Eugene Vinitsky

Ph.D. student, Controls
Department of Mechanical Engineering, UC Berkeley
Berkeley Artificial Intelligence Research (BAIR) Lab, Berkeley DeepDrive (BDD)
652 Sutardja Dai Hall, Berkeley, CA, 94720-1758
Tel: (203) 252-0969, **Email:** vinitsky.eugene@gmail.com
Website: https://eugenevinitsky.github.io

EDUCATION

University of California, Berkeley
Ph.D., Mechanical Engineering **Expected May 2022**
Berkeley Artificial Intelligence Research (BAIR) Lab, Berkeley DeepDrive (BDD)
Thesis: From Sim to Real: Field Operation of Cooperative, Mixed Autonomy Traffic Smoothing Control

University of California, Santa Barbara
M.A., Physics **June 2016**
Project: Parallel Computing Simulation of Epitaxial Growth on an Adaptive Grid

California Institute of Technology
B.S. with Honors, Physics **June 2014**
Thesis: Particle Dynamics in Damped Nonlinear Quadrupole Ion Traps

RESEARCH INTERESTS

Multi-agent Reinforcement Learning, Autonomous Vehicles, Robustness and Sim2real, Intelligent Infrastructure

AWARDS AND HONORS

DOT Eisenhower Fellow,	Jul. 2018, 2020
ITS Outstanding Graduate Student Award,	Dec. 2018
National Science Foundation (NSF) Graduate Fellow,	Mar. 2016

LEAD PROPOSAL WRITER

Berkeley Deep Drive / General Motors, *$80000*	Jan. 2021
Berkeley Deep Drive, *$80000*	Jan. 2020
Amazon Machine Learning Research Award, *$25000 and $75000 computing credits*	Mar. 2019
Amazon Machine Learning Research Award, *$100000 and $150000 computing credits*	Mar. 2018
Amazon Cloud Credits for Research Award, *$30000 computing credits*	Jan. 2018

PUBLICATIONS

Journal Papers

[J1] **E Vinitsky**, N. Lichtlé, K. Parvate, A. Bayen. "Optimizing Mixed Autonomy Traffic Flow With Decentralized Autonomous Vehicles and Multi-Agent Reinforcement Learning." In review, *ACM Cyberphysical Systems*, Oct. 2021.

[J2] **E Vinitsky**, N. Lichtlé, G. Gunter, A. Velu, A. Bayen. "Smoothing Traffic Waves in Multi-Lane Networks." In review 2021, *ACM Transactions on Intelligent Transportation Systems*.

[J3] **E Vinitsky**, N. Lichtlé, M. Nice, R. Bhadani, M. Bunting, S. Elwani, F. Wu, B. Seibold, D. Work, A. Bayen. "Energy Smoothing Cruise Control from Simulation to Reality." In review 2021, *Journal of Field Robotics*.

[J4] C Wu, A Kreidieh, K Parvate, **E Vinitsky**, A Bayen. "Flow: A modular learning framework for mixed autonomy traffic" *IEEE Transactions on Robotics* (2021): in press.

[J5] A. Bayen, J. Goodman, **E. Vinitsky**. "On the Approximability of Time Disjoint Walks" *Journal of Combinatorial Optimization* (2020): pp. 1-22.

Conference Papers

[C1] **E. Vinitsky**, A. Robey, B. Amos. "Learning Bisimulations from Pixels for Robust Imitation Learning." In preparation, *International Conference on Machine Learning*, 2022.

[C2] **E. Vinitsky**, N. Lichtlé, X. Yang, J. Foerster. "Learning Autonomous Driving Behaviors that Zero-Shot Coordinate with Humans." In preparation, *International Conference on Machine Learning*, 2022.

[C3] N. Lichtlé, **E. Vinitsky (equal first author)**, M. Nice, B. Seibold, D. Work, A. Bayen. "Deploying Traffic Smoothing Cruise Controllers Learned from Trajectory Data." In review, *ICRA*, 2022.

[C4] **E. Vinitsky**, R. Koster, JP. Agaiou, E. Duenez-Guzman, AS. Vezhnevets, J. Leibo. "A learning agent that acquires social norms from public sanctions in decentralized multi-agent settings." In review, *AAMAS*, 2022.

[C5] C. Yu, A. Velu, **E. Vinitsky (equal advising)**, Y. Wang, A. Bayen, Y. Wu. "The surprising effectiveness of MAPPO in cooperative, multi-agent games." In review, *AAAI*, 2022.

