse engineering; code analysis</i>
Gaurav Naik	<i>mobile network security; computer network security</i>
Ioannis Savidis	<i>hardware security; Trojan detection and mitigation; gate level logic encryption; side-channel analysis; circuit-level intellectual property protection; design for trust</i>
Harish Sethu	<i>web security and privacy; network anomaly detection</i>
James Shackelford	<i>runtime code injection; virtual address space manipulation; transparent library redirection</i>
Matthew Stamm	<i>information security; multimedia forensics and anti-forensics; information verification</i>
Baris Taskin	<i>hardware security; hardware/software co-design for exascale system performance</i>
Kristene Unsworth	<i>surveillance; national security policy</i>
Steven Weber	<i>network performance; statistical analysis; anomaly detection; security overhead analysis</i>
Christopher Yang	<i>security informatics; information sharing and privacy; sentiment analysis</i>

Faculty affiliate titles, affiliations, and positions (1 of 2)

Murugan Anandarajan	<i>Professor and Department Head</i> , Departments of Management, Decision Sciences & MIS, LeBow College of Business
Kapil Dandekar	<i>Professor</i> , Department of Electrical and Computer Engineering; <i>Associate Dean of Research and Graduate Studies</i> , College of Engineering. <i>Director</i> , Drexel Wireless Systems Laboratory (DWSL)
Rob D'Ovidio	<i>Associate Professor</i> , Department of Criminology and Justice Studies; <i>Associate Dean for Humanities and Social Science Research and Graduate Education</i> , College of Arts and Sciences
David Gefen	<i>Professor and Provost Distinguished Research Professor</i> , Department of Decision Sciences and MIS, LeBow College of Business
Christopher Geib	<i>Associate Professor</i> , Department of Computer Science, College of Computing and Informatics
Rachel Greenstadt	<i>Associate Professor</i> , Department of Computer Science, College of Computing and Informatics. <i>Director</i> , Privacy, Security and Automation Lab (PSAL)
Nagarajan Kandasamy	<i>Professor and Associate Department Head of Graduate Affairs</i> , Department of Electrical and Computer Engineering, College of Engineering
Constantine Katsinis	<i>Associate Teaching Professor</i> , Department of Computer Science, College of Computing and Informatics
Geoffrey Mainland	<i>Assistant Professor</i> , Department of Information Science, College of Computing and Informatics

Faculty affiliate titles, affiliations, and positions (2 of 2)

Spiros Mancoridis	<i>Isaac L. Auerbach Technical Fellow</i> , Department of Computer Science; <i>Interim Dean</i> , College of Computing and Informatics
Gaurav Naik	<i>Assistant Research Professor</i> , Department of Computer Science, College of Computing and Informatics
Ioannis Savidis	<i>Assistant Professor</i> , Department of Electrical and Computer Engineering, College of Engineering. <i>Director</i> , Integrated Circuits and Electronics (ICE) Design and Analysis Laboratory
Harish Sethu	<i>Associate Professor</i> , Department of Electrical and Computer Engineering, College of Engineering
James Shackleford	<i>Assistant Professor</i> , Department of Electrical and Computer Engineering, College of Engineering
Matthew Stamm	<i>Assistant Professor</i> , Department of Electrical and Computer Engineering, College of Engineering. <i>Director</i> , Multimedia and Information Security Laboratory (MISL)
Baris Taskin	<i>Profesor</i> , Department of Electrical and Computer Engineering, College of Engineering. <i>Director</i> , Drexel VLSI and Architecture Laboratory
Kristene Unsworth	<i>Assistant Professor</i> , Department of Information Science, College of Computing and Informatics
Steven Weber	<i>Professor</i> , Department of Electrical and Computer Engineering, College of Engineering; <i>Director</i> , Drexel Cybersecurity Institute. <i>Director</i> , Drexel Modeling and Analysis of Networks Laboratory (MAN-Lab)
Christopher Yang	<i>Associate Professor</i> , Department of Information Science, College of Computing and Informatics

Faculty profile - Murugan Anandarajan, Ph.D.



Title	Professor
College	LeBow College of Business
Department	Management, Decision Sciences & MIS
Position	Department Head
Research keywords	text analytics; visual analytics; protection motivation theory
Cybersecurity expertise	data mining and identity theft; text mining; predictive modeling; cyber deviant behavior

Publications:

Rob D'Ovidio, Murugan Anandarajan, and Irv Schlanger. Patrons Beware: Security Vulnerabilities and Public Access Internet Facilities. *ASIS Security Journal*, (in press) 2015.

Murugan Anandarajan and Irina-Marcela Nedelcu. Self-protecting the smartphone: A motivational model. *Proceedings of the Northeast Decision Sciences Institute Annual Conference (DSI)*, Baltimore, MD, April 2015.

Alexander Jenkins, Murugan Anandarajan, and Rob D'Ovidio. 'All that Glitters is not Gold': The Role of Impression Management in Data Breach Notification. *WSCA Western Journal of Communication*, 78(3):337–357, May 2014.

Murugan Anandarajan, Rob D'Ovidio, and Alexander Jenkins. Safeguarding consumers against identity-related fraud: examining data breach notification legislation through the lens of routine activities theory. *Oxford Journal of International Data Privacy Law*, 3(1):51–60, March 2013.

Research funding:

Murugan Anandarajan and Rob D'Ovidio. Cyber crime and forensics institute expansion of services. *United States Department of Justice, National Institute of Justice*, 2010–. \$500,000.

Murugan Anandarajan and Rob D'Ovidio. Cyber crime and computer forensics research. *United States Department of Justice*, 2009–. \$500,000.

Murugan Anandarajan and Rob D'Ovidio. Cyber crime and computer forensics research. *National Institute of Justice*, 2008–. \$223,250.

Faculty profile - Kapil R. Dandekar, Ph.D.



Title	Professor
College	Engineering
Department	Electrical and Computer Engineering
Position	Associate Dean of Research and Graduate Studies – College of Engineering
Research Lab	Drexel Wireless Systems Laboratory (DWSL)
Research keywords	wireless communications; antenna design; software defined radio
Cybersecurity expertise	wireless security; reactive jamming; wireless penetration testing; visualization

Publications:

J. Chacko, K. Juretus, M. Jacovic, C. Sahin, N. Kandasamy, I. Savidis, and K. Dandekar. Securing wireless communication through physical layer key based packet obfuscation. *IEEE Transaction on Computers*, 2017.

Cem Sahin, Brandon Katz, and Kapil Dandekar. Secure and robust symmetric key generation using physical layer techniques under various wireless environments. *2016 IEEE Radio and Wireless Symposium (RWS)*, 2016.

Cem Sahin, Danh Nguyen, James Chacko, and Kapil R. Dandekar. Cybersecurity education: taking research into the classroom. *Frontiers in Education (FIE) Conference*, El Paso, TX, October 2015.

Research funding:

Steven Weber (PI), Kapil Dandekar, Ioannis Savidis, and Matthew Stamm. Security by design: Drexel hands-on cybersecurity laboratory curriculum. *NSA-CNAP*, October 1, 2017 – September 30, 2018. \$255,359.93.

Kapil Dandekar (PI), Stefan Rank, Pramod Abichandani and Nagarajan Kandasamy, and Jennifer S. Stanford. Satc: Edu: Software defined radio wars for cybersecurity and information assurance education. *National Science Foundation*, September, 2017 – August 2019. \$299,888.

Kapil R. Dandekar (PI), Jaudelice C. de Oliveira, Karen Miu Miller, Chikaodinaka Nwankpa, and Steven Weber. Secure wireless control for future naval smart grids. *Office of Naval Research (ONR)*, N000141612037, November, 2015 – December, 2018. \$749,831.

Courses taught:

ECES	306	Analog & Digital Communication	ECET	512	Wireless Systems
ECEL	404	Software Defined Radio Laboratory	ECET	890	Software Defined Radio Security Lab

Faculty profile - Rob D'Ovidio, Ph.D.



Title	Associate Professor
College	Arts and Sciences
Department	Criminology and Justice Studies
Position	Associate Dean for Humanities and Social Science Research and Graduate Education – College of Arts and Sciences
Research keywords	computer & high technology crime; criminal justice technology; criminological theory
Cybersecurity expertise	intersection of computer technology, crime, and the criminal justice system

Publications:

Rob D'Ovidio, Murugan Anandarajan, and Irv Schlanger. Patrons Beware: Security Vulnerabilities and Public Access Internet Facilities. *ASIS Security Journal*, (in press) 2015.

Alexander Jenkins, Murugan Anandarajan, and Rob D'Ovidio. 'All that Glitters is not Gold': The Role of Impression Management in Data Breach Notification. *WSCA Western Journal of Communication*, 78(3):337–357, May 2014.

Research funding:

Rob D'Ovidio (Co-PI) and NAMES. Research and training program to educate stakeholders on crimes committed using handheld devices. *U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Assistance*, 2011-BE-BX-K001, January, 2012 – December, 2013. \$986,976 (collaborative project with Drakontas, LLC and BKForensics).

Rob D'Ovidio (Co-PI) and NAMES. Real crimes in virtual worlds and online video game worlds. *U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Assistance*, 2009-D2-BX-K005, January, 2012 – December, 2013. \$500,000 (collaborative project with Drakontas, LLC).

