Amutheezan Sivagnanam

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SUMMARY

PhD Candidate and **Machine Learning Researcher** specializing in **Deep Reinforcement Learning** with **six** years of academic research and **two** years of industrial software development experience. Expertise in **scalable deep learning and reinforcement learning systems**, ML **training, and deployment**, complemented by a **strong publication record (h-index 6)**. Proficient in **Python**, **TensorFlow**, **PyTorch**, AWS, Agile and CI/CD practices, with hands-on experience in **optimizing ML models and pipelines**.

EDUCATION

Pennsylvania State University
Ph.D., Computer Science — *Aug 2025*
Dissertation: *Application of Deep Reinforcement Learning to Solve Optimization Problems in Transportation Domains*

University of Houston
M.S., Computer Science — *Aug 2022*

University of Moratuwa
B.S., (Hons) Engineering (Computer Science and Engineering) — *Jan 2018*
Final Year Project: *Sentimental Analysis of Twitter using Semi-Supervised Approaches*

AREAS OF EXPERTISE

Reinforcement Learning, Optimization, Operational Research

SKILLS

Programming Languages: Python, C++, Java, C, JavaScript, PHP, MATLAB
Frameworks & Libraries: PyTorch, TensorFlow, Scikit-learn, Ray, RLLib, OpenAI Gym, NumPy, pandas, matplotlib, CPLEX, Gurobi, Mosek, OR-Tools
Databases: SQL, MySQL, SQLite, MongoDB
Tools & Platforms: Amazon Web Services, Git, GitHub, Linux, Docker, Spark, CI/CD, Bash
Methodologies: Object-Oriented Development, Agile, Behaviour Driven Development

RESEARCH EXPERIENCE

Pennsylvania State University — Graduate Research Assistant
Applied Artificial Intelligence Lab
Aug. 2022 - May 2025

- Spearheaded research projects funded by the U.S. Department of Energy (DOE) and the National Science Foundation (NSF), leading to advancements in cost and energy-efficient technologies
- Studied real-world decision-making problems and identified gaps in existing solution approaches, leading to the development of innovative strategies for improved decision-making
- Developed mathematical models and formulated problems to address these challenges, resulting in more accurate predictions and solutions for complex issues
- Applied artificial intelligence–based solutions to tackle real-world problems and successfully deployed them in relevant industries
- Published research findings in AI conferences (ICML) and assisted in preparing slides for presenting results at DOE and NSF meetings
- Developed a deep reinforcement learning (DRL) method (using DDPG) for proactive responder repositioning in emergency management, achieving significantly faster response times while reducing operational delays
- Applied DRL (using DQN) to solve online vehicle routing with advance booking, enabling real-time confirmations within seconds

The University of Houston — Graduate Research Assistant
Resilient Networks and Systems Lab
Sep. 2019 - Aug. 2022

- Spearheaded research projects funded by the U.S. Department of Energy (DOE) and the National Science Foundation (NSF), leading to advancements in energy-efficient technologies
- Studied real-world decision-making problems and identified gaps in existing solution approaches, leading to the development of novel methodologies for enhanced decision-making
- Developed mathematical models and formulated problem statements to effectively address these challenges, resulting in more accurate predictions and solutions for complex issues
- Applied AI-based solution approaches to real-world problems and successfully deployed them in relevant industries
- Published research findings in AI conferences (AAAI, IJCAI) and assisted preparing slides for presenting results at DOE and NSF meetings
- Introduced heuristics that reduced annual energy costs by $140K for public transit agencies operating mixed fleets of buses

- Implemented a deep reinforcement learning (using DQN) approach that reduced operational costs by 20% by enabling online booking for traditionally offline Vehicle Routing Problems (VRPs)
- Collected and analyzed real-world data using Python to identify trends—such as changes in paratransit operations before and after COVID-19 and the impact of vulnerability reward programs

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SOFTWARE ENGINEERING EXPERIENCE

LSEG Technology — Software Engineer
Post Trade Team
Jan 2018 – Jul 2019

- Developed application software using Object-Oriented principles, enhancing code maintainability and scalability
- Implemented agile development practices, such as Scrum, to improve team collaboration and project delivery speed
- Developed software solutions using Java, Python, and C++, improving system performance and reliability
- Introduce Unit Testing for Libraries in Post Trade C++ Code
- Modified database structures and tested using BDD-based testing, ensuring data integrity and system functionality
- Identified and replaced duplicated error codes with valid new error codes, improving system reliability
- Developed a dynamic scripting object (DSO) for front-end end-to-end testing using Java, enhancing test coverage and efficiency
- Analyzed and modified back-end regression scripts to work with both old and new testing frameworks, ensuring compatibility and reducing testing time
- Developed a new report generation system for the testing framework, automating email dispatch at the end of regression and improving communication efficiency
- Completed code integration tasks related to back-end regression, streamlining the development process and enhancing system performance
- Updated automatic updates to auto-generated codes based on Database changes using Integration Plans
- Contributed to code integration and deployment plans, ensuring seamless software updates and minimizing downtime
- Participated in professional training programs conducted by Millennium IT Software and Post Trade Team
- Worked on Front-End Development for both Product and Solution which consists of Enhancement, Bug Fixing, Merging and Introducing new features

WSO2 Lanka PVT Ltd — Software Engineering Intern
Data Analytics Team
Jul 2016 – Dec 2016

- Developed an alert generation system analyzing descriptive HL7/FHIR data to monitor disease outbreaks, triggering timely email and SMS notifications
- Engineered a mechanism to evaluate hospital functionality by assessing admission and discharge messages, including bed and oxygen cylinder availability

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PUBLICATIONS

CONFERENCE PROCEEDINGS

[C7] **Sivagnanam, A.,** Pettet, A., Lee, H., Mukhopadhyay, A., Dubey, A., & Laszka, A. (2024). Multi-agent reinforcement learning with hierarchical coordination for emergency responder stationing. In *Proceedings of the International Conference on Machine Learning (ICML-24)*.

