

Ben Wooding

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Background

I am a Postdoctoral Scholar (Research) at the Institute for Software Integrated Systems, Vanderbilt University, in the group of Taylor T. Johnson, where I develop theory and software that deliver *provable guarantees* for safe artificial intelligence, verifiable machine learning, and cyber-physical systems (CPS). I contribute to the **DAINS** (Dependable AI for National Security) project, collaborating with the Air Force Research Laboratory (AFRL) and Oak Ridge National Laboratory (ORNL).

My work provides rigorous correctness and safety guarantees for autonomous systems, especially when the underlying model is unknown and only data is available. I am the lead author of several open-source tools: **IMPACT**, **ProTECT**, and **TRUST**, and have contributed to version three of **NNV**. My theoretical contributions include published work at *NAHS*, *CDC*, *HSCC*, *ICCPs*, *ATVA*, *SAIV*, *NeuS*, *ICTAC*, *QEST+FORMATS*, *ADHS*, *ECC*, and *Environmental Science: Water Research & Technology*. I currently co-lead the **AINNCS** (Artificial Intelligence and Neural-Network Control Systems) category of the ARCH-COMP verification competition, and am the publicity chair for **VNN-COMP** (Verification of Neural Networks Competition).

I was awarded the 2023 EPSRC Doctoral Prize Research Fellowship (**7% acceptance**) for “Reliable AI-Enabled Design of Cyber-Physical Systems” at Newcastle University. I completed my PhD in Formal Methods for Cyber-Physical Systems at Newcastle University in 2023, supervised by Sadegh Soudjani under an EPSRC studentship, following a 1st-class integrated Master’s (MComp) in Computer Science (Security and Resilience), with a dissertation mark of 92%. I contribute to the international community through invited talks across Europe and the US, program-committee membership, and extensive peer review.

Research Interests

Trustworthy Autonomy & AI • Verification of Neural Networks • Cyber-Physical Systems • Formal Learning & Control • Data-Driven Methods • Abstraction Techniques • Control Barrier Certificates • Probabilistic Verification • Descriptor Systems • Stochastic Systems • Scenario Optimization

Education

- Oct.19–Nov.23 **PhD** in Formal Methods for Cyber-Physical Systems, School of Computing, **Newcastle University**, UK.
Thesis: *Model-Based and Data-Driven Formal Synthesis of Power Systems*.
- Oct.15–Sep.19 **M.Comp (Hons.)** in Computer Science (Security and Resilience), **Newcastle University**, UK.
Dissertations: (i) *Using Formal Methods and Proof to Verify a CANDO Epilepsy Medical Device (2019)*;
(ii) *Modelling Computer Security Principles as a Strategy Game (2018)*.

Achievements

- Jun.25 Selected as Newcastle University applicant for the Royal Academy of Engineering Fellowship [**16.67% acceptance**]
- Jun.25 2nd place — ARCH 2025 Best Result Award
- 2025 *A logic-based resilience metric for water resource recovery facilities* chosen for the themed collection *Highlights from Environmental Science: Water Research & Technology in 2024* [**1 of 20 papers — 8.5% of eligible papers**]
- Oct.15–Sep.20 Newcastle University Sports Scholarship

Grants, Funding & Projects

- Nov.23–Nov.25 **EPSRC Doctoral Prize Research Fellowship** — £93,000 (personal fellowship) [**7% acceptance**]
- Oct.19–Mar.23 **EPSRC PhD Studentship** — £68,362 (funding secured by Sadegh Soudjani)
- 2025–Pres. **DAINS (Dependable AI for National Security)** — project contributor; regular engagement with the Air Force Research Laboratory (AFRL) and Oak Ridge National Laboratory (ORNL), Vanderbilt University.

