Atharv Sonwane

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Research Interests

⋆ Robotics ⋆ Neurosymbolic AI ⋆ Meta Learning ⋆ Task and Motion Planning ⋆ Reinforcement Learning
⋆ Cognitive Science ⋆ Program Synthesis ⋆ Automata Theory ⋆ Hierarchical Learning ⋆ Distributed Systems

Education

⋆ **Birla Institute of Technology and Science, Pilani** *2018 - 2022 (Expected)*
Bachelor in Engineering, Computer Science. CGPA = 8.76 / 10 *Goa, India*

Publications

1. **Atharv Sonwane**, Gautam Shroff, Lovekesh Vig, Ashwin Srinivasan, Tirtharaj Dash. Solving Visual Analogies Using Neural Algorithmic Reasoning. In *AAAI-22 Student Abstract and Poster Program.*

2. **Atharv Sonwane***, Sharad Chitlangia*, Tirtharaj Dash, Lovekesh Vig, Gautam Shroff, Ashwin Srinivasan. Using Program Synthesis and Inductive Logic Programming to solve Bongard Problems. As a *Work in Progress Report* at the *10th International Workshop on Approaches and Applications of Inductive Programming.*

Experience

⋆ **Robot Vision and Learning Lab, University of Toronto** *Sept 2021 - Present*
Research Intern | Advisor: Dr. Florian Shkurti

- ▷ Developing a task and motion planning approach for robotic arms that integrates learning from experience.

⋆ **TCS Research & Innovation** *June 2021 - Sept 2021*
Research Intern | Primary Advisor: Dr. Gautam Shroff

- ▷ Investigated the use of neural algorithmic approach to perform analogical reasoning in a visual domain.
- ▷ Demonstrated that search over learned neural primitives can perform equivalently to symbolic ones.

⋆ **APP Centre for Artificial Intelligence Research & TCS Research** | **WEB** *Jan 2021 - June 2021*
Undergraduate Researcher | Primary Advisor: Prof Ashwin Srinivasan

- ▷ Developed an Inductive Programming approach to solve visual reasoning problems using program synthesis for representation and ILP for concept identification.
- ▷ Contributed to a project on automaton augmented reinforcement learning

⋆ **Centre of Robotics and Machine Intelligence IIIT Allahabad** | **WEB** *Summer 2020*
Research Intern | Advisor: Prof G.C. Nandi

- ▷ Implemented and tested performance of various Deep RL algorithms from scratch in PyTorch

⋆ **Council of Scientific and Industrial Research - CERRI** | **WEB** | **CODE** *Summer 2020*
Research Intern | Advisors: Samarth Singh and Dr. Rakesh Warier

- ▷ Built a drone controller module and OpenAI Gym Environment on top of the MAVROS and PX4 frameworks

Technical Skills

Programming	C/C++, Python, Julia, Java, MATLAB, SQL, Bash
Deep Learning	PyTorch, Tensorflow, Keras, NumPy, JAX, scikit-learn, pandas, Matplotlib
Robotics	Robot Operating System (ROS), rViz, Gazebo, MAVROS, PX4, Raspberry Pi
Tools	Git, LaTeX , Unix, TravisCI, AutoCAD, Qiskit

Selected Projects

⋆ **GenRL | PyTorch Reinforcement Learning Library | CODE** *June 2020 – Jan 2021*
Society for Artificial Intelligence and Deep Learning (SAiDL)

- ▷ Contributed implementations of various Deep Contextual Bandits
- ▷ Core Maintainer and worked on implementation of distributed RL using RPC

⋆ **Trotbot | Autonomous Delivery Robot | CODE** *Sep 2018 – Dec 2020*
Electronics and Robotics Club, BITS Goa (ERC)

- ▷ Built obstacle detection and path planning stack using Robot Operating System (ROS) in Python
- ▷ Implemented Rapidly Exploring Random Trees (RRT) for path planning in complex indoor environments

⋆ **GenNav | Python library for Robotics Navigation | CODE** *March 2020 – Dec 2020*
Electronics and Robotics Club, BITS Goa (ERC)

- ▷ Co-author and Lead Maintainer working with a team of 10+ student contributors
- ▷ Modular collection of navigation algorithms and utilities commonly used in Robotics with a ROS wrapper

⋆ **Causal Reasoning from Meta-Reinforcement Learning Exploration | CODE** *March 2021 - May 2021*
Meta Learning Course Project

- ▷ Implemented methods described in the paper and reproduced results on various experiments.
- ▷ Devised, performed and documented additional experiments to futher evaluate the central claim that Meta RL agents can performs Causal Inference.

⋆ **Structure and Inductive Biases in Reinforcement Learning | CODE** *July 2020 – Dec 2020*

- ▷ Implemented methods which used graph representations in RL to explore structural inductive biases

Teaching and Leadership Roles

⋆ **Teaching Assistant - Deep Learning (CS F425) | WEB** *Aug 2021 – Present*

- ▷ Conducting weekly labs and tutorials for course taught by Prof Tirtharaj Dash

⋆ **Teaching Assistant - Machine Learning (BITS F464) | WEB** *Jan 2021 – May 2021*

- ▷ Conducted weekly labs and organised course project for course taught by Prof Ashwin Srinivasan

⋆ **Teaching Assistant - Discrete Structures for Computer Science (CS F222)** *Aug 2020 – Dec 2020*

- ▷ Mentored undergraduate students in weekly problem solving sessions for course taught by Prof AB Matthews

⋆ **Organising Co-Lead - APPCAIR AI Symposium 2021 | WEB** *October 2021*

- ▷ Organised an event with 500+ attendees aimed at bringing together the AI community in India. Included a social along with talks from a mix of senior researchers and early career practitioners in the field of AI.

⋆ **President - Society for Artificial Intelligence and Deep Learning | WEB** *June 2021 – Present*

- ▷ Organising research, open-source projects, student-run courses and regular reading sessions for a group of talented undergraduates interested in AI

⋆ **Student Coordinator - Electronics and Robotics Club | WEB** *Aug 2020 – July 2021*

- ▷ Organising research projects, funding, work exhibitions and holding regular discussion sessions for a large (100+) group of undergraduates interested in Robotics

⋆ **Instructor for Student Run Courses on Robotics and Deep Learning** *April 2020 – Dec 2020*

⋆ **Committee Member - SandBox Innovation Laboratory | WEB** *Aug 2020 – Aug 2021*

Relevant Coursework

Meta Learning[#*], **Machine Learning**, **Artificial Intelligence**, Linguistics, Probability and Statistics, Graphs and Networks, Theory of Computation, Data Structures and Algorithms, Linear Algebra, Calculus, Operating Systems, Object Oriented Programming, Computational Physics, Quantum Informatics and Computing, Convolutional Neural Networks for Visual Recognition [†] (Stanford CS231n), Deep Reinforcement Learning [†] (UC Berkeley CS285)

= graduate level, * = ranked top 2 students, † = online