

Geoff Twardokus

Ph.D. Student in Electrical and Computer Engineering

Wireless and IoT Security and Privacy (WISP) Lab
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Overview

I am a Ph.D. student in Electrical and Computer Engineering at Rochester Institute of Technology (RIT) studying under the supervision of Dr. Hanif Rahbari. My research in the Wireless and IoT Security and Privacy (WISP) lab within the ESL Global Cybersecurity Institute at RIT is focused on security in mobile radio communications, with a particular focus on emerging vehicle-to-everything (V2X) technologies such as 5G V2X and IEEE 802.11bd, as well as post-quantum security for connected vehicles. I have published in multiple peer-reviewed venues including the top-ranked IEEE INFOCOM and Network and Distributed System Security (NDSS) conferences, as well as the IEEE Transactions on Wireless Communications.

Education

Doctor of Philosophy, Electrical and Computer Engineering August 2021 – Present
Rochester Institute of Technology, Rochester, NY

Master of Science, Computing Security August 2021
Rochester Institute of Technology, Rochester, NY
Thesis Title: *Intelligent Lower-Layer Denial-Of-Service Attacks Against Cellular Vehicle-To-Everything*

Bachelor of Science, Computing Security, magna cum laude August 2021
Immersion in Russian Language
Rochester Institute of Technology, Rochester, NY

Noteworthy Coursework at Rochester Institute of Technology:

Wireless Networks and Network Security	EEEE 797 – Wireless Communication CSEC 759 – Advanced Topics in Wireless Security CSEC 731 – Web Server Application Security Audits CSEC 744 – Network Security CSEC 742 – Computer System Security CSEC 469 – Wireless Security
Cryptography	CMPE 789 – Quantum Computing CSEC 472 – Authentication CSCI 462 – Introduction to Cryptography

Associate of Science, Computer Science, with highest honors May 2017
Tompkins Cortland Community College, Dryden, NY

Associate of Science, Mathematics and Science, with highest honors May 2017
Tompkins Cortland Community College, Dryden, NY

Journal Articles

- [TWC] **G. Twardokus** and H. Rahbari, "Towards Protecting 5G Sidelink Scheduling in C-V2X Against Intelligent DoS Attacks," *IEEE Transactions on Wireless Communication*, vol. 22, no. 11, pp. 7273-7286, Nov. 2023.

Conference Papers

- [NDSS'24] **G. Twardokus**, N. Bindel, H. Rahbari, and S. McCarthy, "When Cryptography Needs a Hand: Practical Post Quantum Authentication for V2V Communications," *Network and Distributed System Security Symposium (NDSS)*, San Diego, CA, Feb. 2024. **Artifacts Evaluated.**
- [INFOCOM'22] **G. Twardokus** and H. Rahbari, "Vehicle-to-Nothing? Securing C-V2X Against Protocol-Aware DoS Attacks," *Proc. IEEE Int. Conf. on Computer Communications (INFOCOM)*, May 2022. Acceptance rate: 225/1129 = 19.92%.
- [ICC'21] **G. Twardokus**, J. Ponicki, S. Baker, P. Careno, H. Rahbari, and S. Mishra, "Targeted Discreditation Attack against Trust Management in Connected Vehicles," *Proc. IEEE Int. Conf. Communications (ICC)*, Virtual, Jun. 2021.

Workshops/Demos/Posters

- [VehicleSec'24] **G. Twardokus** and H. Rahbari, "Demo: An Open-Source Hardware-in-the-Loop Testbed for Post-Quantum V2V Security Research," *Proc. ISOC Symposium on Vehicle Security and Privacy (VehicleSec)*, San Diego, CA, Feb. 2024.
- [CNERT'21] **G. Twardokus** and H. Rahbari, "Evaluating V2V Security on an SDR Testbed," *Proc. IEEE International Workshop on Computer and Networking Experimental Research using Testbeds (CNERT) in conjunction with IEEE INFOCOM*, Virtual, May 2021.

Pre-Prints, Presentations, Theses, etc.