Courses taught:

CJS	274	Sex, Violence, and Crime on the Internet	CJS	273	Surveillance, Technology, and the Law
CJS	276	Computer Crime	CJS	366	Technology and the Justice System
CJ	377	Intellectual Property Theft in the Digital Age			

Professional service:

- Member, International Association of Chiefs of Police, Computer Crime and Digital Evidence Committee

Faculty profile - David Gefen, Ph.D.



Title	Professor and Provost Distinguished Research Professor
College	LeBow College of Business
Department	Decision Sciences and MIS
Research keywords	information systems (IS) outsourcing; strategic management of IS; database analysis and design; data analysis; ecommerce; online markets; IS implementation; informatics
Cybersecurity expertise	trust management systems; behavioral effects of fraud; privacy management

Publications:

David Gefen and Erran Carmel. Why the first provider takes it all: The consequences of a low trust culture on pricing and ratings in online sourcing markets. *European Journal of Information Systems*, pages 604–618, Winter 2013.

David Gefen and P.A. Pavlou. The boundaries of trust and risk: The quadratic moderating role of institutional structures. *Information Systems Research*, 23:940–959, November 2012.

Research funding:

David Gefen (PI), Frances Cornelius, Jennifer Taylor, Noreen Robertson, and Murugan Anadarajan. Applying and improving latent semantic analysis to extract insight from claims and EMR documents. *Drexel University Provost Award*, November 2015. \$20,000.

Dominic Gullo (PI), David Gefen, and Michel Miller. Risk, resiliency and protective factors: Building a bioecological model for understanding school readiness and social competence in young children. *Drexel University Social Science Research Fund*, November 2013. \$20,000.

Courses taught:

MIS	633	Predictive Business Analytics with Relational Database Data
MIS	634	Advance Programming in SAS
STAT	990	Multivariate II, Covariate based Structured Equation Modeling
MIS	651	IS Outsourcing Management

Faculty profile - Christopher Geib, Ph.D.



Title	Associate Professor
College	Computing and Informatics
Department	Computer Science
Research keywords	decision making and reasoning under conditions of uncertainty; planning; scheduling; constraint-based reasoning; human-computer and robot interaction; probabilistic reasoning; process control; user interfaces
Cybersecurity expertise	computer network security

Publications:

Research funding:

Courses taught:

INFO	108	Foundations of Software	INFO	336	Distributed Network Security
CS	380	Artificial Intelligence	CS	510	Introduction to Artificial Intelligence

Professional service:

Faculty profile - Rachel Greenstadt, Ph.D.



Title	Associate Professor
College	Computing and Informatics
Department	Computer Science
Research Lab	Privacy, Security and Automation Lab (PSAL)
Research keywords	artificial intelligence; privacy; security; multi-agent systems
Cybersecurity expertise	privacy & security of multi-agent systems; economics of electronic privacy & information security

Publications:

B. Alsulami, E. Dauber, R. Harang, S. Mancoridis, and R. Greenstadt. Source code authorship attribution using long short-term memory based networks. *European Symposium on Research in Computer Security (ESORICS)*, 2017.

E. Dauber, R. Overdorf, and R. Greenstadt. Stylometric authorship attribution of collaborative documents. *International Symposium on Cyber Security, Cryptography, and Machine Learning (CSCML)*, 2017.

Research funding:

Rachel Greenstadt (PI). Attribution of malicious binaries. *Defence Advanced Research Project Agency (DARPA)*, 2017 – 2019. \$599,729 (share \$352,205).

Rachel Greenstadt (PI) and Andrea Forte. EAGER: Cybercrime science. *National Science Foundation Division Of Computer and Network Systems (CNS)*, CNS-1347151, September, 2013 – August, 2016. \$188,676.

Courses taught:

CS	613	Machine Learning	CS	475	Computer and Network Security
CS	590	Privacy			

Professional service:

- General chair, Privacy Enhancing Technologies Symposium (PETS), Philadelphia, PA, June, 2015.
- Co-Editor-in-Chief, Proceedings on Privacy Enhancing Technologies.
- Program Chair, Privacy Enhancing Technologies Symposium.

Faculty profile - Nagarajan Kandasamy, Ph.D.



Title	Professor
College	Engineering
Department	Electrical and Computer Engineering
Position	Associate Department Head for Graduate Affairs
Research keywords	computer performance management; computer architecture; fault-tolerant systems; dependable computing
Cybersecurity expertise	network anomaly detection

Publications:

J. Chacko, K. Juretus, M. Jacovic, C. Sahin, N. Kandasamy, I. Savidis, and K. Dandekar. Securing wireless communication through physical layer key based packet obfuscation. *IEEE Transaction on Computer*, 2017.

T. Huang, H. Sethu, and N. Kandasamy. A fast algorithm for detecting anomalous changes in network traffic. *Proceedings of the 11th International Conference on Network and Service Management (CNSM)*, Barcelona, Spain, November 2015.

Research funding:

Kapil Dandekar (PI), Stefan Rank, Pramod Abichandani, Nagarajan Kandasamy, and Jennifer S. Stanford. Satc: Edu: Software defined radio wars for cybersecurity and information assurance education. *National Science Foundation*, September, 2017 – August 2019. \$299,888.

Matthew C. Stamm (PI) and Nagarajan Kandasamy. High performance techniques to identify the source of digital images using multimedia forensics. *Defense Forensics and Biometrics Agency (DFBA) and the Army Research Office (ARO)*, W911NF-15-2-0013, February, 2015 – July, 2016. \$374,971.

Courses taught:

ENGR	121	Computation Lab I	ENGR	122	Computation Lab II
ECEC	413	Introduction to Parallel Computer Architecture	ECEC	622	Parallel Computer Architecture
ECE	200	Digital Logic	ECEC	353	Introduction to Operating Systems
ECEC	520	Dependable Computing	ECEC	355	Computer Architecture and Organization
ECEC	414	High Performance Computing			

Faculty profile - Constantine Katsinis, Ph.D.



Title	Associate Teaching Professor
College	Computing and Informatics
Department	Computer Science
Research keywords	parallel computer architectures; mobile computing; fault tolerant systems; image processing; pattern recognition
Cybersecurity expertise	computer security; network security; information assurance

Publications:

Research funding:

Courses taught:

Professional service:

Faculty profile - Geoffrey Mainland, Ph.D.



Title	Assistant Professor
College	Computing and Informatics
Department	Computer Science
Research keywords	programming languages; functional programming; metaprogramming; type systems; software defined radio
Cybersecurity expertise	program analysis; anomaly detection

Publications:

Gordon Stewart, Mahanth Gowda, Geoffrey Mainland, Bozidar Radunovic, Dimitrios Vytiniotis, and Cristina Luengo Agull. Ziria: An optimizing compiler for wireless PHY programming. *Proceedings of the 20th international conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '15)*, Istanbul, Turkey, 2015.

Geoffrey Mainland, Roman Leshchinskiy, and Simon Peyton Jones. Exploiting vector instructions with generalized stream fusion. *Proceedings of the 18th ACM SIGPLAN International Conference on Functional Programming (ICFP '13)*, pages 37–48, New York, NY, USA, 2013.

Geoffrey Mainland. Explicitly heterogeneous metaprogramming with MetaHaskell. *Proceedings of the 17th ACM SIGPLAN International Conference on Functional Programming (ICFP '12)*, pages 311–322, Copenhagen, Denmark, 2012.

Geoffrey Mainland and Greg Morrisett. Nikola: Embedding compiled GPU functions in Haskell. *Proceedings of the third ACM Symposium on Haskell (Haskell '10)*, pages 67–78, Baltimore, Maryland, USA, 2010.

Geoffrey Mainland, Greg Morrisett, and Matt Welsh. Flask: Staged Functional Programming for Sensor Networks. *Proceeding of the 13th ACM SIGPLAN International Conference on Functional Programming (ICFP '08)*, pages 335–346, Victoria, BC, Canada, 2008.

Faculty profile - Spiros Mancoridis, Ph.D.



Title	Isaac L. Auerbach Technical Fellow
College	Computing and Informatics
Department	Computer Science
Position	Interim Dean – College of Computing and Informatics
Research Lab	Software Engineering Research Group (SERG)
Research keywords	security and privacy; software engineering; reverse engineering; software clustering; software visualization; genetic algorithms; software engineering education; evolutionary computation
Cybersecurity expertise	malware detection, classification, and mitigation; software security; reverse engineering; code analysis

Publications:

Ni An, Alexander Duff, Gaurav Naik, Michaelis Faloutsos, Steven Weber, and Spiros Mancoridis. Behavioral anomaly detection of malware on home routers. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.

Bander Alsulami, Spiros Mancoridis, Avinash Srinivasan, and Hunter Dong. Lightweight behavioral malware detection for windows platforms. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.

M. Ping, B. Alsulami, and S. Mancoridis. On the effectiveness of application characteristics in the automatic classification of malware smartphones. *Proc. 2016 IEEE International Conference on Malicious and Unwanted Software (MALWARE'16)*, Puerto Rico, October 2016.

Research funding:

Spiros Mancoridis (PI), Harish Sethu, Naga Kandasamy, and Steven Weber. Machine learning and big data analytics. *Comcast and University of Connecticut Center of Excellence for Security Innovation (CSI)*, January, 2015 – December, 2016. \$200,000.

Marcello Balduccini and Spiros Mancoridis. Robustness testing of smart grids. *Drexel University Institute for Energy and the Environment (IE&E) internal competitive grant*, 2014–2015. \$50,000.