[C6] R. Sen, **A. Sivagnanam,** A. Laszka, A. Mukhopadhyay and A. Dubey, "Grid-Aware Charging and Operational Optimization for Mixed-Fleet Public Transit," *2024 IEEE 27th International Conference on Intelligent Transportation Systems (ITSC)*, Edmonton, AB, Canada, 2024, pp. 4172-4179,

[C5] Pavia, S., Rogers, D., **Sivagnanam, A**., Wilbur, M., Edirimanna, D., Kim, Y., Mukhopadhyay, A., Pugliese, P., Samaranayake, S., Laszka, A., & Dubey, A. (2024). SmartTransit.AI: A dynamic paratransit and microtransit application. In *Proceedings of the Thirty-Third International Joint Conference on Artificial Intelligence (IJCAI-24)* (pp. 8767–8770).

[C4] Atefi, S., **Sivagnanam, A.,** Ayman, A., Grossklags, J., & Laszka, A. (2023, May). The benefits of vulnerability discovery and bug bounty programs: Case studies of Chromium and Firefox. In *Proceedings of the ACM Web Conference* (pp. 2209–2219).

[C3] **Sivagnanam, A**., Kadir, S. U., Mukhopadhyay, A., Pugliese, P., Dubey, A., Samaranayake, S., & Laszka, A. (2022, July). Offline vehicle routing problem with online bookings: A novel problem formulation with applications to paratransit. In *Proceedings of the Thirty-First International Joint Conference on Artificial Intelligence (IJCAI-22)* (pp. 3933–3939).

[C2] **Sivagnanam, A**., Ayman, A., Wilbur, M., Pugliese, P., Dubey, A., & Laszka, A. (2021, May). Minimizing energy use of mixed-fleet public transit for fixed-route service. In *Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 35, No. 17, pp. 14930–14938).*

[C1] Ayman, A., Wilbur, M., **Sivagnanam, A.,** Pugliese, P., Dubey, A., & Laszka, A. (2020, September). *Data-driven prediction of route-level energy use for mixed-vehicle transit fleets.*

In Proceedings of the 6th IEEE International Conference on Smart Computing (SMARTCOMP) (pp. 1–8). IEEE.

JOURNALS

[J2] Wilbur, M., Ayman, A., **Sivagnanam, A.,** Ouyang, A., Poon, V., Kabir, R., Vadali, A., Pugliese, P., Freudberg, D., Laszka, A., & Dubey, A. (2023). Impact of COVID-19 on Public Transit Accessibility and Ridership. *Transportation Research Record*, *2677*(4), 531-546.

[J1] Ayman, A., **Sivagnanam, A**., Wilbur, M., Pugliese, P., Dubey, A., & Laszka, A. (2022). Data-driven prediction and optimization of energy use for transit fleets of electric and ICE vehicles. *ACM Transactions on Internet Technology, 22*(1), Article 7, 1–29

WORKSHOPS

[W1] **Sivagnanam, A.,** Atefi, S., Ayman, A., Grossklags, J., & Laszka, A. (2021). On the benefits of bug bounty programs: A study of Chromium vulnerabilities. In *Workshop on the Economics of Information Security (WEIS)* (Vol. 10).

BOOK CHAPTERS

[BC1] Wilbur, M., **Sivagnanam, A.,** Ayman, A., Samaranayake, S., Dubey, A., & Laszka, A. (2023, August). Artificial intelligence for smart transportation. In **Y. Vorobeychik & A. Mukhopadhyay (Eds.),** *Artificial Intelligence and Society* (book chapter). ACM Press.

TALKS

IJCAI (Vienna, Austria) 2022
For the paper: Offline Vehicle Routing Problem with Online Bookings: A Novel Problem Formulation with Applications to Paratransit

WEIS (Virtual Workshop) 2021
For the workshop paper: On the Benefits of Bug Bounty Programs: A Study of Chromium Vulnerabilities

AAAI (Virtual Conference) 2021
For the paper: Minimizing Energy Use of Mixed-Fleet Public Transit for Fixed-Route Service

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SERVICES

Program Committee Member
International Joint Conference on Artificial Intelligence (AI For Social Good) 2025

Reviewer
International Joint Conference on Artificial Intelligence (AI For Social Good) 2024

Reviewer
AI4Research Workshop @IJCAI2024 2024

Auxiliary Reviewer
22nd International Conference on Autonomous Agents and Multiagent Systems 2023

AWARDS AND HONORS

Information Security Quiz 2015 - Runners Up 2015
Issued by Sri Lanka Computer Emergency Readiness Team(SLCERT)
and Information and Communication Technology Agency of Sri Lanka(ICTA)

Mahapola Scholarship 2014 - 2017