

ANANYA RAGHU BURLI

CURRICULUM VITAE

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Education

University of Michigan - Ann Arbor

Doctor of Philosophy in Chemical Engineering

Ann Arbor, Michigan

August 2023 - Present

- **GPA:** 4.0/4.0 | **Advisor:** Dr. Greg M. Thurber

Indian Institute of Technology Bombay

Bachelor of Technology with Honors in Chemical Engineering

Mumbai, India

July 2019 - May 2023

- **CPI:** 9.52/10 | **Honors CPI:** 9.75/10

Honors and Awards

- 2024 **Invited to 'Tau Beta Pi'** : the National Engineering Honor Society for perfect GPA in Fall 2023 at UMich
- 2023 **Earned 'Best Design Project'** amongst 24 teams with the successful design of a vinyl acetate production plant
- 2022 **Awarded 3rd position** out of 9 teams in the prestigious N. R. Kamath ChemE Quiz organized annually by IChE
- 2021 **Conferred the Undergraduate Research Award (URA01)** for exemplary contribution to research on COVID-19
- 2021 **Secured 1st position** amongst 12 teams in the drug toxicity modeling competition Predictioneer organized by AZeotropy, the Chemical Engineering Symposium of IIT Bombay
- 2019 **Achieved State Rank 1** in the CBSE All India Senior School Certificate Examination among 1.2 million+ candidates
- 2019 **Attained State Rank 11** in the Karnataka state Common Entrance Test amongst 200,000+ resident candidates

Publications

1. Mukherjee, A., Pednekar, C. B., Kolke, S. S., Kattimani, M., Duraisamy, S., **Burli, A.**, R., Gupta, S. & Srivastava, S. "Insights on Proteomics-Driven Body Fluid-Based Biomarkers of Cervical Cancer". *Proteomes*, 10(2), 13. **April 2022.**
DOI:10.3390/proteomes10020013
2. Mukherjee, A., Verma, A., Bihani, S., **Burli, A.**, Mantri, K., & Srivastava, S. "Proteomics advances towards developing SARS-CoV-2 therapeutics using in silico drug repurposing approaches". *Drug Discovery Today: Technologies*. **December 2021.**
DOI:10.1016/j.ddtec.2021.06.004
3. Suvarna, K., Biswas, D., Pai, M. G. J., Acharjee, A., Bankar, R., Palanivel, V., Salkar, A., Verma, A., Mukherjee, A., Choudhury, M., Ghantasala, S., Ghosh, S., Singh, A., Banerjee, A., Badaya, A., Bihani, S., Loya, G., Mantri, K., **Burli, A.**, Roy, J., Srivastava, A., Agrawal, S., Shrivastav, O., Shastri, J. & Srivastava, S. "Proteomics and machine learning approaches reveal a set of prognostic markers for COVID-19 severity with drug re-purposing potential". *Frontiers in Physiology*, 12, 432. **April 2021.**
DOI:10.3389/fphys.2021.652799

Professional Experience

ITC Limited | FMCG | KITES Technical Intern | Capsule Quality Improvement

Bangalore, India

Guide: **Mr. Amitabh Bhadauriya** | Manager: Capsule & Filter Manufacturing | ITD, ITC Limited

May 2022 - July 2022

- Outlined key process parameters impacting the quality of flavored capsules in cigarettes including temperature, relative humidity
- Generated on-site data from trials and tested hypotheses on the effectiveness of process changes to capsule quality using statistical methods like **Student's t-test** and **Z-test** on software viz. Minitab and Excel
- Achieved **8.5% hardness standard deviation improvement** by tweaking the process standardization across the three plants
- Streamlined capsule **coating and drying** processes to reduce hardness standard deviation of high-volume capsules by **15%**

Technical Skills

Programming C++, Python, MATLAB, R, \LaTeX , scikitlearn, pandas, SQL, Shell (Bash)

Software Minitab, OpenFOAM, Gmsh, ParaView, DWSIM, ALOHA, PyRx, Perseus, PyMOL, Cytoscape, SolidWorks

