

# Ashwin Balakrishna

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- EDUCATION**      **UC Berkeley**, Berkeley, CA      2018-Present  
Ph.D. in Computer Science (Focus in AI + Robotics)      GPA: 3.97  
Advisor: Ken Goldberg
- California Institute of Technology**, Pasadena, CA      2014-2018  
Bachelor of Science in Electrical Engineering      GPA: 3.97  
Advisors: Steven Low, Hyuck Choo
- EXPERIENCE**      **UC Berkeley AUTOLAB**, Ph.D. Student Researcher      2018-Present  
**SpaceX**, Avionics Software Intern      2017  
**Intel**, Power Electronics Intern      2016  
**Caltech Choo Lab**, Student Researcher      2015-2017
- PREPRINTS**
- [1] 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. Preprint 2021.
- [2] Albert Wilcox\*, **Ashwin Balakrishna\***, Brijen Thananjeyan\*, Joseph E. Gonzalez, Ken Goldberg. Latent Space Safe Sets (LS<sup>3</sup>): Safe RL for Long Horizon Visuomotor Control in Iterative Tasks. Preprint 2021.
- [3] 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. Preprint 2021.
- [4] 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. Preprint 2021.
- [5] 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. Preprint 2021.
- PUBLICATIONS** [27] Priya Sundaresan\*, Jennifer Grannen\*, Brijen Thananjeyan, **Ashwin Balakrishna**, Jeffrey Ichnowski, Ellen Novoseller, 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, **Ashwin Balakrishna**, Zaynah Javed, Satvik Sharma, Jerry Zhu, Marek Petrik, Anca Dragan, Ken Goldberg. Policy Gradient Bayesian Robust Optimization for Imitation Learning. *International Conference on Machine Learning (ICML)* 2021.

- [25] Aditya Ganapathi, Priya Sundareshan, Brijen Thananjeyan, **Ashwin Balakrishna**, Daniel Seita, Jennifer Grannen, Minh 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 Srinivisan, Minh 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, 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 Sundareshan\*, Brijen Thananjeyan, Jeffrey Ichnowski, **Ashwin Balakrishna**, Minh 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 Sundareshan\*, 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, Minh Hwang, Edward Cen, Ajay Kumar Tanwani, **Ashwin Balakrishna**, Brijen Thananjeyan, Jeffrey Ichnowski, Nawid Jamali, Katsu 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 Sundareshan, Jeniffer 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 Stretavan, 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 postop-

erative 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=mc<sup>2</sup> High School Mathematical Science Journal, Intel Science Talent Search Semifinalist* 2013.

**\* = equal contribution**

<b>TEACHING</b>	<i>Teaching Assistant</i> , California Institute of Technology EE 111: Signal-Processing Systems and Transforms	2017
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<b>AWARDS &amp; HONORS</b>	National Science Foundation Graduate Research Fellowship Henry Ford II Scholar Award (Top GPA in EE at Caltech)	2018-2021 2017
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<b>PROFESSIONAL ACTIVITIES</b>	<i>Paper Reviewing:</i> IEEE International Conference on Robotics and Automation (ICRA) 2020, 2021 IEEE International Conference on Intelligent Robots and Systems (IROS) 2020, 2021 IEEE Conference on Automation Sciences and Engineering (CASE) 2019, 2020, 2021 Conference on Neural Information Processing Systems (NeurIPS): Machine Learning for the Physical Sciences Workshop 2019, 2020 IEEE Robotics and Automation Letters Journal 2020, 2021 <i>Services:</i> Berkeley AI Research Admissions Reader 2019 Berkeley Be a Scientist Program Volunteer 2018 Mentored 10+ Undergraduate and Masters Students on Projects Related to Reinforcement Learning, Control Theory, Machine Learning, Computer Vision, and Deformable Manipulation 2018-2021	
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