Satwik Pasani

satu002@gmail.com | StackExchange: stochastic13 | GitHub: stochastic13

My personal webpage + blog is available at stochastic13.github.io/my_page

Degree and Certifications

All India Institute of Medical Sciences — New Delhi, India
MBBS (Bachelor of Medicine, Bachelor of Surgery) — *Aug 2014 – Dec 2019*

Publications & Poster Presentations

I **S. Pasani**, S. Sahoo, and M. K. Jolly, "Hybrid E/M Phenotype(s) and Stemness: A Mechanistic Connection Embedded in Network Topology," *JCM, vol. 10, no. 1, p. 60, Dec. 2020*, doi: 10.3390/jcm10010060. link

II **S. Pasani**, and S. Viswanath, "A Framework for Stochastic Optimization of Parameters for Integrative Modeling of Macromolecular Assemblies," *Life, vol. 11, no. 11, Nov. 2021*, doi: 10.3390/life11111183. link

III Poster presented at Research Day, AIIMS (All India Institute of Medical Sciences, New Delhi), 2019 on "Modeling Anthropometric catchup in pediatric TB patients on treatment"

IV Poster presented (I was involved in the work behind the poster; poster presented by the first author) at the *34th International Epilepsy Conference by ILAE* (International League Against Epilepsy), 2021 titled "Inter-observer agreement between Primary Care Physicians and Pediatric Neurologists in classifying epilepsy in children according to ILAE 2017 scheme", work authored by P. K. Choudhary, R. Tiwari, P. Kaur, S. Bansal, G. Puri, S. Pattisapu, **S. Pasani**, P. Jauhari, B. Chakrabarty, R. Lodha, R. M. Pandey, V. K. Paul, S. Gulati link

Upcoming Research Engagements

I **OIST (Okinawa Institute of Science and Technology), Okinawa** — Upcoming in Feb 2022
*Research Intern with **Prof. Simone Pigolotti*** — *Biological Complexity Unit*

- Selected for a short term Internship as part of the OIST research internship program (link)

Research Experience

I **Yale, Connecticut** — Mar. 2021 – Ongoing
*Research Intern with **Dr. David van Dijk*** — *Comp Bio & ML @ Yale Medical School*

- **Project 1:** I am working on developing transformer-based novel frameworks for self-supervised learning for ECG classification and utilizing gradient-based saliency analysis (integrated-gradients, GradCAM) of ECG Deep Learning models, *Ongoing*
- **Project 2:** I am working on using deep CNN models for bone-age prediction from pediatric radiographs, *Ongoing*
- **Project 3:** I am working on developing contrastive learning frameworks to augment survival analysis (cox and Accelerated Failure Time models) for RCT data for personalized medicine, *Ongoing*
- **Tools:** pytorch, torchvision, pillow, xgboost, sklearn, sksurv, pysurvival, scipy, numpy, pandas, matplotlib

II **NCBS (National Center for Biological Sciences), India** — Oct 2020 – Ongoing
*Graduate Trainee and Intern with **Dr. Shruthi Viswanath*** — *Integrative Structural Biology Lab*

- **Project 1:** I am working on Integrative Modeling of Desmosome via the Integrative Modeling Platform involving Bayesian structural modeling using spatial restraints from multiple kinds of biochemical and biophysical experiments and Markov-Chain-Monte-Carlo sampling methods, *Ongoing*
- **Project 2:** I worked on developing a Stochastic Optimization algorithm with flexible parallel computing for Integrative Modeling parameters, *Publication II*

- Contributed to the C++ and Python codebase for Integrative Modeling Platform, Python Modeling Interface and the imp-sampcon repositories. (link)
- **Tools:** IMP, MODELLER, biopython, UCSF Chimera, PSIPRED/HHPRED, multiprocessing, scipy, numpy, pandas, matplotlib