[C6] N. Lichtlé, **E. Vinitsky (equal first author)**, G. Gunter, A. Velu, A. Bayen. "Fuel Consumption Reduction of Multi-Lane Road Networks using Decentralized Mixed-Autonomy Control" *International Conference on Intelligent Transportation Systems* (2021): pp. 2068-2073.

[C7] M. Dennis, N. Jaques, **E. Vinitsky**, A. Bayen, S. Russell, A. Critch, S. Levine. "Emergent complexity and zero-shot transfer via unsupervised environment design (PAIRED)" *NeurIPS, oral presentation* (2020).

[C8] B. Chalaki, LE. Beaver, B. Remer, K. Jang, **E. Vinitsky**, A. Bayen. "Zero-shot autonomous vehicle policy transfer: From simulation to real-world via adversarial learning " *Conference on Control and Automation, Best Paper Finalist* (2020): pp. 35-40.

[C9] K. Jang, LE. Beaver, B. Chalaki, B. Remer, **E. Vinitsky, AA. Malikopoulos, A. Bayen**. "Simulation to scaled city: zero-shot policy transfer for traffic control via autonomous vehicles" *ACM International Conference on Cyber-Physical Systems* (2019): pp. 291-300.

[C10] **E.Vinitsky**, A. Kreidieh, L. Le Flem, N. Kheterpal, K. Jang, C. Wu, F. Wu, R. Liaw, E. Liang, A. Bayen. "Benchmarks for reinforcement learning in mixed-autonomy traffic " *Conference on Robotic Learning* (2018): pp. 399-409.

[C11] **E. Vinitsky**, K. Parvate, A. Kreidieh, C. Wu, A. Bayen. "Lagrangian Control through Deep-RL: Applications to Bottleneck Decongestion" *International Conference on Intelligent Transportation Systems* (2018): pp. 759-765.

[C12] A. Bayen, J. Goodman, **E. Vinitsky**. "On the Approximability of Time Disjoint Walks" *Conference on Combinatorial Optimization and Applications* (2018): pp. 1-22.

[C13] C. Wu, A. Kreidieh, **E. Vinitsky**, A. Bayen. "Emergent Behaviors in Mixed Autonomy Traffic" *Conference on Robot Learning* (2017): pp. 398-407.

[C14] C. Wu, **E. Vinitsky**, A. Kreidieh, A. Bayen. "Multi-lane Reduction: A Stochastic Single-lane Model for Lane Changing" *IEEE International Conference on Intelligent Transportation Systems* (2017): pp. 1-8.

Industry Experience

Researcher at Facebook AI   **July 2021 - Present**
Work with Brandon Amos / Jakob Foerster studying robustness of RL control and zero-shot coordination of Autonomous Vehicles with human testers.

Deepmind Multi-agent Artificial General Intelligence Team   **Jan. 2021 - July 2021**
Worked with Joel Leibo and Raphael Koster studying methods for creating agents that learn and maintain social norms.

Tesla Autopilot Vision Team   **Jan. 2019 - July 2019**
Worked with Andrej Karpathy, head of AI at Tesla, developing tools for prediction of vehicle trajectories from radar and vision.

Research Leadership Experience

FLOW: Deep Reinforcement Learning for Autonomous Vehicle Based Traffic Control
Led development of FLOW, the first library designed for applying machine learning techniques to mixed autonomy traffic. Ran a team of 3 graduate students and many masters students and undergraduates. FLOW is now a standard benchmark for traffic control and optimization. FLOW is supported by companies such as Amazon and Siemens (through their ownership of AIMSUN).

CIRCLES: Congestion Impacts Reduction via CAV-in-the-loop Lagrangian Energy Smoothing
Currently run the Reinforcement Learning algorithm team for the CIRCLES project. Designed controllers that have been deployed onto four autonomous vehicles and will be tested on up to one hundred autonomous vehicles in the summer of 2022. Managed a team of four graduate students and several undergraduates. Set the research agenda, coordinated the individual researchers, and ensured the codebase was appropriately designed. Designed the only controller in the project judged to be viable for road-testing.

Teaching Experience

Lead Instructor/Co-Course Developer for EE 290OS: Deep multi-agent reinforcement learning with applications to autonomous traffic
Served as the lead instructor and course developer for a new course on multi-agent reinforcement learning at UC Berkeley. Taught an introduction to reinforcement learning and transportation at a masters-student level covering the basics of optimal control all the way to multi-agent reinforcement learning alongside material in transportation system modeling. Students applied these techniques to a project involving multi-agent intelligent transportation infrastructure. Syllabus is available at: EE29O.

