

# Parul Jain

☎ 646 431 9601 • ✉ parul.jain@mssm.edu  
📁 paruljainneuro.github.io

## Academic Appointments

---

### Postdoctoral Associate

Department of Psychiatry, Advisor: Daniela Schiller  
Icahn School of Medicine at Mount Sinai (ISMMS), New York, NY

*April 2023 - present*

## Education

---

### Doctor of Philosophy

Physiology, Biophysics, and Systems Biology  
Weill Cornell Medical College (WCMC), New York, NY

*Aug 2017 - March 2023*

### Bachelor of Technology

Computer Science and Engineering, with a minor in Computational Biology  
Indian Institute of Technology Delhi (IIT Delhi)

*Jul 2012 - May 2016*

## Research Projects

---

### Hippocampal representations of social spaces

*Dr. Daniela Schiller, ISMMS*

*Current*

Social interactions are an unavoidable part of our daily lives. How "close" one feels to people in their social circle can be mapped with an egocentric geometry, where affiliation and power drive the distance one puts between themselves and others. This generates an abstract navigable map of social spaces. Such maps have been shown to be represented in hippocampal place cells. Since many psychiatric conditions impair social cognition, the social maps and their hippocampal representations may be systematically altered in these conditions. This work attempts to understand such changes that accompany social cognitive impairment.

### Understanding Misophonia

*Drs. Daniela Schiller and Jennifer Foss-Feig, ISMMS*

*Current*

Misophonia is a relatively new syndrome characterized by reduced tolerance to certain sounds. While the symptoms of misophonia are widely agreed upon, its phenomenology and neural mechanisms remain elusive. Via behavioral and electrophysiological studies, this project aims to understand these processes and establish a spectrum for the syndrome by identifying the dimensional features that describe it.

### Detecting low-level language processing in severely brain-injured patients

*Drs. Jonathan D. Victor and Nicholas D. Schiff, WCMC*

*Ph.D. Thesis*

In survivors of severe brain injury, residual cognitive abilities are assessed traditionally via behavioral tests such as the Coma Recovery Scale-Revised (CRS-R) and, recently, via EEG/fMRI-based tests of motor imagery. However, these tests rely on language comprehension. Given the hierarchical nature of language, there could be a subset of patients with no evidence of language comprehension but with evidence of partial language processing. We explored this question using EEG recording of brain injury patients as they passively listened to a section of a popular story. Our results confirm that there are patients with no evidence of language processing in behavioral or motor imagery tests but with evidence of low-level language processing in EEG.

### Application of Hermite-based measure of non-Gaussianity to normality tests and ICA

*Dr. Jonathan D. Victor, WCMC, and Bruce W. Knight Jr., The Rockefeller University*

*Ph.D. Thesis*

Measures of Gaussianity are the basis of normality tests and independent component analysis, two widely used methods in neural data analysis. As a result, there are many ways to measure non-Gaussianity, but none directly captures the signal distribution's shape. We explored the suitability and feasibility of a Hermite functions-based measure of non-Gaussianity to normality tests and ICA. We compared it to existing ones using synthesized non-Gaussian datasets and simulated realistic EEG datasets. The method shows promise as a normality test with applicability for artifact removal in EEG datasets.

### Network inferencing in neuronal circuits in zebrafish

*Dr. Mark Goldman, UC Davis, and Dr. Emre Aksay, WCMC*

*Aug 2016 - Dec 2017*

This project aimed to model the oculomotor neural integrator in zebrafish to understand the working of short-term memory. I developed new tools for the simultaneous recording and stimulation of the oculomotor system in larval zebrafish were developed. Specifically, I processed real-time images from two-photon microscopy via MATLAB-based image analysis routine for automatic neuron identification. The output was linked to a Python-based analysis pipeline for model fitting, which compared negative derivative feedback models to conventional positive feedback models. The Python-based analysis sent feedback to MATLAB based on sensitivity analysis for controlled stimulation.

### **Causality in gene regulatory networks**

*Dr. Sumeet Agarwal, Dr. Parag Singla, and Sahil Loomba, IIT Delhi*

*Jul 2015 - May 2016*

To understand the dynamics of gene-regulatory networks (GRNs), we used simulated mRNA concentrations in multiple subject data and across time series data. We compared standard information theory techniques such as Granger causality and transfer entropy to novel methods like convergent cross maps and manifold learning.

## **Publications**

---

**Jain, P.,** Conte, M. M., Voss, H. U., Victor, J. D., & Schiff, N. D. (2023). Low-level language processing in brain-injured patients. *Brain communications*, 5(2).

**Jain, P.,** Knight Jr, B. W., & Victor, J. D. (2023). Application of a Hermite-based measure of non-Gaussianity to normality tests and independent component analysis. *Frontiers in Neuroinformatics*, 17.

## **Presentations**

---

**Society for Neuroscience Conference, Chicago, Nov 2019**

**Poster**

**P. Jain,** M. M. Conte, J. D. Victor, N. D. Schiff. EEG evidence of phonemic processing in severely brain-injured patients.

**Vincent du Vigneaud Research Symposium, WCMC, Apr 2022**

**Talk**

**P. Jain,** M. M. Conte, H. U. Voss, J. D. Victor, N. D. Schiff. EEG evidence of phoneme processing in severely brain-injured patients.

**Society for the Neurobiology of Language, Philadelphia, Oct 2022**

**Poster**

**P. Jain,** M. M. Conte, H. U. Voss, J. D. Victor, N. D. Schiff. EEG evidence of phoneme processing in severely brain-injured patients.

## **Teaching Experience**

---

- Teaching Assistant, Applied Quantitative Techniques for the Biological Sciences, headed by Dr. Diane Lane, WCMC, Sep - Oct 2021
- Teaching Assistant, Dynamic Models in Biology, taught by Dr. Trine Krogh-Madsen, WCMC, Sep - Dec 2018 and 2019

## **Work Experience**

---

**Zolve (educational platform for student query redressal)**

*Chief Technical Officer*

*Oct 2015 - May 2016*

Developed string algorithms, machine learning-based performance evaluations, and web security methods for the platform. Optical character recognition was implemented for parsing mathematical expressions in student queries. Additional responsibilities included database management, server maintenance, and web product design.

**Microsoft, India**

*Software Development Intern*

*May 2015 - Jul 2015*

Developed a prototype SDK library for OneNote Services. The library serves as an API and facilitates the development of Android applications that use OneNote at the backend by handling data transfer, representation, and storage.

## **Technical Skills**

---

MATLAB, python, L<sup>A</sup>T<sub>E</sub>X, R, C++, Java

## **Awards and Honors**

---

- Kishore Vaigyanik Protsahan Yojana Fellow, 2010
- National Talent Search Scheme Scholar, 2008