III **IISc (Indian Institute of Science), Bangalore** Mar 2020 – Dec 2020
*Research Intern with **Dr. Mohit Kumar Jolly*** *Center for BioSystems Science and Engineering*

- **Project:** I worked on non-linear dynamical simulations with randomly sampled circuit parameters of the (epithelial to mesenchymal transition) EMT-Stemness oncologically-relevant genetic network, *Publication I*
- **Tools:** RACIPE, scipy, numpy, pandas, matplotlib

IV **AIIMS (All India Institute of Medical Sciences), New Delhi** 2019
*Undergraduate Intern with **Prof. Sheffali Gulati*** *Pediatrics Department*

- **Project:** I worked on studying the inter-observer variation in the clinical classification of pediatric epilepsy, *Poster IV*
- Part of the data collection team based on a clinical questionnaire for the pediatric OPD

V **AIIMS (All India Institute of Medical Sciences), New Delhi** 2016 – 2018
*Undergraduate Intern with **Prof. Rakesh Lodha*** *Pediatrics Department*

- **Project 1:** I worked on clustering analysis of a pediatric asthma cohort to discover clinical subphenotypes in an unsupervised manner and the subsequent comparison of clustering algorithms on the clinical dataset, *Submitted to ICMR under the STS program*
- **Project 2:** I worked on modeling the anthropometric parameter catchup profile during pediatric tuberculosis treatment, *Poster presented III*
- **Tools:** R - cluster, dplyr, ggplot2, Python - scipy, numpy, pandas, matplotlib

Mentoring and Teaching Experience

I **Taught a 20-lecture Course on Computer Science, Algorithms and Programming** 2021
AIIMS (All India Institute of Medical Sciences), New Delhi *upcoming on YouTube*

II **Full time TA in an 3-week international Computational Neuroscience workshop** 2021
Neuromatch Academy *NMA link*

- The course covered Machine Learning (GLM, Deep Learning, Dimensionality Reduction, Autoencoders), Dynamical Systems (Biological Neuron Models, Dynamic Networks) and Stochastic Processes (Bayesian Decisions, Hidden Dynamics, Optimal Control, Reinforcement Learning and Network Causality)

III **TA in a graduate course on Statistical Inference in Biology** 2021 (ongoing)
NCBS (National Center for Biological Sciences), Bangalore

- The course covers Basic Statistical Theory, Bayesian Inference, Markov-chain Monte Carlo methods, Machine Learning Theory and the python implementation of these

IV **Active in answering on peer-to-peer QA sites on Multiple Subjects** 2012 – Ongoing
StackExchange Network (Math, CS, Stats, etc) and StackOverflow and KhanAcademy QA Forums *KA link and SE Link*

Workshops

I **Computational Approaches to Memory and Plasticity (CAMP)** July 2018
Annual Course on Computational Neuroscience *NCBS, Bangalore*

- Worked on a small group project (python; MOOSE) to simulate cellular dynamics to create a bistable switch capable of acting as synaptic memory
- Introduction and hands-on training for MOOSE, BRIAN, NEURON and allied computational tools to model dynamical systems, single-neuron compartment model and multi-scale neuronal networks

II **Simons Monsoon School** June 2018
Introductory Physics and Mathematics for Biological Problems *Simons Center, NCBS, Bangalore*

- Worked on a small group project (python) to simulate dispersal dynamics in a computational model of a forest

III **B4 program workshop** Dec 2017
SAI-Harvard course on Bioinformatic and Lab-based techniques for Genomics *IBAB, Bangalore*

- Introduction and hands-on training for mutation calling, genome alignment, analysis of NGS whole-genome and ChIP-seq data, de-novo genome synthesis and lab procedures for DNA/RNA extraction, purification and amplification

IV **Visualizing Science**
Wellcome-DBT and Nature, India organized course on Visualizations in science *NII, Delhi*

- Explanation of various aesthetic concepts involved in scientific illustrations and usage of multi-media to communicate and develop science