Professional service:

- Technical Program Committee Member, Malware Conference, Fajardo, Puerto Rico, 2017

Faculty profile - Gaurav Naik



Title	Assistant Research Professor
College	Computing and Informatics
Department	Computer Science
Research keywords	architectures and algorithms of computer networks; software defined networks
Cybersecurity expertise	mobile network security; computer network security

Publications:

Ahmad Darki, Alex Duff, Z. Qian, Gaurav Naik, Spiros Mancoridis, and M. Faloutsos. Don't trust your router: detecting compromised router. *The IEEE proceedings of the 12th International Conference on Emerging Networking Experiments and Technologies CoNEXT'16 Student Workshop*, Irvine, CA, 2016.

J. Kopena, E. Sultanik, G. Naik, I. Howley, M. Peysakhov, V.A. Cicirello, M. Kam, and W. Regli. Service-based computing on manets: Enabling dynamic interoperability of first responders. *IEEE Intelligent Systems*, 20(5):17–25, Sep–Oct 2005.

V. Cicirello, M. Peysakhov, G. Anderson, Gaurav Naik, K. Tsang, W. Regli, and M. Kam. Designing dependable agent systems for mobile wireless networks. *IEEE Intelligent Systems*, 19(5):39–45, Sep–Oct 2004.

Research funding:

Ali Shokoufandeh (PI), Gaurav Naik, and Steven Weber. Predicting QoE. *Comcast/Xfinity R&D TechFund*, November, 2015 – July, 2016. \$87,547.

Gaurav Naik (PI). Content addressing. *NBC Universal*, November, 2015 – July, 2016.

Gaurav Naik (PI). IPv6 Routing (Phase 2). *Comcast Cable*, June, 2015 – May, 2016.

Courses taught:

CS 675 Reverse Engineering

Faculty profile - Ioannis Savidis, Ph.D.



Title	Assistant Professor
College	Engineering
Department	Electrical and Computer Engineering
Research Lab	Integrated Circuits and Electronics (ICE) Design and Analysis Laboratory
Research keywords	analysis, modeling, and design methodologies for high performance digital and mixed-signal integrated circuits; emerging integrated circuit technologies; electrical and thermal modeling and characterization; signal and power integrity analysis; power and clock analysis and design
Cybersecurity expertise	hardware security; Trojan detection and mitigation; gate level logic encryption; side-channel analysis; circuit-level intellectual property protection; design for trust

Publications:

J. Chacko, K. Juretus, M. Jacovic, C. Sahin, N. Kandasamy, I. Savidis, and K. Dandekar. Physical gate based preable obfuscation for securing wireless communication. *IEEE International Conference on Computing, Networking and Communication (ICNC)*, 2017.

K. Juretus and I. Savidis. Reducing logic encryption overhead through gate level key insertion. *submitted for inclusion in the proceedings of the IEEE International Symposium on Circuits and Systems (ISCS)*, Montreal, Quebec, May 2016.

Research funding:

Ioannis Savidis (PI). Secure hardware ip solution low overhead circuit obfuscation primitives. *Drexel Ventures Innovation Fund*, July, 2017 – June 2018. \$50k.

Ioannis Savidis (PI). Eager: Securing integrated circuits through realtime hardware trojan detection. *National Science Foundation*, CNS-1648878, September, 2016 – August, 2018. \$288,650.

Courses taught:

ECEC	471	Introduction to VLSI Design	ECEC	571	Introduction to VLSI Design
ECEC	472	Custom VLSI Design & Analysis I	ECEC	572	Custom VLSI Design & Analysis I
ECEC	473	Modern VLSI IC Design I	ECEC	573	Custom VLSI Design & Analysis II
ENGR	121	Computation Lab I			

Faculty profile - Harish Sethu, Ph.D.



Title	Associate Professor
College	Engineering
Department	Electrical and Computer Engineering
Research keywords	network science and data mining; social computing; web security and privacy; web performance; design and analysis of protocols, architectures and algorithms in computer networks
Cybersecurity expertise	web security and privacy; network anomaly detection

Publications:

T. Huang, H. Sethu, and N. Kandasamy. A fast algorithm for detecting anomalous changes in network traffic. *Proceedings of the 11th International Conference on Network and Service Management (CNSM)*, Barcelona, Spain, November 2015.

T. Huang, N. Kandasamy, and H. Sethu. Anomaly detection in computer systems using compressed measurements. *Proceedings of the IEEE International Symposium on Software Reliability Engineering (ISSRE)*, Gaithersburg, MD, November 2015.

Justin Hummel, Andrew McDonald, Vatsal Shah, Riju Singh, Bradford D. Boyle, Tingshan Huang, Nagarajan Kandasamy, Harish Sethu, and Steven Weber. A modular multi-location anonymized traffic monitoring tool for a WiFi network (outstanding poster award). *ACM Conference on Data and Application Security and Privacy (CODASPY)*, San Antonio, TX, March 2014.

Research funding:

Steven Weber (PI), Kapil R. Dandekar, Spiros Mancoridis, and Harish Sethu. TTP: Medium: Securing the Wireless Philadelphia Network. *National Science Foundation Secure and Trustworthy Cyberspace Program (NSF-SaTC)*, CNS-1228847, September, 2012 – August, 2016. \$1,080,800.

Spiros Mancoridis (PI), Harish Sethu, Naga Kandasamy, and Steven Weber. Machine learning and big data analytics. *Comcast and University of Connecticut Center of Excellence for Security Innovation (CSI)*, January, 2015 – December, 2016. \$200,000.

Courses taught:

ECEC 690	Web Security I	ECEC 690	Web Security II
ECEC 631	Principles of Computer Networking	ECEC 632	Performance Analysis of Computer Networks
ECEC 633	Advanced Topics in Computer Networks	ECEC 203	Programming for Engineers
ECEC 301	Advanced Programming for Engineers	ECEC 433	Network Programming

Faculty profile - James Shackleford, Ph.D.



Title	Assistant Professor
College	Engineering
Department	Electrical and Computer Engineering
Research keywords	medical image processing; high performance computing; embedded systems; computer vision; machine learning
Cybersecurity expertise	runtime code injection; virtual address space manipulation; transparent library redirection

Publications:

James Shackleford, Nagarajan Kandasamy, and Gregory Sharp. *High Performance Deformable Image Registration Algorithms for Manycore Processors*. Morgan Kaufmann Publishers Inc., San Francisco, CA, 2013.

James Shackleford, Nagarajan Kandasamy, and Gregory Sharp. Analytic regularization of uniform cubic b-spline deformation fields. *Proceedings of the 15th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, Nice, France, October 2012.

James Shackleford, Nagarajan Kandasamy, and Gregory Sharp. Deformable volumetric registration in B-Splines. Wen mei W. Hwu, editor, *GPU Computing Gems Emerald Edition (Applications of GPU Computing Series)*. Morgan Kaufmann Publishers Inc., San Francisco, CA, 2011.

James Shackleford, Nagarajan Kandasamy, and Gregory Sharp. On developing B-spline registration algorithms for multi-core processors. *Physics in Medicine and Biology*, 55(21):6329, 2010.

Courses taught:

ECE	200	Digital Logic Design	ECEC	353	Systems Programming
ECEC	631	Principles of Computer Networking	ECEC	632	Performance Analysis of Computer Networks
ECEC	301	Advanced Programming for Engineers			

Faculty profile - Matthew Stamm, Ph.D.



Title	Assistant Professor
College	Engineering
Department	Electrical and Computer Engineering
Research Lab	Multimedia and Information Security Laboratory (MISL)
Research keywords	information security; multimedia forensics and anti-forensics; information verification; adversarial dynamics; signal processing
Cybersecurity expertise	information security; multimedia forensics and anti-forensics; information verification

Publications:

O. Mayer and M. Stamm. Accurate and efficient image forgery detection using lateral chromatic aberration. *IEEE Transactions on Information Forensics and Security*, 2017.

Xiaoyu Chu, Matthew C. Stamm, and K.J.R. Liu. Compressive sensing forensics. *IEEE Transactions on Information Forensics and Security*, 10(7):1416–1431, July 2015.

Research funding:

Matthew C. Stamm (PI) and Nagarajan Kandasamy. High performance techniques to identify the source of digital images using multimedia forensics. *Defense Forensics and Biometrics Agency (DFBA) and the Army Research Office (ARO)*, W911NF-15-2-0013, February, 2015 – July, 2016. \$374,971.

Matthew C. Stamm (PI). CAREER: Scaling multimedia forensic algorithms for big data and adversarial environments. *NSF Faculty Early Career Development Program (CAREER)*, March, 2016 – February, 2021 (estimated). \$587,000.

Courses taught:

ECES	301	Transform Methods and Filtering	ECES	435	Multimedia Signal Processing and Information Security
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Professional service:

- *Technical Program Committee Member*, IEEE International Workshop on Information Forensics and Security (WIFS), (2014, 2015)
- *General Chair*, ACM Workshop on Information Hiding and Multimedia Security (2017)

Faculty profile - Baris Taskin, Ph.D.



Title	Professor
College	Engineering
Department	Electrical and Computer Engineering
Research Lab	Drexel VLSI and Architecture Laboratory
Research keywords	electronic design automation (EDA) of VLSI circuits; high-performance circuits; resonant clocking; integrated circuit (IC) physical design; networks-on-chip (NoC); hardware/software design for exascale computing
Cybersecurity expertise	hardware security; hardware/software co-design for exascale system performance

Publications:

Weicheng Liu, Emre Salman, Can Sitik, Baris Taskin, Savithri Sundareswaran, and Benjamin Huang. Circuits and algorithms to facilitate low swing clocking in nanoscale technologies. *Proceedings of Semiconductor Research Corporation (SRC) TechCon*, Santa Clara, CA, November 2015.

