

Vikash Kumar

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Interests

Embodied Artificial Intelligence, Data Driven Robot Learning, Robotics, Optimal Control


Positions

Adjunct Professor, Robotics Institute, CMU	Jan'23 - Now
FAIR-MetaAI, Research Scientist (mentor: Abhinav Gupta)	Nov'20 - Now
Assistant Professor, DIRO, Université de Montréal+CIFAR chair nomination+associate faculty Mila	(declined)
Google Brain, Research Scientist (mentor: Vincent Vanhoucke)	Feb'18 - Aug'19
OpenAI, Member of technical staff (mentor: Elon Musk)	Apr'17 - Oct'17
Roboti LLC, Founding Member (startup: acquired by DeepMind)	Jan'12 - Nov'20

Education

University of Berkeley, Berkeley Artificial Intelligence Research Lab (BAIR), Postdoctoral scholar	Oct'17 - Jan'18
University of Washington, Ph.D. in Computer Science and Engineering	Feb'13 - Feb'17
University of Washington, M.S. in Computer Science and Engineering	Sep'10 - Feb'13
Indian Institute of Technology (IIT) Kharagpur, M.S. in Mathematics and Computing	July'09 - Apr'10
Indian Institute of Technology (IIT) Kharagpur, B.S. in Mathematics and Computing	July'05 - Apr'09

Manuscripts

 [Google Scholar](#)

