

## Z. BERKAY CELIK

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### EDUCATION

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| 2014 - Present | <b>The Pennsylvania State University</b> , Ph.D. in Computer Science and Engineering <ul style="list-style-type: none"><li>• Thesis: Automated IoT Security and Privacy Analysis</li><li>• Advisor: Professor Patrick McDaniel</li></ul>  |
| 2009 - 2011    | <b>The Pennsylvania State University</b> , M.S. in Computer Science <ul style="list-style-type: none"><li>• Minor in Computational Science</li><li>• Thesis: Salting Public Traces with Attack Traffic to Test Flow Classifiers</li><li>• Advisor: Professor George Kesidis</li></ul> |
| 2002 - 2006    | <b>Naval Academy (Istanbul, Turkey)</b> , B.S. in Computer Science ( <i>summa cum laude</i> )   |

### ACADEMIC AND RESEARCH APPOINTMENTS

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| 2018 - present | <b>Lead Graduate Student</b><br>Systems and Internet Infrastructure Security (SIIS) Laboratory, Pennsylvania State University <ul style="list-style-type: none"><li>• Conduct weekly lab meetings of nine graduate students</li><li>• Provide students with mentoring, research guidance and leadership skills</li></ul>   |
| 2014 - 2018    | <b>Computer Security Graduate Research Assistant</b><br>Systems and Internet Infrastructure Security (SIIS) Laboratory, Pennsylvania State University <ul style="list-style-type: none"><li>• Designed algorithms to automate IoT security and privacy analysis</li><li>• Proposed defense for sensitive data leaks and safety and security violations in IoT</li><li>• Introduced detection under privileged information to improve detection accuracy</li><li>• Disseminated research through a survey article and open-source contributions</li></ul> |
| 2011 - 2014    | <b>Visiting Research Associate</b><br>Computer Networks Research Laboratory, Istanbul Technical University <ul style="list-style-type: none"><li>• Worked Prof. Sema Oktug's group on ML and malware detection systems</li><li>• Gave seminars in machine learning algorithms for security</li><li>• Developed ML algorithms for malware detection</li><li>• Published results on early-detection of fast-flux botnets at IEEE ISCC'13</li></ul>   |
| 2009 - 2011    | <b>Research Assistant</b><br>Advanced Network Sciences and Communications Laboratory, Pennsylvania State University <ul style="list-style-type: none"><li>• Advised by Prof. George Kesidis and Prof. David J. Miller</li><li>• Worked on NSF NeTSE: Unsupervised Flow-Based Clustering project</li><li>• Developed machine learning models for flow-based malware detection systems</li><li>• Published results on botnet detection at USENIX Security CSET'11</li></ul>  |

### INDUSTRIAL EXPERIENCE

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| May - Aug 2017 | <b>VMware, Software Engineer in Research Intern</b><br>VMware Monitor Team, Cambridge, MA <ul style="list-style-type: none"><li>• Hosted by Josh Simmons and Ronn Mann at VMware's Office of the CTO</li><li>• Applied Deep Learning to evaluate VMware software for security and efficacy</li><li>• Developed ML and NLP algorithms to automate software security analysis</li><li>• Researched VMware's IoT agent for security and privacy issues</li></ul> |
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- May - Aug 2015      Vencore Labs in Research Intern**  
Cybersecurity and Data Analytics Team, Basking Ridge, NJ
- Hosted by Dr. Ritu Chadha (Security) and Rauf Izmailov (ML)
  - Developed malware simulation scenarios in a controlled testbed
  - Designed Learning Using Privileged Information (LUPI) models for security
  - Implemented algorithms to retain classifier accuracy when users redact private data
- 2011 - 2014      Turkish Naval Forces**  
Software Developer
- Developed algorithms for Naval and NATO software systems
  - Implemented naval inventory management system serving thousands of users
  - Attended multiple international and NATO-related software trainings
- 2007 - 2009      Turkish Naval Forces**  
First Officer
- Exercised command over Naval and NATO software systems
  - Led 87 petty officers and enlisted men under my command

