



Institute of Networking and Security Research

<http://insr.cse.psu.edu/>

9th INSR Industry Day Welcome and Overview

Professor Patrick McDaniel, Director
School of Electrical Engineering and Computer Science
College of Engineering, Penn State University

Mission: Enabling robust, high performance secure internetworked information systems

Welcome

- On behalf of the the faculty, staff, and students of INSR, we would like to welcome you to Penn State.



Welcome from Penn State

- Anthony Atchley, Senior Associate Dean, College of Engineering
- Tom La Porta, Head, School of Electrical Engineering and Computer Science
- Chita Das, Head, Department of Computer Science and Engineering



- **Task:** Over the next 1.5 days we will highlight the technical efforts and accomplishments of the INSR faculty and students
- **Goal:** Open up new opportunities for collaboration, student placement, and make connections
- Highlights
 - ▶ Overview and research talks
 - ▶ Poster session (**28!** posters this year)
 - ▶ *New:* Featured Faculty and Student Talks
 - ▶ Hallway track (breaks, dinner ...)



- What INSR wants from you ...
 - ▶ What are the key problems facing your organization today?
 - ▶ What are the market and technical imperatives moving forward?
 - ▶ What is the role of University research in your organization and industry? What do you want it to be and how can we make it better?
 - ▶ What are your hiring needs?



The real key for us is understanding how what we do as educators, researchers, and members of the technical community can provide relevance to your industry?

Thanks to the organizers!

- It is difficult to underestimate the amount of work that goes into preparing an event like this, and we want to thank the staff and students who have made this happen.
- A couple of people to thank in particular
 - ▶ Crystal Rearick
 - ▶ Amy Hasan
 - ▶ **Judy Bowes**
 - ▶ INSR Students!





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INSR Overview

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A brief history of INSR ...



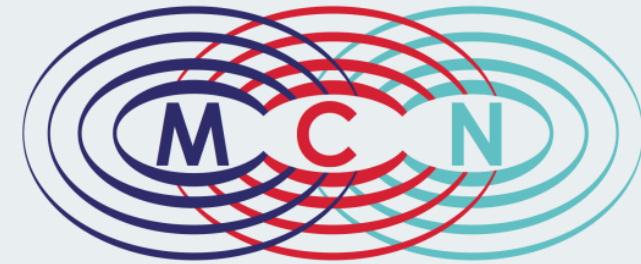
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Lucent Technologies
Bell Labs Innovations



- Networking and communications:
 - ▶ Wireless networking, communication and information theory
 - ▶ enables ubiquitous connectivity Internet and telecommunications, ad hoc and sensor networks Information dissemination and quality of information
 - ▶ Supported by **NSF CISE; DoD (ARL, DTRA), UK MoD, industry ...**



Mobile Computing and
Networking Laboratory



CSE



- Systems and network security:
 - ▶ Security and privacy
 - ▶ enables secure end-to-end information flow Secure platforms, programming languages, distributed systems, privacy, cryptography, monitoring, security management and architecture, design for security Internet, telecommunication and military networks
 - ▶ Supported by **NSF CISE; DoD (AFOSR, ARL), NSA, industry, ...**

- 13 faculty, over 50 students
 - ▶ Ph.D., M.S. and Schreyer Honors College Seniors
- Diverse Expertise
 - ▶ Wireless networking and communications Software systems
 - ▶ All aspects of security: networking, systems, policies, cryptography, privacy
- **Industrial sponsors:** Accipiter Systems, Alcatel-Lucent, Applied Sciences, AT&T, Battelle, BBN-Raytheon, Bluecoat, Boeing, Cisco, Google, Harris, Hewlett-Packard, HP, IBM, Intel, Lockheed Martin, Microsoft, Motorola, Narus, Raytheon, Sprint, Symantec, Vocollect, ...
 - ▶ Ben Franklin Center of Excellence (2007-2009)
- **Student placements:** Ga Tech, U. of Oregon, U. of Florida, Microsoft Research, Amazon, Google, Nokia, U. of Tennessee, U. of Arkansas, U. of Waterloo, AMD, Symantec, Samsung, Imperial College, Klout, Palo Alto Networks, Oracle, Akamai, and *many, many* more



