Ashwin Balakrishna

Email: abalakrishna@gmail.com, Website, Google Scholar

BACKGROUND

I am excited about algorithms for data-driven decision making. I am currently a Research Scientist at Google DeepMind working on building foundation models for general purpose robotic manipulation. I am particularly interested in bridging vision and language foundation models with decision-making algorithms which can actively interact with users and improve based on experience.

EDUCATION

UC Berkeley, Berkeley, CA — Aug 2018 - May 2022
Ph.D. in Computer Science — GPA: 3.97/4.00
Thesis: Scalable Supervision for Safe and Efficient Online Robot Learning
Advisor: Ken Goldberg

California Institute of Technology, Pasadena, CA — Sep 2014 - Jun 2018
Bachelor of Science in Electrical Engineering — GPA: 3.97/4.00
Advisors: Steven Low and Hyuck Choo

INDUSTRY EXPERIENCE

Google DeepMind, Senior Research Scientist — 2024 - Present
Building a robot brain with Gemini
Toyota Research Institute, Research Scientist — 2023 - 2024
Building a robot foundation model
Nuro, Research Scientist — 2022 - 2023
Applying reinforcement learning for motion planning
Toyota Research Institute, Research Intern — 2021
Research in reinforcement learning
SpaceX, Software Engineering Intern (Avionics) — 2017
Power system analysis automation for Falcon 9 rocket

PUBLICATIONS

[41] Moo Jin Kim*, Karl Pertsch*, Siddharth Karamcheti*, Ted Xiao, **Ashwin Balakrishna**, Suraj Nair, Rafael Rafailov, Ethan Foster, Grace Lam, Pannag Sanketi, Quan Vuong, Thomas Kollar, Benjamin Burchfiel, Russ Tedrake, Dorsa Sadigh, Sergey Levine, Percy Liang, and Chelsea Finn. OpenVLA: An Open-Source Vision-Language-Action Model. *Preprint* 2024.

[40] Jonathan Booher, Khashayar Rohanimanesh, Junhong Xu, Vladislav Isenbaev, **Ashwin Balakrishna**, Ishan Gupta, Wei Liu, and Aleksandr Petiushko. CIMRL: Combining IMitation and Reinforcement Learning for Safe Autonomous Driving. *Preprint* 2024.

[39] Alexander Khazatsky*, Karl Pertsch*, Suraj Nair, **Ashwin Balakrishna**, et al. DROID: A Large-Scale In-The-Wild Robot Manipulation Dataset. *Robotics Science and Systems (RSS)* 2024.

[38] Siddharth Karamcheti, Suraj Nair, **Ashwin Balakrishna**, Percy Liang, Thomas Kollar, and Dorsa Sadigh. Prismatic VLMs: Investigating the Design Space of Visually-Conditioned Language Models. *International Conference on Machine Learning (ICML)* 2024.

[37] Albert Wilcox, **Ashwin Balakrishna**, Jules Dedieu, Wyame Benslimane, Daniel S. Brown, Ken Goldberg. Monte Carlo Augmented Actor-Critic for Sparse Reward

Deep Reinforcement Learning from Suboptimal Demonstrations. *Conference on Neural Information Processing Systems (NeurIPS)* 2022.

[36] Satvik Sharma*, Ellen Novoseller*, Vainavi Viswanath, Zaynah Javed, Rishi Parikh, Ryan Hoque, **Ashwin Balakrishna**, Daniel S. Brown, Ken Goldberg. Learning Switching Criteria for Sim2Real Transfer of Robotic Fabric Manipulation Policies. *International Conference on Automation Science and Engineering (CASE)* 2022.

[35] Leitan Fu, Michael Danielczuk, **Ashwin Balakrishna**, Daniel S. Brown, Jeffrey Ichnowski, Eugene Solowjow, Ken Goldberg. LEGS: Learning Efficient Grasp Sets for Exploratory Grasping. *International Conference on Robotics and Automation (ICRA)* 2021.

[34] Blake Wulfe, **Ashwin Balakrishna**, Logan Ellis, Jean Mercat, Rowan McAllister, Adrien Gaidon. Dynamics-Aware Comparison of Learned Reward Functions. *International Conference on Learning Representations (ICLR)* 2022.

[33] Michael Luo, **Ashwin Balakrishna**, Brijen Thananjeyan, Suraj Nair, Julian Ibarz, Jie Tan, Chelsea Finn, Ion Stoica, Ken Goldberg. MESA: Offline Meta-RL for Safe Adaptation and Fault Tolerance. *NeurIPS Workshop on Safe and Robust Control of Uncertain Systems* 2021.

[32] Albert Wilcox*, **Ashwin Balakrishna***, Brijen Thananjeyan, Joseph E. Gonzalez, Ken Goldberg. Latent Space Safe Sets (LS^3): Safe RL for Long Horizon Visuomotor Control of Sparse Reward Iterative Tasks. *Conference on Robot Learning (CoRL)* 2021.

