

Saurabh Daptardar

GRADUATE STUDENT · RICE UNIVERSITY

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Research Interests

Machine Learning, Deep Learning, Reinforcement Learning, Graphical Models and Inference

Education

Rice University

M.S. IN ELECTRICAL ENGINEERING

Houston, TX

Aug. 2016 - Present

- Research Areas: Neuroscience and Reinforcement Learning
- Cumulative GPA: 3.90

Indian Institute of Technology, Madras

B.TECH IN ELECTRICAL ENGINEERING

Chennai, India

Aug. 2010 - May 2014

- Cumulative GPA: 8.77/10.0

Relevant Coursework

Masters

Artificial Intelligence, Graphical Models and Networks, Theoretical Neuroscience II, Data Mining & Statistical Learning

B.Tech

Linear Algebra, Probability Theory, Calculus (multidimensional)

Technical Skills

Programming Languages C, C++, Python, R, MATLAB

Deep learning frameworks PyTorch, Tensorflow

Experience

Xaq Lab, Rice

RESEARCH ASSISTANT

Houston, TX

Nov. 2016 - Nov. 2018

- Designed experiments to study decision making/control in the animal brain.
- Formulated, modeled, and solved the control problem for the designed experiments.
- Proposed novel approach to explain and detect change of mind/decision using the control framework.
- Developed **novel** framework for Inverse Reinforcement Learning in POMDPs with continuous states and continuous actions.
- Applied the framework to recover the internal latent parameters for the brains' control model.
- Predicted the choices made by monkey's with **96%** accuracy with our model with the recovered parameters.
- Predicted **change of mind** ~100 ms prior to the intended actions using our model.
- Culminated the research in my Master's Thesis [1].

Samsung Research

SENIOR SOFTWARE ENGINEER

Bengaluru, India

Jul. 2014 - Aug. 2016

- **Samsung Auto Connect: Car and Driver Analytics**
 - Developed a solution for driver profiling and scoring.
 - Trained algorithms for detection and classification of driving maneuvers with **92%** accuracy.
 - Modeled and developed dynamic context based fuel estimation.
- **Samsung Gear Smartwatches: Sports Analytics**
 - Developed application for smart self tutoring for Tennis and Badminton in 'Gear S2' device.
 - Engineered data collection (from professionals), preprocessing, and storing pipeline.
 - Worked on providing smart recommendations, feedback and action matching based on professional players' strokes.
- **Samsung Smart Glove (research)**
 - Designed wearable gloves (with sensors) to control Samsung devices.
 - Built gesture recognition and user command interpretation based on sensor signals from the gloves with **82%** accuracy.

Projects

Parameter Space Inverse Reinforcement Learning

Master's Thesis, Advisor: Dr. Xaq Pitkow

- Developed a novel generalized framework for Inverse Reinforcement Learning to recover true parameters accurately within error bounds.

Decoding neural activity to estimate control target

Neural Signal Processing

- Decoded reach targets with **84%** accuracy using the plan period and movement period signals from the dorsal pre-motor cortex.

Neural decoding: ECOG data to speech

Statistical Learning

- Implemented ensemble methods to classify the neural recordings into dictionary of words with an accuracy of **74%**.

Control and Reinforcement Learning (RL)

- Implemented and trained various control and deep RL algorithms
- LQR, Iterative LQG, deep Q Networks (DQN), Double DQN, deep deterministic Policy gradient (DDPG), Advantage Actor Critic (A2C) etc.

Image Captioning with RNNs

- Implemented and trained a RNN (LSTM) model to caption images on COCO dataset.

Character Sequence RNNs

- Implemented and trained a single layer RNN (LSTM) char by char model to generate text.

Single Frame Image Super Resolution

B.Tech Thesis, Advisor: Dr. Jaliha

- Implemented the kernel Hebbian algorithm for single frame image super resolution.
- Integrated algorithm into a web application for medical/agricultural advisory.

Publications

- [1] Saurabh Daptardar. "The Science of Mind Reading - New Inverse Optimal Control Framework". MA thesis. Rice University, 2018.
- [2] Saurabh Daptardar et al. "Hidden Markov Model based driving event detection and driver profiling from mobile inertial sensor data". In: *SENSORS, 2015 IEEE*. IEEE. 2015, pp. 1–4.

Honors & Awards

2016 - 2018 **Fellowship**, Rice ECE Department

Houston, TX