INSR: Principal Faculty/Research Members



Viveck Cadambe	EE/COE	Communication and Storage Systems
Guohong Cao	CSE/COE	Mobility, Distributed Systems
Bruce Einfalt	ARL	Networking and Comm
Swaroop Ghosh	CSE/COE	Hardware Security
Sean Hallgren	CSE/COE	Theory, Cryptography
Ting He	CSE/COE	Networking, Tomography
Trent Jaeger	CSE/COE	Secure operating systems
Thomas La Porta	CSE/COE	Mobility, Telecommunications
Wang-Chien Lee	CSE/COE	Pervasive computing
Patrick McDaniel	CSE/COE	Network and Systems Security
Adam Smith	CSE/COE	Cryptography, Privacy
Allan Sonsteby	ARL	Networking and Comm
Gan Tan	CSE/COE	Programing Languages, Security
Jing Yang	EE/COE	Wireless Comms and Information Theory
Danfeng Zheng	CSE/COE	Programing Languages, Security
Sencun Zhu	CSE/COE and IST	Network Security

By the numbers ...

- More than 100 refereed publications every year since 2010
- Funding: Over \$46.6M since 2005 (over \$11.5M since 2014)
 - ▶ National Science Foundation (10)
 - ▶ Air Force Research Laboratory
 - ▶ Army Research Lab
 - ▶ Army Research Office
 - ▶ Defense Threat Reduction Agency
 - ▶ National Security Agency
 - ▶ Office of Naval Research
 - ▶ Sloan Foundation Research Award
 - ▶ Symantec Research Labs
 - ▶ ...



News Highlights ...

- New faculty in INSR: Viveck Cadambe, Ting He, Swaroop Ghosh, Gong Tan, Jing Yang, and Danfeng Zhang
- Distributed Analytics and Information Sciences ITA
 - ▶ 10 year project with ARL on new network analytics launched in fall 2016
- *Best Student Paper*
 - ▶ 2017 ACM Symposium on SDN Research (SOSR), *S. Achleitner*, T. La Porta and T. Jaeger, and P. McDaniel
- *Science of Security Index of Significant Research in Cyber*
 - ▶ "Toward a Science of Secure Environments", Science of Security Virtual Organization (SOS-VO), August 2015
- INSR Organization
 - ▶ Tom La Porta Name Head of new EECS School
 - ▶ Patrick McDaniel Named as Director of INSR



- Adam Smith, a computer science and engineering professor for the School of Electrical Engineering and Computer Science at Penn State, has been awarded the 2017 Gödel Prize for his 2006 paper, “Calibrating noise to sensitivity in private data analysis,” which introduced the concept of *differential privacy*. Smith shares the award with co-authors Cynthia Dwork, Frank McSherry and Kobi Nissim.

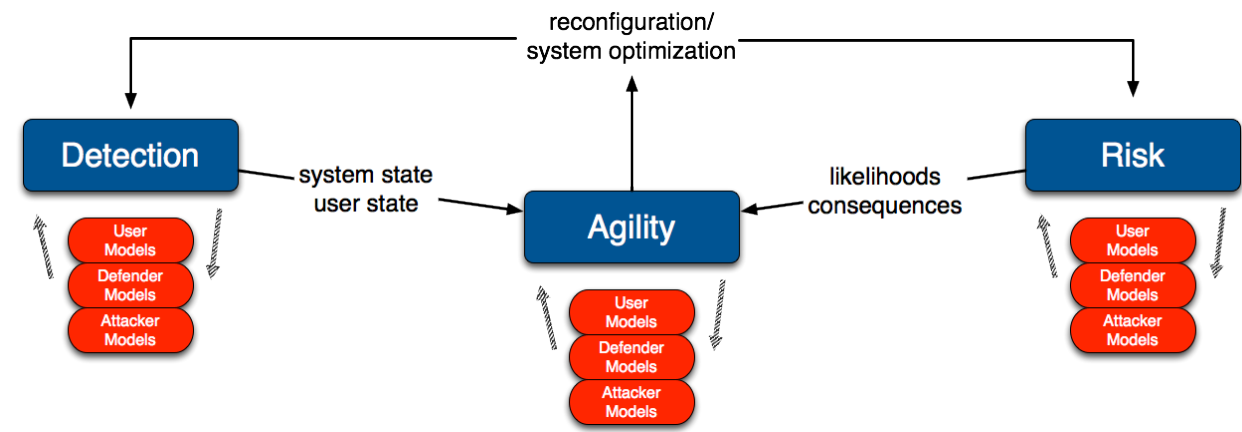


- **Differential privacy**: Imagine you have two otherwise identical databases, one with your information in it, and one without it. Differential Privacy ensures that the probability that a statistical query will produce a given result is (nearly) the same whether it's conducted on the first or second database.
- This is a limit on the amount of information you share ...