Karthik Sangaiah, Mark Hempstead, and Baris Taskin. Uncore RPD: Rapid design space exploration of the uncore via regression modeling. *Proceedings of IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, Austin, TX, November 2015.

Leo Filippini, Emre Salman, and Baris Taskin. A wirelessly powered system with charge recovery logic. *Proceedings of the IEEE International Conference on Computer Design (ICCD)*, New York, NY, October 2015.

Research funding:

Baris Taskin (PI) and Kapil R. Dandekar. Wireless on-chip interconnects. *National Science Foundation (NSF)*, ECCS-1232164, September, 2012 – August, 2016. \$416,000.

Mark Hempstead and Baris Taskin (Co-PI). Fast and Efficient Hardware Design Exploration through Memory-NoC Analysis for Multi-Core SoCs. *Samsung Global Research Organization*, #003897-002, September, 2014 – August, 2015. \$100,000.

Courses taught:

ECEC	671	Electronic Design Automation for VLSI Circuits I	ENGR	121	Computation Lab I
ECEC	672	Electronic Design Automation for VLSI Circuits II	ENGR	122	Computation Lab II

Faculty profile - Kristene Unsworth, Ph.D.



Title	Assistant Professor
College	Computing and Informatics
Department	Information Science
Research keywords	information policy; ethics; government information
Cybersecurity expertise	surveillance; national security policy

Publications:

Research funding:

Courses taught:

Professional service:

Faculty profile - Steven Weber, Ph.D.



Title	Professor
College	Engineering
Department	Electrical and Computer Engineering
Position	Director of the Drexel Cybersecurity Institute
Research Lab	Drexel Modeling and Analysis of Networks Lab (MANLab)
Research keywords	computer networks; wireless networks; resource allocation; network performance analysis; probability; stochastic processes; statistics; information theory; optimization
Cybersecurity expertise	network performance; statistical analysis; anomaly detection; security overhead

Publications:

Ni An, Alexander Duff, Gaurav Naik, Michaelis Faloutsos, Steven Weber, and Spiros Mancoridis. Behavioral anomaly detection of malware on home routers. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.

Ni An, Vinod Mishra, and Steven Weber. Pca-based statistical anomaly detection of stealthy reactive jamming in wifi networks. *IEEE Conference on Communications and Network Security (CNS)*, Las Vegas, NV, October 2017.

Ni An and Steven Weber. On the sample size of pca-based anomaly detection. *Proceedings of the 51st Annual Conference on Information Sciences and Systems (CISS)*, Baltimore, MD, March 2017.

Research funding:

Steven Weber (PI), Kapil Dandekar, Ioannis Savidis, and Matthew Stamm. Security by design: Drexel hands-on cybersecurity laboratory curriculum. *NSA-CNAP*, October 1, 2017 – September 30, 2018. \$255,359.93.

Steven Weber (PI). Cyber risk management: Identification and quantification of unreported health care data breaches. *Casualty Actuarial Society (CAS) Cyber Risk Task Force*, January, 2016 – December, 2016. \$30,000.

Courses taught:

ECE	361	Probability for engineers	ECES	523	Detection and estimation theory
ECES	302	Transform methods and filtering	ECEC	631	Principles of computer networking
ECES	521	Probability and random variables	ECEC	632	Performance analysis of comp. networks
ECES	522	Random proc. & spectral analysis	ECEC	633	Advanced topics in comp. networking

Faculty profile - Christopher Yang, Ph.D.



Title	Associate Professor
College	Computing and Informatics
Department	Information Science
Research keywords	web search & mining; knowledge mgmt; cross-lingual information retrieval; text summarization; multimedia retrieval; information visualization; electronic commerce
Cybersecurity expertise	security informatics; information sharing and privacy; sentiment analysis

Publications:

Zhen Hai, Kuiyu Chang, Jung-Jae Kim, and Christopher C. Yang. Identifying opinion features in sentiment analysis via domain-specific and generic topical relevance. *IEEE Transactions on Knowledge and Data Engineering*, 26(3):623–634, March 2014.

Xuning Tang and Christopher C. Yang. Social network integration and analysis using a generalization and probabilistic approach for privacy preservation. *SpringerOpen Security Informatics Journal*, 1(7), December 2012.

Research funding:

Hsinchun Chen (PI), Catherine Larson, Mark Patton, and Chris Yang. CIF21 DIBBs: DIBBs for intelligence and security informatics research community. *National Science Foundation (NSF) Division Of Advanced Cyber Infrastructure (ACI)*, ACI-1443019, October, 2014 – September, 2017. \$1,499,531 total, \$150,000 to Drexel.

Kapil R. Dandekar (PI), Rachel Greenstadt, Constantine Katsinis, Steven Weber, and Christopher C. Yang. Capacity building: Development and dissemination of the Drexel University cybersecurity program. *National Science Foundation CyberCorps Scholarship for Service Program (NSF-SFS)*, DUE-1241631, November, 2012 – October, 2015. \$888,491.

Courses taught:

INFO 101	Introduction to Information Technology	INFO 300	Information Retrieval Systems
INFO 812	Research Statistics I		

Professional service:

- Chair, IEEE ICDM Workshop on Intelligence and Security Informatics 2015, Atlantic City, November, 2015
- Chair, ACM SIGKDD Workshop on Intelligence and Security Informatics 2012, Beijing, China, August, 2012
- Associate Editor-in-Chief, SpringerOpen Security Informatics Journal

1 Governance

2 Faculty affiliates

3 Research

Research projects

Research funding

Research articles

Graduate students

Research community engagement

Technology commercialization

4 Business development

5 Education

6 Community engagement

7 In the news

8 Contact Us

Sample research projects

- 1 Fridman, Weber, Greenstadt, Kam – *active authentication on mobile devices*
- 2 Alsulamy, Canzanese, Balduccini, Mancoridis, Kam – *malware detection, classification, and mitigation*
- 3 Huang, An, Sethu, Kandasamy, Stamm, Weber – *network anomaly detection*
- 4 Nguyen, Sahin, Shishkin, Kandasamy, Dandekar – *secure wireless symmetric key generation and protocol-aware reactive jamming of wireless signals*

Research project: active authentication on mobile devices

Lex Fridman	Post-doc	AgeLab	M.I.T.
Steven Weber	Professor	Dept. of ECE	Drexel University
Rachel Greenstadt	Associate Professor	CS Dept.	Drexel University
Moshe Kam	Professor	Dept. of ECE	NJIT



L. Fridman



S. Weber

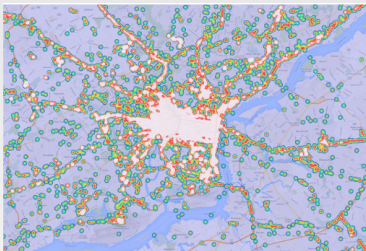


R. Greenstadt



M. Kam

Research summary: data fusion of cell texts, apps, websites, GPS in a binary classifier to actively identify whether or not a cell user's behavior is consistent with the authorized user's profile.



Publication:

Lex Fridman, Steven Weber, Rachel Greenstadt, and Moshe Kam. Active authentication on mobile devices via stylometry, application usage, web browsing, and GPS location. *IEEE Systems Journal*, June 2017.

Research grant:

Rachel Greenstadt (PI), Moshe Kam, and P. Juola. Active authentication via linguistic modalities. *Defense Advanced Research Projects Agency (DARPA) Active Authentication Program*, MONTH, 2012 – MONTH, 2013. \$699,379.

Research project: malware detection, classification, and mitigation

Bander Alsulamy	Ph.D. student	CS Dept.	Drexel University
Raymond Canzanese	Ph.D.		Sift Security
Marcello Balduccini	Assistant Research Professor	CS Dept.	Drexel University
Spiros Mancoridis	Isaac L. Auerbach Professor	CS Dept.	Drexel University
Moshe Kam	Professor	Dept. of ECE	NJIT



B. Alsulamy



R. Canzanese



M. Balduccini



S. Mancoridis



M. Kam

Research summary: detecting and classifying malicious processes using system call trace analysis. The goal is to identify techniques that are 'lightweight' enough and exhibit a low enough false positive rate to be deployed in production environments.

Publications:

Raymond Canzanese, Spiros Mancoridis, and Moshe Kam. Run-time classification of malicious processes using system call analysis. *Proceedings of the 10th International Conference on Malicious and Unwanted Software (MALCON)*, Puerto Rico, USA, October 2015.

Marcello Balduccini and Spiros Mancoridis. Action languages and the mitigation of malware. *Proceedings of the First Workshop on Action Languages, Process Modeling, and Policy Reasoning (ALPP)*, Lexington, KY, September 2015.

Research grants:

Spiros Mancoridis (PI), Harish Sethu, Naga Kandasamy, and Steven Weber. Machine learning and big data analytics. *Comcast and University of Connecticut Center of Excellence for Security Innovation (CSI)*, January, 2015 – December, 2016. \$200,000.

Steven Weber (PI), Kapil R. Dandekar, Spiros Mancoridis, and Harish Sethu. TTP: Medium: Securing the Wireless Philadelphia Network. *National Science Foundation Secure and Trustworthy Computing Program (NSF-SaTC)*, CNS-1228847, 2012-2015.

