

# Aditya Sinha

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## EDUCATION

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- **Columbia University** New York, NY  
*M.S. in Electrical Engineering (Systems Biology & Neuroengineering), Dec 2019* CGPA: 3.76/4.00
  - **Awards:** Recipient of the Nikola Tesla Scholarship
  - **Courses:** Genomics, Neural Networks & Deep Learning, Brain Computer Interfaces, Sparse Representation, Computing with Brain Circuits, Speech Processing, Computational Neuroscience
- **Indian Institute of Technology Kharagpur** Kharagpur, India  
*B.Tech in Electronics & Electrical Communication Engineering, 2018* CGPA: 9.61/10.00
  - **Awards:** Best B.Tech. Thesis in Electrical Engineering, Nilanjan Ganguly Memorial Endowment
  - **Courses:** Neural Coding of Sensory Information, Biological Systems, Image Processing, Digital Signal Processing, Algorithms, Data Analytics, Machine Learning, Control Systems, Probability & Statistics

## RESEARCH INTEREST

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As an engineer steeped in biology, I seek to use computational and machine learning methods to answer questions in systems biology and neuroscience, to understand better how we function and to learn from it. My main interests lie in the fields of computational biology and neural processing in brain computer interfaces.

## PROFESSIONAL EXPERIENCE

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- **Student Intern, Christina Leslie Lab** New York, NY  
*Memorial Sloan Kettering Cancer Center* Jun 2019 - Present
  - Proposed louvain clustering based global, automated analysis pipeline for flow cytometry data of Renal Cell Carcinoma patients.
  - The proposed analysis pipeline seeks to replace classical gating based analyses as a more robust, stable and omniscient method for identifying and quantifying the immune cell composition of the tissue sample.
- **Research Assistant, Bionet Lab** New York, NY  
*Columbia University* Jan 2019 - May 2019
  - Worked on graph-based models for integration of landmark and motion information in the ellipsoid body of the Drosophila. Modeled detection units for visual input from the fly retina, integrated them using ring oscillator based neural circuit to track stimulus movement.
- **Design and Verification Tool Optimization** Noida, India  
*Mentor Graphics, Internship* May 2017 - Jul 2017
  - Designed shell scripts, test cases in SystemVerilog to improve the performance of the QuestaSim simulator.

## PUBLICATIONS

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- **Secure Communication in Interference Limited Environment** IIT Kharagpur  
*B.Tech Thesis* Apr 2017 - Apr 2018
    - Use of Network Information Theory to ensure reliable, secure communication at the physical layer using independent secret keys.
    - Seeks to use the properties of the channel to ensure secrecy at the physical layer, and is a better alternative to cryptographic methods in decentralized nodes with lower computing power, such as IoT systems.
- A. Sinha**, P. Mohapatra, J. Lee and T. Q. S. Quek, "On the Secrecy Capacity of 2-user Gaussian Interference Channel with Independent Secret Keys," 2018 International Symposium on Information Theory and Its Applications (ISITA), Singapore, 2018, pp. 663-667. doi: 10.23919/ISITA.2018.8664253 [[IEEE](#)] [[pdf](#)]

## RESEARCH PROJECTS

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- **EEG analysis of Acute Cognitive Impairment** Shah Lab, Weill Cornell Medicine  
*Research Project* *Sep 2019 - Present*
  - Analyzed EEG response of child patients to language listening tasks using temporal response functions (TRF), in an effort to probe higher advanced functions in motor impaired cases.
  - Compared the TRFs of the cases that show improvement with those that don't to understand the difference in neural response.
- **Human Protein Atlas Image Classification** Columbia University  
*Term Project* *Sep 2018 - Dec 2018*
  - Designed novel CNN based classifier to predict protein localization labels with reference images of nucleus, cytoplasm and endoplasmic reticulum.
  - Treats the three correlation sources independently and learns features concurrent with the protein localization. The three networks are then merged, with a threshold detection applied for multiclass classification.
- **A Neural Algorithm of Artistic Style** Columbia University  
*Term Project* *Sep 2018 - Dec 2018*
  - Used a VGG-19 Deep Neural Network to perform style transfer to create artistic renditions of scenes.
  - Content and style images were passed through a pretrained VGG-19 and the forward layer activations were used to backpropagate into the original image to create artistic style transfer.
- **Speech Denoising using Deep Autoencoder** Columbia University  
*Term Project* *Jan 2019 - May 2019*
  - Used a Deep Autoencoder to learn the statistics of gaussian noise in speech mel-spectrograms in order to denoise the speech samples.
- **Sparse reconstruction of heard speech spectrogram** Columbia University  
*Term Project* *Jan 2019 - May 2019*
  - Trained speech spectrograms and neural response pairs to learn Spectro Temporal Receptive Fields (STRFs)
  - Used neural responses and trained STRFs to model the relation as a convolution. The convolution was modeled as matrix multiplication and a sparse reconstruction problem.
  - Used sparse reconstruction algorithms like augmented lagrangian, proximal subgradient, accelerated proximal gradient and Frank-Wolfe to reconstruct spectrograms with a higher accuracy than dense methods.
- **Neural Coding of Sensory Information** IIT Kharagpur  
*Term Project* *Jan 2018 - Dec 2018*
  - Simulated olfactory pathway in fruit fly, time encoding/decoding of audio in the ear, ocular dominance & synaptic plasticity in visual cortex. Study of Auditory Nerve Fibre responses to tones and speech in cats using phase locking and Spectro-Temporal Receptive Field (STRF) based analysis.
  - Mock PhD. project proposal: *"Restoration of Olfaction in anosmic patients by Glomerular microstimulation through the Cribiform plate"*
- **Grayscale Image Recolorization using CNNs** IIT Kharagpur  
*Term Project* *July 2016 - Nov 2016*
  - Employed a VGG-16 convolutional neural network along with a reconstruction path to colour grayscale images and videos. Link to website: <https://cs60050.github.io/SkyNet/website/>

## TECHNICAL SKILLS

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Python, R, C, C++, TensorFlow, MATLAB, Compute Engine, CUDA, Shell, Verilog