Mohit Kulkarni

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Educational Qualifications

Year	Degree	Institution(Board)	CGPA/%
July'19 – June'23 (expected)	B.S., Mathematics	Indian Institute of Technology, Kanpur	8.7/10.0
2019	SSC – XII	Vidyadham Junior, Aurangabad	87.8%
2017	ICSE – X	Podar International School, Aurangabad	95.6%

Interests

Open Source, Computational Neuroscience, Nonlinear Dynamics, Robotics, Image Processing, Machine Learning

Skills

Prog. Language: C, C++, Python, Java, Bash
Utilities: OpenCV, ROS, Brian2, PyTorch, Tensorflow, Gazebo, Makefile, Git, MATLAB, LaTeX

Achievements

- AIR 615, JEE Advanced - 2019, amongst 200,000 candidates
- AIR 637, JEE Main - 2019, amongst 1.2 million candidates
- Awarded INSPIRE scholarship by Department of Science and Technology, Government of India,

Research Experience

Svoboda Lab, Janelia Research Campus
Remote Undergraduate Intern Sep'20 - Present

- Working on learning and plasticity in the Somatosensory cortex.
- Experimented with more biologically plausible learning algorithms such as Feedback Alignment, localised hebbian learning etc.
- Currently Experimenting with recurrent and chaotic models of learning(FORCE etc.)

Positions of Responsibility

Brain and Cognitive Society, IIT Kanpur BCS @IITK
Group Leader Apr'21 - Present

- Overall Head for all activities BCS conducts such as Journal Clubs, Summer projects etc

Robotics Club, IIT Kanpur
Secretary April'20 - April'21

Counselling Service, IIT Kanpur
Student Guide November'20 - Present

Camps and Workshops

Neuromatch Academy 2020
An online school for Computational Neuroscience July'20

Vijyoshi Camp 2019
IISER, Kolkata Dec'19

Projects

The Omniglot Project Github
Brain and Cognitive Society, IIT Kanpur May'20 - July'20

- This project was aimed at understanding and solving the problem of one-shot learning.
- Implemented SOTA meta-learning models to solve one-shot classification and generative problem.
- Used architectures like GANs, VAEs, LSTMs and bayesian statistics to develop models in PyTorch.

Autonomous Humanoid(AUTOMI) Github
Team Humanoid, IIT Kanpur Sep'19 - Present

- Involved in the development of a complete, highly optimised software stack for AUTOMI.
- AUTOMI v1 is designed for autonomous navigation in a static environment using techniques like depth estimation, SLAM, object recognition, avoidance, lane detection etc.
- The software stack is based on ROS, with image processing using OpenCV.

Following Sub-Population Signals Github
Mentor: Prof. James Murray, University of Oregon July'20

- The goal was to reveal more insights about the connection between different brain areas and how the sub-populations communicate, like order of firing of specific neuronal type, and the correlation between order of firing between different brain regions.
- This analysis was performed on Steinmetz dataset, as a part of Neuromatch Academy 2020.
- Techniques such as Granger Causality, PCA, dPCA, Markov Models were used.

PETcat Github
Robotics Club, IIT Kanpur April'20 - Present

- Aimed at developing a biologically inspired robotic cat.
- Simultaneous Localization and Planning Algorithms like orb-SLAM, gmapping, roVIO were implemented and benchmarked.
- Currently involved in optimization of software stack using storage optimization, multi-threading etc.

Talks and Mentorship

Does The Brain Do Backpropagation? Recording and Slides
Journal Club, BCS@IITK Dec'20

Dynamics Of Life
Stamatics IIT Kanpur Mar'21 - Present

- Mentored a group of 30 Freshman and Sophomores in a reading project on Nonlinear Dynamics and Chaos in Nature
- Primarily based on Steven Strogatz's book and Dynamical Systems in Neuroscience.

Relevant Courses

Fundamentals of Computing(ESC101)
Linear Algebra and ODE(MTH201/MTH102)
Probability and Statistics(MSO201)
Bioinformatics(BSE322)
Introduction to Electronics(ESC201)
Set Theory and Mathematical Logic(MTH302)
Fluid Mechanics(ESO204)
Computational Cognitive Science(CS786)[1]
Analysis-I(MTH301)
Abstract Algebra(MTH204)
Neurobiology(BSE656)
Deep Learning Specialization*

([1]): Ongoing Courses (*): Coursera course