[31] Ryan Hoque, **Ashwin Balakrishna**, Ellen Novoseller, Daniel S. Brown, Albert Wilcox, Ken Goldberg. ThriftyDAgger: Budget-Aware Novelty and Risk Gating for Interactive Imitation Learning. *Conference on Robot Learning (CoRL)* 2021 - **Oral**.

[30] Vainavi Viswanath*, Jennifer Grannen*, Priya Sundaresan*, Brijen Thananjeyan, **Ashwin Balakrishna**, Ellen Novoseller, Jeffrey Ichnowski, Michael Laskey, Joseph E. Gonzalez, Ken Goldberg. Disentangling Dense Multiple-Cable Knots. *International Conference on Intelligent Robots and Systems (IROS)* 2021.

[29] Ryan Hoque, **Ashwin Balakrishna**, Brijen Thananjeyan, Carl Putterman, Michael Luo, Daniel Seita, Daniel S. Brown, Ken Goldberg. LazyDAgger: Reducing Context Switching in Interactive Robot Imitation Learning. *Conference on Automation Science and Engineering (CASE)* 2021.

[28] Shivin Devgon, Jeffrey Ichnowski, Michael Danielczuk, Daniel S. Brown, **Ashwin Balakrishna**, Shirin Joshi, Eduardo M. C. Rocha, Eugen Solowjow, Ken Goldberg. Kit-Net: Self-Supervised Learning to Kit Novel 3D Objects into Novel 3D Cavities. *Conference on Automation Science and Engineering (CASE)* 2021.

[27] Priya Sundaresan*, Jennifer Grannen*, Brijen Thananjeyan, **Ashwin Balakrishna**, Jeffrey Ichnowski, Ellen Noveoseller, Minho Hwang, Michael Laskey, Joseph E. Gonzalez, Ken Goldberg. Untangling Dense Nonplanar Knots by Learning Manipulation Features and Recovery Policies. *Robotics: Science and Systems (RSS)* 2021.

[26] Daniel Brown, Zaynah Javed, Satvik Sharma, Jerry Zhu, **Ashwin Balakrishna**, Marek Petrik, Anca Dragan, Ken Goldberg. Policy Gradient Bayesian Robust Op-

timization for Imitation Learning. *International Conference on Machine Learning (ICML)* 2021.

[25] Aditya Ganapathi, Priya Sundaresan, Brijen Thananjeyan, **Ashwin Balakrishna**, Daniel Seita, Jennifer Grannen, Minho Hwang, Ryan Hoque, Joseph E. Gonzalez, Nawid Jamali, Katsu Yamane, Soshi Iba, Ken Goldberg. Learning Dense Visual Correspondences in Simulation to Smooth and Fold Real Fabrics. *International Conference on Robotics and Automation (ICRA)* 2021.

[24] Brijen Thananjeyan*, **Ashwin Balakrishna***, Suraj Nair, Michael Luo, Krishnan Srinivasan, Minho Hwang, Joseph E. Gonzalez, Julian Ibarz, Chelsea Finn, Ken Goldberg. Recovery RL: Safe Reinforcement Learning with Learned Recovery Zones. *Robotics and Automation Letters (RA-L), International Conference on Robotics and Automation (ICRA), and NeurIPS Robot Learning Workshop* 2021.

[23] Michael Danielczuk*, **Ashwin Balakrishna***, Daniel Brown, Shivin Devgon, Ken Goldberg. Exploratory Grasping: Performance Bounds and Asymptotically Optimal Algorithms for Learning to Robustly Grasp an Unknown Polyhedral Object. *Conference on Robot Learning (CoRL)* 2020.

[22] Jennifer Grannen*, Priya Sundaresan*, Brijen Thananjeyan, Jefrey Ichnowski, **Ashwin Balakrishna**, Minho Hwang, Vainavi Viswanath, Michael Laskey, Joseph E. Gonzalez, Ken Goldberg. Learning Robot Policies for Untangling Dense Knots in Linear Deformable Structures. *Conference on Robot Learning (CoRL)* 2020 - **Oral**.

[21] Aditya Ganapathi*, Priya Sundaresan*, Brijen Thananjeyan, **Ashwin Balakrishna**, Daniel Seita, Ryan Hoque, Joseph E. Gonzalez, Ken Goldberg. MMGSD: Multi-Modal Gaussian Shape Descriptors for Correspondence Matching in 1D and 2D Deformable Objects. *IROS Workshop on Managing Deformation: A Step Towards Higher Robot Autonomy* 2020.