Research project: network anomaly detection

Tingshan Huang	Ph.D.		Akamai
Ni An	Ph.D. student	Dept. of ECE	Drexel University
Harish Sethu	Associate Professor	Dept. of ECE	Drexel University
Naga Kandasamy	Associate Professor	Dept. of ECE	Drexel University
Matthew C. Stamm	Assistant Professor	Dept. of ECE	Drexel University
Steven Weber	Professor	Dept. of ECE	Drexel University



T. Huang



N. An



H. Sethu



N. Kandasamy



M. Stamm



S. Weber

Research summary: *i)* dimensionality reduction techniques for low-cost online performance monitoring and anomaly detection, and *ii)* performance overhead tradeoff of distributed principal component analysis via data partitioning.

Publications:

Ni An, Alexander Duff, Gaurav Naik, Michaelis Faloutsos, Steven Weber, and Spiros Mancoridis. Behavioral anomaly detection of malware on home routers. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.



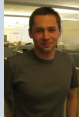


Ni An and Steven Weber. On the sample size of PCA-based anomaly detection. *Proceedings of the 50th Conference on Information Sciences and Systems (CISS)*, Baltimore, MD, March 2017.

Research grants:

Steven Weber (PI), Kapil R. Dandekar, Spiros Mancoridis, and Harish Sethu. TTP: Medium: Securing the Wireless Philadelphia Network. *National Science Foundation Secure and Trustworthy Computing Program (NSF-SaTC)*, CNS-1228847, September, 2012 – August, 2018. \$1,080,800.

Spiros Mancoridis (PI), Harish Sethu, Naga Kandasamy, and Steven Weber. Machine learning and big data analytics. *Comcast and University of Connecticut Center of Excellence for Security Innovation (CSI)*, January, 2015 – December, 2016. \$200,000.

Research project: secure wireless symmetric key generation and protocol-aware reactive jamming of wireless signals

Danh Nguyen	Ph.D. student	Dept. of ECE	Drexel University	
Cem Sahin	Ph.D. student	Dept. of ECE	Drexel University	
Boris Shishkin			LMCO-ATL	
Naga Kandasamy	Associate Professor	Dept. of ECE	Drexel University	
Kapil Dandekar	Professor	Dept. of ECE	Drexel University	
				
D. Nguyen	C. Sahin	B. Shishkin	N. Kandasamy	K.R. Dandekar

Research summary: *i)* **key generation:** collects channel state information (CSI) data from the wireless channel to develop a shared secret key, *ii)* **software-defined radio (SDR) framework** for real-time reactive adversarial jamming in wireless networks. Publications:

Danh Nguyen, Cem Sahin, Boris Shishkin, Nagarajan Kandasamy, and Kapil R. Dandekar. A real-time and protocol-aware reactive jamming framework built on software-defined radios. *Proceedings of the ACM SIGCOMM Software Radio Implementation Forum (SRIF)*, Chicago, IL, August 2014.

Nikhil Gulati, Rachel Greenstadt, Kapil R. Dandekar, and John M. Walsh. GMM based semi-supervised learning for channel-based authentication scheme. *Proceedings of the 7th IEEE Fall Vehicular Technology Conference (VTC)*, Las Vegas, NV, September 2013.

Research grants:

Steven Weber (PI), Kapil R. Dandekar, Spiros Mancoridis, and Harish Sethu. TTP: Medium: Securing the Wireless Philadelphia Network. *National Science Foundation Secure and Trustworthy Cyberspace Program (NSF-SaTC)*, CNS-1228847, September, 2012 – August, 2016. \$1,080,800.

Kapil R. Dandekar (PI), Rachel Greenstadt, and John MacLaren Walsh. A framework for wireless network security based on

Federal funding agencies supporting Drexel cybersecurity research since 2010

Army Research Office	Rapid Innovation Fund	2017–2019
National Security Agency (NSA)	Cybersecurity National Action Plan (CNAP)	2017–2018
National Science Foundation	Computer and Network System (CNS)	2016–2018
National Science Foundation	Secure and Trustworthy Computing (SaTC)	2012–2017
National Science Foundation	Division of Advanced Cyber Infrastructure (ACI)	2014–2017
National Science Foundation	Cybercorps Scholarships for Service (SFS)	2012–2015
National Science Foundation	Faculty Early Career Development Program (CAREER)	2013–2018, 2016–2021
Defense Forensics and Biometrics Agency (DFBA) and Army Research Office (ARO)		2015–2016
Defense Advanced Research Projects Agency (DARPA)	Active Authentication Program	2012–2013
Defense Advanced Research Projects Agency (DARPA)	Integrated Cyber Analysis System (ICAS) Program	2013–2014
Office of Naval Research (ONR)		2015–2018
Air Force Research Labs (AFRL)		2011–2014
National Security Agency (NSA)		2013–2015
Department of Justice (DoJ)	Office of Justice Programs, Bureau of Justice Assistance	2012–2013
Department of Justice (DoJ) / National Institute of Justice (NIJ)		2009–2011

Federal & corp. support for Drexel cybersecurity research projects by agency & year

Agency	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
NSF	200	360		1081	607	150		876	300	4,462
DoJ/NIJ	489			1,487						2,199
DARPA		100	393	699	230				600	2,022
ONR							750			750
DFBA/ARO							375		648	1,023
AFRL			293							293
Intel			540							540
Comcast							288			288
CSRA					60					60
CAS								30		30
Total	689	460	1,225	4,155	897	150	1,413	906	1,548	11,433

More than \$11.4M in cybersecurity research over past nine years, from 7+ agencies, 4+ companies, for 25+ projects, supporting 15+ faculty.

Recent funding awards

Investigators	Agency	Program	Amount	Date
Dandekar	NSF	SaTC	\$300k	September, 2017
Stamm	NSF	CAREER	\$587k	March, 2016
Weber	CAS	Cyber-risk	\$30k	January, 2016
Shokoufandeh, Naik, Weber	Comcast	R&D TechFund	\$88k	November, 2015
Dandekar, de Oliveira, Miller, Nwankpa, Weber	ONR		\$750k	November, 2015
Stamm, Kandasamy	DFBA, ARO		\$375k	February, 2015
Mancoridis, Sethu, Kandasamy, Weber	Comcast	CSI	\$200k	January, 2015
Chen, Larson, Patton, Yang	NSF	CIF21	\$150k	October, 2014
Balduccini, Mancoridis	CSRA		\$60k	October, 2013

Funded research project profile: NSF CAREER (M. Stamm)

Project title	CAREER: Scaling multimedia forensic algorithms for big data and adversarial environments
Funding agency	National Science Foundation
Program	Faculty Early Career Development Program (CAREER)
Investigator	Matthew C. Stamm (PI)
Dates	March, 2016 – February, 2021 (estimated)



M. Stamm

Research summary: (1) scaling forensic algorithms to meet big data challenges, (2) scaling forensic algorithms to handle complex forgeries, and (3) Scaling forensics to meet increased adversarial capabilities.

Funded research project profile: NSF CAREER (R. Greenstadt)

Project title	CAREER: Privacy Analytics for End-Users in a Big Data World
Funding agency	National Science Foundation
Program	Faculty Early Career Development Program (CAREER)
Investigator	Rachel Greenstadt (PI)
Dates	February, 2013 – January, 2018
Award #	CNS-1253418
Link	http://www.nsf.gov/awardsearch/showAward?AWD_ID=1253418



R. Greenstadt

Research summary: answer three interconnected questions about online persona (1) what data does the user consider sensitive, and in what contexts should one share it?; (2) what does the data say about the user; and (3) who knows what?

Funded research project profile: NSF-SaTC (S. Weber)

Project title	TTP: Medium: Securing the Wireless Philadelphia Network
Funding agency	National Science Foundation
Program	Secure and Trustworthy Computing Program (NSF-SaTC)
Investigators	Steven Weber (PI), Spiros Mancoridis, Harish Sethu, Kapil R. Dandekar
Dates	September, 2012 – August, 2016
Award #	CNS-1228847
Link	http://www.nsf.gov/awardsearch/showAward?AWD_ID=1228847



S. Weber



S. Mancoridis



H. Sethu



K.R. Dandekar

Research summary: *i)* efficient anomaly detection algorithms for large wireless networks, *ii)* physical layer encryption algorithms and user authentication in wireless networks, and *iii)* software sensors on the hardware, operating system, virtual machine, and application server for web server anomaly detection.

Funded research project profile: NSF-SFS (K. Dandekar)

Project title	Capacity building: Development and dissemination of the Drexel University cybersecurity program
Funding agency	National Science Foundation
Program	CyberCorps Scholarship for Service Program (NSF-SFS)
Investigators	Kapil R. Dandekar (PI), Constantine Katsinis, Steven Weber, Chris Yang, Rachel Greenstadt
Dates	November, 2012 – October, 2015
Award #	DUE-1241631
Link	http://www.nsf.gov/awardsearch/showAward?AWD_ID=1241631



K.R. Dandekar



C. Katsinis



S. Weber



C. Yang



R. Greenstadt

Research summary: funded the development of the interdisciplinary Master of Science in Cybersecurity degree program at Drexel University.