Peer-Reviewed Publications:-

- R3M: A Universal Visual Representation for Robot Manipulation. Suraj Nair, Aravind Rajeswaran, Vikash Kumar, Chelsea Finn, Abhinav Gupta. Conf. on Robot Learning (CoRL) 2022, **Best Paper Award**, Scaling Robot Learning Workshop ICRA'22
- Can Foundation Models Perform Zero-Shot Task Specification For Robot Manipulation? Yuchen Cui, Scott Niekum, Abhinav Gupta, Vikash Kumar and Aravind Rajeswaran. Learning for Decision and Control (L4DC) 2022. **Best Paper Award finalist**, Scaling Robot Learning Workshop Robotics Science and Systems RSS'22
- MyoSuite: A contact-rich simulation suite for musculoskeletal motor control. Vittorio Caggiano, Huawei Wang, Guillaume Durandau, Massimo Sartori, Vikash Kumar. Learning for Decision and Control (L4DC) 2022
- MyoSim: A contact-rich simulation suite for musculoskeletal motor control. Vittorio Caggiano, Huawei Wang, Guillaume Durandau, Massimo Sartori, Vikash Kumar. International Conference on Robotics and Automation (ICRA) 2022
- RB2: Robotic Manipulation Benchmarking with a Twist. S Dasari, J Wang, J Hong, S Bahl, Y Lin, A Wang, A Thankaraj, K Chahal, B Calli, S Gupta, D Held, L Pinto, D Pathak, Vikash Kumar, Abhinav Gupta. NeurIPS 2021
- RRL: Resnet as representation for Reinforcement Learning. Rutav Shah, Vikash Kumar. International Conference on Machine Learning (ICML) 2021
- Reset-Free Reinforcement Learning via Multi-Task Learning. Abhishek Gupta*, Justin Yu*, Tony Z. Zhao*, Vikash Kumar*, Aaron R., Kelvin Xu, Thomas Devlin, Sergey Levine. International Conference on Robotics and Automation (ICRA) 2021
- A Game Theoretic Perspective of Model-Based Reinforcement Learning. Aravind Rajeswaran, Igor Mordatch, Vikash Kumar. International Conference on Machine Learning (ICML) 2020
- Emergent Real-World Robotic Skills via Unsupervised Off-Policy Reinforcement Learning. Archit Sharma, Michael Ahn, Vikash Kumar, Sergey Levine, Karol Housman, Shane Gu. Robotics Science and Systems (RSS) 2020
- Time Reversal as Self-Supervision. Suraj Nair, Mohammad B., Chelsea Finn, Sergey Levine, Vikash Kumar. IEEE International Conference on Robotics and Automation (ICRA) 2020
- Dynamics-Aware Unsupervised Discovery of Skills. Archit Sharma, Shixiang Gu, Sergey Levine, Vikash Kumar, Karol Hausman. International Conference on Learning Representations (ICLR) 2020
- Ingredients of Real World Robotics Reinforcement Learning. Henry Zhu, Justin Yu, Dhruv Shah, Abhishek Gupta, Vikash Kumar, Sergey Levine. International Conference on Learning Representations (ICLR) 2020
- Benchmarking In-Hand Manipulation. Silvia Cruciani, Balakumar Sundaralingam, Kaiyu Hang, Vikash Kumar, Tucker Hermans, Danica Kragic. IEEE Robotics and Automation Letters (RAL) 2020
- Deep Dynamics Models for Learning Dexterous Manipulations. Anusha Nagabandi, Kurt Konolige, Sergey Levine, Vikash Kumar. Conference on Robot Learning (CoRL) 2019
- ROBEL: Robotics Benchmarks for Learning. Michael Ahn, Henry Zhu, Kristian Hartikainen, Hugo Ponte, Abhishek Gupta, Sergey Levine, Vikash Kumar. Conference on Robot Learning (CoRL) 2019
- Multi-Agent Manipulation via Locomotion using Hierarchical Sim2Real. Ofir Nachum, Michael Ahn, Hugo Ponte, Shane Gu, Vikash Kumar. Conference on Robot Learning (CoRL) 2019
- Relay Policy Learning: Solving Long-Horizon Tasks via Imitation and Reinforcement Learning. Abhishek Gupta, Vikash Kumar, Corey Lynch, Sergey Levine, Karol Hausman. Conference on Robot Learning (CoRL) 2019
- Learning Latent Plans from Play. Corey Lynch, Mohi Khansari, Ted Xiao, Vikash Kumar, Jonathan Tompson, Sergey Levine, Pierre Sermanet. Conference on Robot Learning (CoRL) 2019
- Dexterous Manipulation with Deep Reinforcement Learning: Efficient, General, and Low-Cost. Henry Zhu*, Abhishek Gupta*, Aravind Rajeswaran, Sergey L., Vikash Kumar. International Conference on Robotics and Automation (ICRA) 2019
- Learning Deep Visuo-motor Policies for Dexterous Hand Manipulation. Divye Jain, Andrew Li, Shivam Singhal, Aravind Rajeswaran, Vikash Kumar, Emanuel Todorov. International Conference on Robotics and Automation (ICRA) 2019
- Learning Complex Dexterous Manipulation with Deep Reinforcement Learning and Demonstrations. Rajeswaran A, Kumar V, Gupta A, Schulman J, Todorov E and Levine S. Robotics Science and Systems (RSS) 2019

- Divide-and-Conquer Reinforcement Learning. Ghosh D, Singh A, Rajeswaran A, Kumar V, Levine S. International Conference on Learning Representations (ICLR) 2018
- Variance Reduction for Policy Gradient with Action-Dependent Factorized Baselines. Wu C., Rajeswaran A., Duan Y., Kumar V, Bayen A, Kakade S, Mordatch I, Abbeel . International Conference on Learning Representations (ICLR) 2018
- Optimal Control with Learned Local Models: Application to Dexterous Manipulation. Kumar V, Todorov E, Levine S. **Best Manipulation Paper Award**, IEEE International Conference on Robotics and Automation (ICRA) 2016
- MuJoCo Haptix: A virtual reality system for hand manipulation. Kumar V, Todorov E. IEEE-RAS International Conference on Humanoid Robots (Humanoids) 2015
- Real-time behavior synthesis for dynamic hand-manipulation. Kumar V, Tassa Y, Erez T, Todorov E. IEEE International Conference on Robotics and Automation (ICRA) 2014
- STAC: Simultaneous Tracking And Calibration. Wu T, Tassa Y, Kumar V, Movellan J, Todorov E. Humanoids 2013
- An integrated system for real time Model Predictive Control for humanoid robots. Erez T, Lowrey K, Kumar V, Kolev S, Todorov E. Humanoids 2013
- A low cost and modular, 20 dof anthropomorphic robotic hand: Design, Actuation and Modelling. Zhe X, Kumar V, Todorov E. IEEE-RAS International Conference on Humanoid Robots (Humanoids) 2013
- Synthesis of Complex Behaviors with Optimal Control. Todorov E, Tassa Y, Erez T, Mordatch I, Kulchenko P, Kumar V Computational and Systems Neuroscience (COSYNE) 2013
- Fast, strong and compliant pneumatic actuation for dexterous tendon-driven hands. Kumar V, Todorov E. IEEE International Conference on Robotics and Automation (ICRA) 2013
- Design of an anthropomorphic robotic finger system with biomimetic artificial joints. Zhe X, Kumar V, Matsuoka Y, Todorov E. IEEE International Conference on Biomedical Robotics and Bio mechatronics (BioRob) 2012
- Self and Mutual learning in Robotic Arm, based on Cognitive systems. Kumar V, Patil C, Sachan S. (**best paper award finalist**) International Multi-Conference of Engineers and Computer Scientists 2010

