

# AMUTHEEZAN SIVAGNANAM

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## EDUCATION

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- PhD in Informatics** Aug. 2022 - Present  
Pennsylvania State University, University Park, PA  
Supervisor: Dr. Aron Laszka
- PhD. in Computer Science (Transferred to PSU)** Aug. 2019 - Aug. 2022  
The University of Houston, Houston, TX  
Supervisor: Dr. Aron Laszka
- MSc. in Computer Science** Aug. 2019 - Aug. 2022  
University of Houston, Houston, TX, GPA : 4.00/4.00
- BSc. (Hons) in Computer Science and Engineering** Jan. 2014 - Jan. 2018  
Faculty of Engineering, University of Moratuwa, Sri Lanka, GPA : 3.81/4.20

## SKILLS

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**Fields :** Artificial Intelligence, Machine Learning, Deep Reinforcement Learning, Operational Research  
**Language and Tools :** Python, TensorFlow, PyTorch, Git, Docker, CPLEX, Mosek, Google OR-Tools, C, C++, Java

## PUBLICATIONS

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- **Amutheezan Sivagnanam**, Ava Pettet, Hunter Lee, Ayan Mukhopadhyay, Abhishek Dubey, Aron Laszka. “*Multi-Agent Reinforcement Learning with Hierarchical Coordination for Emergency Responder Stationing*” Accepted to be present in the Proceedings of the 41 st International Conference on Machine Learning, Vienna, Austria. PMLR 235, 2024 (**ICML 2024**). <https://proceedings.mlr.press/v235/sivagnanam24a.html>
- **Amutheezan Sivagnanam**, Salah Uddin Kadir, Ayan Mukhopadhyay, Philip Pugliese, Abhishek Dubey, Samitha Samaranyake, Aron Laszka. “*Offline Vehicle Routing Problem with Online Bookings: A Novel Problem Formulation with Applications to Paratransit.*” In proceedings of the 31st International Joint Conference on Artificial Intelligence (**IJCAI 2022**). <https://www.ijcai.org/proceedings/2022/0546.pdf>
- **Amutheezan Sivagnanam**, Afiya Ayman, Michael Wilbur, Philip Pugliese, Abhishek Dubey, Aron Laszka. “*Minimizing Energy Use of Mixed-fleet Public Transit for Fixed-route Service.*” In Proceedings of the 35th AAAI Conference on Artificial Intelligence (**AAAI ’21**), February 2-9, 2021, Virtual Event, 7 pages. <https://ojs.aaai.org/index.php/AAAI/article/view/17752>
- Soodeh Atefi, **Amutheezan Sivagnanam**, Afiya Ayman, Jens Grossklags, Aron Laszka. “*The Benefits of Vulnerability Discovery and Bug Bounty Programs: Case Studies of Chromium and Firefox.*” Published in In Proceeding of The Web Conference 2023 (**WWW 2023**), April 30 - May 4, 2023, Austin, TX, USA, 8 Pages. <https://dl.acm.org/doi/abs/10.1145/3543507.3583352>

## RESEARCH EXPERIENCE

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- Graduate Research Assistant — Pennsylvania State University** University Park, PA, USA  
**Applied Artificial Intelligence Lab** Aug. 2022 - present
- Developed a novel deep reinforcement learning framework to optimize proactive responder repositioning in emergency management systems, enhancing response efficiency and minimizing operational delays. Python, Google OR Tools, Tensorflow, Scikit-Learn
  - Applied deep reinforcement learning approach to solve the problem of online vehicle routing with advance booking. Python, Google-OR-Tools, Keras, Tensorflow, PyTorch
- Graduate Research Assistant — The University of Houston** Houston, TX, USA  
**Resilient Networks and Systems Lab** Sep. 2019 - Aug. 2022
- Introduced mathematical models to solve transit optimization problems (e.g., minimizing energy consumption in public transportation operating mixed fleets of electric and gasoline vehicles, optimizing the online booking for paratransit services with offline vehicle routing problem setting).
  - Implemented the algorithm and solution approaches for mathematical models in Python, using libraries such as CPLEX, Google OR Tools, and TensorFlow.
  - Collected the real-world data and analyzed it to study trends with the assistance of Python (e.g., para-transit operation before and after COVID-19, the benefits using external bug hunters using vulnerability reward programs)

## WORK EXPERIENCE

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### **Software Engineer — LSEG Technology** **Post Trade Team**

Colombo, Srilanka  
*Jan. 2018 - Jul. 2019*

- Unit Testing for Libraries in Post Trade C++ Code was introduced. Database changes for Post Trade products for Singapore Stock Exchange were made and validated with Behavior Driven Development (BDD) testing approaches using Java. And worked on CI/CD of the Post Trade product with Python and Git. Practiced Agile-based development throughout the entire period of work.

### **Software Engineering Intern — WSO<sub>2</sub> Lanka PVT Ltd.** **Data Analytics Team**

Colombo, Srilanka  
*Jul. 2016 - Dec. 2016*

- Implemented alert generation mechanism, which provides email and SMS alerts when a disease spreads wide by analyzing the description. Implemented alert generation mechanism, which could determine the functional state of hospitals (i.e., number of beds available, number of Oxygen cylinders available) based on the admission and discharge messages.

## PHD PROJECTS

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### **Minimizing Energy Use of Mixed-Fleet Public Transit for Fixed-Route Service**

- Formulated the mathematical model to optimize the energy consumption of public transit agencies that operates mixed fleets of Electric (EV) and Internal Combustion Engine (ICEVs) Vehicles.
- Solution approach comprised of heuristics and meta-heuristics to solve larger problem instances in polynomial time.

### **Offline Vehicle Routing Problem with Online Bookings for Paratransit Operations**

- Introduced a novel mathematical formulation that helps to determine tight pickup windows, given the online day-ahead booking is flexible.
- The solution approach determined the tight pickup windows using deep reinforcement learning support by anytime algorithm to provide the solution with minimum vehicles.

### **Multi-Agent Reinforcement Learning with Hierarchical Coordination for Emergency Responder Stationing**

- Introduce Deep Deterministic Policy Gradient (DDPG) based solution approach to solve the problem of proactive reallocation of ambulances.
- The solution approach able to make the reallocation decision in fraction of seconds and reduces the average time to reach the incident locations.

### **The Benefits of Vulnerability Discovery and Bug Bounty Programs**

- Study the chromium data to determine whether external bug-hunters enhance the software security through Chromium Vulnerability Reward Programs.