

Anuj Mahajan

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Research Interests

Reinforcement Learning (RL), Generalization in Machine Learning (ML), Multi-Agentness, Game Theory, Computational Learning Theory, Open-Ended / Never-Ending RL, Safe RL, Large-scale RL, Probability & ML, Optimization

Selected Publications⁺

Anuj Mahajan, Mikayel Samvelyan, Tarun Gupta, Benjamin Ellis, Mingfei Sun, Tim Rocktäschel, and Shimon Whiteson. Generalization in cooperative multi-agent systems. 2022 [[arXiv](#)].

Adam Stooke, Anuj Mahajan, Catarina Barros, Charlie Deck, Jakob Bauer, Jakub Sygnowski, Maja Trebacz, Max Jaderberg, Michael Mathieu, Nat McAleese, Nathalie Bradley-Schmieg, Nathaniel Wong, Nicolas Porcel, Roberta Raileanu, Steph Hughes-Fitt, Valentin Dalibard, and Wojciech Marian Czarnecki. Open-ended learning leads to generally capable agents. 2021 [[DeepMind Tech report](#)].

Anuj Mahajan, Mikayel Samvelyan, Lei Mao, Viktor Makoviychuk, Animesh Garg, Jean Kossaifi, Shimon Whiteson, Yuke Zhu, and Animashree Anandkumar. TESSER-ACT: Tensorised actors for multi-agent reinforcement learning. In *Thirty-eighth International Conference on Machine Learning*. 2021 [[ICML](#)].

Tarun Gupta, Anuj Mahajan, Bei Peng, Wendelin Boehmer, and Shimon Whiteson. UNEVEN: Universal value exploration for multi-agent reinforcement learning. In *Thirty-eighth International Conference on Machine Learning*. 2021 [[ICML](#)].

Tonghan Wang, Tarun Gupta, Anuj Mahajan, Bei Peng, Shimon Whiteson, and Chongjie Zhang. Rode: Learning roles to decompose multi-agent tasks. In *Ninth International Conference on Learning Representations*. 2021 [[ICLR](#)].

Anuj Mahajan, Tabish Rashid, Mikayel Samvelyan, and Shimon Whiteson. MAVEN: Multi-agent variational exploration. In *Thirty-third Conference on Neural Information Processing Systems*. 2019 [[NeurIPS](#)].

Anuj Mahajan*, Matthew Fellows*, Tim GJ Rudner, and Shimon Whiteson. VIREL: A variational inference framework for reinforcement learning. In *Thirty-third Conference on Neural Information Processing Systems*. 2019 [[Spotlight, NeurIPS](#)].

Anuj Mahajan and Theja Tulabandhula. Symmetry detection and exploitation for function approximation in deep RL. In *Proceedings of the 16th Conference on Autonomous Agents and MultiAgent Systems*. International Foundation for Autonomous Agents and Multiagent Systems, 2017 [[AAMAS](#)].

Happy Mittal, Anuj Mahajan, Vibhav G Gogate, and Parag Singla. Lifted inference rules with constraints. In *Advances in Neural Information Processing Systems 28*, pages 3501–3509. Curran Associates, Inc., 2015 [[NeurIPS](#)].

⁺ Full updated list available at Google Scholar: [Here](#)

* Equal contribution

Education

- 2017–Current **Doctor of Philosophy in Computer Science**, *University of Oxford*, U.K., Supervisor: Prof. Shimon Whiteson.
- 2011–2016 **Master of Technology in Computer Science & Engg (Dual degree)**, *Indian Institute of Technology*, Delhi, **Thesis** : Exploring new techniques for MAP Inference in Markov Random Fields.
- 2011–2016 **Bachelor of Technology in Computer Science & Engg (Dual degree)**, *Indian Institute of Technology*, Delhi.