Peer Reviewed Workshop Publications (excluding work that appeared above) :-

- Towards Universal Visual Reward and Representation via Value-Implicit Pre-Training. Jason Yecheng Ma, Shagun Sodhani, Dinesh Jayaraman, Osbert Bastani, {Vikash Kumar*, Amy Zhang*}.
- Learning Dexterous Manipulation from Exemplar Object Trajectories and Pre-Grasps. Sudeep Dasari, Abhinav Gupta, Vikash Kumar.
- Offline Reinforcement Learning on Real Robot with Realistic Data Source. Gaoyue Zhou*, Liyiming Ke*, Siddhartha Srinivasa, Abhinav Gupta, Aravind Rajeswaran, Vikash Kumar
- Hand Manipulation Suite: A benchmark for dexterous manipulation. Kumar V, Rajeswaran R, Gupta A, Todorov E, Levine S, Robotics Science and Systems (RSS) 2017
- Physically-Consistent Hand Manipulation Dataset. Kumar V, Todorov E. Workshop on Grasping and Manipulation Datasets. IEEE International Conference on Robotics and Automation (ICRA) 2016

Selected Press Coverage

- [Teach@Meta](#), [Engadget](#), [Gizmodo](#), [Yahoo](#), [Economic Times](#), [CNET](#): MyoSuite: Embodied AI platform that unifies neural & motor intelligence, May 23,2022
- [VentureBeat](#): Google AI researchers want to teach robots tasks through self-supervised reverse engineering. May26rd 2020
- [CNN](#): Google shows off far-flung A.I. research projects. Jan 29 2020
- [VentureBeat](#): Google's robotic hand AI can learn to rotate Baoding balls with minimal training data. Sept 27th 2019
- [The New York Times](#): Inside Google's Rebooted Robotics Program. Mar 26th 2019
- [Columns](#): Inventing the future: A 'new landmark' for computer science and engineering. Feb 28th 2019
- [NeuroHive](#): A Robot To Use Fingers Like Human Oct 15th 2019
- [The New York Times](#): How robot hands are evolving to do what ours. July 30th 2018
- [New Atlas](#): Bridging the gap between science and fiction. Dec 28, 2016
- [Communications of the ACM](#): Hand Jive: A Robot Hand Learns to Spin. Aug 23, 2016
- [Reuters](#): Robot hand gets a human touch. May 13th 2016
- [Wired](#): This dexterous robot can teach itself to spin a tube of coffee beans. May 10, 2016
- [Business Insider](#): Researchers created a robotic hand that is eerily human-like and can learn on its own. May 29, 2016
- [MIT Tech Review](#): ADROIT featured in TR35. 2016
- [UW360](#): A robotic hand that can move like a human hand, Aug 31 2016
- [ScienceDaily](#): This 5-fingered robot hand learns to get a grip on its own. May 9th 2016
- [Engadget](#): Robot hand learns to twirl objects on its own. May 11th 2016
- [GeekWire](#): UW team creates robotic hand that learns to become more dexterous than yours. May 9th 2016
- [Gizmodo](#): This Robot's Teaching Itself to Twirl a Stick. May 11th 2016
- [UWToday](#): This five-fingered robot hand learns to get a grip on its own. May 9th 2016
- [UW CSE News](#): UW CSE robot hand teaches itself to manipulate objects. May 9th 2016
- [CNN](#): The superhuman robot hand that learns from its mistakes. May 19th 2016
- [Tech Insider](#): Researchers created a robotic hand that is eerily human-like and can learn on its own. May 25th 2016
- [Indian Express](#): Five-fingered robot hand learns to get a grip on its own. May 10th 2016
- [UK's Daily Mirror](#): Incredible five-fingered robotic hand has ability to learn from its own experiences. May 11th 2016

