Rishabh Patra

3rd Year Undergraduate

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Research Interests

Reinforcement Learning, Graph Networks and Structured DL, Meta Learning, Machine Perception, Causality, Cognitive Sciences, Spiking Networks and reward Modulation

Education

Birla Institute of Technology and Sciences — Goa, India

B.E.(Hons) in Electronics and Communications engineering, CGPA - 7.96/10 — *Aug. 2018 – Present*

Experience

Research Fellow — Oct 2020 – Present

Maritime Research Centre, Pune | Advisor - Dr. (Cdr.) Arnab Das

- Validating and testing an ML based acoustic channel model for estimating the transmission loss between two communicating entities in the IOR
- Developing a Passive Sonar simulator, for real time ambient noise mapping of the IOR

Summer Intern — March 2018 – April 2020

Maritime Research Centre, Pune | Advisor - Dr. (Cdr.) Arnab Das

- Research on the existing underwater channel models and their feasibility of use in real time applications
- Provide Proof of concept of a ML based approach for the same, saving in computational time (faster than the current by 80x)

Prediction of ionospheric scintillation — March 2018 – April 2020

Digital Communications Lab, BITS Goa | Advisors - Abhijeet Dey and Dr. Nitin Sharma

- 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

Projects

GenRL | Python Reinforcement Learning library | CODE — Aug 2020 – Present

- Collection of SOTA algorithms in Deep and Classical RL along with various utilities
- Currently contributing to various Model based RL algorithms

Low Frequency Ambient Noise mapping in the IOR — July 2020 – Sept 2020

- Performed Spectral analysis of RAW hydrophone data recorded in the IOR region
- Compared that with open sourced AIS data to compare the actual and the predicted shipping noise values

Structure and Inductive biases in Reinforcement Learning | CODE — July 2020 – Present

- Investigating how inductive biases are incorporated in various ML algorithms
- Implemented Self attention to learn relational interactions between different entities for an RL agent
- Implemented a GNN for message passing and coordination in a multi-agent setting

Simulating an LIF neuron | CODE — Jul 2020

- simulated a simple LIF neuron from scratch and plotted its responses to various inputs

Reinforcement Learning on Easy21 | CODE — Aug 2019

- Assignment of David Silver's RL course offered at UCL
- Developed an environment to simulate playing of Easy 21 (a less complicated version of black jack)
- Performed Monte Carlo control, TD Learning on this environment, plotting out the value functions

Deep Q learning on Atari Games | CODE — Aug 2019

- Experimented with DQN algorithms to play Pacman

Study of optimizers | CODE Jan 2019

- Compared different optimizers and their rate of convergence on a simple dataset
- All optimizers coded from scratch using jax

One shot classification using Transfer learning | CODE Jan 2019

- Used transfer learning techniques to improve performance of a Siamese network for one shot learning on the Omniglot dataset.

Technical Skills

Programming: Python, R, C/C++, MATLAB, Bash
Tools: Git, LATEX, Unix, VIM, AUTOCAD
Deep Learning: PyTorch, Tensorflow, Keras, NumPy, pandas, Matplotlib, jax, BINDSnet
Libraries: pandas, NumPy, Matplotlib

Mentoring and Leadership Roles

Core Memeber Oct 2020 – Present
Society for Artificial Intelligence and Deep Learning (SAiDL)

- Developed a full-stack web application using with Flask serving a REST API with React as the frontend
- Implemented GitHub OAuth to get data from user's repositories
- Visualized GitHub data to show collaboration
- Used Celery and Redis for asynchronous tasks

Relevant Coursework

Multivariate Calculus, Probability and Statistics, Linear Algebra and complex analysis, Non-linear Dynamics and Chaos, Statistical Mechanics, **Convolutional Neural Networks for Image Recognition**@ (Stanford's CS231n), **Deep Reinforcement Learning**@ (UC Berkeley's CS285), **Natural Language Processing**@ (Stanford's CS224n), **Reinforcement Learning**@ (UCL's COMPM050)
(@ = online)