Funded research project profile: ONR (K.R. Dandekar)

Project title	Secure wireless control for future naval smart grids
Funding agency	Office of Naval Research (ONR)
Investigators	Kapil R. Dandekar (PI), Steven Weber, Chikaodinaka Nwankpa, Jaudelice de Oliveira, Karen Miu Miller
Dates	November, 2015 – December, 2018
Award #	N000141612037



K.R. Dandekar



S. Weber



C. Nwankpa



J. de Oliveira



K. Miu

Research summary: design secure wireless sensor networks for monitoring shipboard power generation and distribution systems.

Funded research project profile: NSF (C. Yang)

Project title	CIF21 DIBBs: DIBBs for Intelligence and Security Informatics Research Community
Funding agency	National Science Foundation
Program	Division Of Advanced Cyber Infrastructure (ACI)
Investigators	Hsinchun Chen (U. Arizona) (PI), Catherine Larson (U. Arizona), Mark Patton (U. Arizona), Chris Yang
Dates	October, 2014 – September, 2017
Award #	ACI-1443019
Link	



H. Chen



C. Larson



M. Patton



C. Yang

Research summary: develop a research infrastructure for the Intelligence and Security Informatics (ISI) community comprised of experts across the computer, information, and social sciences.

Funded research project profile: Comcast (S. Mancoridis)

Project title	Machine learning and big data analytics
Funding agency	Comcast and the University of Connecticut
Program	Center of Excellence for Security Innovation (CSI)
Investigators	Spiros Mancoridis (PI), Harish Sethu, Naga Kandasamy, Steven Weber
Dates	January, 2015 – December, 2016



S. Mancoridis



H. Sethu



N. Kandasamy



S. Weber

Research summary: *i)* develop anomaly detection methods and algorithms for large-scale DNS datasets, and *ii)* develop malware detection and classification sensors for embedded systems.

Recent cybersecurity research publication venues by Drexel faculty

- 2017 IEEE Wireless Communications and Networking Conference (WCNC)
- 2016,2017 Conference on Information Sciences and Systems (CISS)
- 2017 IEEE Transactions on Information Forensics and Security
- 2017 IEEE Transaction on Computer
- 2016 IEEE International Symposium on Circuits and Systems (ISCAS)
- 2016 *IEEE Systems Journal*
- 2016 IEEE/ACM Great Lake Symposium on VLSI (GLSVLSI)
- 2015 *ASIS Security Journal*
- 2015 *IEEE Transactions on Information Forensics and Security*
- 2015 IEEE International Workshop on Information Forensics and Security (WIFS)
- 2015 Usenix Security Symposium
- 2015 Information Security Solutions Europe (ISSE)
- 2015,2017 International Conference on Malicious and Unwanted Software (MALCON)
- 2015 International Conference on Quality, Reliability, and Security (QRS)
- 2015 IEEE International Symposium on Software Reliability Engineering (ISSRE)
- 2014 ACM SIGCOMM Software Radio Implementation Forum (SRIF)
- 2014 ACM Conference on Data and Application Security and Privacy (CODASPY)

Select set of cybersecurity research publications by Drexel faculty

Ni An, Alexander Duff, Gaurav Naik, Michaelis Faloutsos, Steven Weber, and Spiros Mancoridis. Behavioral anomaly detection of malware on home routers. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.

Bander Alsulami, Spiros Mancoridis, Avinash Srinivasan, and Hunter Dong. Lightweight behavioral malware detection for windows platforms. *12th International Conference on Malicious and Unwanted Software*, Fajardo, Puerto Rico, October 11 – 14 2017.

J. Chacko, K. Juretus, M. Jacovic, C. Sahin, N. Kandasamy, I. Savidis, and K. Dandekar. Securing wireless communication through physical layer key based packet obfuscation. *IEEE Transaction on Computer*, 2017.

O. Mayer and Matthew Stamm. Accurate and efficient image forgery detection using lateral chromatic aberration. *IEEE Transactions on Information Forensics and Security*, 2017.

Ni An and Steven Weber. On the sample size of PCA-based anomaly detection. *Proceedings of the 50th Conference on Information Sciences and Systems (CISS)*, Baltimore, MD, March 2017.

M. Ping, Bander Alsulami, and Spiros Mancoridis. On the effectiveness of application characteristics in the automatic classification of malware smartphones. *the IEEE International Conference on Malicious and Unwanted Software (MALWARE'16)*, Puerto Rico, October 2016.

Ahmad Darki, Alex Duff, Z. Qian, Gaurav Naik, Spiros Mancoridis, and M. Faloutsos. Don't trust your router: detecting compromised router. *The IEEE proceedings of the 12th International Conference on Emerging Networking Experiments and Technologies CoNEXT'16 Student Workshop*, Irvine, CA, 2016.

Kyle Juretus and Ioannis Savidis. Reduced overhead gate level logic encryption. *IEEE/ACM Great Lake Symposium on VLSI (GLSVLSI)*, Boston, MA, May 2016.

Rob D'Ovidio, Murugan Anandarajan, and Irv Schlanger. Patrons Beware: Security Vulnerabilities and Public Access Internet Facilities. *ASIS Security Journal*, (in press) 2015.

T. Huang, N. Kandasamy, and H. Sethu. Anomaly detection in computer systems using compressed measurements. *Proceedings of the IEEE International Symposium on Software Reliability Engineering (ISSRE)*, Gaithersburg, MD, November 2015.

Current Drexel graduate students performing cybersecurity research



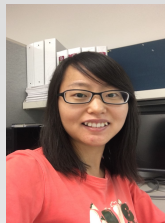
Bander Alsulamy
Ph.D. student
Advisor: S. Mancoridis



Ni An
Ph.D. student
Advisor: S. Weber



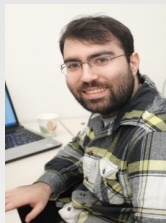
Belhassen Bayar
Ph.D. student
Advisor: M.C. Stamm



Chen Chen
Ph.D. student
Advisor: M.C. Stamm



Owen Mayer
Ph.D. student
Advisor: M.C. Stamm



Cem Sahin
Ph.D. student
Advisor: K.R. Dandekar



Xinwei Zhao
Ph.D. student
Advisor: M.C. Stamm

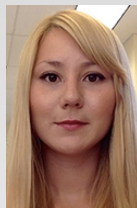
Drexel Ph.D. graduates with cybersecurity-related theses



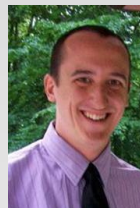
Sadia Afroz
Berkeley Post-doc
Advisor: R. Greenstadt



Michael Brennan
Ford Foundation
Advisor: R. Greenstadt



Aylin Caliskan-Islam
Princeton Post-doc
Advisor: R. Greenstadt



Ray Canzanese
Sift Security
Advisors: S. Mancoridis / M. Kam



Lex Fridman
M.I.T. Post-doc
Advisors: M. Kam / S. Weber



Tingshan Huang
Akamai
Advisors: H. Sethu / N. Kandasamy



Prathaban Mookiah
SAS
Advisor: K.R. Dandekar



Ariel Stoleran
Google
Advisor: R. Greenstadt

Drexel Ph.D. graduates with cybersecurity-related theses

Brandon Katz. Enabling real-time wireless channel based encryption key generation (MS thesis defense). *Advised by Kapil Dandekar, May 2016.*

Tingshan Huang. Adaptive sampling and statistical inference for anomaly detection (Ph.D. thesis defense). *Advised by Harish Sethu and Naga Kandasamy, November 2015.*

Aylin Caliskan-Islam. Stylometric fingerprints and privacy behavior in textual data (Ph.D. thesis defense). *Advised by Rachel Greenstadt, June 2015.*

Ray Canzanese. Detection and classification of malicious processes using system call analysis (Ph.D. thesis defense). *Advised by Moshe Kam and Spiros Mancoridis, May 2015.*

Ariel Stolerman. Authorship verification (Ph.D. thesis defense). *Advised by Rachel Greenstadt, April 2015.*

Lex Fridman. Learning of identity from behavioral biometrics for active authentication on desktop computers and mobile devices (Ph.D. thesis defense). *Advised by Moshe Kam and Steven Weber, December 2014.*

Sadia Afroz. Deception in authorship attribution (Ph.D. thesis defense). *Advised by Rachel Greenstadt, June 2014.*

Michael Brennan. Managing quality, identity and adversaries in public discourse with machine learning (Ph.D. thesis defense). *Advised by Rachel Greenstadt, December 2012.*

Select list of Drexel faculty leadership in the cybersecurity research community

Spiros Mancoridis. Technical Program Committee Member. *Malware Conference*, Fajardo, Puerto Rico, October 2017.

Steven Weber. Academia Sector Chief. *Philadelphia Cyber Education Alliance*, Philadelphia, PA, February 2017.

Matthew Stamm. General Chair. *ACM Workshop on Information Hiding and Multimedia Security*, Philadelphia, PA, June 2017.

Rachel Greenstadt. Co-Editor in Chief. *Proceedings on Privacy Enhancing Technologies*, 2017 – 2018.

Christopher C. Yang. General Chair. *IEEE ICDM Workshop on Intelligence and Security Informatics*, Atlantic City, NJ, November 2015.

Rachel Greenstadt. General Chair. *Privacy Enhancing Technologies Symposium*, Philadelphia, PA, June 2015.

Marcello Balduccini. Member. *NIST Cyber-Physical Systems Public Working Group*, 2014–present.

Chris Yang. Associate Editor-In-Chief. *Springer Security Informatics*, 2010–present.