Work Experience

Industrial

- 2021 **Research Scientist Intern**, *DeepMind*, London, UK.
Open Ended Learning Systems
- 2020–2021 **Research Intern**, *J.P. Morgan Chase*, London, UK.
Safe Reinforcement Learning for long term decision making with constraints.
- 2019–2020 **Research Intern**, *NVIDIA*, Santa Clara, USA.
Multi-Agent Reinforcement Learning using tensorised function approximations.
- 2016–2017 **Research Scientist**, *Xerox Research Centre*.
Worked in the Machine Learning and Statistics Group in the following areas:
- Deep Reinforcement Learning
 - Probabilistic Graphical Models
 - Ranking for Duelling Bandits
- 2014 **Research Intern**, *Xerox Research Centre*.
Feature selection methods using Wavelet Packet transforms, published in CoNLL 2015.

Teaching

- 2019 **Tutor**.
Tutor for Machine learning for Computer Science & Philosophy undergrads, Trinity term, Hertford College, University of Oxford.
- 2019 **Teaching Assistant**.
TA for Reinforcement Learning, Hilary term, Autonomous Intelligent Machines and Systems (AIMS), University of Oxford.
- 2015–2016 **Teaching Assistant**.
TA for the following courses at IIT, Delhi:
- Machine Learning (COL774) Spring semester 2015–16.
 - Computer Networks (COL334) Fall semester 2015–16.

Reviewing

- NeurIPS** Neural Information Processing Systems, 2022, 2021, 2020, 2019
- ICML** International Conference on Machine Learning, 2021
- AISTATS** Artificial Intelligence and Statistics, 2021
- ICLR** International Conference on Learning Representations, 2021
- JMLR** Journal of Machine Learning Research, 2020
- AAAI** Association for the Advancement of Artificial Intelligence, 2022

Technical skills

Python, Java, C/C++, Prolog, SQL, Ocaml, Assembly
Pytorch, Tensor Flow, Jax, Docker, Matlab, Android, web2py, Eigen, OpenAI Gym

Patents

- USA Method and system for predicting requirements of a user for resources over a computer network, Number: US010417578B2
- USA Personalizing application interfaces based on usage, Number: US011112950B2

Relevant Courses

Advanced Machine Learning, Computational Learning theory, Machine Learning, Probabilistic Graphical Models, Adv. Algorithms, Data Mining, Computer Vision, Theory of Computation, Computational Biology, Molecular Cell Biology

Scholarships

- Awarded J.P. Morgan AI fellowship 2020.
- Awarded IBM PhD fellowship 2020 (declined).
- Awarded Google Deepmind Scholarship 2017-20 for doctoral studies at University of Oxford.
- Awarded Drapers Hertford graduate Scholarship 2017-20 for doctoral studies at University of Oxford.
- Awarded Microsoft Student Travel Grant for presenting research paper at CoNLL 2015, Beijing, China.
- Awarded Microsoft Student Travel Grant for presenting research paper at NeurIPS 2015, Montreal, Canada.
- Kishore Vaigyanic Protsahan Yojana(KVPY) fellowship awarded by the Department of Science and Technology, Government of India.(**Given to 200 fellows chosen from around one million applicants**)
- Awarded Indian National Association of Engineers (INAE) grant 2015.
- National Talent Search Examination(NTSE) fellowship awarded by NCERT, Department of Education, Government of India.(**500 scholars chosen from around one million applicants**)

Awards & Achievements

- Uber AI resident 2020 (Program rescinded due to covid19)
- Indian Institute of Technology, Delhi, Institute Merit Award : Received the prestigious IITD merit award given to **top 5% students in the institute**.
- Winner, Microsoft 'code.fun.do' : Programming event organized by Microsoft on 16-17/02/2013
- Won the Award of Excellence in Australian National Chemistry Quiz(ANCQ) for securing **All India Rank - 1** for three consecutive years (2006-08)
- Represented the state at Indian National Mathematics Olympiad and Astronomy Olympiad.
- Secured 8th position in the Regional Mathematical Olympiad, 2008 organized by NBHM, Government of India.
- Best Research Poster award at the Xerox open house 2014 poster presentation event.

Media

- MIT Technology Review on Open Ended Learning: [Link](#)
- DeepMind blog on Generally Capable Agents: [Link](#)
- AI plays catch, Two Minute Papers: [Link](#)
- Multi-Agent Perspective to AI, talk at GoodAI: [Link](#)