Cyber-Security CRA (*cra.psu.edu*)

- The Collaborative Research Alliance (CRA) is a 10-year, \$48 million project funded by the Army Research Laboratory and CERDEC



- Diverse collection of researchers from academic, military, and industrial organizations to form an effort in security, risk analysis, and human factors
 - ▶ Developing a new science of cyber-security for DoD
 - ▶ Alliance efforts partitioned into group areas consisting of collaborating members from all partner institutions
- Year 4 (renewal decision in fall 2017)



Network Science CTA

- Three Cross-Cutting Research Thrusts
 - ▶ Evolution and Dynamics of Integrated Networks
 - ▶ Information Processing and Analysis
 - ▶ Quality of Information for Semantically Adaptive Networks
 - Vision: Understand how to control network behaviors so that the capacity of the network to deliver relevant information of sufficient quality can be maximized
 - Treat the network as an Information Source delivering quality information to support decision making
 - New formal definition of network carrying capacity
 - Unified theory for QoI-aware information inference & fusion
- Collaborative Alliance
 - ▶ Funded by US Army Research Lab
 - ▶ Collaborative research with ARL members

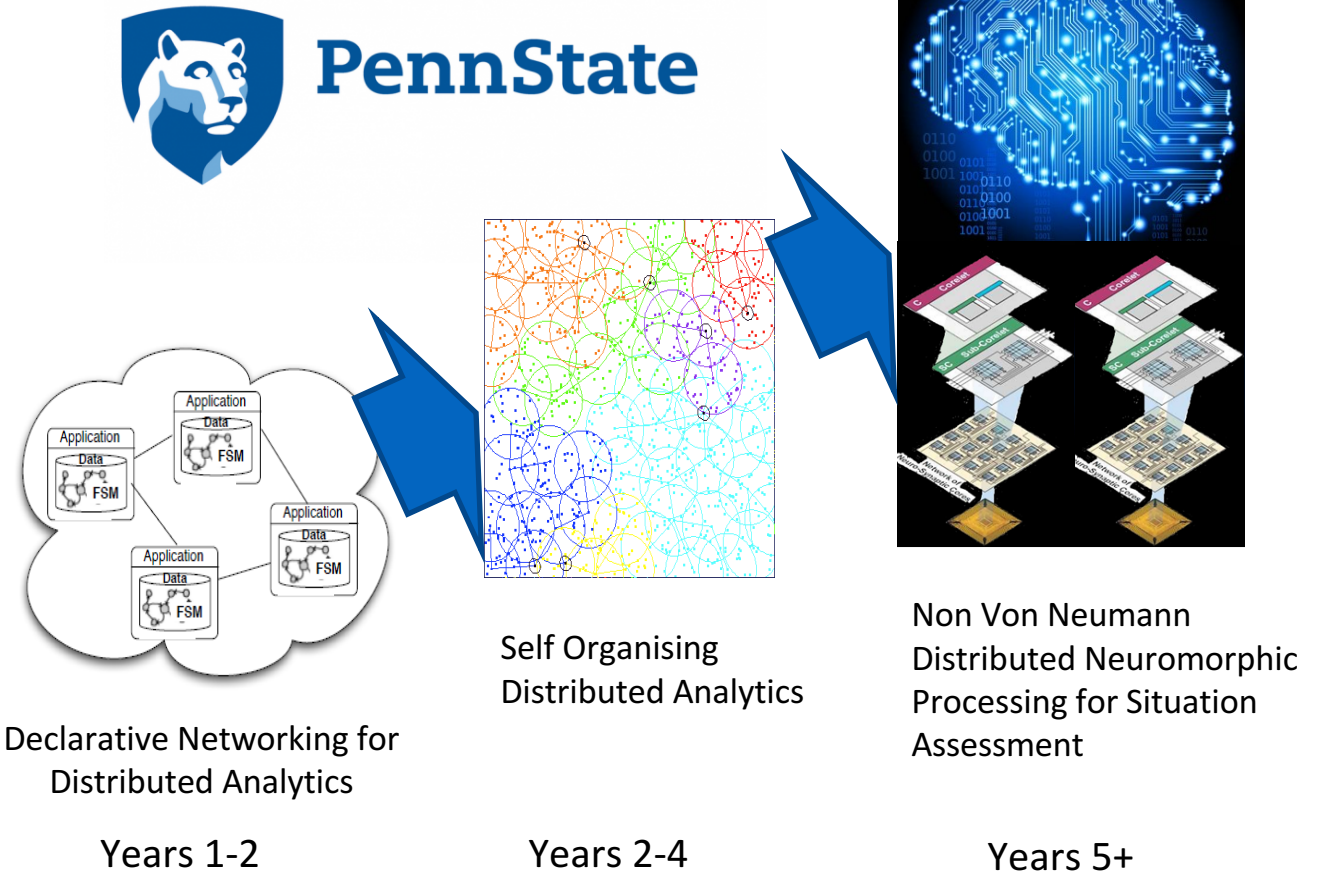


PennState

- International Technology Alliance (ITA)
 - ▶ Partnership between ten Universities and four companies in US and UK funded by ARL and UK MoD
 - ▶ 10 year program focusing on distributed analytics
 - ▶ Projects related to software defined coalitions, distributed analytics services composition, dynamic resource allocation



INSR Focus: Self Assembling Declarative Sensor Analytics in a Coalition Environment



Education Update (Preliminary)

- EECS is currently planning an undergraduate *cyber-security engineering minor* to be offered in conjunction with computer science and engineering
 - ▶ 6 course sequence including
 - Introduction to security
 - Software security
 - Network and wireless security
 - Extensions to architecture, network, operating systems, and theory courses
 - ▶ Later: cryptography, privacy, security and machine learning, embedded/IoT, ...



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Program Notes

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Program Notes

- This event will be held today at the Hyatt (where you are now), and will return to the IST/Westgate Building tomorrow (room 222)
- Federal Employees: meal vouchers at desk
- Except for dinner tonight, all meals and breaks will be held at lobby/hall outside the events
- Dinner tonight: The Tavern (222 E. College Ave)