- [Economic Times](#): Five-fingered robot hand learns to get a grip on its own. May 10th 2016
- [ZDNet](#): Five-fingered robot hand has a mind of its own. May 11th 2016
- [Kurzweil](#): This five-fingered robot hand is close to human in functionality. May 10th 2016
- [Most significant bit](#): Adroit: The robot hand for which practice makes perfect. UW-CSE, Summer'16
- [Futurism](#): This five-fingered robot hand is nimbler than your own. May 13th 2016
- [Hackaday](#): Robot cheerleader just needs a hand to learn basic tricks. May 13th 2016
- [Design](#): Five-fingered robot hand that learns tasks on its own. May 10th 2016
- [Interesting engineering](#): Robotic Hands that Teach Themselves to Move. May 12th 2016
- [Foxnews](#): Cool robot hand learns as it goes. May 10th 2016
- [IEEE Spectrum](#): Next-Gen Prosthetic Limbs in Simulation and Reality. Feb 12th 2015
- [UW CSE News](#): People's choice award. Oct 24th 2013
- [The New York Times](#): A robot with a delicate touch. Sep 18th 2012
- [The Daily](#): UW programmers create software for disaster response robot. Nov 12th 2012

Thesis

Ph.D. : Manipulators and Manipulation in High Dimensional Spaces

Advisor: [Dr. Emanuel Todorov](#), Applied math & CSE, Univ. of Washington, USA

[Dr. Sergey Levine](#), EECS, Univ. of California, Berkeley, USA

M.S. : Fuzzy Genetic Algorithms(FGA) (**BEST M.S. THESIS AWARD**)

Advisor: [Prof. Debjani Chakraborty](#), Dept. of Mathematics, IIT Kharagpur

B.S. : New Genetic Algorithm based multi-objective optimization algorithm(NMGA)

Advisor: [Prof. Nirupam Chakraborty](#), Head of Dept. of Metallurgical & Materials Engineering, IIT-Kharagpur