## HONORS & AWARDS

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**Best Paper:** Security and Privacy in Communications Networks (SecureComm) (2018)  
**Most Amusing Talk:** Program Analysis of IoT Implementations, USENIX Security HoTSec (2018)  
**Best Demonstration:** Sensitive Information Tracking in Commodity IoT, Florida Institute for Cybersecurity Research (FICS) (2018)  
**Student Travel Awards:** NDSS (2019), ACM ASIACCS (2018), MILCOM (2015)  
**Summer Grant Award:** PSU Summer Tuition Assistance Program Fellowship (2015, 2017)  
**Research Assistantship:** The Pennsylvania State University (2014-2019)  
**Exceptional Academic Achievement:** Turkish Naval Academy Honor List (2002-2006)

## PROFESSIONAL ACTIVITIES

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### Session Chair

- 2018: SecureComm Conference (Session on Web Security)

### Program Committee Member

- 2019: Conference on Uncertainty in Artificial Intelligence (UAI)
- 2019: ASIA Conference on Computer and Communications Security (ASIACCS)
- 2018: NIPS Workshop on Security in Machine Learning
- 2018: CCS Poster/Demonstration Session
- 2018: Privacy-Aware Computing Symposium (IEEE PAC)
- 2017: Internet of Things Security and Privacy Workshop (IoT S&P) (co-located with CCS)
- 2017: Cyber-Physical Systems Security Workshop (CPS-Sec) (co-located with CNS)
- 2016: Conference for Military Communications (MILCOM)

### External Reviewer

- 2019, 2018: USENIX Security Symposium
- 2019, 2018, 2017: IEEE Symposium on Security and Privacy (S&P)
- 2018: ACM Conference on Computer and Communications Security (CCS)
- 2018: ACM Computing Surveys (CSUR)
- 2018: Conference on Decision and Game Theory for Security (GameSec)
- 2018: Neural Information Processing Systems (NIPS)
- 2017: IEEE Security and Privacy Magazine
- 2017: ACM Computing Surveys (CSUR)

- 2017: Neural Processing Letters
- 2017: IEEE Transactions on Information Forensics and Security
- 2016: Computers Open Access Journal
- 2016: Journal of Network and Computer Applications (JNCA)

### **Community Outreach and Research Dissemination**

- Co-authored and maintain the IoT Bench open-source test-suite for IoT apps
  - The repository has 20+ stars on GitHub.
  - Code was written by 5+ contributors
- Co-authored and maintain the source code of the ultimate Java Multithreading course
  - The repository has 300+ stars and 350+ forks on GitHub.

## **TEACHING EXPERIENCE**

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### **Co-instructor**

CSE 597: Security and Privacy of Machine Learning (Fall 2016)

CSE 597: Advanced Topics in the Security and Privacy of Machine Learning (Spring 2017)

### **Guest lecturer**

CMPSC 443: Introduction to Computer and Network Security (Spring 2017, Fall 2018)

CMPSC 311: Introduction to Systems Programming (Fall 2016)

CSE 597: Wireless and Mobile Security (Fall 2017)

CSE 543: Computer Security (Fall 2018)

## **PRESENTATIONS AND INVITED TALKS**

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### **Automated IoT Security and Privacy Analysis**

- November 2018: University of Florida
- October 2018: Worcester Polytechnic Institute
- September 2018: Northeastern University
- August 2018: USENIX Security Lighting Talk Session
- August 2018: USENIX HotSec Workshop
- April 2018: CSE 597 Wireless and Mobile Security, Penn State University
- April 2018: Army Research Laboratory
- March 2018: CMPSC 443 Computer Security, Penn State University
- June 2017: University of California, Davis
- April 2017: Great Lakes Security Day, Rochester Institute of Technology

