

Matthew Landen

PhD Student

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Summary

Aiming to apply deep reinforcement learning algorithms to cyber physical systems to produce systems that are more robust to cyber-attacks.

Research Interests

Attack detection, cyber physical security, smart grid security

Education

Ph.D.	Georgia Institute of Technology Computer Science <i>Specialization:</i> Information security Minor: Security and privacy policy Advisor: Dr. Wenke Lee Cyber Corps Scholarship for Service NSF Graduate Research Fellow Georgia Tech Presidential Fellowship	Atlanta, Georgia Expected May 2023 \$34,000 / year, up to 3 years \$34,000 / year, 3 years \$5,500 / year, 4 years
B.S.	University of Maryland, Baltimore County (UMBC) Computer Science and Mathematics, Summa Cum Laude Meyerhoff Scholar Phi Kappa Phi Honors Society Member GPA: 4.0 / 4.0	Baltimore, Maryland May 2017 \$15,000 / year, 4 years April 2017 – Present

Research Experiences

Lawrence Livermore National Laboratory Advisor: Dr. JP Watson	Livermore, California (Remote) May 2020 – Present
Autonomous power grid operation with cyber attackers	
<ul style="list-style-type: none">Applied deep reinforcement learning to create an autonomous agent to maintain the power grid robustly in the presence of cyber attackersExperimented with deep q networks, actor critic and risk adverse agents	
Georgia Tech, Institute for Information Security & Privacy (IISP) Advisor: Dr. Wenke Lee	Atlanta, GA August 2017 – Present
Autonomous power grid operation with cyber attackers	
<ul style="list-style-type: none">Collaboration with Lawrence Livermore National Laboratory (above)	
Android malware classification using machine learning	
<ul style="list-style-type: none">Features capture the frequency that a sensitive API call is invoked by an android framework endpoint	
Outcomes	
<ul style="list-style-type: none">(Allen, 2020): Mnemosyne: An Effective and Efficient Postmortem Watering Hole Attack Investigation System(Allen, 2018): Improving Accuracy of Android Malware Detection with Lightweight Contextual Awareness	

UMBC MAPLE Lab

Baltimore, MD

Advisor: Dr. Marie desJardins

November 2016 – August 2017

Planning with learned subtask hierarchies in reinforcement learning domains

- Designed and implemented a hierarchical reinforcement learning algorithm using BURLAP java library
- Implanted R-MAXQ as a baseline to our approach
- Outcomes
 - (Winder, 2020): Planning with Abstract Learned Models While Learning Transferable Subtasks
 - (Squire, 2017): R-AMDP: Model-Based Learning for Abstract Markov Decision Process Hierarchies
 - (Winder, 2017): Towards Planning With Hierarchies of Learned Markov Decision Processes

National Institute of Standards and Technology

Gaithersburg, MD

Advisors: Michaela Iorga, Ph.D. and Dmitry Cousin

May 2015 – May 2017

Hash chaining for secure and privacy-preserving digital forensics in the cloud

- Implemented a hash chain logging approach in a research cloud environment using java which has applications in information security and privacy-preserving digital forensics

NIST cloud security framework analyzer and visualizer

- Developed a tool in C# that allows agencies to analyze the NIST cloud computing security architecture and see pertinent information in a variety of situations as well as visual trends

Publications

Miuyin Yong Wong , **Matthew Landen**, Manos Antonakakis , Douglas M. Blough, Elissa M. Redmiles, Mustaque Ahamad. 2021. An Inside Look into the Practice of Malware Analysis. In Proceedings of the 2021 ACM SIGSAC Conference on Computer and Communications Security (CCS '21), November 15–19, 2021, Virtual Event, Republic of Korea. ACM, New York, NY, USA, , 17 pages.

<https://doi.org/10.1145/3460120.3484759>

Joey Allen, Zheng Yang, **Matthew Landen**, Raghav Bhat, Harsh Grover, Andrew Chang, Yang Ji, Roberto Perdisci, and Wenke Lee. Mnemosyne: An Effective and Efficient Postmortem Watering Hole Attack Investigation System. In *Proceedings of the 2020 ACM SIGSAC Conference on Computer and Communications Security (CCS '20)*. Association for Computing Machinery, New York, NY, USA, 787–802.

DOI:<https://doi.org/10.1145/3372297.3423355>

Winder, J., Milani, S., **Landen, M.**, Oh, E., Parr, S., Squire, S., & Matuszek, C. (2020, April). Planning with Abstract Learned Models While Learning Transferable Subtasks. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 34, No. 06, pp. 9992-10000).

Joey Allen, **Matthew Landen**, Sanya Chaba, Yang Ji, Simon Chung, Wenke Lee “Improving Accuracy of Android Malware Detection with Lightweight Contextual Awareness” In Annual Computer Security Applications Conference, 2018

Shawn Squire, John Winder, **Matthew Landen**, Stephanie Milani, Marie desJardins "R-AMDP: Model-Based Learning for Abstract Markov Decision Process Hierarchies" In The Multi-disciplinary Conference on Reinforcement Learning and Decision Making 2017, 2017

John Winder, Shawn Squire, **Matthew Landen**, Stephanie Milani and Marie desJardins "Towards Planning With Hierarchies of Learned Markov Decision Processes" In ICAPS-2017 Integrated Execution of Planning and Acting Workshop, pg 50-53, 2017

Technological Skills

Programming Languages: Java, Python, C, C++, C#, Visual Basic, intel assembly, HTML, CSS, JavaScript, PHP, SQL, Latex
Frameworks / Libraries: Python – Keras, Sklearn, Tensorflow, NumPy, Pwntools, Mpi4Py, multiprocessing
Tools: Web – Jquery, AngularJS
Git, IDA Disassembler

Teaching Experience

Georgia Institute of Technology		
Fall 2018	CS 6262 – Network Security	Teaching Assistant
University of Maryland, Baltimore County		
Fall 2016	COMP 101 – Computational Thinking and Design	Head Teaching Fellow
Fall 2015	COMP 101 – Computational Thinking and Design	Teaching Fellow

Honors

Cyber Corp’s Scholarship for Service (\$34,000 / year)	August 2021 – Present
16 th in the Department of Energy’s Cyberforce competition	November 2020
NSF Graduate Research Follow (\$34,000 / year, 3 years)	August 2017 - Present
Georgia Tech Presidential Fellowship (\$5,500 / year, 4 years)	August 2017 - Present
Phi Kappa Phi Honors Society Member	April 2017 - Present
2 nd place team in Georgia Tech’s Capture the Flag Competition	November 2018
Meyerhoff Scholar (\$15,000 / year, 4 years)	August 2013 - May 2017
President’s List	August 2013 - May 2017
National Honor Society	August 2011- May 2013

Conferences & Workshops Attended

AAAI Conference on Artificial Intelligence	February 2020
Annual Computer Security Applications Conference	December 2018
USENIX Security and Artificial intelligence Networking Workshop	May 2018
CRA Grad Cohort Workshop for Underrepresented Minorities + Persons with Disabilities	March 2018, 2020
ACM Richard Tapia Celebration of Diversity in Computing	September 2017
The Multi-disciplinary Conference on Reinforcement Learning and Decision Making	June 2017

Relevant Employment

United States Defense Intelligence Agency	College Park, MD
Student Intern	June 2014 – August 2017
Software engineering projects	
<ul style="list-style-type: none">Developed a tool to update a mailing list for updates specific to a piece of software automaticallyEngineered software to get digital certificate information from users on a website	

Personal Interests

Performing in theatre productions	September 2010 – May 2021
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