# Michael Luo

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## EDUCATION

**University of California: Berkeley**  Berkeley CA

*M.S. in Electrical Engineering and Computer Science, Advised by **Ion Stoica***  *Aug 2020 – May 2021*

- Cumulative GPA: **TBD**
- Coursework: Advanced Computer Systems (CS 262), Statistical Learning Theory (CS 281A)
- Organizations: BAIR (Berkeley AI Research Lab), RISELab (Real-time Intelligent Secure Explainable Systems Lab), AUTOLab (Automation Lab)

**University of California: Berkeley**  Berkeley, CA

*B.S. in Electrical Engineering and Computer Science + B.S. in Business Administration*  *Aug 2016 – May 2020*

- Technical GPA: **3.98**, Cumulative GPA: **3.91**
- Coursework: Deep Unsuperised Learning (CS 294-158), Deep Reinforcement Learning (CS 285), Computer Vision (CS 280), Theoretical Statistics (STAT 210A), Machine Learning (CS 189), Operating Systems (CS 162), Databases (CS 186), Graphics (CS 184)
- Positions: Teaching Assistant for Machine Learning (CS 189), Manager at ML@B (Machine Learning at Berkeley Club), Officer at IEEE-HKN (EECS Honor Society)
- Awards: Dean's Honors (Top 4% of Undergraduates), Cal Alumni Leadership Award, ACM International Collegiate Programming Contest 1st Place Northwest Regionals (2016), USA Math Olympiad Qualifier (2016)

## PUBLICATIONS

### Importance Weighted Asynchronous Architectures with Clipped Target Networks

**Michael Luo**, Jiahao Yao, Richard Liaw, Eric Liang, Ion Stoica

**Accepted to International Conference on Learning Representations (ICLR) 2020**

- Distributed RL algorithm that combines the sample efficiency of PPO and training speed of IMPALA in model-free RL, resulting in 2x increase in training speed

### Connecting Context-specific Adaptation in Humans to Meta-learning

Rachit Dubey*, Erin Grant*, **Michael Luo***, Karthik Narasimhan, Thomas L. Griffith

In submission to Association for the Advancement of Artificial Intelligence (AAAI) 2021

- Augmenting gradient-based meta-learning algorithms with conditioning networks with contextual cues as input to improve task-adaptation; Attains 1.2x higher post-adaptation performance than context-concatenated baselines

### Recovery RL: Safe Reinforcement Learning with Learned Recovery Zones

Brijen Thananjeyan*, Ashwin Balakrishna*, Suraj Nair, **Michael Luo**, Krishnan Srinivasan, Minho Hwang, Joseph Gonzalez, Julian Ibarz, Chelsea Finn, Ken Goldberg

**Accepted to NeurIPS Robotic Learning Workshop 2020**

- Safe RL method that employs a safety critic and recovery policy to predict the probability the agent is violating a constraint and return the agent from a dangerous state back to a safe state; Attains up to 50x less total constraint violations than existing safe RL methods.

### Distributed Reinforcement Learning is a Dataflow Problem

Eric Liang, Zhanghao Wu, **Michael Luo**, Sven Mika, Ion Stoica

In Submission to MLSys 2021

- A new execution API that recasts RL algorithms as a hybrid-actor framework with parallel iterators, implemented for 20 RL algorithms, resulting in 2x faster training, 1.2x data throughput, and 2-3x reductions in code.

### Discovering Autoregressive Orderings with Variational Inference

Xuanlin Li*, Brandon Trabucco*, **Michael Luo**, Dong Huk Park, Yang Gao, Sheng Shen, Trevor Darrell

In Submission to International Conference on Learning Representations (ICLR) 2021

- We learn autoregressive orderings from scratch in language modeling through a practical end-to-end algorithm that employs variational inference and RL to infer doubly stochastic matrices; Learned orderings significantly beat standard L2R baselines.