Contact: Judy Bowes (jbl811@psu.edu) and Patrick McDaniel (mcdaniel@cse.psu.edu)

Monday, April 24th (Hyatt)



7:00am – 8:30am	Breakfast
8:50am – 9:10am	Welcome
9:10am – 9:40am	INSR Overview
9:40am – 10:30am	Faculty Featured Talk, “Automatic software security hardening” Gang Tan, Associate Professor, CS
10:30am – 11:00am	Break
11:00am – 11:30am	Overview of Network Research , Guohong Cao, Professor CSE
11:30am – 12:00pm	Overview of Security Research , Trent Jaeger, Professor CSE
12:00pm – 1:30pm	Lunch
1:30pm – 3:15pm	Demo and Poster Session
3:15pm – 3:45pm	Break
3:45pm-4:15pm	Student Featured Talk, “Adversarial Network Forensics in Software Defined Networking” , Stefan Achleitner, PhD Student, CSE
4:15pm – 4:45pm	Student Featured Talk, “On Limitations of Access Control Models for Privacy- Sensitive Sensors” , Giuseppe Petracca, PhD Student, CSE
6:00pm – 8:00pm	Dinner at The Tavern

Tuesday, April 23rd (222 IST/Westgate)



7:00am – 8:30am	Breakfast
8:50am – 9:00am	Opening
9:00am – 9:30am	Faculty Talk , Emerging Non-Volatile Memories- Applications, Challenges and Solutions”, Swaroop Ghosh, Assistant Professor, EE
9:30am – 10:00am	Faculty Talk , “Applications of Information Theory to Distributed Computing”, Viveck Cadambe, Assistant Professor EE
10:30am – 11:00am	Break
11:00am – 11:30am	Faculty Talk “Designing Programming Languages for Provably Secure Systems”, Danfeng Zheng, Assistant Professor, CSE
11:30am – 12:00pm	Faculty Talk , Obtaining Global Network State without Global Access via Network Tomography (TBD), Ting He, Associate Professor, CSE
12:00pm – 12:10pm	Closing and Adjourn (w/Boxed Lunch)

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9th INSR Industry Day Closing

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Thanks to all ...

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- We at INSR appreciate you all taking the time to come and listen and share your thoughts on research and education
- Ways of connecting:
 - ▶ All papers, posters, slides or other materials are available by request
 - ▶ If you are interested in furthering collaboration with a cross-site visit, conference calls
 - ▶ If you are interested in learning about how you can get more involved with undergraduate and graduate recruiting



Contact: Judy Bowes (jbl811@psu.edu) and Patrick McDaniel (mcdaniel@cse.psu.edu)

A request for support ...



- Lastly, we are looking for industrial support for INSR to help with fund these meetings and to support student research ...



Safe Travels!

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