

Ryan Sullivan

ryanpnavillus@gmail.com

[linkedin.com/in/ryan-navillus/](https://www.linkedin.com/in/ryan-navillus/)

973-738-7415

Profile

Applying to research and software internships for computer science, machine learning, and artificial intelligence. Currently focusing on reinforcement learning, multiagent systems, and explainable AI.

Education

University of Maryland at College Park | GPA: 3.8 / 4.0 | August 2020 – Present

- Pursuing a Ph.D. in Computer Science, researching reinforcement learning and artificial intelligence.

Purdue University | GPA: 3.7 / 4.0 | August 2016 – May 2020

- Bachelor of Science in Computer Science Honors | Major GPA: 3.8 / 4.0
 - Concentrations in Software Engineering and Machine Learning
- Bachelor of Science in Statistics - Math Emphasis
- Bachelor of Science in Mathematics/Statistics
- Honors College Curriculum

Honors and Awards

- National Merit Scholarship
- Northrop Grumman, Raytheon, and Cisco Corporate Scholarships
- Intel Scholar in the Semiconductor Research Corporation's Undergraduate Research Program

Research

Reward Surfaces of Policy Networks | January 2021 – Present

- Wrote library and performed experiments plotting the loss landscapes of RL agent policy networks.
- Created line searches plots to investigate noise and optimization challenges in the gradient direction.
- Accepted as a full paper at **ICML 2022**. Also appeared at the RL for Games AAAI22 workshop.

TCAV Explanations for Reinforcement Learning Agents | May 2021 – Present

- Using TCAV to explain which concepts in the state space that RL agents use for decision making.

Multiagent Evaluation for Real World Conditions | January 2021 – May 2021

- Tested state of the art methods for game theoretic evaluation of multiagent performance in a population.
- Researched impact of sampling noise and agent collusion on DeepMind's AlphaRank and Meta-Nash.

Computer Vision Research at Michigan State University | May 2019 – July 2019

- Used a U-Net-style convolutional neural network to automatically segment tubes and catheters in pediatric chest X rays, achieving visually accurate results on an unsolved medical computer vision task.
- Experimented with deep learning and image processing techniques, presented findings throughout the summer, and taught Keras and machine learning concepts to other researchers.
- Presented poster at Mid-SURE 2019 and published conference proceedings in **SPIE Medical Imaging 2020**

EnCourse - Honors Capstone Research Project | August 2018 – May 2020

- Worked with Professor Rivera-Rodriguez to develop a web application that tracks class projects using data from Git repositories and generates useful metrics in Python. Published paper at **SIGCSE TS 2022**.
- EnCourse has successfully been used to manage Purdue CS classes for five semesters.

Intel Scholar at Center for Brain-Inspired Computing | February 2018 – May 2020

- Used C++ to create a simulator for Intel's neuromorphic hardware, Loihi, allowing researchers to test the energy saving benefits of spiking neural networks, under supervision of C-BRIC's director, Kaushik Roy.

Conference Publications and Proceedings

- **Sullivan, R.**, Terry, J. K., Black, B., (2022). "Cliff Diving: Exploring Reward Surfaces in Reinforcement Learning Environments". In The International Conference on Machine Learning, 2022.
- Terry, J. K., Black, B., Grammel, N., Jayakumar, M., Hari, A., **Sullivan, R.**, ... Ravi, P. (2021). PettingZoo: Gym for Multi-Agent Reinforcement Learning. In *Advances in Neural Information Processing Systems, 2021*.
- Rodriguez-Rivera G., Turkstra J., Buckmaster J., LeClainche K., Montgomery S., Reed W., **Sullivan R.** and Lee J., "Tracking Large Class Projects in Real-Time Using Fine-Grained Source Control," In *SIGCSE '22: Proceedings of the 52nd ACM Technical Symposium on Computer Science Education, 2022*.
- **Sullivan, R.**, Holste, G., Burkow, J., & Alessio, A. (2020). Deep learning methods for segmentation of lines in pediatric chest radiographs. In *SPIE, Medical Imaging 2020: Computer-Aided Diagnosis* (Vol 11314, bll 577–583). doi:10.1117/12.2550686
- Holste, G., **Sullivan, R.**, Bindschadler, M., Nagy, N., & Alessio, A. (2020). Multi-class semantic segmentation of pediatric chest radiographs. In *SPIE, Medical Imaging 2020: Image Processing* (Vol 11313, bll 323–330). doi:10.1117/12.2544426

Workshop Papers, Talks, and Posters

- J. K. Terry, Benjamin Black, Nathaniel Grammel, Mario Jayakumar, Ananth Hari, **Ryan Sullivan**, Luis Santos, Rodrigo Perez, Caroline Horsch, Clemens Dieffendahl, Niall L. Williams, Yashas Lokesh, & Praveen Ravi (2021). PettingZoo: Gym for Multi-Agent Reinforcement Learning. In *OptLearnMAS-21, Proceedings of the 20th International Conference on Autonomous Agents and MultiAgent Systems 2021*.
- J. K. Terry, Benjamin Black, Nathaniel Grammel, Mario Jayakumar, Ananth Hari, **Ryan Sullivan**, Luis Santos, Rodrigo Perez, Caroline Horsch, Clemens Dieffendahl, Niall L. Williams, Yashas Lokesh, & Praveen Ravi (2020). PettingZoo: Gym for Multi-Agent Reinforcement Learning. In *Deep Reinforcement Learning Workshop, Advances in Neural Information Processing Systems 2020*.
- **R. Sullivan**, G. Holste, A. Alessio (2020). Deep Learning Methods for Automatic Evaluation of Lines in Chest Radiographs. In MID-SURE Symposium, East Lansing, MI, 2019.

Professional Experience

Applied Scientist Intern at Amazon | May 2022 – Present

- Using reinforcement learning and contextual bandits to optimize security rules for all Amazon logins.
- Benchmarking existing methods and creating new ones to reduce false positive rate of account takeovers.
- Developing models that will be deployed globally to reduce friction in the user sign in experience.

PettingZoo | August 2020 – Present

- Maintainer and developer of PettingZoo, a unified API for multi-agent reinforcement learning environments.
- Updated and rewrote environments, improved documentation, and patched significant bugs.
- Published PettingZoo paper at **NeurIPS 2021** and gave multiple workshop talks at top-tier conferences.
- Since I joined the team, PettingZoo became the third most installed RL library, and is supported by many major RL frameworks including Stable Baselines 3, RLLib, and the Autonomous Learning Library.
- Worked alongside J Terry to make design decisions for the maintenance of OpenAI's Gym library.

Graduate Research Assistant for Multi-Agent RL Benchmarking | August 2020 – Present

- Cofounded Umshini, a service for benchmarking in competitive and cooperative multi-agent games.
- Leveraged PettingZoo's universal environment API to develop a tool that allows researchers to directly test their AI agents against others in a tournament setting via online matchmaking.
- Organized and managed team of developers through regular meetings to develop a working demo.