Students Mentored

- [Tony Zhao](#), Ph.D. in CS under Prof. Chelsea Finn at Stanford University. (June'22-now)
- [Rutav Shah](#), Ph.D. in University of Texas Austin under Yuke Zhu. (May'20-now)
- [Homanga Bharadhwaj](#), Ph.D. in RI CMU under Abhinav Gupta and Shubham Tulsiani (Aug'22-now)
- [Sudeep Dasari](#), Ph.D. in RI CMU under Abhinav Gupta (Aug'21-now)
- [Raunaq Bhirangi](#), Ph.D. in RI CMU under Abhinav Gupta and Carmel Majidi. (Jun'22-Jan'23)
- [Gaoyue \(Kathy\) Zhou](#), MS in Robotics CMU under Abhinav Gupta(Jun'21-now)
- [Jason Ma](#), Ph.D. in University of Pennsylvania, Osbert Bastani and Dinesh Jayaraman.(Jun'22-May'23)
- [Zoey Chen](#), Ph.D. student in University of Washington under Dieter Fox and Abhishek Gupta (Jun'21-Jun'22)
- [Liyiming \(Kay\) Ke](#), Ph.D in CSE, UW under Siddhartha Srinivasa and Byron Boots (Jun'21-Jun'22)
- [Mandi Zhao](#), Ph.D in CSE, Columbia University under Prof. Shuram Song. (summer'22)
- [Suraj Nair](#), Ph.D. in CS under Prof. Chelsea Finn and Prof. Silvio Savarese at Stanford University. (June'21-Dec'21)
- [Alla Zhou](#), Ph.D. in CS under Prof. Chelsea Finn at Stanford University. (June'21-Dec'21)
- [Abhishek Gupta](#), Ph.D. in EECS under Prof. Sergey Levine and Prof. Pieter Abbeel at UC Berkeley. (Apr'19-Dec'21)
- [Aravind Rajeshwaran](#), Ph.D. in CS under Prof. Sham Kakade and Prof. Emo Todorov at U of Washington. (Apr'16-Dec'20)
- [Anusha Nagabandi](#), Ph.D. in EECS under Prof. Sergey Levine and Prof. Ron Fearing at UC Berkeley. (Sept'18-Aug'19)
- [Suraj Nair](#), Ph.D. in CS under Prof. Chelsea Finn and Prof. Silvio Savarese at Stanford University. (June'18-Sept'19)
- [Kristian Hartikainen](#), now pursuing Ph.D. under Prof. Shimon Whiteson at University of Oxford
- [Dibya Ghosh](#), Bachelors in EECS at UC Berkeley, (starting Ph.D. at UC Berkeley 2020)
- [Arshit Sharma](#) B. Tech in Electrical Engineering, Indian Institute of Technology, Kanpur. (Ph.D applicant 2020)
- [Henry Zhu](#), Bachelors in EECS at UC Berkeley. (Ph.D applicant 2020)
- Visak CV, Master's in ME, University of Washington (Mar'15-Aug'16) (Pursuing Ph.D. at Georgia Tech under Dr. C. Karen Liu)
- [Kaiyu Zheng](#), Bachelors in CS, University of Washington (Pursuing Ph.D. in at Brown University, under Prof. Stefanie Tellex)
- Dylan Holmes, Bachelors in Computer Science, University of Washington (Jul'14-Mar'16)
- Anselm Nicklas, Visiting student, Electrical and Computer Engineering, Technische Universität München, Germany
- Others: Hugo Ponte, Michael Ahn, Justin Yu, Divye Jain, Andrew Li, Shivam Singhal

Invited Talks (excluding conference/workshop talks)

- ICRA, London. MyoSuite 2.0: Towards generalizable Physiological Agents. May'23
- IIT-Delhi, Building foundation models to parent robots. Jan'23
- MIT. CSL seminar. Physiological Motor Control, Sept'22
- CMU brAln seminar. Physiological Motor Control, Sept'22
- MIT. CSL seminar. Rethinking Dexterous Manipulation, Sept'22
- University of Montreal. Learning at your Fingertips, Aug'20
- Facebook AI Research. Learning at your Fingertips, June'20
- Univ. of Texas Austin. Learning at your Fingertips, May'20
- ADSI summer school: Algorithmic Foundations on Learning and control, Aug'19
- Univ. Of Washington: Guest lecture in Deep Reinforcement Learning class, May'18
- IIT-Delhi: Recent realizations in Robotic Learning, Oct'17

- OpenAI: Learning Dexterous Manipulation in the real world, Dec'16
- DeepMind: Learning Dexterous Manipulation via Experience and Imitation, Dec'16
- Google-Brain: Learning Dexterous Manipulation in High Dimensional spaces, Dec'16
- Kindred: Learning Dexterous Manipulation via Experience and Imitation, Dec'16
- Vicarious: Learning Dexterous Manipulation via Experience and Imitation, Dec'16
- Oculus Research, Redmond: Manipulators and Manipulation in High Dimensional Spaces, Mar'16
- MIT, CSAIL: Towards dexterous hand manipulation, Sept'15
- Harvard: Towards dexterous hand manipulation, Sept'15
- Microsoft Research, Redmond: Real time synthesis of hand manipulation via Dimensionality Augmentation, Feb'14