Teaching

Lectures

- May-26 Formal Methods & AI-Assisted Verification (FMAIV), 4-day short course @ United States Coast Guard Academy (USCGA); designed for the USCGA Mathematics Department with Taylor T. Johnson.
- 2025–26 CS6315 — Automated Verification, advanced graduate course @ Vanderbilt University (2 lectures).

Demonstrating & Marking

Newcastle University (2019–2023): *Cloud Computing; Engineering for AI; Research Methods; Computer Architecture; Software Engineering; Software Verification; Algorithm Design and Analysis; Building Systems for People; Understanding Programming Languages; Group Project in Data Science; Development and Operation of Systems.*

Publications

Bold indicates the author; * denotes equal contribution; large consortium reports are marked “authors alphabetical”.

Conference

- [C20] M. H. Kazma, H. Zhang, A. A. Albustami, **B. Wooding**, M. Ma, T. T. Johnson, and A. F. Taha, “Safe Control of Semi-Explicit Differential-Algebraic Systems: Control Barrier Functions with SOS Verification”, *IEEE Conference on Decision and Control (CDC)*, 2026 (**to appear**).
- [C19] **B. Wooding**, M. H. Kazma, H. Zhang, A. F. Taha, M. Ma, and T. T. Johnson, “Safe Autonomous Takeover for Unknown Descriptor Systems”, *IEEE Conference on Decision and Control (CDC)*, 2026 (**to appear**).
- [C18] H. Zhang, M. H. Kazma, **B. Wooding**, M. Ma, T. T. Johnson, and A. F. Taha, “Control Barrier Function Synthesis for Differential-Algebraic Systems”, *IEEE Conference on Decision and Control (CDC)*, 2026 (**to appear**).
- [C17] A. M. Tumlin*, S. Sasaki*, **B. Wooding**, D. M. Lopez, M. U. Zubair, N. Hashemi, H. Zhang, W. Abbas, I. Oguz, M. Ma, and T. T. Johnson, “NNV3: Expanding Neural Network Verification to New Architectures and Domains”, *International Symposium on Automated Technology for Verification and Analysis (ATVA)*, 2026 (**to appear; *co-first authors**).
- [C16] L. Geretti, J. Alexandre dit Sandretto, M. Althoff, L. Benet, P. Collins, M. Forets, S. Mitsch, M. Perschl, C. Schilling, J. Tillet, and **B. Wooding**, “ARCH-COMP26 Category Report: Continuous and Hybrid Systems with Nonlinear Dynamics”, *13th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH)*, 2026 (**authors alphabetical**).
- [C15] S. Sasaki*, **B. Wooding***, M. Althoff, L. Benet, S. Coogan, M. Forets, A. Harapanahalli, L. Koller, T. Ladner, C. Schilling, T. T. Johnson, H. Zhang, and X. Zhong, “ARCH-COMP26 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants”, *13th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH)*, 2026 (***category co-leads**).
- [C14] **B. Wooding**, H. Zhang, T. T. Johnson, and A. Lavaei, “*k*-Inductive Neural Barrier Certificates for Unknown Nonlinear Dynamics”, *3rd International Conference on Neuro-Symbolic Systems (NeuS)*, 2026 (**selected as oral presentation — 28% of submissions**).
- [C13] Q. Pham, **B. Wooding**, L. Nam, S. Sasaki, and T. T. Johnson, “MetaMoE: Formal Verification of Compositional Robustness and Scalability of Mixture-of-Experts Architecture”, *9th International Symposium on AI Verification (SAIV)*, 2026.
- [C12] A. M. Tumlin, **B. Wooding**, Z. Shao, D. M. Lopez, T. Derr, and T. T. Johnson, “Reachability-Based Formal Verification of Graph Neural Networks with Node and Edge Features”, *9th International Symposium on AI Verification (SAIV)*, 2026.
- [C11] **B. Wooding***, K. Brennan*, A. M. Tumlin, H. Zhang, and T. T. Johnson, “A Self-Correcting Neuro-Symbolic AI Reasoning Framework”, *9th International Symposium on AI Verification (SAIV)*, 2026 (***contributed equally**).
- [C10] A. Abate, O. Akbarzadeh, H. A. P. Blom, S. Haesaert, S. Hassani, A. Lavaei, F. B. Mathiesen, R. Misra, A. Nejati, M. Niehage, F. Ørum, A. Remke, B. Samari, R. Wang, R. Wisniewski, **B. Wooding**, and M. Zaker, “ARCH-COMP25 Category Report: Stochastic Models”, *12th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH25)*, 2025 (**authors alphabetical**).
- [C9] L. Freitas, **B. Wooding**, B. Scott, A. Pollitt, and P. Degenaar, “Proving the Correctness of CANDO3 Optrode Command Interface VDM model in Isabelle/HOL”, *23rd Overture Workshop and 3rd INTO-CPS Association Brainstorm*, 2025.