Rob D'Ovidio. Member. *International Association of Chiefs of Police, Computer Crime and Digital Evidence Committee*, 2010–present.

Cybersecurity patents marketed by Office of Technology Commercialization

Prathaban Mookiah, Kapil R. Dandekar, John MacLaren Walsh, and Rachel Greenstadt. A reconfigurable antenna based solution for device authentication in wireless networks. [Granted Patent: US 9560073 B2, 2017. Drexel University.](#)

Boris Shishkin, Kpil Dandekar, Danh Nguyen, Cem Sahin, Nagarajan Kandasamy, and David Dorsey. Real-time and protocol-aware reactive jamming in wireless networks. [Granted Patent US 9531497 B2, 2016. Drexel University.](#)

Kyle Juretus and Ioannis Savidis. Reduced overhead gate level logic encryption. [Provisional US Patent Application Pending, 2016. DRX.P020.US.61.](#)

Cem Sahin and Kapil Dandekar. Symmetric encryption key generation using wireless physical layer information without sharing any information pertinent to the key. [Provisional Patent Application 62/261,761, 2016. Drexel University.](#)

Spiros Mancoridis, Raymond Canzanese, and Moshe Kam. Behavioral change-point malware detection system, 2016. [Patent Pending.](#)

Kyle Juretus and Ioannis Savidis. Low overhead gate level logic encryption. [U.S. Patent Application No. 62/245,155, 2015. Drexel Technology ID 15-1848.](#)

Raymond Canzanese Jr., Spiros Mancoridis, and Moshe Kam. Behavioral change-point malware detection system. [Provisional US Patent Application 61/979,259 Pending, 2011. Drexel Technology ID 14-1651D.](#)

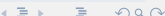
Prathaban Mookiah, Kapil R. Dandekar, John MacLaren Walsh, and Rachel Greenstadt. A reconfigurable antenna based solution for device authentication in wireless networks. [International Application Pending: PCT/US2012/054205, 2011. Drexel Technology ID 11-1327D.](#)

Spiros Mancoridis, Chris Rorres, Maxim Shevertalov, Edward Stehle, and Kevin Lynch. Zero-day malware and software fault detection and mitigation for enterprise, cloud, and ecommerce servers. [US and International patents pending - PCT/US2011/022846, US-2013-0198565-A1, 2009. Drexel Technology ID 09-1111D.](#)

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60+ major engagements with 40+ government agencies and corporations

CenTrak	02/2017	U.S. Army CERDEC and ARDEC	persistent
BHP Enterprises, LLC	01/2017	The Judge Group	07/2015 – present
SAP	03/2017 – present	Areva Nuclear	06/2015
NSA Center of Academic Excellence (CAE) program	09/2016 – present	Exelon/PECO	06/2015
Alion Science and Technology	06/2016 – present	Turkish Air Force Academy	04/2015
National Institute of Standards and Technology (NIST)	05/2016	Jardine Lloyd Thompson (JLT)	04/2015 – 5/2015
Ben Franklin Technology Partners of Southeastern PA	04/2016	National White Collar Crime Center	03/2015
Sabre Systems	03/2016	DSA, Inc.	03/2015
U.S Army Reserve	persistent relationship	Northrup Grumman	03/2015
Foreign Policy Research Institute (FPRI)	01/2016	Comcast	03/2015 – present
Office of Government Relations (OGR)	01/2016 – present	Casualty Actuarial Society	03/2015 – present
Susquehanna International Group (SIG)	01/2016 – present	Fitlinxx Inc.	03/2015
Huawei North America	12/2015	Toffler Associates	3/2015 – 06/2015
Bowhead IT Group	11/2015	Lockheed Martin LMCO-ISGS	03/2015 – 05/2015
Federal Reserve Bank of Phila.	10/2015 – present	National Security Agency	persistent
FAA ASSURE CoE UAS	10/2015 – present	Gnostech	02/2015
Pro2Serve	9/2015 – present	L3 Communications	01/2015 – present
Praxis Engineering	08/2015	Federal Bureau of Investigation	12/2014 – present
Innovative Defense Technologies	8/2015	Vanguard	12/2014 – present
Cybersecurity Analysis, Ltd.	08/2015	Probaris	10/2014 – present

bold denotes significant relationships. In coordination with Debbie Buchwald, Office of Corporate Relations. 

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Courses, degrees, and certificates

NSA/DHS CAE-CDE

NSA-Cybersecurity Workforce Education Grant

USAR P3i-Cyber

NCS-NSA Articulation Agreement

CyberDragons

Other

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Drexel cybersecurity-related academic degree programs

- Masters of Science in Cybersecurity (CYBR)
- Bachelor of Science in Computing and Security Technology (CST)
- Bachelor of Science in Computer Science – Computer Security Concentration.
- Certificate in Computing and Security Technology
- Undergraduate Minor in Computer Crime

Drexel M.S. in Cybersecurity

- Motivation – conversations with NSA about the need for more *deeply technical* graduate programs in cybersecurity.
- Key novelty – interdisciplinary structure with coursework integrated between CCI/CS and CoE/ECE.
- Designed for students with an UG degree in computer engineering, computer science, electrical engineering, etc.
- Launched as an on-campus program in Fall 2013; approved as online program in Spring 2014.
- Development funded by a “capacity building” grant awarded to Drexel in 2012 from the National Science Foundation (NSF) Cybercorps Scholarships for Service (SFS) program (Dandekar (PI), Weber, Katsinis, Greenstadt)
- Advertisement video featuring remarks by Weber, Katsinis, and Dandekar produced in June, 2014

Cybersecurity courses offered AY 2016-2017

Term	Course	Title	Instructor	#
Spr 2017	ECEC 680	Hardware Security and Trust	I. Savidis	6
	ECEC 643	Web Security III	H. Sethu	12
	ECES 523	Detection & Estimation Theory	F. Cohen	5
	CS 475	Computer and Network Security	G. Naik	31
	CS 645	Network Security	B. Stuart	13
	CT 222	Security and Information Warfare	J. McGarvey	28
	INFO 333	Intro. to Information Security	J. McGarvey	19
	INFO 517	Principles of Cybersecurity	P. Grillo	22
	INFO 710	Information Forensics	T. Heverin	16
Win 2017	ECEC 642	Web Security II	H. Sethu	28
	ECES 522	Random Processes & Spectral Analysis	J. Walsh	19
	CS 543	Operating Systems	M. Kain	15
	CT 382	Applied Cryptography	W. Pehrsson	16
	CT 325	Operating system Security Architecture I	D. Comroe	18
	CT 422	Incident Presponse Best Practices	D. Whipple	17
	CT 472	Security Defense Countermeasures	D. Comroe	14
	INFO 712	Information Assurance	C. Mascaró	11
	INFO 719	Intro. to National Security Enterprise	E. Garber	8
	HSM 544	Intro. to Homeland Security	R. Macreight	4
	HSM 604	Technology for Homeland Security	M. Aspland	8
Fall 2016	ECET 511	Physical Foundations of Telecoms.	A. Daryoush	14
	CS 303	Algorithmic Number Theory and Cryptography	J. Johnson	26
	CST 609	National Security Intelligence	R. McCreight	12
	INFO 333	Intro. to Information Security	D. Comroe	21
	INFO 375	Intro. to Information Systems Assurance	C. Mascaró	14
	INFO 517	Principles of Cybersecurity	D. Whipple	29
	INFO 710	Information Forensics	C. McClain	16

Example course – web security I and II (Harish Sethu)

Course topics

- A security-conscious intro. to web protocols
- **Symmetric and public key encryption**
- Digital certificates and authentication
- A security-conscious intro. to HTML & CSS
- A security-conscious intro. to JavaScript
- Origin-based isolation of content
- Encrypted web communications (HTTPS)
- Attacks on Domain Name System (DNS)
- DNS Security Extensions (DNSSEC)
- Security and AJAX
- Web privacy
- Anonymous web browsing
- Illegal hosting and anonymous publishing
- Internet censorship and surveillance
- Elliptic curve cryptography (ECC)
- Web-based malware

Symmetric and public key encryption subtopics

- Symmetric key cryptography; Data Encryption Standard (DES) and the Advanced Encryption Standard (AES); triple DES; cipher block chaining; attacks on cryptographic protocols.
- Secret key exchange protocols; the Diffie-Hellman Exchange (DHE); attacks on DHE and countermeasures.
- Fundamentals of number theory; modular arithmetic; Fermat's and Euler's theorems; primality testing; the Chinese Remainder Theorem.
- Principles of public key cryptography; the RSA algorithm and practical implementation details; the choice of public and private keys; strategies for attacking RSA; how secure is RSA?
- Cryptography in practice on the web; limitations of cryptography.

National Security Agency (NSA) / Department of Homeland Security (DHS) Center of Academic Excellence (CAE) in Cyber Defense Education (CDE)

- Drexel has held designation for over ten years
- The application for the recertification was submitted in January 2017. Drexel was recertified as an NSA-CAE Cyber Defense Education (CDE) in June 2017.
- Conferred upon institutions with cybersecurity-related education programs in line with NSA/DHS recommended best practices
- The certification is valid through academic year 2022.