[20] Daniel Seita, Aditya Ganapathi, Ryan Hoque, Minho Hwang, Edward Cen, Ajay Kumar Tanwani, **Ashwin Balakrishna**, Brijen Thananjeyan, Jeffrey Ichnowski, Nawid Jamali, Kastu Yamane, Soshi Iba, John Canny, Ken Goldberg. Deep Imitation Learning of Sequential Fabric Smoothing Policies. *International Conference on Intelligent Robots and Systems (IROS)* 2020.

[19] Katherine Li*, Michael Danielczuk*, **Ashwin Balakrishna***, Vishal Satish, Ken Goldberg. Accelerating Grasp Exploration by Leveraging Learned Priors. *Conference on Automation Science and Engineering (CASE)* 2020.

[18] Shivin Devgon, Jeffrey Ichnowski, **Ashwin Balakrishna**, Harry Zhang, Ken Goldberg. Orienting Novel Objects using Self-Supervised Rotation Estimation. *Conference on Automation Science and Engineering (CASE)* 2020.

[17] Ryan Hoque*, Daniel Seita*, **Ashwin Balakrishna**, Aditya Ganapathi, Ajay Kumar Tanwani, Nawid Jamali, Katsu Yamane, Soshi Iba, Ken Goldberg. VisuoSpatial Foresight for Multi-Step, Multi-Task Fabric Manipulation. *Robotics: Science and Systems (RSS)* 2020.

[16] Brijen Thananjeyan*, **Ashwin Balakrishna***, Ugo Rosolia, Joseph E. Gonzalez, Aaron Ames, Ken Goldberg. A Sample-Based Learning MPC Algorithm for Stochastic Dynamical Systems with Controller Domain Expansion and Goal Set Adaptation. *Algorithmic Foundations of Robotics (WAFR)* 2020.

[15] Brijen Thananjeyan*, **Ashwin Balakrishna***, Ugo Rosolia, Felix Li, Rowan McAllister, Joseph E. Gonzalez, Sergey Levine, Francesco Borrelli, Ken Goldberg, Safety Augmented Value Estimation from Demonstrations (SAVED): Safe Deep Model-Based RL for Sparse Cost Robotic Tasks. *Robotics and Automation Letters (RA-L), International Conference on Robotics and Automation (ICRA), and NeurIPS Deep Reinforcement Learning Workshop* 2020.

[14] Priya Sundaresan, Jennifer Grannen, Brijen Thananjeyan, **Ashwin Balakrishna**, Michael Laskey, Kevin Stone, Joseph E. Gonzalez, Ken Goldberg. Learning Interpretable and Transferable Rope Manipulation Policies Using Depth Sensing and Dense Object Descriptors, *International Conference on Robotics and Automation (ICRA)* 2020.

[13] **Ashwin Balakrishna***, Brijen Thananjeyan*, Jonathan Lee, Felix Li, Arsh Zahed, Joseph E. Gonzalez, Ken Goldberg. On-Policy Robot Imitation Learning from a Converging Supervisor, *Conference on Robot Learning (CoRL) -* **Oral** *and International Conference on Machine Learning (ICML) Sequential Decision Making Workshop* 2019.

[12] Michael Danielczuk*, Andrey Kurenkov*, **Ashwin Balakrishna**, Matthew Matl, David Wang, Roberto Martin-Martin, Animesh Garg, Silvio Savarase, Ken Goldberg. Mechanical Search: Multi-Step Retrieval of a Target Object Occluded by Clutter, *International Conference on Robotics and Automation (ICRA)* 2019.

[11] Zisu Dong, Sanjay Krishnan, Sona Dolasia, **Ashwin Balakrishna**, Michael Danielczuk, and Ken Goldberg. Automating Planar Object Singulation by Linear Pushing with Single-point and Multi-point Contacts, *Conference on Automation Sciences and Engineering (CASE)* 2019.

[10] Jeong Oen Lee, Vinayak Narasimhan, **Ashwin Balakrishna**, Marcus R. Smith, Juan Du, David Sretavan, and Hyuck Choo. Fabry–Perot Optical Sensor and Portable Detector for Monitoring High-Resolution Ocular Hemodynamics. *IEEE Photonics Letters* 2019.

[9] Men-Andrin Meier, Zachary E Ross, Anshul Ramachandran, **Ashwin Balakrishna**, Suraj Nair, Peter Kundzicz, Zefeng Li, Jennifer Andrews, Egill Hauksson, Yisong Yue. Reliable Real-Time Seismic Signal/Noise Discrimination With Machine Learning. *Journal of Geophysical Research: Solid Earth and Machine Learning for Geophysical and NeurIPS Geochemical Signals Workshop* 2018.

[8] Jeong Oen Lee, Haeri Park, Juan Du, **Ashwin Balakrishna**, Oliver Chen, David Stretavan, Hyuck Choo. A microscale optical implant for continuous in vivo monitoring of intraocular pressure. *Microsystems and Nanoengineering* 2017.