- N. Bindel, **G. Twardokus**, S. McCarthy, and H. Rahbari, "Drive (Quantum) Safe! – Towards Post-Quantum Authentication for V2V Communications," in the *IACR Cryptology ePrint Archive* as Paper 2022/483, April 2022.
- N. Bindel, S. McCarthy, H. Rahbari, and **G. Twardokus**, "Suitability of 3rd Round Signature Candidates for Vehicle-to-Vehicle Communication," presented at the *Third Post-Quantum Cryptography (PQC) Standardization Conference*, National Institute of Standards and Technology (NIST), Virtual, Jun. 7, 2021.
- G. Twardokus**, "Intelligent Lower-Layer Denial-of-Service Attacks Against Cellular Vehicle-to-Everything," M.S. thesis, Dept. of Computing Security, Rochester Institute of Technology (RIT), Rochester, NY. 2021.

Invited Talks

- G. Twardokus** and H. Rahbari, "Sidelink Transmission Scheduling in 5G C-V2X: Attacks and Countermeasures," presented by invitation to the Laboratory of Networking & Information Systems at Boston University, Boston, MA, June 29, 2022.

Professional Service

Journal Reviewer

<u>Publication</u>	<u>Year</u>	<u># of Reviews</u>
IEEE Transactions on Vehicular Technology (TVT) Computing (Springer)	2024	1
Computer Communications (Elsevier)	2023	2

Conference Reviewer

<u>Venue</u>	<u>Year</u>	<u># of Reviews</u>
EAI Int. Conf. on Security and Privacy in Communication Networks (SecureComm)	2023	1

Delegated Conference Reviewer (co-reviews with PI)

<u>Venue</u>	<u>Year</u>	<u># of Reviews</u>
IEEE International Conference on Computer Communications (INFOCOM)	2024	2
IEEE Conference on Communications and Network Security (CNS)	2023	1
Int. Symp. Modeling and Optimization in Mobile, Ad hoc, and Wireless Netw. (WiOpt)	2023	1
IEEE International Conference on Communications (ICC)	2023	1
IEEE Conference on Communications and Network Security (CNS)	2022	2

Presentations

N. Bindel, S. McCarthy, H. Rahbari, and **G. Twardokus**, “Drive (Quantum) Safe! – Towards Post-Quantum Security for Vehicle-to-Vehicle Communications,” presented at the *Real World Crypto Symposium (RWC)*, International Association for Cryptologic Research (IACR), Amsterdam, The Netherlands, Apr. 15, 2022.

G. Twardokus, “A Testbed for Vehicle-to-Vehicle Security Mechanisms,” presented at the 2020 Undergraduate Research Symposium, Rochester Institute of Technology, Virtual, Jul. 30 – Aug. 6, 2020.

Honors and Awards

Dean’s List (5 of 6 eligible semesters), Rochester Institute of Technology	2017 – 2021
Computer Science Graduate of Note , Tompkins Cortland Community College	2017
Phi Theta Kappa , Tompkins Cortland Community College	2017
President’s Citation , Tompkins Cortland Community College	2016
Dean’s List (all semesters), Tompkins Cortland Community College	2016-2017

Funding

Student Travel Grant , ISOC Symposium on Vehicle Security and Privacy (VehicleSec) Role: Presenting Author Amount: \$500	Feb. 2024
Student Travel Grant , Network and Distributed System Security Symposium (NDSS) Role: Presenting Author Amount: \$2,000	Feb. 2024
Travel Grant , NSF Open AI Cellular (OAIC) Workshop Role: Participant Amount: \$1,000	Aug. 2023
BS/MS Scholarship , Rochester Institute of Technology Role: Graduate Student Amount: \$22,000	2020-2021
Trustee Scholarship , Rochester Institute of Technology Role: Student Amount: \$10,000 per year	2017-2020
Phi Theta Kappa Scholarship , Rochester Institute of Technology Role: Student Amount: \$2,000 per year	2017-2020

Teaching Experience

Graduate Teaching Assistant CSEC 569/669 – Wireless Security Rochester Institute of Technology	Jan. 2023 – May 2023 Rochester, NY
Adjunct Instructor CSEC 140 – Introduction to Cybersecurity Rochester Institute of Technology	Aug. 2022 – Dec. 2022 Rochester, NY
Graduate Teaching Assistant CSEC 569 – Wireless Security Rochester Institute of Technology	Jan. 2021 – May 2021 Rochester, NY

