

ANNE TUMLIN

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(she/her/hers)

EDUCATION

Vanderbilt University, Nashville, TN

Russell G. Hamilton Scholar

Department of Energy Computational Science Graduate Fellow

Ph.D. Student in Computer Science

Expected May 2028

GPA: 3.763

University of South Carolina, Columbia, SC

Magna Cum Laude

South Carolina Honors College - McNair Scholar

Bachelor of Science in Computer Science, Minor in Business Administration

August 2019 - May 2023

GPA: 3.918

RESEARCH & TEACHING EXPERIENCE

Vanderbilt University Graduate Research Assistant

VeriVITAL and Network & Data Science (NDS) Labs

August 2023 – Present

- Researching formal methods for the verification of neural networks, with a focus on safety, robustness, and fairness in safety-critical AI applications.
- Currently extending the *Neural Network Verification (NNV)* tool to support Graph Neural Network (GNN) layers by developing custom layer support, formal specifications, and verification pipelines. Applying the framework to certify robustness of GNN-based power flow models using IEEE benchmark datasets, including reachability-based verification of GNNs with both node and edge features (accepted to SAIV 2026).
- Led the design and development of *FairNNV*, a formal verification framework for certifying individual and counterfactual fairness in neural networks. Extended the *Neural Network Verification (NNV)* tool to incorporate fairness specifications and verification methods; published in ICAIF 2024.
- Contributed to DARPA's Assured Neuro Symbolic Learning and Reasoning (ANSR) program by debugging and running simulations of behavior tree models used in verifiable neuro-symbolic systems; published in FMAS 2024.

Undergraduate Research and Teaching Experience

University of South Carolina and New York Institute of Technology

2020 – 2023

- Optimized multi-robot pursuit-evasion algorithms in the SC Autonomous Robotics Lab; reduced path length by up to 75% and published in IEEE ICRA 2021.
- Led a project on toxic comment detection for natural language processing at NYIT, implementing BiLSTM models with GloVe and Emoji2Vec embeddings; published in IEEE MASS 2021.
- Conducted independent research on ocean sensor node networks; received \$2,500 through the Magellan Scholar Program and presented a poster at Discover UofSC 2023.
- Served as a teaching assistant for a Linux/Unix course; designed lab assignments and supported undergraduate instruction.

WORK EXPERIENCE

Year-Round Intern — Verification & Assurance

Sandia National Laboratories

January 2026 – Present

Albuquerque, NM

- Extending my summer practicum through a continued, year-round collaboration bringing verification and assurance approaches to the FACETS project's cyber-physical anomaly detection and mitigation.

- Completed a DOE CSGF-funded summer research practicum at Sandia National Laboratories, focusing on secure and resilient power systems; received \$18,500 in support.
- Contributed to the Flexible, Autonomous, and Cyber-Physical Ecosystem for Trusted Security (FACETS) project, which aims to enable cyber-physical situational awareness for secure grid operations.
- Engineered physics-based and statistical features—including the 16 Signature Elements method and Ohm’s Law-based metrics—to enhance anomaly detection in power systems.
- Integrated features into LSTM autoencoder models and carried out model evaluations to assess detection accuracy and reduce false positives across PMUs.
- Developed a Python-based pipeline compatible with FACETS and GriDNA scripts to integrate newly engineered features; documented functionality and findings to support ongoing lab development.
- Collaborated with electrical engineers, cybersecurity experts, and ML researchers to bridge domain knowledge between physical grid modeling and machine learning-based detection techniques.

PUBLICATIONS

1. Tumlin, A. M., Wooding, B., Shao, Z., Manzanas Lopez, D., Derr, T., Johnson, T. T. (2026). Reachability-Based Formal Verification of Graph Neural Networks with Node and Edge Features. *Symposium on AI Verification (SAIV 2026)*. To appear.
2. Tumlin, A. M., Manzanas Lopez, D., Robinette, P., Zhao, Y., Derr, T., Johnson, T. T. (2024). FairNNV: The Neural Network Verification Tool for Certifying Fairness. *Proceedings of the 5th ACM International Conference on AI in Finance (ICAIF ’24)*, 36–44. <https://doi.org/10.1145/3677052.3698677>
3. Serbinowska, S. S., Potteiger, N., Tumlin, A. M., Johnson, T. T. (2024). Verification of Behavior Trees with Contingency Monitors. *Formal Methods for Autonomous Systems (FMAS 2024), Electronic Proceedings in Theoretical Computer Science*, 411, 56–72. <https://doi.org/10.4204/EPTCS.411.4>
4. Aquino, M., Ortiz, Y., Rashid, A., Tumlin, A. M., Artan, N. S., Dong, Z., Gu, H. (2021). Toxic Comment Detection: Analyzing the Combination of Text and Emojis. *2021 IEEE MASS*.
5. Olsen, T., Tumlin, A. M., Stiffler, N. M., O’Kane, J. M. (2021). A Visibility Roadmap Sampling Approach for a Multi-Robot Visibility-Based Pursuit-Evasion Problem. *2021 IEEE ICRA*.

