Gaurav Awasthi | Curriculum Vitae

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Education

Indian Institute of Technology (IIT) Bombay, Mumbai, India *2020-2024*
B.Tech. in Chemical Engineering with Honors | GPA: **9.49/10** | Honors GPA: **9.5/10**

Research Interests

Modeling, Computational & Systems Biology, Soft Matter, Transport Phenomena

Scholastic Achievements

- Currently holding a **department rank** of **4** out of 155 undergraduate students *Present*
- Received the **Undergraduate Research Award** for exemplary research contributions *'22*
- Achieved a **perfect 10/10 SPI** (semester performance index) in the fourth semester *'22*
- Conferred **3 AP (advanced proficiency)** grades for exceptional performance *'22*
- Awarded the prestigious **KVPY Fellowship** by the Government of India *'20*

Publications

- Sahoo S, **Awasthi G**, Jolly MK, "Elucidating the Mechanisms of Basal Breast Cancer Heterogeneity through Crosstalk between Epithelial-Mesenchymal and Luminal-Basal Plasticity" *(in preparation)*
- Rajoria S, Nair D, Suvarna K, Pai MGJ, Salkar A, Palanivel V, Verma A, Barpanda A, **Awasthi G**, Doshi H, Dhara V, Burli A, Agrawal S, Shrivastav O, Shastri J, Srivastava S. "Proteomic Investigation of COVID-19 Severity During the Tsunamic Second Wave in Mumbai". Adv Exp Med Biol. 2023; 1412:175-195. **DOI:** 10.1007/978-3-031-28012-2_9

Technical Skills

- **Programming:** Python, MATLAB, R, C++, LaTeX, scikitlearn, pandas, Shell (Bash)
- **Software:** LAMMPS, Ovito, RACIPE, DWSIM, MOOSE, ParaView, OpenFOAM, Gmsh

Research Experience

Characterization of Granular Flow in a Rotating Cylinder *Aug '23 - Present*
Guide: Prof. Devang Khakhar, IIT Bombay
Characterizing the velocity and stress profiles to aid understanding of flow, mixing and segregation dynamics; with relevance in the pharmaceutical and chemical industries

- Simulated the system in **LAMMPS**, highlighted deviations in velocity profiles from existing models and developed alternate formulations that improve goodness-of-fit by up to **5%**
- Observing segregation dynamics of differently-sized particles for industrial applications

Investigating Breast Cancer Heterogeneity due to E-M Plasticity *Nov '22 - Jan '23*
Guide: Prof. Mohit Jolly, Indian Institute of Science, Bengaluru
Analyzed the associations between the luminal-basal (L-B) and epithelial-mesenchymal (E-M) nature of cells by comparing correlations between the individual L-B and E-M characteristics

- Performed perturbation analysis on possible gene network topologies and implemented clustering algorithms on the steady states to compare them with observed cell phenotypes
- Demonstrated a strong association between epithelial and luminal characteristics, and between the basal nature of breast cancer and a partial E-M signature

Modeling Regulatory Networks Underlying Phenotypic Plasticity *Apr '22 - Jun '22*
Guide: Prof. Mohit Jolly, Indian Institute of Science, Bengaluru
Built a Boolean network to model how "teams" of epithelial and mesenchymal transcription factors interact, specifically to elucidate the existence of a partial E-M hybrid in cancer

- Utilized a Boolean architecture to simulate the dynamic gene regulatory networks underlying phenotypic plasticity during **cell fate switching** through E-M transitions
- Developed an alternative computational framework using a matrix-based approach that increased efficiency by **60%** while simulating upto **100x** larger networks

Modeling Evolution of Microstructures in Cu-Al and Fe-Cr Systems *Nov '21 - Oct '22*
Guide: Prof. Anirban Patra, IIT Bombay
Simulated the residual stresses in microstructures during solidification to explain the asymmetry in compressive and tensile stress-strain behavior of additively manufactured (AM) metals

- Implemented **phase-field** models on MOOSE and used **finite-element methods** to model **grain growth** during solidification of pure metals and alloys
- Developed an image-processing pipeline using **OpenCV** to compare simulated microstructural attributes such as primary and secondary dendritic arm spacing with experimental data

Proteomic Analysis of the Second Wave of COVID-19 in India *May '21 - Oct '21*
Guide: Prof. Sanjeeva Srivastava, IIT Bombay
Studied the reasons behind the increased severity of the second wave of COVID-19 by finding differentially expressed proteins and peptides in nasal swab and blood plasma samples

- Leveraged **Skyline** and **MetaboAnalyst** to examine mass spec files of nasal swab samples
- Identified **3** peptides from **2** proteins which were differentially expressed in severe cases

Academic Projects: Link to document entailing details

Professional Experience

Research & Development Intern | **Hindustan Unilever Limited** *May '23 - Jul '23*
Guide: Dr. Janhavi Raut | Unilever Leadership Internship Program Mumbai R&D Centre
Received a **pre-placement offer** for exemplary performance

- Built a predictive and inferential model of the bar soap finishing line by analyzing sensor data, generating insights to help scale-up **4** formulations from pilot plant to factory
- Implemented a digital twin in Python and used gradient descent algorithms for regression and feature selection, achieving a **98%** reduction in error relative to previous work

Teaching, Mentoring and Volunteering

Institute Student Mentor & Department Academic Mentor *May '22 - Present*
ISMP and D-AMP, Student Mentor Program, IIT Bombay
Selected among **380**+ ISMP and **110**+ DAMP applicants based on interviews and peer reviews

- Guiding 12 freshmen and 5 sophomores in their academic and extra-curricular pursuits
- Mentoring a specially-abled student part of the Academic Rehabilitation Program

Teaching Assistant | **Course: Introduction to Biology** *May '22 - Jun '22*
Instructors: Prof. Ambarish Kunwar & Prof. Hari Varma, IIT Bombay

- Conducted tutorial sessions for a batch of **40**+ **students** throughout the semester
- Held one-on-one doubt-solving sessions to help students with conceptual difficulties

Volunteer | **Educational Outreach** *Dec '20 - Jun '21*
National Service Scheme (NSS), IIT Bombay
Awarded the **NSS Special Mention** for exemplary work

- Personally tutored a student of grade 6 in elementary concepts of mathematics and English
- Recorded video lectures to tutor students of grades 8-11 in science and mathematics