Ishan Durugkar

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Education

Ph.D. Computer Science (2017+)
The University of Texas at Austin, USA
Research areas: Reinforcement Learning, Multi-agent Reinforcement Learning, Robotics, Imitation Learning, Deep Learning
Affiliations: Learning Agents Research Group (LARG)

M.S. Computer Science (2014 – 2017)
University of Massachusetts Amherst
Research Areas: Deep Learning, Reinforcement Learning, Generative Adversarial Networks
GPA: 4.0

B.Engg. Computer Engineering (2007 – 2013)
Maharashtra Institute of Technology, India
Research and Extracurricular interests: Robotics, Swarm techniques, non-convex optimization

Bio & Research Statement

I am a PhD Student in the Department of Computer Science at the University of Texas at Austin. I am part of the Learning Agents Research Group (LARG) and advised by Prof. Peter Stone. My research focuses on the sub-field of Machine Learning called Reinforcement Learning. Within this field I have worked on a variety of projects that looks at different aspects of the RL problem. Some of these directions that I have worked on are optimization perspectives of TD learning, considering agent preferences in multi-agent RL, using adversarial techniques for transferring policies from simulation to real robots, and some applications of RL (for example, learning a policy to navigate knowledge bases). My current focus is twofold: intrinsic rewards learned through adversarial objectives, and distributed multi-agent RL.

Apart from these research interests, I also coordinate the weekly RL Reading Group with participation across the University. I also participate in the RoboCup Standard Platform League as part of the UT Austin Villa team. Here I work with the Nao robots, and focus on their vision system for the competition, along with using it as a testbed for research on sim-to-real transfer.

I have interned with Microsoft Research in Redmond, WA, in the Summer of 2018, where I worked with Adith Swaminathan and Matthew Hausknecht on figuring out how to help developers train RL agents. Before joining UT, I was a Master's student at UMass Amherst and have worked with Sridhar Mahadevan at the Autonomous Learning Lab. There I focused on Deep Learning (Variational Autoencoders and Generative Adversarial Networks), Deep Reinforcement Learning (macro-actions for DQN, policy gradient for navigating knowledge bases), and manifold learning.

Research Work Experience

Research Assistant
The University of Texas at Austin 2017 +
Assisted and authored research with UT Austin faculty and other graduate students on various projects. Primary research focus has been on Reinforcement Learning with different projects focusing on different aspects of this problem, including optimization, human feedback, sim-to-real transfer, and multi-agent RL.

Research Intern
Microsoft Research, Redmond Summer 2018
Researched and implemented algorithms to improve ease of developing RL agents. Particularly, focused on incorporating multiple different feedback channels into learning and agent policy. Concretely tested the idea by leveraging demonstrations to speed up the A2C algorithm.

Research Assistant
University of Massachusetts at Amherst 2015–2017
Assisted and authored research with faculty and other graduate students on various research topics including: *(1)* Generative Adversarial Networks (GANs), *(2)* learning temporal abstractions for actions with Deep Q Networks, *(3)* manifold learning on graphs, and *(4)* learning policies to navigate large knowledge bases.

Research Member
Maharashtra Institute of Technology 2013
Participated in research on non-convex optimization using swarm techniques, leading to a novel Cohort Intelligence algorithm. Presented the research at IEEE Systems, Man and Cybernetics conference in 2013 at Manchester, UK.

Other Work Experience

Software Engineering Intern
Amazon Comixology Summer 2015
Implemented certain components of the Comixology continuous integration pipeline. Developed a build system based on Ruby, PHP and ANT. Enabled developers to run Unit, Integration and Functional Tests in a single setting. Complete development of this system and integration into the development process.

Data Scientist – Research Assistant
UMass Amherst Alumni Association 2015 – 2016
Used data aggregation, cleaning and analysis along with machine learning techniques to identify and better engage alumni with on campus events and fund raising.

Software Engineer
Microsoft India 2013 – 2014
As part of the Code Search team in Visual Studio Online, implemented a prototype of code search based on Elasticsearch, which was then approved for further development. Participated in the effort to scale the prototype to integrate with Visual Studio Online.

Computing skills

Python (proficient); C++ (intermediate); Experience with various NN training libraries (Tensorflow, PyTorch, Theano); HPC clusters; Distributed NN Training.

Relevant Coursework

University of Texas at Austin: Reinforcement Learning, Advanced Robotics, Optimization.
University Of Massachusetts Amherst: Advanced Machine Learning, Deep Learning, Probabilistic Graphical Models, Optimization, Advanced Algorithms.

Robotics Competitions

RoboCup
UT Austin Villa 2019
Quarter-finalists in Standard Platform League
ABU Asia-Pacific Robot Contest
Maharashtra Institute of Technology 2010 – 2012

Teaching

Teaching Assistant
The University of Texas at Austin Fall 2019
Reinforcement Learning: Theory and Practice
Teaching Assistant
UMass Amherst 2015 – 2017
- Applied Machine Learning
- Distributed and Operating Systems

Reviewing Experience

Academic Conferences:
- AAAI Conference on Artificial Intelligence 2021
- International Conference on Learning Representations (ICLR) 2021
- Conference on Neural Information Processing Systems (NeurIPS) 2020
- International Joint Conferences on Artificial Intelligence (IJCAI) 2020

Journals:
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS) 2020

Workshops:
- Lifelong Machine Learning (ICML 2020)
- Multi-Task and Lifelong Reinforcement Learning (ICML 2019)

Organizational

Indian Student Association
University of Massachusetts, Amherst Fall 2015 – Fall 2016
Vice-President of the Indian Student Association at the University of Massachusetts, Amherst.

Publications

Conference Proceedings

- Durugkar, Ishan, Elad Liebman, and Peter Stone (2020). "Balancing Individual Preferences and Shared Objectives in Multiagent Reinforcement Learning". In: *Proceedings of the 29^{th} International Joint Conference on Artificial Intelligence*, pp. 2505–2511.
- Pavse, Brahma et al. (2020). "Reducing Sampling Error in Batch Temporal Difference Learning". In: *Proceedings of 37^{th} International Conference on Machine Learning, Vienna, Austria*.
- Das, Rajarshi et al. (2018). "Go for a Walk and Arrive at the Answer: Reasoning Over Paths in Knowledge Bases using Reinforcement Learning". In: *International Conference on Learning Representations*.
- Durugkar, Ishan, Ian Gemp, and Sridhar Mahadevan (2017). "Generative multi-adversarial networks". In: *International Conference on Learning Representations*.
- Thomas, Philip S et al. (2017). "Predictive off-policy policy evaluation for nonstationary decision problems, with applications to digital marketing". In: *Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence*, pp. 4740–4745.
- Kulkarni, Anand J, Ishan P Durugkar, and Mrinal Kumar (2013). "Cohort intelligence: a self supervised learning behavior". In: *2013 IEEE international conference on systems, man, and cybernetics*. IEEE, pp. 1396–1400.

Preprints

- Desai, Siddarth et al. (2020). *An Imitation from Observation Approach to Transfer Learning with Dynamics Mismatch*. To appear in NeurIPS 2020.
- Durugkar, Ishan, Matthew Hausknecht, et al. (2019). *Multi-Preference Actor Critic*. arXiv preprint arXiv:1904.03295.
- Durugkar, Ishan and Peter Stone (2018). *TD learning with constrained gradients*.
- Durugkar, Ishan P et al. (2016). *Deep reinforcement learning with macro-actions*. arXiv preprint arXiv:1606.04615.