Research Projects

Computational Analysis of Jet-Induced Flow Patterns in a 2-D Fluidized Bed

Mumbai, India

Guide: [Prof. Devang V. Khakhar](#) | IIT Bombay

July 2022 - Dec 2022

- Analyzing the patterns of jets in fluidized beds for optimal fluidization and high fluid-solid contact for improved heat/mass transfer
- Reviewed literature and exercised elementary problems employing the two-fluid and Eulerian-Lagrangian **2-phase fluidized bed models on OpenFOAM** to understand the effects of jet injections in a low-gas-velocity bed
- Designed the system domain & mesh on Gmsh and simulated the PDEs using **multiphaseEulerFoam** and **twoPhaseEulerFoam**
- Investigating the impact of jet velocity and position on the jet penetration characteristics and solid volume fraction profiles

Identification of Differentially Expressed Proteins in Cervical Cancer

Mumbai, India

Guide: [Prof. Sanjeeva Srivastava](#) | IIT Bombay

April 2021 - May 2022

- Performed a thorough literature survey regarding the protocol of obtaining differentially expressed proteins (DEPs) in patient samples and cell-line studies via the corresponding comparison to healthy cohort counterparts
- Employed **molecular docking** software like Autodock4 for determining potential **drug repurposing** aspects in mitigating therapy resistance against cervical cancer, the 4th highest occurring female malignancy
- Explored the limma package in R and software Perseus and analyzed **differential proteogenomic and transcriptomic expression** using normal-distribution-based missing value imputation, log transformation, and Student's t-test for **hypothesis testing**
- Illustrated the mapping of pivotal DEPs in the **body-fluid analysis** of cervical cancer patients to **pathways** using Cytoscape

Molecular Docking of Inhibitors to Host Proteins against SARS-COV-2

Mumbai, India

Guide: [Prof. Sanjeeva Srivastava](#) | IIT Bombay

October 2020 - February 2021

- Investigated existing FDA-approved drugs & computationally analyzed their therapeutic potential to be re-purposed for COVID-19
- Performed docking of a library of 80+ FDA-approved drugs to 75+ host proteins using PyRx and Python to gauge their **binding affinity** and visualized their **binding sites** with the help of PyMOL to ascertain their ability to bind to inhibition sites on the proteins
- Analyzed and recommended select drugs to be taken forward for *in-vitro* & *in-vivo* studies

Academic & Other Technical Projects

Detailed Kinetic Model of Human Hepatic Glucose Metabolism

Mumbai, India

Advanced Chemical Reaction Engineering (CL 325) (Report)

Guide: [Prof. A. K. Suresh](#) | IIT Bombay

January 2022 - April 2022

- Reviewed the König *et. al.*(2012) article quantifying and elucidating the contribution of the liver to glucose homeostasis
- Scrutinized the novel ODE model to integrate the involvement of glucose-modulating hormones (e.g., insulin) by phosphorylation

Cilia-driven Transport of Mucus

Mumbai, India

Advanced Transport Phenomena (CL 336) (Report)

Guide: [Prof. Jason Picardo](#) | IIT Bombay

July 2021 - November 2021

- Modeled the movement of an integrated mucosal layer with coarse-grained solid cilia as well as air using **long-wave theory**
- Simulated development of vortices with MATLAB showing constant flow rates of mucus despite periodic asymmetric cilia strokes

Simulation of 2-D Turbulent Flow across Bank of Cylinders

Mumbai, India

Fluid Mechanics (CL 254) (Report)

Guide: [Prof. Devang V. Khakhar](#) | IIT Bombay

January 2021 - April 2021

- Designed configurations of cylinders and performed two-dimensional meshing of the system using Gmsh
- Utilized the **simpleFoam** solver on OpenFOAM to perform a simulation of incompressible, steady state, turbulent external flow across the system of horizontal cylinders by employing the various configurations
- Analyzed and visualized velocity fields, pressure fields, streamlines, and path-lines using ParaView for post-processing

SoVac: Heat Transfer Analysis of Solar-Powered Vaccine-Storage Refrigerator

Mumbai, India

Heat Transfer (CL 246) (Report)

Guides: [Prof. P. Sunthar](#) & [Prof. V. Gundabala](#) | IIT Bombay

January 2021 - April 2021

- Worked in an 8-member team to engineer the design of a vaccine storage unit using solar power as a **renewable and sustainable alternative** to traditional methods by applying concepts of heat transfer like **conduction and convection**
- Modeled heat transfer by choice of appropriate storage unit **design parameters** after implementing optimization on MATLAB
- Utilized appropriate **Nusselt number correlations** to calculate the optimal insulation thickness for maintenance of temperature

