Ishaant Agarwal

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Education

May 2021 / Aug 2016 — **Birla Institute of Technology and Science (BITS) Pilani**, Goa, India
Master of Science, Physics — CGPA: 8.1/10
Bachelor of Engineering, Electrical and Electronics Engineering

Experience

Present / Dec 2020 — **ETH Zürich | Institute of Neuroinformatics** [🏛] — **Zürich, Switzerland**
Visiting Researcher | Advisors: Dr Benjamin Grewe, Dr Pau Aceituno
Investigating biologically plausible alternatives to backpropagation in neural networks.

Present / May 2020 — **ETH Zürich | Image and Data Analysis Group** [▮▮▮] — **Zürich, Switzerland**
Student Researcher | Advisors: Dr Simon F. Nørrelykke, Dr Andrzej Rzepiela
Building deep learning based denoising tools to facilitate drug discovery.

Dec 2019 / May 2019 — **ESPCI Paris, PSL | Brain Plasticity Laboratory Group** [🧠] — **Paris, France**
Research Intern | Advisors: Dr Gisella Vetere, Dr José Casanova
Developed image processing and data analysis tools to analyse mouse behavior.

May 2018 / Aug 2018 — **IISc Bangalore | National Institute of Advanced Studies** [⬡] — **Bengaluru, India**
Summer Intern | Advisors: Dr Balakrishnan Ashok, Dr Janaki Balakrishnan
Created various models to predict population dynamics of the fruit fly.

Select Projects

Feedback and Target Propagation in Biologically Trained Neural Networks Dec'20-Present
Advisors: Dr Benjamin Grewe, Dr Pau Aceituno
- Formulated a new biological learning rule for neural networks that can mimic backpropagation's non-local learning without the weight transport limitation.
- Demonstrated that the rule can be successfully used to train rudimentary classifiers.
- Currently upscaling testing environment to more complex deep learning problems.

Restoration and Reconstruction of 3D cryoEM Images- DeepNoise3D June'20-Present
Advisor: Dr Simon F. Nørrelykke
- Built the first 3D deep learning solution to denoise whole cryoEM maps.
- Proposed a novel frequency balancing loss function that boosts crucial medium and high frequency details (corresponding to protein chains).
- Successfully used a self-supervised approach to train a UNet on real world data without ground truth.

Analysis of Spatial codes and Memory Changes in Rodents May'19-Dec'19
Advisors: Dr Gisella Vetere, Dr José Casanova
- Developed a full package for processing and analyzing video data from a single-photon mini-microscope.
- Used an RNN along with traditional morphological processing to extract RoIs and calcium traces from these recordings and worked to register these cells to track them across sessions individually.

Synchronization and Collective Dynamics of Non-Linear Systems Jan'18-Dec'18
Advisor: Dr. Gaurav Dar
- Extensively studied and simulated the synchronization behaviour of weakly coupled oscillators.
- Investigated topological events like fixed points and bifurcations and investigated their generation as a way of modulating seizure response in animals, using the Kuramoto Model.

Note: Please refer to my website for a complete list of my projects.

Teaching Experience

Instructor	Deep Learning for Image Analysis [📊]	*EMBL Heidelberg, Germany*	2021
Teaching Assistant	EEE F435: Digital Image Proccessing	*Dept. of EEE, BITS Pilani*	2020
Teaching Assistant	PHY F313: Computational Physics	*Dept. of Physics, BITS Pilani*	2019

Programming Skills

Languages: Python, C++, MATLAB, Excel, LaTeX Libraries: Keras, Tensorflow 1.0 and 2.0, sklearn

Relevant Courses

Learning in Deep Artificial and Biological Neuronal Networks (at ETH), Digital Image Processing, Digital Signal Processing, Probability and Statistics, Optimization, Linear Algebra, Computational Physics, Theoretical Neuroscience, Non-Linear Dynamics.