- [C8] J. Gardner*, **B. Wooding***, A. Nejati, and A. Lavaei, “TRUST: Stability and Safety Controller Synthesis for Unknown Dynamical Models Using a Single Trajectory”, *Hybrid Systems: Computation and Control (HSCC)*, 2025 (**contributed equally*).
- [C7] **B. Wooding**, V. Horbanov, and A. Lavaei, “PRoTECT: Parallelized Construction of Safety Barrier Certificates for Nonlinear Polynomial Systems”, *International Colloquium on Theoretical Aspects of Computing (ICTAC)*, 2025 [2nd place — ARCH 2025 Best Result Award].
- [C6] O. Schön, S. Naseer, **B. Wooding**, and S. Soudjani, “Data-Driven Abstractions via Binary-Tree Gaussian Processes for Formal Verification”, *Analysis and Design of Hybrid Systems (ADHS)*, 2024.
- [C5] **B. Wooding** and A. Lavaei, “IMPACT: Interval MDP Parallel Construction for Controller Synthesis of Large-Scale Stochastic Systems”, *Quantitative Evaluation of Systems and Formal Modeling and Analysis of Timed Systems (QEST+FORMATS)*, 2024.
- [C4] **B. Wooding**, A. Lavaei, V. Vahidinasab, and S. Soudjani, “Robust Simulation Functions with Disturbance Refinement”, *European Control Conference (ECC)*, 2023.
- [C3] S. Bogomolov, J. Fitzgerald, F. F. Foldager, C. Gamble, P. G. Larsen, K. Pierce, P. Stankaitis, and **B. Wooding**, “Tuning Robotti: the machine-assisted exploration of parameter spaces in multi-models of a cyber-physical system”, *18th International Overture Workshop*, 2021 (*authors alphabetical*).
- [C2] A. Abate, H. Blom, N. Cauchi, J. Delicaris, A. Hartmanns, M. Khaled, A. Lavaei, C. Pilch, A. Remke, S. Schupp, F. Shmarov, S. Soudjani, A. Vinod, **B. Wooding**, M. Zamani, and P. Zuliani, “ARCH-COMP20 Category Report: Stochastic Models”, *7th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH20)*, 2020 (*authors alphabetical*).
- [C1] **B. Wooding**, V. Vahidinasab, and S. Soudjani, “Formal Controller Synthesis for Frequency Regulation Utilising Electric Vehicles”, *Smart Energy Systems and Technologies (SEST)*, 2020.

Journal

- [J2] A. S. Laino, **B. Wooding**, S. Soudjani, and R. J. Davenport, “A logic-based resilience metric for water resource recovery facilities”, *Environmental Science: Water Research & Technology*, 2025 [1 of 20 papers (8.5% of eligible papers) chosen for the themed collection — Highlights from Environmental Science: Water Research & Technology in 2024].
- [J1] M. Kazemi*, R. Majumdar, M. Salamati*, S. Soudjani, and **B. Wooding***, “Data-Driven Abstraction-Based Control Synthesis”, *Nonlinear Analysis: Hybrid Systems (NAHS)*, 2024 (**contributed equally*).

