

# ISHAN DURUGKAR

@ ishand@cs.utexas.edu

+1 (919)987-5230

Austin, TX

<https://idurugkar.github.io/>

## 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: Peter Stone, 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: 3.97

Affiliations: Sridhar Mahadevan, Autonomous Learning Lab (ALL)

### B.ENG. 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 candidate 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. My doctoral thesis will focus on improving RL algorithms by controlling the data they generate. In particular I use the estimation and control of the visitation distributions induced by reinforcement learning agents, such as the distribution of states they visit, or the distribution of transitions they experience.

Additionally, 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).

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.

In Summer 2021, I interned with DeepMind, where I worked with Volodymyr Mnih on unsupervised RL. I have also 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.

## 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 Scientist Intern

#### DEEPMIND

Summer 2021

Mentored by Volodymyr Mnih in the Discovery team at DeepMind. Focus on research and development of deep reinforcement learning algorithms, specifically unsupervised RL and learning of skillful policies in the absence of reward signals from the environment. Evaluation of the learned skills on the Atari benchmark.

### Research Intern

#### MICROSOFT RESEARCH (MSR), REDMOND

Summer 2018

With Adith Swaminathan and Matthew Hausknecht, research into approaches to improve ease of developing RL agents. Focused on incorporating multiple different feedback channels into learning the agent policy. Specifically, leveraged demonstrations to speed up learning of a policy gradient based agent.

### Research Assistant

#### UNIVERSITY OF MASSACHUSETTS AT AMHERST

2015–2017

Research on various topics including: (1) Generative Adversarial Networks (GANs) and Variational Auto-Encoders (VAEs), (2) temporal abstractions for actions in Deep RL, (3) manifold learning on graphs, and (4) learning policies to navigate large knowledge bases.

### Research Member

#### MAHARASHTRA INSTITUTE OF TECHNOLOGY

2013

Research on non-convex optimization using swarm techniques.

## OTHER WORK EXPERIENCE

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### 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

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Python (proficient); C++ (intermediate); Experience with various NN training libraries (Tensorflow, PyTorch, Theano); HPC clusters; Distributed NN Training (using Condor, Slurm, and the Azure system at MSR).

## RELEVANT COURSEWORK

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The University of Texas at Austin  
University Of Massachusetts Amherst

Reinforcement Learning, Advanced Robotics, Optimization  
Advanced Machine Learning, Deep Learning, Probabilistic  
Graphical Models, Optimization, Advanced Algorithms

## ROBOTICS COMPETITIONS

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### RoboCup Standard Platform League

#### UT AUSTIN VILLA

2019 - 2022

Quarter-finalists 2019, 2022, 4rd place in 2021

### ABU Asia-Pacific Robot Contest

#### MAHARASHTRA INSTITUTE OF TECHNOLOGY

2010 – 2012

Represented India in 2010 and 2012

## TEACHING

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### 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

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### Academic Conferences:

- AAAI Conference on Artificial Intelligence 2021, 2022
- International Conference on Learning Representations (ICLR) 2021, 2022 - *Highlighted Reviewer*
- Conference on Neural Information Processing Systems (NeurIPS) 2020, 2021, 2022
- International Conference on Machine Learning (ICML) 2021, 2022
- Conference on Lifelong Learning Agents (CoLLAs) 2022 - *Inaugural Program Committee*
- International Conference on Artificial Intelligence and Statistics (AISTATS) 2022
- The Conference on Robot Learning (CoRL) 2020
- International Joint Conferences on Artificial Intelligence (IJCAI) 2020, 2021

### Journals:

- Journal of Artificial Intelligence Research (JAIR) 2022
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS) 2020, 2021, 2022

### Workshops:

- Lifelong Machine Learning ICML 2020
- Multi-Task and Lifelong Reinforcement Learning ICML 2019
- Neverending learning workshop ICLR 2021

## ORGANIZATIONAL

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**RL Reading Group**

**UT AUSTIN**

Coordinator

**Indian Student Association**

**UNIVERSITY OF MASSACHUSETTS, AMHERST**

Vice-President of the Indian Student Association at the University of Massachusetts, Amherst.

Spring 2019 -

Fall 2015 – Fall 2016

## PUBLICATIONS

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### Conference Proceedings

- Durugkar, Ishan et al. “Adversarial Intrinsic Motivation for Reinforcement Learning”. In: *Advances in Neural Information Processing Systems*. 2021.
- Desai, Siddharth et al. “An Imitation from Observation Approach to Transfer Learning with Dynamics Mismatch”. In: *Advances in Neural Information Processing Systems. Joint first author*. 2020.
- Durugkar, Ishan, Elad Liebman, and Peter Stone. “Balancing Individual Preferences and Shared Objectives in Multiagent Reinforcement Learning”. In: *Proceedings of the 29<sup>th</sup> International Joint Conference on Artificial Intelligence*. 2020, pp. 2505–2511.
- Pavse, Brahma et al. “Reducing Sampling Error in Batch Temporal Difference Learning”. In: *Proceedings of 37<sup>th</sup> International Conference on Machine Learning, Vienna, Austria*. 2020.
- Das, Rajarshi et al. “Go for a Walk and Arrive at the Answer: Reasoning Over Paths in Knowledge Bases using Reinforcement Learning”. In: *International Conference on Learning Representations*. 2018.
- Durugkar, Ishan, Ian Gemp, and Sridhar Mahadevan. “Generative multi-adversarial networks”. In: *International Conference on Learning Representations*. 2017.
- Thomas, Philip S et al. “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*. 2017, pp. 4740–4745.
- Kulkarni, Anand J, Ishan P Durugkar, and Mrinal Kumar. “Cohort intelligence: a self supervised learning behavior”. In: *2013 IEEE international conference on systems, man, and cybernetics*. IEEE. 2013, pp. 1396–1400.

### Preprints

- Narayanaswami, Sai Kiran et al. *Towards a Real-Time, Low-Resource, End-to-end Object Detection Pipeline for Robot Soccer*. to be published in Proceedings of RoboCup 2022: Robot World Cup (Bangkok, Thailand), **nominated for best paper**. 2022.
- Wang, Caroline et al. *DM<sup>2</sup>: Distributed Multi-Agent Reinforcement Learning for Distribution Matching*. arXiv preprint arXiv:2206.00233. 2022.
- Durugkar, Ishan et al. *Wasserstein Distance Maximizing Intrinsic Control*. NeurIPS Deep Reinforcement Learning Workshop. 2021.
- Durugkar, Ishan et al. *Multi-Preference Actor Critic*. arXiv preprint arXiv:1904.03295. 2019.
- Durugkar, Ishan and Peter Stone. *TD learning with constrained gradients*. NeurIPS Deep Reinforcement Learning Symposium. 2018.
- Durugkar, Ishan P et al. *Deep reinforcement learning with macro-actions*. arXiv preprint arXiv:1606.04615. 2016.