### **Generating Machine Learning Models under Privileged Information**

- December 2016: Istanbul Technical University
- September 2016: Florida International University
- September 2016: Institute for Networking and Security Research, Penn State University
- May 2016: Indiana University

### **Security and Privacy in Machine Learning**

- December 2018: CSE 543 Computer Security, Penn State University (Adversarial ML lecture)
- August 2018: VMware Monitor Team
- July 2018: VMware CTO Office
- July 2017: College of Engineering Symposium, Penn State University

### **Malware Detection and Modeling Operations in Cyberspace**

- March 2016: Army Research Laboratory
- March 2016: George Mason University

- August 2015: Vencore Labs
- June 2015: University of California, Riverside

## PUBLICATIONS

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Complete list of publications is maintained at <https://berkay.github.io/>.

### Journal Publications

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[J1]. Z. Berkay Celik, Patrick McDaniel, and Thomas Bowen, **Malware Modeling and Experimentation through Parameterized Behavior**, In Journal of Defense Modeling and Simulation, 2018

### Conference Publications

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[C1]. Z. Berkay Celik, Gang Tan, and Patrick McDaniel **IoTGuard: Dynamic Enforcement of Security and Safety Policy in Commodity IoT**, Proceedings of the Network and Distributed System Security Symposium (NDSS), 2019 Acceptance Rate: 17%

[C2]. Z. Berkay Celik, Abbas Acar, Hidayet Aksu, Ryan Sheatsley, Patrick McDaniel, and Selcuk Uluagac, **Curie: Policy-based Secure Data Exchange**, ACM Conference on Data and Application Security and Privacy (CODASPY), 2019 Acceptance Rate: 23.5%

[C3]. Z. Berkay Celik, Patrick McDaniel, and Gang Tan, **Soteria: Automated IoT Safety and Security Analysis**, Proceedings of the USENIX Annual Technical Conference (USENIX ATC), 2018, Acceptance Rate: 19% (4 citations)

[C4]. Z. Berkay Celik, Leonardo Babun, Amit K. Sikder, Hidayet Aksu, Gang Tan, Patrick McDaniel, and Selcuk Uluagac, **Sensitive Information Tracking in Commodity IoT**, Proceedings of the USENIX Security Symposium, 2018, Acceptance Rate: 18% (8 citations)

[C5]. Z. Berkay Celik, Patrick McDaniel, Rauf Izmailov, Nicolas Papernot, Ryan Sheatsley, Raquel Alvare, and Ananthram Swami, **Detection under Privileged Information**, Proceedings of the Asia Conference on Computer and Communications Security (ASIACCS), 2018, Acceptance Rate: 20%

[C6]. Sayed Saghaian, Tom La Porta, Trent Jaeger, Z. Berkay Celik, and Patrick McDaniel, **Mission-oriented Security Model, Incorporating Security Risk, Cost and Payout**, Proceedings of the Security and Privacy in Communication Networks (SecureComm), 2018, **(Best Paper Award)**

[C7]. Z. Berkay Celik, David Lopez-Paz, and Patrick McDaniel, **Patient-Driven Privacy Control through Generalized Distillation**, Proceedings of the IEEE Privacy-aware Computing (PAC), 2017

[C8]. Nicolas Papernot, Patrick McDaniel, Ian Goodfellow, Somesh Jha, Z. Berkay Celik et al., **Practical Black-Box Attacks against Machine Learning**, Proceedings of the Asia Conference on Computer and Communications Security (ASIACCS), 2017, Acceptance Rate: 20% (427 citations)

[C9]. Abbas Acar, Z. Berkay Celik, Hidayet Aksu, A. Selcuk Uluagac, and Patrick McDaniel, **Achieving Secure and Differentially Private Computations in Multiparty Settings**, Proceedings of the IEEE Privacy-aware Computing (PAC), 2017, Acceptance Rate: 33%

