Jeongkeun Shin

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Education

Carnegie Mellon University, School of Computer Science — Pittsburgh, PA
Doctor of Philosophy (Ph.D.) in Societal Computing

Carnegie Mellon University, School of Computer Science — Pittsburgh, PA
Master of Science (M.S.) in Societal Computing — *May 2025*

Carnegie Mellon University, College of Engineering — Pittsburgh, PA
Master of Science (M.S.) in Electrical and Computer Engineering — *May 2021*
- Advisor: Professor Marios Savvides

University of Michigan, College of Engineering — Ann Arbor, MI
Bachelor of Science in Engineering (B.S.E.) in Computer Science — *Dec 2019*

Research & Work Experience

Graduate Research Assistant, CASOS Center — Pittsburgh, PA
Advisor: Professor Kathleen M. Carley, Professor L. Richard Carley — Jan 2022 - Now

- Developed an agent-based simulation of hybrid spearphishing and watering hole attacks to quantify how phishing training and patch compliance reduce organizational cyber damage.
- Built a large-scale MITRE ATT&CK–based attack flow network and optimized budget-constrained defense strategies using minimum multi-vertex cut and interdiction modeling.
- Modeled trust dynamics between human operators and intrusion detection systems to analyze how alert frequency affects decision accuracy and system effectiveness under DoS conditions.

Graduate Research Assistant, CyLab Biometrics Center — Pittsburgh, PA
Advisor: Professor Marios Savvides — Jan 2020 - Dec 2020

- Designed and implemented the user interface for a web-based product detection system capable of identifying grocery items in real-world market environments using computer vision and deep learning models.
- Improved model robustness and detection accuracy through systematic optimization of computer vision workflows and deep learning architectures tailored to retail deployment scenarios.

Graduate Research Assistant, Human and Robot Partners Lab — Pittsburgh, PA
Advisor: Professor Henny Admoni — Jan 2020 - May 2020

- Engineered a high-fidelity 3D simulation environment modeling restaurant operations, integrating heterogeneous human behavior patterns to realistically replicate dynamic daily interactions and workflows.

Undergraduate Research Assistant, Crowd and Machine Lab — Ann Arbor, MI
Advisor: Professor Walter S. Lasecki — Jan 2018 - Jan 2019

- Developed and deployed a web-based platform to streamline research lab operations, enabling structured weekly reporting, multi-criteria review, and targeted or lab-wide announcements.
- Designed web applications for large-scale human subject data collection, supporting research in misinformation classification and human–computer interaction.

Undergraduate Research Scholar, Illinois Geometry Lab — Champaign, IL
Advisor: Professor Xin Zhang — Jan 2017 - May 2017

- Developed a simulation framework to generate empirical data for testing hypotheses on group orbit behavior in local–global conjectures, with emphasis on integer density distributions.
- Identified structural variations in convergence rates driven by group properties and critical exponents, offering new insight into subgroup-dependent behavior within the local–global framework.

Squad Leader, Sergeant, Republic of Korea Army Gapyeong, South Korea
Engineering Department, 66th Infantry Division Jan 2014 - Oct 2015

- Led multiple mobilization exercises, developing and simulating plans for the allocation and operation of equipment, vehicles, and fuel in both peacetime and wartime scenarios.

Publications - Journal

[J.3] Cyber Attack Flow Intelligence Network: Backbone Analysis and Defense Strategy Optimization
Jeongkeun Shin, L. Richard Carley, Kathleen M. Carley
IEEE Transactions on Network Science and Engineering - *Forthcoming*

[J.2] Simulating Trust Dynamics Model for Human-IDS Interaction under DoS Alerts
Jeongkeun Shin, L. Richard Carley, Kathleen M. Carley
Under Review

[J.1] Simulating Cyber Defense: The Impact of Phishing Training and System Updates on Mitigating Damage from Hybrid Phishing and Watering Hole Attacks
Jeongkeun Shin, Siyuan Zhai, L. Richard Carley, Kathleen M. Carley
The Journal of Defense Modeling and Simulation

Publications - Conference Proceedings

[C.11] The Illusion of Optimal Defense: Static Interdiction under Adaptive and Persistent Attackers
Jeongkeun Shin, Siyuan Zhai, L. Richard Carley, Kathleen M. Carley
Association for the Advancement of Artificial Intelligence (AAAI) 2026 Summer Symposium - *Forthcoming*

[C.10] Towards Real-time Cyber Warfare Simulation: A High-efficiency Heuristic for Budget-constrained Attack Interdiction
Jeongkeun Shin, L. Richard Carley, Kathleen M. Carley
Under Review

[C.9] Network Analysis of Attack Flows in Ransomware Groups and Campaigns
Jeongkeun Shin, Siyuan Zhai, L. Richard Carley, Kathleen M. Carley
International Conference on Social Computing, Behavioral-Cultural Modeling & Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS) 2025

[C.8] A Baseline Simulation of Hybrid Misinformation and Spearphishing Campaigns in Organizational Networks
Jeongkeun Shin, Han Wang, L. Richard Carley, Kathleen M. Carley
Winter Simulation Conference (WSC) 2025

[C.7] Simulation of Human Organizations with Computational Human Factors Against Phishing Campaigns
Jeongkeun Shin, L. Richard Carley, Kathleen M. Carley
International Conference on Cyber Warfare and Security (ICCWS) 2025

[C.6] Design, Modeling and Simulation of Cybercriminal Personality-based Cyberattack Campaigns
Jeongkeun Shin, Geoffrey B. Dobson, L. Richard Carley, Kathleen M. Carley
Winter Simualtion Conference (WSC) 2024

