ATHARV SONWANE

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ABOUT ME

I am interested in Artificial Intelligence, specifically in the areas of deep learning, reinforcement learning and their applications in robotics. I am exploring how human like generalization and reasoning can be incorporated into reinforcement through various human learning priors.

EDUCATION

Birla Institute of Technology and Science Pilani, Goa, India *Aug 2018 - Present*
Bachelor in Engineering (Hons.), Computer Science
CGPA = 8.86 / 10

EXPERIENCE

Reinforcement Learning for Robotics *Summer 2020*
Prof G. C. Nandi, Centre of Robotics and Machine Intelligence, IIIT Allahabad

- Exploring how Deep Reinforcement Learning algorithms can be used for robotics in a simulated setting
- Implemented and tested performance of various algorithms from scratch in PyTorch

Reinforcement Learning for Drone Automation *Summer 2020*
Research Internship at CSIR - CEERI

- Applied Deep Q learning to navigation of autonomous quadcopters. A live depth-map feed was taken as input to generate movement commands for the drone.
- Built a controller on top of the MAVROS framework and simulated the learning process using PX4 and PX4 SITL.

Prediction of Ionospheric Scintillation *Jan – May 2020*
Digital Communications Lab, BITS Pilani, Goa

- Analysis and forecasting of GNSS (Global Navigation Satellite System) signals to learn more about disturbances due to ionospheric activity using Deep Learning
- Implemented LSTM based models in tensorflow for both prediction and classification of ionospheric time series data.

Prediction of Ionospheric Scintillation *Jan – May 2020*
Advisor – Prof. Neena Goveas Dept. CS and IS, BITS Pilani, Goa

- Prepared lectures and lab exercise for an introductory robotics course
- Designed final project around the various aspects that make up an embedded system

PROJECTS

- **GenRL** – PyTorch Reinforcement Learning Library *June 2019 - Present*
  - Collection of SOTA algorithms in Deep and Classical RL along with various utilities
  - Contributed implementations of various Deep Contextual Bandits
  - Core Maintainer and currently working on implementation of distributed RL

- **Inductive Biases in Machine Learning** *July 2020 - Present*
  - Exploring how relational inductive biases are incorporated into machine learning algorithms.

- **GenNav:** Python library for Robotics Navigation *May 2018 - Present*
  - Lead Maintainer and co-author.
  - Collection of navigation algorithms and utilities commonly used in Robotics
  - The library aims to be completely modular and have a unified API so that it is useable in a broad range of applications and easily extensible to new robotics domains

- **Causality in Reinforcement Learning** *July 2020 – September 2020*
  - Experimentation with integrating causal factors in RL algorithms.

- **Onseshot Classification using Transfer Learning** *Aug 2019*
  - Used transfer learning techniques to improve performance of a Siamese network for one shot learning on the Omniglot dataset

- **Q – Learning for some Atari Environments** *Aug 2019*
  - Experimented with using Double DQN algorithm to play Pong and Pacman gym environments.

- **Spoken Digit Classification** *Dec 2019*
  - Trained a CNN to classify audio clips of spoken digits encoded with a Short Time Fourier transform.

- **Trotbot:** Autonomous delivery robot *Sep 2018 - Present*
  - 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

- **Robotic Sketcher** *Jan 2020*
  - Created an automated sketching machine to produce visually appealing sketches from images.

TEACHING

Teaching Assistant – Discrete Maths for Computer Science *Aug 2020 – Present*

- Mentor 20 undergraduate students in weekly problem solving sessions

CTE: Deep Learning *Aug 2020 – Present*

- Created reference material and assignments for the course as well as mentoring over 100 students in introductory ROS, Control Theory, Motion Planning

CTE: Intermediate Robotics *Jan 2020 – April 2020*

- Mentor for the Intermediate Robotics Course where I guided students in motion planning and automation of robots

QSTP: Robotics and Automation *June 2020 – July 2020*

- Created reference material and assignments for the course as well as mentoring over 100 students in introductory ROS, Control Theory, Motion Planning

RELEVANT COURSEWORK

Online Convolutional Neural Networks for Visual Recognition (Stanford CS231n), Deep Reinforcement Learning (UC Berkley CS285)

Offline Machine Learning (Ongoing), Graphs and Networks, Quantum Informatics and Computing, Linear Algebra, Data Structures and Algorithms, Object Oriented Programming, Probability and Statistics, Digital Design, Calculus

SKILLS

Programming: Python, C, Java, C++, Bash, Assembly, MATLAB, Rust

Frameworks and Tools: Pytorch, Keras, NumPy, Tensorflow, Pandas, Qiskit, Git

Robotics and Embedded Systems: Robot Operating System (ROS), rViz, Gazebo, MAVROS, PX4, Raspberry Pi, Arduino.

RESEARCH INTERESTS

Deep learning, Reinforcement Learning, Causality, Machine Perception and Robotics, Cognitive Neuroscience, Meta Learning.

EXTRA-CIRCULAR ACTIVITIES

Electronics and Robotics Club (ERC) - *Chief Coordinator*

Society for Artificial Intelligence and Deep Learning (SAiDL) - *Core Member*

IEEE Student Chapter - *Member*