[C10]. Z. Berkay Celik, Nan Hu, Yun Li et al., **Mapping Sample Scenarios to Operational Models**, Proceedings of the IEEE Conference for Military Communications (MILCOM), 2016

[C11]. Nicolas Papernot, Patrick McDaniel, Somesh Jha, Matt Fredrikson, Z. Berkay Celik et al., **The Limitations of Deep Learning in Adversarial Settings**, Proceedings of the European Symposium on Security and Privacy (Euro S&P), 2016, Acceptance Rate: 17.3% (469 citations)

[C12]. Z. Berkay Celik, Robert J Walls, Patrick McDaniel, and Ananthram Swami, **Malware Traffic**

**Detection using Tamper Resistant Features**, Proceedings of the IEEE Military Communications (MILCOM) Conference, 2015, (17 citations)

[C13]. Z. Berkay Celik and Sema Oktug, **Detection of Fast-flux Networks using Various DNS Feature Sets**, Proceedings of the IEEE Computers and Communications Symposium (ISCC), 2013, (19 citations)

### Workshop Publications

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[W1]. Z. Berkay Celik and Patrick McDaniel, **Extending Detection with Privileged Information via Generalized Distillation**, IEEE Workshop on Deep Learning and Security (colocated with S&P), 2018, Acceptance Rate: 27%

[W2]. Z. Berkay Celik, Jayaram Raghuram, George Kesidis, and David J. Miller, **Salting Public Traces with Attack Traffic to Test Flow Classifiers**, Proceedings of USENIX Security Workshop on Cyber Security and Experimentation (CSET), 2011, (31 citations)

[W3]. Z. Berkay Celik, Patrick McDaniel, and Rauf Izmailov, **Feature Cultivation in Privileged Information augmented Detection**, Proceedings of the Security And Privacy Analytics Workshop (CODASPY, IWSPA), 2017 (Invited paper)

### Columns

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[CL1]. Patrick McDaniel, Nicolas Papernot and Z. Berkay Celik, **Machine Learning in Adversarial Settings**, IEEE Security & Privacy Magazine (May/June 2016), (31 citations)

### Technical Reports

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[T1]. Z. Berkay Celik, Patrick McDaniel, and Rauf Izmailov, **Proof and Implementation of Algorithmic Realization of Learning Using Privileged Information (LUPI) Paradigm: SVM+**, NSCR, Department of CSE, Pennsylvania State University, Tech. Rep. NAS-TR-0187-2015

### Papers Under Review

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[S1]. Kyle Denney, Leonardo Babun, Z. Berkay Celik, Patrick McDaniel, and Selcuk Uluagac **A Survey of IoT Programming Platforms: Security and Privacy Perspective**, 2019

[S2]. Z. Berkay Celik, Patrick McDaniel, Gang Tan, Selcuk Uluagac, and Leonardo Babun, **Verifying IoT Safety and Security in Physical Spaces**, 2018

[S3]. Z. Berkay Celik, Earlence Fernandes, Eric Pauley, Gang Tan, and Patrick McDaniel, **Program Analysis of Commodity IoT Apps for Security and Privacy: Opportunities and Challenges**, 2018, (<https://arxiv.org/pdf/1809.06962.pdf>)

[S4]. Leonardo Babun, Z. Berkay Celik, Patrick McDaniel, and Selcuk Uluagac, **IoTWatch: Semantics-aware Real-time Privacy Analysis of IoT Apps**, 2018

[S5]. Amit Sikder, Leonardo Babun, Z. Berkay Celik, Abbas Acar, Engin Kirda, Patrick McDaniel, and Selcuk Uluagac, **Kratos: Multi-User Multi-Device-Aware Access Control System for Smart Home**, 2018

[S6]. Nan Hu, Novella Bartollini, Tom La Porta, Z. Berkay Celik, and Patrick McDaniel, **On the Optimization of Cyber Missions under Risk**, 2018

## REFERENCES

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Available upon request.