Awards and Merits

I **Scholarships**

- Awarded the **NTSE** National Talent Search Scholarship by NCERT (National Center for Education, Research and Training) since 2010
- Awarded national scholarship **KVPY** (under mentorship scheme) and attended the **Vijyoshi Camp** (2012)
- Awarded the **Aruna Lal Scholarship** by Physical Research Laboratory, Ahmedabad (top 5 students of the state) (2013)

II **CSIR-UGC NET (Life Sciences)** NTA
***National Rank: 3**; Overall percentile: 99.9969* *Nov 2020*

- Junior Research Fund (JRF) awarded; Awarded to ≈ 1% of total students (Total applicants ≈ 60000)

III **Medical Entrances**

1. Secured **All India Rank 17** in AIIMS Entrance Examination with one of the smallest acceptance ratios (2014)
2. Secured **All India Rank 5** in JIPMER Entrance examination (2014), **Rank 116** in AIPMT (General Medical Entrance examination) (2014) and ≥**99th Percentile** in State Board Examination (Gujarat) (2014)

Standardized Tests

I **GRE General Examination** ETS
Overall: 336/340 *Feb 2020*

- Quantitative Reasoning: 170/170 (pr: ≥96), Verbal Reasoning: 166/170 (pr: 97), Essays: 6/6 (pr: 99)

II **TOEFL** ETS
Overall: 119/120 *Nov 2020*

- Writing: 30/30, Listening: 30/30, Reading: 30/30, Speaking: 29/30

Software Experience & Open-Source Projects

Programming Language Proficiency: **Python** (Expert), **R** (proficient), **MATLAB/Octave** (Moderate), **C/C++** (Moderate), **LaTeX** (Moderate), **shell** (basics)
Python Frameworks I am Fluent in: **Pytorch/Keras/XGBoost** (for DL),
sklearn/scipy/numpy/pandas/matplotlib (for ML and Data Science), **biopython/MODELLER/IMP** (for structural biology and bioinformatics), **tkinter** (for python based GUI), **ctypes** (for interfacing with C), **multiprocessing/subprocess** (for parallel computing), **pytest** (for unittests and github CI)
Other Frameworks I have experience in: **GNU MPFR** (for arbitrary precision arithmetic), **openMPI** (for parallel computing in C), **Makefile** (for build systems in C), **Arduino Language** (for electronic prototyping with Arduino)

I **Authored and Actively Maintaining *lemniscate*** C, Python, Makefile
Arbitrary Precision Multiprocessing Color Fractal Engine *GitHub Link*

II **Authored and Actively Maintaining *homeFinance*** Python
A GUI-based Encrypted Personal Finance Manager and Analyzer GitHub Link

III **Authored and Actively Maintaining *StOP*** Python, Shell
Parallel Stochastic Optimization algorithm, adjunct to publication II GitHub Link

IV **Authored *voronoiTessellations*** Python
Parallel Framework for a Voronoi-Map based Mosaic Patterning of Images GitHub Link

V **Miscellaneous projects and other software contributions** C++, Python

- **CLI Scrabble**: Co-author
- **Keract, IMP, PMI, IMP-Sampcon**: Contributions

Management Experience, Service and Extra-Curriculars

I **Literary Secretary and a member of the Students' Union** 2017 – 2018

II **Member of the Editorial Board for College Magazine** 2016

III **Executive member of the organizing committee for PULSE** 2014 – 2016

- PULSE: One of the Largest medical college fest in south-east asia

IV **Sports**

1. **Yellow Belt** and **State Rank 3** (2009) in Judo
2. Participated (and finished) in **Winter Delhi Half Marathon** 2018, **Grand Prix 10k Run**, **AIIMS 5K run** twice and **Pulsathon 5K run**

V **Miscellaneous**

1. Delivered lectures for AIM4AIIMS portal aimed towards helping students clear the AIIMS entrance examination and co-authored the AIM4AIIMS preparation book, first edition