Head Teaching Assistant - Astronomy 1
Served as the head TA for Astronomy 1 at UC Santa Barbara, an approximately 100 student course. Designed and graded exams and homeworks. Held a review session each week for three sections and planned and held review sessions for each exam.

Mentorship of UC Berkeley students
Served as research advisor for twelve undergraduate students, a team of masters students, and several graduate students. Co-authored papers with five of the undergraduate students. Several of these students are now graduate students; the others are employed at major tech companies as machine learning researchers and engineers.

Graduate and Masters Students

Nathan Lichtlé, Visiting Researcher: 2020 - present. Currently Ph.D. student at Ecole Normal Supérieure, Paris.
Kathy Jang, EECS: 2017 - current. Currently Ph.D. student in EECS at UC Berkeley.
Abdul Rahman Kriedieh, CEE: 2016 - 2017. Currently Ph.D. student in CEE at UC Berkeley.
Jesse Goodman, Visiting Researcher: 2017-2018. Currently Ph.D student in TCS at Cornell.

Undergraduate Students

Akash Velu, EECS: 2020 - 2021. Currently Masters student at Stanford.
Kanaad Parvate, EECS: 2016 - 2020. Currently engineer at Waymo.
Nicholas Liu, EECS: 2018-2020 Currently software engineer at Amazon.
Nishant Kheterpal, EECS: 2016-2019. Currently graduate student at the University of Michigan.
Zian Hu, Statistics: 2016 - 2018. Currently machine learning engineer at Petuum.
Mahesh Murag, EECS: 2018 - 2019. Currently product manager at Scale AI.
Kevin Chien, EECS: 2018 - 2019. Currently EECS undergraduate.
Jonathan Lin, EECS: 2018 - 2019. Currently software engineer at C3.AI.
Arjun Sridhar, EECS: 2017-2018 Currently Ph.D. student in CS at Duke.
Ananth Kuchibhotla, EECS 2017-2018 Currently software engineer at Google.

Mentor and content developer for AI4All camp, Reinforcement Learning Section
Helped develop and co-lead a course on reinforcement learning for AI-curious high schoolers of varied backgrounds. Course material available at: AI4All

Mentor for Cooperative AI Workshop
Served as a research mentor for a student for the NeurIPS 2021 Cooperative AI Workshop.

Service

Invited Talks
Tsinghua Workshop on Multi-agent Reinforcement, 2021
University of Arizona Modeling and Computation Seminar, 2021
Facebook Functional Manipulation Seminar, 2021
NorCal Controls Workshop, 2021
Bay Area Robotics Symposium (BARS), 2020
Berkeley Deep Drive Seminar, 2020
Berkeley AI Research Seminar, 2020
Presentations to Ford, Nissan, and GM on our cruise control work, 2020
"Learning Social Norms" at Deepmind's Multiagent Seminar, 2021

Conference Reviewer
International Conference on Learning Representations (ICLR), 2022 and 2021
International Conference on Robotics and Automation (ICRA), 2022
Intelligent Transportation Systems Conference (ITSC), 2018
International Joint Conference on Autonomous Agents and Multi-agent Systems (AAMAS), 2020
Reinforcement Learning for Transportation Workshop - Intelligent Transportation Systems Conference (ITSC), 2018
Cooperative AI Workshop - Neural Information Processing Systems (NeurIPS), 2022

Seminars
Co-organize the Berkeley Multi-agent Reinforcement Learning Seminar. Featured experts on multi-agent systems such as Michael Littman, Thore Graepel, and Noam Brown. 2020 - present.

Workshop Organization
Co-organized the Reinforcement Learning for Transportation Workshop at ITSC 2018.
Co-organized the Lagrangian Control for Traffic Flow Smoothing Workshop at CDC 2019.

Diversity, Inclusion, and Equity

Student Liason for Institute of Transportation Studies Anti-Racism Plan
Served as a moderator and active solicitor for townhalls and planning sessions when the Berkeley Institute of Transportation Studies was putting together its anti-racism plan. One of the students in charge of gathering student feedback and helping organize it for the department.

Mentor for Black in AI
Served as an applications mentor for the Black in AI program for students applying to graduate school in 2018 and 2019.

Graduate Applications Editor for Iranian Students
Edited and helped with the applications of Iranian students for the 2020 applications cycle.

Other Interests and Projects

Formerly founded a small startup to build anti-harassment tools.
Fluent in Russian and am learning Hindi.
Captained the Caltech fencing team for 3 years, fenced competitively for 10.
Play the guitar, the drums, and the piano.