[7] Frank L Brodie, David A Ramirez*, Sundar Pandian*, Kelly Woo, **Ashwin Balakrishna**, Eugene De Juan, Hyuck Choo, Robert H Grubbs. Novel positioning sensor with real-time feedback for improved postoperative positioning: pilot study in control subjects. *Clinical Ophthalmology* 2017.

[6] Jeong Oen Lee, Haeri Park, Juan Du, Vinayak Narasimhan, **Ashwin Balakrishna**, Oliver Chen, David Stretavan, Hyuck Choo. In vivo Intraocular Pressure Monitoring using Implantable Optomechanical Sensor. *International Symposium on Optomechatronic Technology* 2016.

[5] Jeong Oen Lee, Haeri Park, Juan Du, Vinayak Narasimhan, **Ashwin Balakrishna**, Oliver Chen, David Stretavan, Hyuck Choo. Validation of sensor for postoperative positioning with intraocular gas. *Clinical Ophthalmology* 2016.

[4] Hyunjun Cho, **Ashwin Balakrishna**, Yuan Ma, Joen Oen Lee, Hyuck Choo. Efficient Power Generation from Vocal Fold Vibrations for Medical Electronic Implants. *International Conference on Micro Electro-Mechanical Systems (MEMS)* 2016.

[3] **Ashwin Balakrishna**, Oliver Chen, Jeong Oen Lee, Hyuck Choo. A Neural Network Approach to Monitor Intraocular Pressure for Glaucoma Diagnosis. *PIERS (Oral Presentation)* 2016.

[2] Sophia Chen, Jeff Rosenberg, **Ashwin Balakrishna**, Grace Ma, Hyunjun Cho, Jeong Oen Lee and Hyuck Choo. On-Demand Power Source for Medical Electronic Implants: Acousto-Mechanical Vibrations from Human Vocal Folds. *NAPA Institute Workshop on Enabling Future Health Care: the Role of Micro and Nano Technologies* 2015.

[1] **Ashwin Balakrishna**. Optimal Control Strategies for Trajectory Optimization with Applications to Continuous Solar Flight. *Oral Presentation at INFORMS Annual Meeting, E=mc2 High School Mathematical Science Journal, Intel Science Talent Search Semifinalist* 2013.

* = equal contribution

TEACHING	Teaching Assistant, UC Berkeley	Spring 2022
	CS 189: Introduction to Machine Learning	
	Teaching Assistant,, UC Berkeley	Summer 2021
	CS 188: Introduction to Artificial Intelligence	
	Teaching Assistant,, California Institute of Technology	Fall 2017
	EE 111: Signal-Processing Systems and Transforms	

AWARDS & HONORS	Qualcomm Innovation Fellowship Finalist	2021
	Timothy B. Campbell Innovation Award (Berkeley EECS)	2020-2021
	Apple AI/ML PhD Fellowship Nomination (Berkeley EECS)	2020
	National Science Foundation Graduate Research Fellowship	2018-2021
	Henry Ford II Scholar Award (Top GPA in EE at Caltech)	2017

PROFESSIONAL ACTIVITIES

Academic Services:
Student Engagement Co-Chair, CoRL 2022
Organizer of Safe and Robust Control Workshop, NeurIPS 2021
Reviewing for CoRL, ICML, NeurIPS, RA-L, ICRA, IROS, CASE 2019-2022
Berkeley AI Research Admissions Reader 2019, 2021
Berkeley PhD Buddy Program Mentoring 2020-2021
Berkeley Be a Scientist Program Volunteer 2018

Mentoring: I have been fortunate to work with the following undergraduate and masters students in the AUTOLAB at UC Berkeley:

Albert Wilcox (2020-2022); Next: PhD Student at Georgia Tech
Leitan Fu (2020-2022); Next: PhD Student at UC Berkeley

Satvik Sharma (2020-2022); Next: PhD Student at Stanford
Priya Sundaresan (2019-2021); Next: PhD Student at Stanford
Jennifer Grannen (2019-2021); Next: PhD Student at Stanford
Michael Luo (2020-2021); Next: PhD Student at UC Berkeley
Bobby Yan (2020-2021); Next: PhD Student at Stanford
Ryan Hoque (2019-2020); Next: PhD Student at UC Berkeley
Zaynah Javed (2020-2022); Next: Facebook
Shivin Devgon (2019-2021); Next: Singular Genomics
Aditya Ganapathi (2019-2021); Next: Grabango
Zisu Dong (2018-2019); Next: Facebook
David Wang (2018-2019); Next: Google
Arsh Zahed (2018-2019); Next: NVIDIA
Felix Li (2018-2019); Next: Undergraduate at UC Berkeley
Vainavi Viswanath (2019-2021); Next: MS Student at UC Berkeley
Kaushik Shivakumar (2019-2021); Next: MS Student at UC Berkeley