QSAR Modeling | Tools for data science | Learning project (Code)

Mumbai, India

Seasons of Code (SoC) | Web and Coding Club | IIT Bombay

April 2021 - July 2021

- Studied the concepts of **regression, classification and clustering** along with an introduction to **neural networks** on Python
- Implemented a computational drug discovery project using the Quantitative Structure-Activity Relationship of small molecules
- Applied numerous multi-linear and non-linear regression models like **BayesianRidge and SVR** to target the pIC50 levels of a library of drug-like compounds with the use of their unique PubChem fingerprints

Computational Neuroscience | Learning project (Report)

Mumbai, India

Summer of Science (SoS) | Maths and Physics Club | IIT Bombay

April 2020 - June 2020

- Studied the types of receptive fields to interpret the process of encoding of stimuli in the brain using **Bernoulli spiking**, dimensionality reduction, and decoding of responses using population coding
- Reviewed the basics of modeling a single neuron and synapse junctions using Cable Theory and Resistor-Capacitor circuits
- Quantified the mutual information between stimuli and responses by using **Information Theory** with an aim to maximize it
- Analyzed and mathematically expressed the concepts of Long Term Potentiation and Long Term Depression using Hebb's rule

Relevant Courses Undertaken

Core	Fluid Mechanics, Heat Transfer, Thermodynamics, Mass Transfer, Process Control, Solid Mechanics
Specialized Courses	Advanced Transport Phenomena, Advanced Chemical Reaction Engineering, Process Safety, Biological Process Modeling, Cell & Molecular Biology
Math & Programming	Calculus, Linear Algebra, Differential Equations, Numerical Analysis, Data Analysis, DSA

Teaching, Mentoring & Volunteering Experiences

Teaching Assistant | Course: CL 254: Fluid Mechanics

Mumbai, India

Instructor: [Prof. Devang V. Khakhar](#) | IIT Bombay

January 2022 - April 2022

- Appointed as the **only undergraduate TA** among a teaching team of **four** post-graduate and pre-doctoral candidate students
- Tutored **75 students** throughout the semester by means of conceptual doubt clarification and homework assignment corrections

Teaching Assistant | Course: BB 101: Biology

Mumbai, India

Instructors: [Prof. Ambarish Kunwar](#), [Prof. Neeta Kanekar](#) | IIT Bombay

April 2021 - June 2021

- Selected to be a part of a team of 53 undergraduate and postgraduate TAs, owing to excellent academic performance in BB 101
- Responsible for conducting tutorial worksheet-solving sessions for a batch of **80 students** throughout the semester
- Conducted one-on-one doubt-solving sessions to help students with conceptual and problem-solving difficulties

Mentor | Department Academic Mentorship Program (D-AMP)

Mumbai, India

Student Mentorship Program (SMP) | IIT Bombay

May 2021 - May 2023

- Mentoring **6 sophomores** on a one-on-one basis to duly assist their decision-making on academic and extra-curricular pursuits
- Spearheading and contributing to the D-AMP Academic Resources sub-team for accumulating resources and **85+** course reviews

Volunteer: Teaching Assistant

Mumbai, India

English Language Improvement Training Program (ELIT) | IIT Bombay

August 2020 - December 2020

- Selected for a team of 20 for teaching elementary **English grammar** as well as imparting **soft skills** to improve students' fluency
- Adopted the pedagogical method of **module creation** and interactive quizzing for improved learning and concept assimilation
- Organized **weekly sessions** to teach tenses and the syntax of sentence formation to **95+ students** for facilitating speaking/writing

Extracurricular Activities

Classical Music

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- Performed in the **Carnatic classical music** performances of Dharohar by Roots, the folk arts club of IIT Bombay (2021, 2022)
- Performed during graduate students' Convocation, Independence Day, and Gandhi Jayanti with an audience of **1000+** (2020)
- Completed the year-long **NSO Hindustani classical vocals** training program (2019 - 2020)
- Performed as a **band lead vocalist** in the Freshmen Music Orientation of Symphony, the music club of IIT Bombay (2019)