Work Experience Highlights

Graduate Research Assistant May 2023 – Present
Rochester Institute of Technology Rochester, NY

Data Science Intern May 2022 – August 2022
Modern Hire Cleveland, OH (Remote)

- Developed innovative natural language processing (NLP) solutions based on deep learning to provide artificial intelligence support to corporate hiring processes.
- Worked to leverage artificial intelligence technique to remove human biases from the hiring process and ensure the most meritorious applicants are considered for job openings.

Graduate Cybersecurity Research Assistant May 2020 – May 2022
ESL Global Cybersecurity Institute Rochester, NY
Rochester Institute of Technology

- Published three times in peer-reviewed venues (IEEE INFOCOM 2022, IEEE ICC 2021 and IEEE INFOCOM 2021 Workshops).
- Simulated wireless channel propagation for multiple protocols (LTE/5G/IEEE 802.11) using MATLAB.
- Designed and implemented a novel software-defined radio testbed for vehicle-to-vehicle (V2V) communication security. Project involved substantial extensions of open-source projects in combination with original Python, C, and C++ development.
- Studied next-generation wireless protocols for connected transportation systems (IEEE 802.11bd, 3GPP Release 15/16+ C-V2X).
- Examined feasibility of using NIST candidate post-quantum cryptographic algorithms to secure inter-vehicle communications within hardware limits of resource-constrained vehicular radio devices.

Engineering Intern II Nov. 2016 – Aug. 2017
BAE Systems, Inc. Endicott, NY

- Developed software in C and various assembly languages for flight control computers of a military aircraft type.
- Coauthored and maintained structural coverage test suite and associated documentation (managed through Synergy and DOORS).
- Troubleshoot code errors and test failures by disassembling/decompiling binaries and analyzing using Green Hills' AdaMULTI IDE.

Senior Assistant Application Administrator Aug. 2019 – May 2020
Assessment, Technology and Communications Rochester, NY
Rochester Institute of Technology

- Partnered with the Information Security Office to implement a divisional initiative to ensure the security of personally identifiable information (PII) stored on information assets owned by the Division of Student Affairs.
- Conceived of and implemented a new identity and access management system for applications administered by the department.
- Partnered with the Office of Legal Affairs to negotiate and finalize a data protection agreement with a third-party software vendor in order to comply with E.U. (GDPR) and U.S. federal data processing regulations.

Additional Work Experience

Assistant Business/Applications Administrator Assessment, Technology and Communications Rochester Institute of Technology	May 2019 – Aug. 2019 Rochester, NY
Assistant Systems Administrator Information Technology Services Rochester Institute of Technology	Jan. 2019 – May 2019 Rochester, NY
Course Grader CSCI 462 – Introduction to Cryptography Department of Computer Science Rochester Institute of Technology	Aug. 2018 – Dec. 2019 Rochester, NY
Assistant Applications Administrator Assessment, Technology and Communications Rochester Institute of Technology	Oct. 2017 – Dec. 2018 Rochester, NY
Computer Technology Assistant Technology Learning and Support Services Tompkins Cortland Community College	Sep. 2016 – Nov. 2016 Dryden, NY
Office Assistant Academic Records Tompkins Cortland Community College	Jan. 2016 – Aug. 2016 Dryden, NY

Media Coverage

J. Gilbert, “Protecting cars and their computers,” News 8 WROC. Oct. 26, 2020. [TV] Available: <https://youtu.be/MH7pCgxaKjQ>.

IEEE Innovation at Work, “Student Research Team Create Prototype of Secure Vehicle-to-Vehicle (V2V) Communications System,” Jul. 1, 2020. [Online] Available: <https://bit.ly/3kxQDov>.

Professional Memberships and Affiliations

- IEEE (Graduate Student Member)
- IEEE Communications Society
- IEEE Intelligent Transportation Systems Society
- IEEE Vehicular Technology Society
- IEEE Computer Society
- Phi Theta Kappa Honor Society