Book Chapters

- [B3] **B. Wooding**, V. Vahidinasab, M. Kazemi, and S. Soudjani, “Cyber-Physical Smart Homes/Buildings”, *Cyber-Physical Structures of Power Applications*, 2025.
- [B2] **B. Wooding**, V. Vahidinasab, M. Kazemi, and S. Soudjani, “Control and management of active buildings”, *Active Building Energy Systems: Operation and Control*, 2021.
- [B1] **B. Wooding**, V. Vahidinasab, and S. Soudjani, “Operation and control of a population of active buildings at network level”, *Active Building Energy Systems: Operation and Control*, 2021.

Posters & Competition Contributions

- [M3] S. Sasaki, **B. Wooding**, H. D. Wang, A. M. Tumlin, M. Ma, and T. T. Johnson, “n2v: Neural Network Verification in Python (Competition Contribution)”, *9th International Symposium on AI Verification (SAIV)*, 2026.
- [M2] **B. Wooding**, V. Horbanov, and A. Lavaei, “Poster Abstract: PRoTECT: Parallel Construction of Barrier Certificates for Safety Verification of Polynomial Systems”, *International Conference on Cyber-Physical Systems (ICCPs)*, 2025 [2nd place — ARCH 2025 Best Result Award].
- [M1] **B. Wooding** and A. Lavaei, “Poster Abstract: IMPACT: A Parallelized Software Tool for IMDP Construction and Controller Synthesis with Convergence Guarantees”, *Hybrid Systems: Computation and Control (HSCC)*, 2024.

Preprints (under review)

- [P11] J. Fong, **B. Wooding**, and T. T. Johnson, “Benchmark: Formal Verification for Surgical Robots”, *under submission*, 2026.
- [P10] J. Fong, **B. Wooding**, and T. T. Johnson, “Composing Multi-Agent Behavior Trees”, *under submission*, 2026.
- [P9] S. Sasaki, **B. Wooding**, A. J. Clark, and T. T. Johnson, “From Estimation to Detection: Sequential Change Detection for Alignment Monitoring”, *under submission*, 2026.

- [P8] S. Sasaki, **B. Wooding**, and T. T. Johnson, “Learning Reach-Set Geometry for Tighter Probabilistic Neural Network Verification”, *under submission*, 2026.
- [P7] S. S. Serbinowska, **B. Wooding**, D. M. Lopez, L. Nam, A. M. Tumlin, N. K. Potteiger, H. Zhang, and T. T. Johnson, “BehaVerify: A Formal Verification Tool for Behavior Trees”, *under submission*, 2026.
- [P6] **B. Wooding** and T. T. Johnson, “Roger? Probabilistic Certificates for Safety-Critical ATC Speech Recognition”, *under submission*, 2026.
- [P5] **B. Wooding**, M. H. Kazma, H. Zhang, M. Ma, A. F. Taha, and T. T. Johnson, “Control Barrier Certificates for Unknown Linear Differential-Algebraic Equation Systems”, *under submission*, 2026.
- [P4] **B. Wooding** and S. Soudjani, “Robust Simulation Functions for Interconnected Systems under Large Disturbances”, *under submission*, 2026.
- [P3] **B. Wooding**, A. M. Tumlin, S. Sasaki, H. Zhang, and T. T. Johnson, “Input-Agnostic Probabilistic Neural Network Verification for Vision, Speech and Depth”, *under submission*, 2026.
- [P2] **B. Wooding** and A. Lavaei, “Learning k -Inductive Control Barrier Certificates for Unknown Non-linear Dynamics Beyond Polynomials”, *arXiv preprint, under submission*, 2024.
- [P1] **B. Wooding**, A. Lavaei, and S. Soudjani, “Formal Control of New England 39-Bus Test System: An Assume-Guarantee Approach”, *arXiv preprint*, 2023.

