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# Shengyi "Costa" Huang

## Summary


- CS Ph.D. student in Deep Reinforcement Learning (DRL) with 2+ years of in-depth research.
- Proficient in Python, Numpy, Pytorch for building Machine Learning models.
- Authored a DRL library CleanRL with algorithms such as Deep-Q Networks and Proximal Policy Gradient. Received 340+ upvotes from Reddit and 242+ stars from Github.
- Streamline experiment version management that keeps tracks of 5,000+ experiments with logging of hyper-parameters and important metrics. Selected example see https://benchmark.cleanrl.dev.


## Education

### Ph.D. in Computer Science
*Drexel University, Philadelphia, PA* **Expected Jun 2023**

- Advisor: Dr. Santiago Ontañón
- Research Area: Game Artificial Intelligence with Deep Reinforcement Learning

### B.S in Computer Science, B.S in Mathematics
*Furman University, Greenville, SC* **May 2018**

## Experience

### Ph.D. Student
*Drexel University, Philadelphia, PA* **Sep 2018 – Present**

- Design the first DRL library that displays complete hyper-parameters, training metrics, and exact commands to reproduce experiments in a dashboard, bringing reproducibility to a new level.
- Design scalable DRL infrastructure that is cloud-friendly (e.g. we are able to leverage AWS Batch and Docker to finish 8,000+ CPU hours of tasks within 4 hours).
- Develop new DRL algorithms and techniques for Real-time Strategy Games to improve sample-efficiency in large discrete action spaces.

### Graduate Research Assistant
*Drexel University, Philadelphia, PA* **Sep 2019 – Jun 2020**

- Utilized Dynamic Bayesian Network (DBN) infer players' intentions in Real-time Strategy Games.
- Used the trained DBN to synthesize potential game states to help the strategy planner.
- Communicated and presented our findings to the funding agency for fast iteration on experiments.

### Graduate Teaching Assistant
*Drexel University, Philadelphia, PA* **Sep 2018 – Jun 2019**

- Tutored 30+ students with Python and Java lab assignments, and collaborated with them and gave advice on their final projects.
- Graded 200+ students' homework and provided detailed feedback.

### Backend Developer
*Carely, Inc., Greenville, SC* **Jun 2018 – Sep 2018**

- Developed the API server using Go and MySQL that serves 10,000+ users.
- Perfected the development environment by using Docker to enable cross-platforms reproducibility.
- Automated API test workflow by using OpenAPI (Swagger).
- Coordinated with the team of 5 people through Jira, Slack, Github.

### Computing in Community Deveoper
*Furman University, Greenville, SC* **Oct 2017 – Feb 2018**

- Developed an application for the commencement of 200+ graduating students.
- Collaborated with the university registrar and IT department for logistical setups.
- Utilized Go and Algolia to build real-time search of student's profiles.

### Teaching Assistant

*Furman University, Greenville, SC* **Aug 2017 – Dec 2017**

- Tutored 30+ students on Web Programming topics: JavaScript, VueJs, Webpack, Vuetify, AWS, PHP, Go, MySQL, Docker, REST API, Python, and Laravel.
- Helped the professor with preparing lab materials with respect to the latest tools and projects.
- Collaborated with the professor to create the course website using the latest front-end tools.

### Research Fellow

*Furman University, Greenville, SC* **Jun 2017 – Aug 2017**

- Authored a Python package, StreetTraffic, that collects more than 100 GBs of traffic flow data.
- Worked with Dr. Chirs Healy to conduct research on travel plan recommendations.
- Set up proper unit-tests and documentation by using Sphinx.

## Projects

### (2019) CleanRL

*High-quality single file implementation of Deep Reinforcement Learning algorithms with research-friendly features*

benchmark.cleanrl.dev • Python ★ 242

### (2019) Gym-MicroRTS

*The OpenAI Gym wrapper for MicroRTS for DRL research*

github.com/vwxyzjn/gym-microrts • Python ★ 18

### (2018) Portwarden

*Create Encrypted Backups of Your Bitwarden Vault with Attachments*

github.com/vwxyzjn/portwarden • Go ★ 179

### (2017) StreetTraffic

*Collects the traffic flow data of your favorite routes and cities*

streettraffic.org • Python ★ 14

### (2017) SC2AI

*Integrated Tensorforce and OpenAI Gym to train SC II game agents*

costa.sh/SC2AI • Jupyter Notebook ★ 12

## Skills

Python, Pytorch, Tensorflow, Numpy, Git, Linux, Statistics, Go, Docker, JavaScript, SQL.

## Publications

**Huang, S.**, Ontañón, S., "Action Guidance: Getting the Best of Training Agents with Sparse Rewards and Shaped Rewards", *in review for AIIDE Strategy Games Workshop*, August 2020

Dossa, R., **Huang, S.**, Ontañón, S., Matsubara, T., "An Empirical Investigation of Early Stopping Optimizations in Proximal Policy Optimization", *in review for NeurIPS 2020*, June 2020

**Huang, S.**, Ontañón, S., "A Closer Look at Invalid Action Masking in Policy Gradient Algorithms", *preprint; to be submitted to ICLR 2021*, June 2020

**Huang, S.**, Ontañón, S., "Comparing Observation and Action Representations for Reinforcement Learning in $\mu$RTS", *AAIIDE Strategy Games Workshop*, October 2019

**Huang, S.**, Grethlein, D., "Generating Interpretable Class Model Visualizations for CNNs with Varying Dilation Factors", *preprint*, June 2019

**Huang, S.**, Healy, C., "StreetTraffic: a Library for Traffic Flow Data Collection and Analysis", poster presentation in *ACMSE 2018 Conference*, March 2018

## Relevant courses

Artificial Intelligence, Machine Learning, Computer Vision, Computer Graphics, Algorithmic Game Theory, Software Design, Statistics, Probability, Linear Algebra, Real Analysis, Abstract Algebra, Fundamentals of Databases, Developing User Interfaces