[C.5] Simulation-Based Study on False Alarms in Intrusion Detection Systems for Organizations Facing Dual Phishing and DoS Attacks
Jeongkeun Shin, L. Richard Carley, Kathleen M. Carley
Annual Modeling and Simulation Conference (ANNSIM) 2024 - 🏆 **Best Paper Runner Up Award**

[C.4] Integrating Human Factors into Agent-Based Simulation for Dynamic Phishing Susceptibility
Jeongkeun Shin, Kathleen M. Carley, L. Richard Carley
International Conference on Social Computing, Behavioral-Cultural Modeling & Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS) 2023

[C.3] Beyond Accuracy: Cybersecurity Resilience Evaluation of Intrusion Detection System against DoS Attacks using Agent-based Simulation
Jeongkeun Shin, Geoffrey B. Dobson, L. Richard Carley, Kathleen M. Carley
Winter Simualtion Conference (WSC) 2023

[C.2] Modeling and Simulation of the Human Firewall against Phishing Attacks in Small and Medium-sized Businesses
Jeongkeun Shin, Geoffrey B. Dobson, L. Richard Carley, Kathleen M. Carley
Annual Modeling and Simulation Conference (ANNSIM) 2023

[C.1] OSIRIS: Organization Simulation in Response to Intrusion Strategies
Jeongkeun Shin, Geoffrey B. Dobson, Kathleen M. Carley, L. Richard Carley
International Conference on Social Computing, Behavioral-Cultural Modeling & Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS) 2022

Publications - Posters

[P.4] A Machine Learning Surrogate Approach for Scalable Design Optimization in Cybersecurity Simulation
Siyuan Zhai, **Jeongkeun Shin**, L. Richard Carley, Kathleen M. Carley
International Conference on Social Computing, Behavioral-Cultural Modeling & Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS) 2025 Poster Session

[P.3] Impact of Operating System Updates on Cybercriminal Access Duration: A Simulation-Based Study
Jeongkeun Shin, Tanav Changal, L. Richard Carley, Kathleen M. Carley
Winter Simulation Conference (WSC) 2024 Poster Session

[P.2] Leveraging OSIRIS to Simulate Real-world Ransomware Attacks on Organization
Jeongkeun Shin, Geoffrey B. Dobson, L. Richard Carley, Kathleen M. Carley
Winter Simulation Conference (WSC) 2022 Poster Session

[P.1] Finding Integers from Group Orbits
Jake Shin, Yike Xu, Catherine Zhang, Xin Zhang, Junxian Li, Xin Zhang
Illinois Geometry Lab (IGL) Spring 2017 Open House

Publications - Technical Reports

[T.2] Attack Flow Network Models of MITRE ATT&CK Groups and Campaigns
Jeongkeun Shin, Siyuan Zhai, L. Richard Carley, Kathleen M. Carley
CASOS Technical Report (2025) - *Forthcoming*

[T.1] Revelation of System and Human Vulnerabilities Across MITRE ATT&CK Techniques with Insights from ChatGPT
Jeongkeun Shin, Geoffrey B. Dobson, L. Richard Carley, Kathleen M. Carley
CASOS Technical Report (2023)

Skills

Programming Languages: C, C++, C#, Java, Groovy, Python

Web Programming: HTML/CSS, JavaScript/jQuery, Node.js, React.js, TypeScript, Vue.js, PHP/MySQL

Simulation: NetLogo, Repast Simphony

Video Production: Davinci Resolve

Machine Learning: Weka, Pytorch

Game Development: Unity

Design: Adobe Photoshop, Google Sketchup, Blender

Optimization: IBM CPLEX

Network Analysis: ORA

Academic Services

Mentoring

- **Yunshu (Cathy) Wang** (01/2026 - Now)
  - Bachelor of Science (B.S.) in Information Systems & Computer Science @ Carnegie Mellon University
- **Han (Corince) Wang** (01/2025 - 06/2025)
  - Bachelor of Science (B.S.) in Information Systems @ Carnegie Mellon University
  - Co-authored **[C.8]**
- **Tong (Adrianna) Fu** (01/2025 - 04/2025)
  - Bachelor of Science (B.S.) in Mathematical Sciences @ Carnegie Mellon University
- **Siyuan (Freya) Zhai** (10/2024 - Now)
  - Bachelor of Science (B.S.) in Mathematical Sciences & Statistics @ Carnegie Mellon University
  - Co-authored **[J.1][C.9][P.4][T.2]**
- **Tanav Changal** (06/2024 - 07/2024)
  - High School Student @ Troy High School
  - First Position: Bachelor of Science (B.S.) in Mathematics @ University of California, Berkeley
  - Co-authored **[P.3]**
- **Devashish Ubale** (05/2023 - 08/2024)
  - Master of Information Technology Strategy (MITS) @ Carnegie Mellon University
  - First Position: AI/ML Researcher @ FPrime AI
  - Current Position: Software Engineer @ Microsoft

Peer Review

- Computational and Mathematical Organization Theory [2025]
- The Journal of Artificial Societies and Social Simulation (JASSS) [2024 · 2025]
- Annual IDeaS Conference: Disinformation, Hate Speech, and Extremism Online [2024]
- International Conference on Social Computing, Behavioral-Cultural Modeling and Prediction and Behavior Representation in Modeling and Simulation (SBP-BRiMS) [2024 · 2025]
- Winter Simulation Conference (WSC) Agent-Based Simulation Track [2024]

Guest Lecture

- CMU 17-821: Computational Modeling of Complex Socio-Technical Systems [Fall 2024]
  - Agent-based Modeling and Simulation (ABMS) for Cybersecurity with OSIRIS