## LazyDAgger: Reducing Context Switching in Interactive Robot Imitation Learning

Ryan Hoque, Ashwin Balakrishna, Brijen Thananjeyan, **Michael Luo**, Carl Putterman, Daniel Seita, Daniel Brown, Ken Goldberg

In Submission to International Conference on Robotics and Automation (ICRA) 2021

- LazyDAgger seeks to minimize context switching and online supervisor burden when a robot requests expert assistance in the imitation learning setting; Reduces context switching by 2x when compared to SafeDAgger

## AlphaGarden: Learning Seed Placement and Automation Policies For Polyculture Farming

Yahav Avigal, Anna Deza, William Wong, Sebastian Oehme, Mark Presten, Mark Theis, Jackson Chui, Paul Shao, Huang Huang, Atsunobu Kotani, Satvik Sharma, **Michael Luo**, Stefano Carpin, Joshua Viers, Stavros Vougioukas, and Ken Goldberg

In Submission to International Conference on Robotics and Automation (ICRA) 2021

- Various seed placement and pruning algorithms are investigated to optimize coverage and plant diversity in a polyculture farming garden simulator.

## WORK EXPERIENCE

### Software Development Engineer, Intern
June 2020 – Aug 2020

*Anyscale, Ray Core/RLlib Team*
*Berkeley, CA*

- Developed model-based and meta-learning RL algorithms, improving sample efficiency by 10x against model-free RL benchmarks

### Teaching Assistant
Aug 2019 – Dec 2019

*University of California: Berkeley*
*Berkeley, CA*

- Teaching Assistant for Machine Learning Course (CS 189) for Fall 2019

### Software Development Engineer, Intern
June 2019 – Aug 2019

*Amazon A9, Search Advertisement Team*
*Palo Alto, CA*

- Developed a deep contrastive-learning approach to differentiate and quickly classify advertisement images into multi-class categories

### Computer Vision Engineer, Intern
June 2018 – Aug 2018

*Cisco Meraki, Smart Camera Team*
*San Francisco, CA*

- Experimented with various deep and algorithmic object detection and tracking methods to track and identify individuals across Meraki cameras in public areas

## PROJECTS

### Ray RLlib Core Contributor | *Python, Pytorch, Tensorflow*
Aug 2018 – Present

- Created distributed model-free, model-based, and meta-learning RL algorithms on RLlib, including APPO/IMPACT, MAML, MBMPO, Google Dreamer
- Improved and tuned performance of existing algorithms on various, including PPO and SAC
- Participated in maintaining RLlib and resolve hundreds of Git issues, PRs, and various user demands for Ray/RLlib
- Developed SOTA distirbuted PPO implementation, beating previous SOTA by two-fold, achieving 10k reward on HalfCheetah-v2 in 1 hour

### Spotify Recommendation Systems Project | *Python, Tensorflow*
Feb 2018 – May 2018

- Devised two latent embedding vector approaches from Spotify Million Playlist Dataset, one embedding trained via constrastive learning over pairwise song IOUs and the other trained via Skipgram encoding; sequences are then predicted with LSTM

### Avatarmind iPal Robots Project | *Python, C++, Tensorflow*
Sept 2017 – Dec 2017

- Trained LSTM to map a sequence of song wave-forms into a sequence of frame-by-frame motor movements for the robot for robotic dancing

### OpenARK Project at Center for Augmented Reality | *C++, OpenCV*
Oct 2016 – June 2017

## TECHNICAL SKILLS

**Areas**: Deep Reinforcement Learning, Operating Systems, Robotics, Natural Language Processing
**Languages**: Python, Java, C/C++, SQL (Postgres), Javascript, C#, Golang, Bash, HTML/CSS
**Developer Tools**: Git, Docker, TravisCI, Google Cloud Platform, Kubernetes, Vim, Sublime Text
**Libraries**: Tensorflow, Pytorch, Pandas, Numpy, Matplotlib, Seaborn, OpenAI Gym