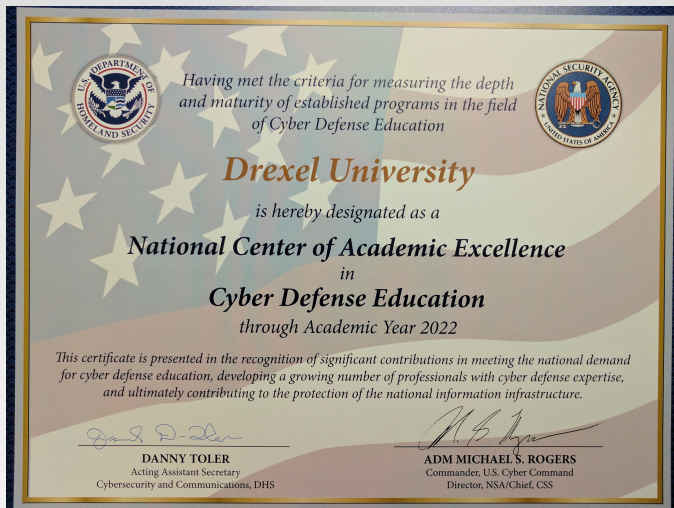
National Security Agency (NSA) / Department of Homeland Security (DHS) Center of Academic Excellence (CAE) in Cyber Defense Education (CDE)

Recertification requires establishing coverage of each of twenty-two (22) knowledge units (KUs):

Basic data analysis	Networking concepts
Basic scripting	Operating systems concepts
Cyber defense	Policy, legal, ethics, compliance
Cyber threats	Probability and statistics
Databases	Programming
Fundamental security design principles	Systems administration
IA Fundamentals	Advanced network technology and protocols
Intro to cryptography	Database management systems
IT system components	Low level programming
Network defense	Operating systems theory
Network technology and protocols	Security risk analysis

Each KU has an associated set of topics to be matched with topics covered in courses.

National Security Agency (NSA) / Department of Homeland Security (DHS) Center of Academic Excellence (CAE) in Cyber Defense Education (CDE)



National Security Agency (NSA) / Department of Homeland Security (DHS) Center of Academic Excellence (CAE) in Cyber Defense Education (CDE)



NSA/DHS CAE-CDE Certification ceremony at the 9th Annual National Cyber Summit

NSA Cybersecurity Workforce Education Grant

This grant will fund the development and offering of several new cybersecurity laboratory courses aimed at senior undergraduate students in Drexel's Department of Electrical and Computer Engineering (ECE), including:

- 1 Security Offensive and Defensive Topics
- 2 Blockchain and Cryptocurrency Laboratory
- 3 Wireless Security Laboratory
- 4 Image and Video Forensics Laboratory

U.S. Army Reserve Private Public Partnership in Cybersecurity

- ILACI was notified on August 30th 2016 that the Drexel Cybersecurity for Soldiers Program (DCSP), a proposal written by Drexel, was recommended for funding by the NSA and U.S. Army Reserve.
- Use. The funds will be used to develop new cybersecurity courses and laboratories in CCI and in CoE over the next twelve months.
- Seminar series. Besides the courses, the DCSP Seminar Series, consisting of six cybersecurity seminars, will also be developed.

National Cryptologic School (NCS) of National Security Agency (NSA) Articulation Agreement

Since 2016, ILACI has put an effort on the agreement between Drexel University and National Cryptologic School (NCS) of the National Security Agency (NSA). The purpose of this agreement is to address the individual needs of the students of the NCS, to recognize the complementary nature of the NSA and Drexel University programs and to provide students who have completed certain NSA-sponsored coursework an opportunity to more efficiently earn the Drexel University Master of Science degree in Cybersecurity.

- ILACI and NCS agreed to confer with each other on a yearly basis regarding changes in curricula involved in this articulation agreement.
- The agreement was shared with NCS in June, 2017, and has been under review.

CyberDragons

- In August 2016, the Drexel CyberDragons, a student group, was officially formed.
- The club focuses on general education in cybersecurity and the training students for the Collegiate Cyber Defense Competition (CCDC)
- Initial Officers. Colbert Zhu (President), Jennifer Bondarchuk (Vice President), Maksim Bazhydlouski (Treasurer), and Chuck Clift (System Administrator).
- Mentorship. Mr. Chuck Ludwig, head of security at Susquehanna International Group (SIG).
- Structure. Any student with an interest in cybersecurity can join the CyberDragons and participate in the trainings.
- Equipment. SIG has donated equipment for use by the Drexel CyberDragons; the equipment is housed in the ECE Department.
- In February, the team had the first qualifier and placed top 8. The team was qualified to participate regional competition.
- From March 30th to April 1st, the team participated the first Mid-Atlantic Collegiate Cyber Defense Competition and placed 4th.

CyberDragons



CyberDragons' logo

CyberDragons



CyberDragons' first qualifier

CyberDragons



CyberDragons' first MACCDC

Variety of other engagements on cybersecurity education

- Formation of the organization called Philadelphia Cybersecurity Education Alliance in 2017
- Accommodation of the first Philly BSide Conference in 2016 and 2017
- Accommodation of Philadelphia Security Shell regular meetings since 2016
- Extensive interactions with Susan Aldridge and Drexel University Online (DUO) on marketing Drexel cybersecurity education degrees
- Extensive interactions with Debbie Buchwald (Office of Corporate Relations) and Anna Koulas / Patricia Connelly in LeBow Corporate and Executive Education on corporate cybersecurity education
- Involvement in CoE Dean Joe Hughes's effort to build Drexel Peace Engineering, through engagement with Bernard Amadei (Engineers Without Borders) and the Peace Tech Lab (Sheldon Himelfarb)
- Joined the National Cyberwatch Center (cybersecurity education resource clearinghouse), executive director Casey O'Brien
- Participated in 2015 Comcast / U. Conn. CyberSEED hackathon (Mancoridis and Kandasamy)
- Presented at the 2015 Drexel University Computing Academy (DUCA) (M. Stamm)
- Discussions about joint degree and certification initiative with ISACA
- Discussions with Philadelphia String Theory charter school (Balchunas)
- Discussions with Valley Forge Military College (Wayne, PA) (Balchunas)
- Creation of first student chapter of National Military Intelligence Association (NMIA) (Balchunas)

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15 events, guest lectures, symposia organized or co-organized by ILACI

2017	Dec.	Philly BSides	Philly BSides Conference
	Jan.	Alion Science	Visitors from Alion Science
2016	Dec.	Philly BSides	Philly BSides Conference
	Nov.	Avinash Srinivasan	Research and Education in Cybersecurity and Forensics: Quo Vadis?
	Oct.	Min Wu, U. Maryland	When Power Meets MULTimedia
	Oct.	4A Security	Healthcare Data Privacy Symposium
	Jan.	Marty Schratz, Judge Group	Best practices for students with IT graduate degrees to enter the business world
2015	Oct.	Ben Goodman, 4A Security	Healthcare Data Security and Privacy Symposium
	June	Dave Whipple, Exelon	Innovating Securely
	May	Rob Johnson, Unisys	Public and Private Cloud Network Security: Mitigating Virtual Machine Vulnerabilities
	Apr.	DCI/CVDI	Balancing Act: Big Data, Cybersecurity, and Privacy
	Mar.	Hal Berghel, UNLV	The Future of Digital Money Laundering
	Mar.	Darin Bielby, Navigant	Data Privacy Challenges in 2015
	Feb.	Ben Goodman, 4A Security	Life threatening hacks: mobile health and medical device data security
	Feb.	DCI	Drexel Cybersecurity Education Summit (Washington, D.C.)

Near-monthly newsletter sent out to the ILACI “community”

December, 2014
November, 2014
October, 2014

August, 2014
July, 2014
June, 2014
May, 2014

March, 2014
February, 2014

December, 2015
November, 2015
October, 2015
September, 2015

June, 2015
May, 2015
April, 2015
March, 2015
February, 2015
January, 2015

April, 2017

September, 2017

Since 2017, the newsletter is sent out near-quarterly.

75 / 80

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Three Drexel faculty regularly interviewed by the media



Steven Weber
Interim Dept. Head
Professor, CoE
Mathematical Modeling of
Computer



Rob D'Ovidio
Associate Professor, CoAS
Digital forensics and Cyber crime



Rachel Greenstadt
Associate Professor, CCI
Privacy and security



Kapil Dandekar
Professor, CoE
Wireless physical layer security

Select list of recent cybersecurity news articles quoting Drexel faculty

Britt Faulstick. Drexel Team Eyes Collegiate Cyber Defense Competition. *DrexelNow*, January 11, 2017.

Harold Brubaker. Wearable tech gaining in healthcare, but privacy is a concern. *Philly Inquirer*, January 20, 2017.

Melony Roy. Hacker has message for President Trump: Change your security settings. *CBS News*, January 27, 2017.

Ian Bush. Team of drexel students compete against the best in computer programming and defense. *CBS Philly News*, January 28, 2017.

Drexel student team qualifies for Mid-Atlantic Collegiate Cyber Defense Competition. *College of Computing and informatics*, March 13, 2017.

Britt Faulstick. How can higher ed catch up with the demand for cybersecurity pros? *Drexel University Drexel News Blog*, March 20, 2017.

Natalie Gross. 10 schools top new ranking of best cybersecurity programs. *Military Times*, April 3, 2017.

Ben Seal. Drexel Cybersecurity Team's first season marked by 'Amazing' growth. *Drexel Now*, April 13, 2017.

Lauren Mayk. Global Cyberattack Concerns Go Local. *NBC 10*, May 15, 2017.

Britt Faulstick. Drexel named center of academic excellence for cybersecurity education. *Drexel Now*, June 28, 2017.

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Contact Us



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