Research Software

- QEST’24 **IMPACT** — C++ (GPU-parallelized via SYCL/AdaptiveCpp; Armadillo, HDF5, GLPK). First tool for parallel construction of interval MDPs and controller synthesis for large-scale stochastic systems with convergence guarantees. (*lead author; QEST+FORMATS 2024*)
- ICTAC’25 **PRoTECT** — Python (SOS/SDP via SumOfSquares, PICOS, MOSEK; PyQt6 GUI; parallelized). Construction of safety barrier certificates for nonlinear polynomial systems. (*lead author; ICTAC 2025*)
- HSCC’25 **TRUST** (web app) — Python/Flask + Vue web tool with a MOSEK SOS backend. Data-driven stability/safety controller synthesis for unknown systems from a single trajectory. (*co-lead author; HSCC 2025*)
- ATVA’26 **NNV** — MATLAB toolbox for set-based reachability verification of neural networks and neural-network control systems (star sets, zonotopes, ImageStar). (*co-author of NNV3; ATVA 2026*)
- SAIV’26 **n2v** — Python (PyTorch, ONNX, CVXPY) toolbox for set-based reachability verification of neural networks; a Python reimplement of NNV. (*contributor; SAIV 2026 / VNN-COMP*)
- tool **Google-Scholar-Orderer** — JavaScript browser extension (33★) adding citation-based sorting and venue-ranking badges to Google Scholar.

Invited Talks & Panels

- Aug.25 *TRUST: Stability and Safety Controller Synthesis for Unknown Dynamical Models Using a Single Trajectory*, **Max Planck Institute**, DE.
- Jun.25 *Open-Source Software Tools for Research*, Open Research Conference, **Newcastle University**, UK.
- Jun.25 *IMPACT: Abstraction and Control Design for Large-Scale Stochastic Systems using Interval MDPs*, **UCLouvain**, BE.
- May.25 *Safety Barrier Certificates and Data-Driven k -Inductive Safety Control Barrier Certificates for Nonlinear Systems*, **Vanderbilt University**, US.
- Feb.25 *Data-Driven k -Inductive Safety Control Barrier Certificates for Nonlinear Systems*, **TU Eindhoven**, NL.
- Dec.24 *Safety Barrier Certificates for Nonlinear Systems*, School of Computing and Communications, **Lancaster University**, UK.
- Nov.24 *IMPACT: A software tool for controller synthesis of stochastic systems using interval MDPs*, Software Systems Group (SSY) Seminar, **King’s College London**, UK.
- Nov.24 *Safety Barrier Certificates for Nonlinear Polynomial Systems*, Institute of Perception, Action and Behaviour (IPAB) Seminar, **Edinburgh University**, UK.
- Nov.24 *IMPACT: A software tool for controller synthesis of stochastic systems using interval MDPs*, Scientific Computing (SciComp) Seminar, **Durham University**, UK.
- Jul.24 “Ask the Experts” Session, PARTNERS24, **Newcastle University**, UK. [The PARTNERS programme supports young people who face barriers that make them less likely to attend university.]

Conference Presentations

- Jul.26 9th International Symposium on AI Verification (SAIV) @ FLoC, Lisbon, Portugal. **Presented [C13] and [C11].**
- Jun.26 3rd International Conference on Neuro-Symbolic Systems (NeuS), University of Southern California, USA.
- Jun.25 Open Research Conference, Newcastle-upon-Tyne, UK.
- Jun.25 12th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH25), Virtual. **[on behalf of the Stochastic Models category]**
- May.25 International Conference on Hybrid Systems: Computation and Control (HSCC), Irvine, California.
- May.25 International Conference on Cyber-Physical Systems (ICCPS), Irvine, California.
- Sep.24 QEST+FORMATS, Calgary, Canada. **[Regular, Work-in-Progress, and Demo Sessions]**
- Jun.23 21st European Control Conference (ECC), Bucharest, Romania.
- Sep.20 3rd Int. Conf. on Smart Energy Systems and Technologies (SEST), Istanbul, Turkey. **[Virtual]**

