Souvadra Hati
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Education

Georgia Institute of Technology — Atlanta, USA
Doctor of Philosophy; Major: ***Computational Science and Engineering*** — *Starting in Aug. 2022*

Indian Institute of Science — Bangalore, India
Bachelor of Science (Research); Major: ***Biology****; CGPA: 8.4/10* — *Aug. 2018 – Jul. 2022*

Awards and Fellowships

SMB 2021 Annual Meeting: Best Poster Award **2021**

Cargill Global Scholars Fellowship (top 10, India): USD 5,000 Grant, Mentorship **2020**

iGEM Competition: Gold Medal **2019**

Mimamsa National Science Quiz: National Math Topper Team **2019**

iBEC Grant (team IISc): INR 1 Million (≈ USD 13,500) Grant by Government of India **2019**

KVPY-SX: All India Rank - 242 **2018**

Research

ATCG Lab, Computational and Data Sciences, Indian Institute of Science — Bengaluru, India
Advisor*: Dr. Chirag Jain* — *Aug 2021 - Current*

- **Science**: Demonstrated that *minimizer* counting can replace all k-mer counting for analysis of large genome sequencing data using only a fraction of computational resources.
- **Development**: Developed *MMC* toolkit, a fast and multithreaded, and scalable minimizer counter. [Link]

GrayLab, Biomolecular and Chemical Engineering, Johns Hopkins University — Baltimore, MD
Advisor*: Dr. Jeffrey J. Gray* — *Sep 2020 - Jul 2021*

- **Science**: Designed an enzyme for efficient conversion of A-type to O-type blood group which is more stable than the naturally present FpGalNAc deacetylase.
- **Development**: Developed a software module in Python on top of Rosetta code-base for simulation of elongation reactions of mucin-type glycosylation.

Cancer Systems Biology Lab, Bioengineering, Indian Institute of Science — Bengaluru, India
Advisor*: Dr. Mohit Kumar Jolly* — *Dec 2019 - Sep 2020*

- **Science**: Designed a novel regulatory network and used that to model the differentiation of naive $CD4^+$ **T-cells** into Th1, Th2, Th17 and its hybrid states.
- **Development**: Developed MATLAB scripts for analysis of RACIPE data and ODE solvers for visualizing the dynamics of the reactions in biological networks.

International Genetically Engineered Machine (iGEM) — Cambridge, MA
Advisor*: Dr. Utpal Nath* — *Mar 2019 - Nov 2019*

- **Hardware**: Managed a group of seven students. Designed and prototyped a hardware capable of counting the relative concentration of two different bacterial species present in a culture media.
- **Outreach**: Presented the project work, along with the wet-lab team in the iGEM Giant Jamboree, 2019. Organized seminars on fundamentals of genetic engineering for K-12 students at schools in Bengaluru and Kolkata.

Publications

[1] **S. Hati**, A. S. Duddu, M. K. Jolly, Operating Principles of Circular Toggle Polygons, *Physical Biology*, May 2021. Link

[2] A. S. Duddu, S. Sahoo, **S. Hati**, S. Jhunjhunwala, M. K. Jolly, Multi-stability in cellular differentiation enabled by a network of three mutually repressing master regulators, *Journal of Royal Society Interface*, Sep 2020. Link

Other Projects

Recent advances in sequence-to-graph alignment: As part of a graduate course in Computational Genomics, I wrote a comprehensive review article, and gave a lecture on advantages of using graph based representations of reference-genome compared to traditionally used string based ones and explained recent algorithmic advances in efficient alignment of query read (string) to reference (graph) problem, which is essential to almost all Bioinformatics applications. Link **(Algorithms, Bioinformatics)**

Head-pose estimation: As part of a graduate course in Machine Learning I developed a ML model using a *ResNet* inspired architecture for solving the head-pose estimation problem using 'Yale's extended dataset'. - Link **(Machine Learning, Computer Vision)**

Understanding the dynamics of a complex biological networks without parameter information: As part of a graduate Systems Biology course, I developed a toolkit to look into dynamics of biological networks without prior knowledge of reactions parameters. Wrote a report showing its use in a case study on cell-cycle network of fission-yeast (*S.pombe*) - Report, Repository **(Systems Biology, Dynamical Systems)**

Image Classifier from Scratch: I developed an image classifier using Support Vector Machines from scratch in MATLAB. Used the famous CIFAR10 dataset for training and testing of my model. - Link **(Numerical Methods)**

Conferences and Seminars

SMB 2021: S.Hati, A.S.Duddu, M.K.Jolly, *Operating Principles of Circular Toggle Polygons* - poster presentation

GLS 2021 (Global Leadership Seminar, Cargill Inc.): One of the 60 participants selected from India, China, Brazil, Indonesia, Russia, and the United States to attend a week-long seminar on leadership and management.

iGEM Giant Jamboree 2019: Team IISc, *Automated Optimal Growth Using Optics* - Link

Technical Skills

Proficient: C++ • Python • MATLAB • R • C • LaTeX

Familiar: Shell • Java • Julia • SQLite

Technologies: Tensorflow • Git • Rosetta • PyMOL

Miscellaneous

Languages: English (fluent) • Bengali (native) • Hindi (fluent)