Achievements

Awards	<ul style="list-style-type: none"> ● Best Paper Award, Scaling Robot Learning Workshop ICRA'22 ● Best Manipulation Paper Award, ICRA'16 ● 'Viewer's choice award', Affiliates'13, UW, CSE ● Best Thesis Award, M.Sc. thesis, Dept. of Mathematics and Computing, IIT Kharagpur '10 ● Gold, Open hardware, KSHITIJ'09- Asia's largest techno-management Fest ● 'Most Industrially feasible', Techkriti'09, IIT Kanpur ● Silver, Open hardware, KSHITIJ'08, IIT Kharagpur ● Gold, Geobotics, Great Step'08, IIT Kharagpur ● Gold in Inter-hall Hardware modeling'07, IIT Kharagpur ● Silver in Inter-hall Hardware modeling'08, IIT Kharagpur ● Bronze, Robotic Water-polo, KSHITIJ'06, IIT Kharagpur ● Gold, Inter-hall Product design'06, IIT Kharagpur ● Bronze, Inter-hall ad-design'09, IIT Kharagpur
Honors	<ul style="list-style-type: none"> ● BEST ALL ROUNDER, Indian Institute of Technology IIT-Kharagpur '10 (Ankik Dhar Memorial) ● 'Spirit Of Nehru Award', Nehru Hall, IIT Kharagpur '10 ● Best All Rounder'09 & Budding Spirit'07, Nehru Hall, IIT Kharagpur
Position of Responsibilities	<ul style="list-style-type: none"> ● Vice President, Dept. of Mathematics'08-09, IIT Kharagpur ● Chief Editor, AWAAZ – campus monthly newsletter'06-09 ● Member of Kharagpur Robotics & Artificial Intelligence Group (KRAIG)
Others	<ul style="list-style-type: none"> ● Several state/district level awards in Hockey, Volleyball, Fine Arts

Scholarships and Grants

- Google cloud research grant, 2019
- NSF Student travel grant, 2014
- Center for Neuroscience Travel Award, Univ. of Washington, 2012, 2014, 2015
- MERIT-CUM-MEANS Scholarship, IIT Kharagpur, 2005, 2006, 2007, 2008, 2009, 2010
- Inter-IIT Sports Scholarship, IIT Kharagpur, 2006-07

Other Professional Involvements

- Organizer
 - [MyoSymposium](#): Neuromechanics meets deep learning, ICRA June 2022
 - [MyoChallenge](#): Learning Physiological Dexterity. Neurips. Dec 2022
 - Robotics Science and Systems Workshop, What did we learn from the DARPA Robotics Challenge, June 2013
 - University of Washington, Robotics Colloquium, 2014
- Associate Editor
 - IEEE International Conference on Robotics and Automation (ICRA) - 2019, 2021, 2023
 - Conference on Robot Learning (CoRL) - 2021
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) - 2021, 2022, 2023
- Conference program Committee / Reviewer
 - Robotics Science and Systems, 2020
 - IEEE Robotics and Automation Letters (RA-L), 2019
 - Science, 2018
 - IEEE International Conference on Robotics and Automation (ICRA), 2014, 2015, 2016, 2017, 2018, 2019
 - Mechatronics, 2018
 - IROS 2014, 2017
- Grant Committee
 - Dutch Research Council, Netherlands Organization for Scientific Research, 2020
- Admissions Committee
 - Computer science graduate admissions committee, University of Washington, 2013, 2014

References

- Dr. Sergey Levine, Assistant Professor, Dept. of Electrical Engineering & Computer Science, Univ. of California, Berkeley
- Dr. Emo Todorov, Associate Professor, Applied Mathematics, Computer Science & Engineering, Univ. of Washington, Seattle
- Dr. Pieter Abbeel, Professor, Department of Electrical Engineering & Computer Sciences, Univ. of California, Berkeley
- Dr. Dieter Fox, Professor, Paul G. Allen School of Computer Science & Engineering, Univ. of Washington, Seattle
- Dr. Abhinav Gupta, Associate Professor, The Robotics Institute, Carnegie Mellon University, Pittsburgh