Academic Service

Workshop Organization

- ARCH'26 *AINNCS Co-Lead* for the Applied Verification for Continuous and Hybrid Systems (ARCH) Friendly Competition, 2026.
- VNN-COMP'26 *Publicity Chair* for the International Verification of Neural Networks Competition, co-located with SAIV @ FLoC 2026, Lisbon, Portugal.
- AAAI'26 *Contributor* for the VNN-COMP Lab for Benchmark Proposers, Verification Tool Participants, and the Broader AI Community at AAAI, LH03, 2026.
- CPS-IoT'21 *Website Chair* for the Verification of Autonomous & Robotic Systems (VARS) Workshop at CPS-IoT Week, 2021.

Program Committees

- FMAS'26 **PC Member**, Formal Methods for Autonomous Systems (FMAS), 2026.
- CAV'26 **Artifact Evaluation PC**, Computer Aided Verification (CAV), 2026.
- HSCC/ICCPS'26 **Demos and Posters PC**, Hybrid Systems: Computation and Control / Int. Conf. on Cyber-Physical Systems (HSCC/ICCPS), 2026.
- FSE'24 **Artifact Evaluation PC**, Foundations of Software Engineering (FSE), 2024.
- FORMATS'23 **Artifact Evaluation PC**, Formal Modeling and Analysis of Timed Systems (FORMATS), 2023.
- HSCC'20–22 **Repeatability PC**, Hybrid Systems: Computation and Control (HSCC), 2020, 2021, 2022.
- ADHS'21 **Repeatability PC**, IFAC Conf. on Analysis and Design of Hybrid Systems (ADHS), 2021.

Reviewing Activities [12 journals, 25 conferences, 1 book chapter]

Journals: *IEEE Access*, *Springer Annals of Mathematics and Artificial Intelligence*, *IFAC Automatica*, *IEEE Control Systems Letters (L-CSS)*, *RSC Environmental Science: Processes & Impacts*, *Elsevier European Journal of Control (EJCON)*, *Elsevier Nonlinear Analysis: Hybrid Systems (NAHS)*, *Elsevier Performance Evaluation (PEVA)*, *Royal Society Philosophical Transactions of the Royal Society A*, *Cambridge University Press Research Directions: Cyber-Physical Systems*, *IEEE Transactions on Automatic Control (TAC)*, *IEEE Transactions on Control Systems Technology (TCST)*.

Conferences: *IFAC American Control Conference (ACC)*, Annual Meeting of the *Association for Computational Linguistics (ACL)*, *IFAC Conf. on Analysis and Design of Hybrid Systems (ADHS)*, *Automated Technology for Verification and Analysis (ATVA)*, *Computation-Aware Algorithmic Design for Cyber-Physical Systems (CAADCPS)*, *Computer Aided Verification (CAV)*, *IEEE Conf. on Control Technology and Applications (CCTA)*, *IEEE Conf. on Decision and Control (CDC)*, *IEEE European Control Conference (ECC)*, *European Conf. on Computer Vision (ECCV)*, *IEEE/ACM Int. Conf. on Embedded Software (EMSOFT)*, *IEEE Engineering Reliably Autonomous Systems (ERAS)*, *ACM Hybrid Systems: Computation and Control (HSCC)*, *ACM/IEEE Int. Conf. on Cyber-Physical Systems (ICCPS)*, *Leveraging Applications of Formal Methods (ISoLA)*, *IEEE Intelligent Transportation Systems (ITSC)*, *Intelligent Vehicle Symposium (IV)*, *Learning for Decision and Control (L4DC)*, *Neural Information Processing Systems (NeurIPS)*, *Neuro-Symbolic Systems (NeuS)*, *Quantitative Evaluation of Systems / Formal Modeling and Analysis of Timed Systems (QEST+FORMATS)*, *IEEE Real-Time Systems Symposium (RTSS)*, *Runtime Verification (RV)*, *Symposium on AI Verification (SAIV)*, *IFAC World Congress*.