INVITED TALKS AND CONFERENCE PRESENTATIONS

- **Formal Verification of Neural Networks and Graph Neural Networks** — Guest Lecturer, Formal Methods Course, Vanderbilt University, April 2026
- **Fairness in Machine Learning and Fairness Verification** — Guest Lecturer, Data Science Rights and Responsibilities Course, February 2026
- **GNN Verification for Power Systems** — Guest Speaker, Los Alamos National Laboratory, July 2025
- **Toward Graph Neural Network Verification** — Poster Presentation, DOE Computational Science Graduate Fellowship Annual Program Review ’25, July 2025
- **GNN Verification for Power Systems** — Poster Presentation, Software for National Security Partnership Forum (SPF) ’25, March 2025
- **Fairness in Machine Learning** — Guest Lecturer, Data Science Rights and Responsibilities Course, February 2025

- **FairNNV: Formal Fairness Verification of Neural Networks** — Oral Presentation, ACM ICAIF '24, November 2024
- **Fairness in Machine Learning** — Guest Lecturer, Vanderbilt AI Training Series, October 2024

GRADUATE COURSEWORK

- Social Network Analysis
- Algorithms for Decision Making
- Hybrid and Embedded Systems
- Automated Verification
- Advanced Artificial Intelligence
- Distributed Electrical Energy Systems
- Mathematical Data Science
- Statistical Foundations of Deep Learning
- Big Data Scaling
- Systems Theory

GRADUATE COURSE PROJECTS

- **A Large Scale Data-Driven Approach to Estimating Power Generation Costs in AC-OPF Problems** (Spring 2025): https://github.com/atumlin/DS5460_FinalProject
- **Verifying the Robustness of FDIA Detection Models in Smart Grid Systems** (Spring 2024): <https://github.com/judydnguyen/nnv>
- **Comparative Analysis of RL and Linear Control Methods for the Inverted Pendulum Problem** (Fall 2023): https://github.com/atumlin/CS6376_TermProject

LEADERSHIP AND TEAMWORK

VALIANT Attempt (Officer)

April 2025 - Present

Nominated officer of the student organization for Vanderbilt Lab for Immersive AI Translation, contributing to student-led efforts that support immersive AI translation research and engagement.

Computer Science Graduate Student Association (Vice President)

August 2023 - Present

Elected Vice President; co-founder and executive board member, supporting professional development and academic community building among graduate students.

UofSC Senior Capstone Project (Project Manager)

August 2022 - May 2023

Led the development of Cocky Calendar, a web app for campus events. Managed the database system and implemented a web scraping tool for event aggregation.

UofSC Chapter of Women in Computing (President)

August 2020 - December 2021

Promoted inclusion and leadership in tech through organized meetings, events, and outreach. Increased visibility and engagement within the CS department.

AWARDS

Department of Energy Computational Science Graduate Fellowship (DOE CSGF)

2024

Highly competitive fellowship awarded by the U.S. Department of Energy to support graduate students pursuing research in computational science and engineering. Provides full tuition and a stipend of \$45,000 annually to advance work in areas of national importance.

Provost Graduate Scholarship

2023

Merit-based scholarship awarded by Vanderbilt University to outstanding Ph.D. students. Provides an annual supplement of \$10,000 to support academic development and research.

Benjamin A. Gilman International Scholarship

2022

Nationally competitive \$5,000 scholarship funded by the U.S. Department of State to support undergraduate study abroad and promote cross-cultural learning among underrepresented students.

NYIT Research Experience for Undergraduates (REU)

2021

Selected for a competitive NSF-funded summer research program at the New York Institute of Technology.

Magellan Scholar Research Grant

2021

\$2,500 undergraduate research grant awarded by the University of South Carolina to support student-led research projects under faculty mentorship.

UofSC Research Experience for Undergraduates (REU)

2020

Selected for a competitive NSF-funded summer research program at the University of South Carolina.

McNair Scholarship

2019

Full-ride merit scholarship awarded to top undergraduate students at the University of South Carolina. Covered tuition, fees, and living expenses totaling approximately \$194,000 over four years.