Book Chapters: Active Building Energy Systems: Operation and Control.

Memberships

IEEE Member (2024–present); IEEE Student Member (2023).

Supervision & Mentoring

Publications co-authored with mentees:

- *2026*: the self-correcting neuro-symbolic reasoning framework (*with K. Brennan; joint first authors*); **MetaMoE** (Pham et al.); **n2v** (Sasaki et al.); reach-set geometry for probabilistic neural-network verification (Sasaki et al.); sequential change detection for alignment monitoring (Sasaki et al.); the surgical-robot verification benchmark (Fong et al.); composing multi-agent behavior trees (Fong et al.).
- *2025 and earlier*: the WRRF resilience metric (Laino et al.); Binary-Tree Gaussian Process abstractions (Schön et al.); **TRUST** (Gardner et al.).

Professional Development & Training

Career development:

- Developing Your Good Leadership Identity and Practice (Prof. Geraldine Fitzpatrick)
- Building an Impactful Presentation: A Step-by-Step Guide
- Leading and Managing Research Teams
- Certified Peer Review Course
- Getting Those Grants: Early Career Fellowships — The Foundation
- Public Engagement Training
- Academy of College Teaching (ACT 2026S), Vanderbilt University
- Postdoctoral Mentoring Skills Workshop, Vanderbilt University

EECI M17 (2024): *The scenario approach: data science for systems, control, and machine learning.*

Technical Skills

Languages: C++, Python, MATLAB/Simulink, JavaScript (Vue), C#, PHP.

Proof assistants & formal modeling: Isabelle/HOL, Lean, VDM; SMT solvers (Z3, dReal).

Parallel & HPC: GPU computing via SYCL/AdaptiveCpp, OpenMP, multiprocessing.

Optimization: convex optimization & LP (CVXPY, CVXOPT, GLPK), SOS/SDP (SumOfSquares, PICOS, MOSEK), scenario optimization & chance-constrained programming.

Scientific computing: Armadillo, HDF5, GSL, Boost; NumPy, SciPy, SymPy.

Machine learning: PyTorch, ONNX; verification across graph neural networks, mixture-of-experts, vision-language models, speech recognition and depth estimation.

Software engineering: GUI (PyQt6), web apps (Flask/Vue, WordPress), Docker, CMake, Poetry, Git & GitHub Actions CI; artifact packaging & reproducibility (Docker, Zenodo).

AI-assisted development: routine use of agentic programming tools — Claude Code (Max subscription) — for research-software development, refactoring and automation.

Additional Information

Leadership: Held a Volleyball sports scholarship at Newcastle University for four seasons, playing semi-professionally in the Men’s Super League (the UK’s highest division) during my first PhD year. Leadership roles included Men’s Team Captain, Club Secretary and Club President; Chairman of JPCFC, an FA-registered football (soccer) team, in the 2024–25 season.

Community: Weekly volunteer at [The Store](#), a choice-based food pantry providing free groceries to referred Nashville families (*Centennial location*).

Global perspective: Spent ten years of my childhood in Uganda, East Africa, attending an international school representing over 70 nations — giving me a broad perspective across countries, cultures and worldviews.

References

PhD Supervisor: Sadegh Soudjani, Max Planck Institute — sadegh@mpi-sws.org

Fellowship Collaborator: Abolfazl Lavaei, Newcastle University — abolfazl.lavaei@ncl.ac.uk

Postdoc Supervisor: Taylor T. Johnson, Vanderbilt University — taylor.johnson@vanderbilt.edu