

Palak Chaudhry

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EDUCATION

- **Masters in Bioinformatics** Dec 2024
Georgia Institute of Technology GPA 3.91/4
- **B.Tech in Bioengineering + M.Tech in Biomedical Engineering (Dual Degree)** Jul 2022
Indian Institute of Technology (BHU) Varanasi GPA 3.91/4

PUBLICATIONS

- Colombo M, **Chaudhry P**, et. al. [Integrative modeling of hemodynamic changes and perfusion impairment in coronary microvascular disease](#) in Frontiers in Bioengineering and Biotechnology, July 2023

RESEARCH EXPERIENCE

- **Emory University** under [Prof. Eliver Ghosn](#)

Graduate Bioinformatics Research Assistant

Project 1: Comprehensive Single Cell Characterization of Plasma cells across gestational ages Aug 2024 - Dec 2024

- Integrated scRNA-seq, ADT surface markers, B-Cell Receptors sequencing data from 20 donor samples across 3 tissues
- Analysing multi-modal data in Seurat, applying normalization, feature selection, clustering, visualization and differential gene expression to uncover celltype-specific transcriptional profiles
- Performing in-depth B-cell receptor repertoire analysis using Immcantation framework, characterizing clonal expansion, somatic hypermutation rates, and isotype usage across developmental ages

Project 2: Reconstruction of B-lymphocyte lineage based on mitochondrial mutations Sep 2023 - Apr 2024

- Developed a comprehensive bioinformatics pipeline for mitochondrial DNA variant calling using scRNA-seq data
- Applied statistical models to reconstruct lineage based on mutational patterns, employing techniques such as Gaussian Mixture Model and Subspace Cross-Entropy Model
- Implemented unsupervised clustering machine learning approaches, including k-means and hierarchical clustering algorithms, to reveal distinct lineage trajectories across donors

- **ETH Zurich** under [Prof. Andrew deMello](#)

Sep 2021 - Apr 2022

Masters Thesis: Clinical Solution for Diagnosis of Coronary Microvascular Dysfunction (CMD) ([Thesis](#))

- Designed a CFD model to simulate micro-artery dynamics, incorporating perfusion information as boundary conditions
- Employed 3D printing and soft lithography to develop a bio-compatible microfluidic device for studying microcirculation
- Conducted adherent cell culture, testing cyto-compatibility and validating the microfluidic device's biocompatibility

- **Indian Institute of Technology (BHU) Varanasi** under [Prof. Neeraj Sharma](#)

Sep 2019 - Apr 2020

Undergraduate Thesis: Automated Brain Tumor Segmentation using Deep Learning ([code](#))

- Collaborated with Institute Hospital to curate and pre-process raw T1 MRI scan data from patients for brain tumor analysis
- Implemented a U-Net deep learning architecture to automatically segment and identify areas of damaged brain tissues
- Achieved a dice score of 0.76, demonstrating superior performance compared to other methods on benchmark datasets

WORK EXPERIENCE

- **Bioinformatics Intern: Ionis Pharmaceuticals**

Jun 2024 - Aug 2024

- Implemented large language foundation model on scRNA seq data for drug-target discovery resulting in 234 targets
- Optimized model for efficient fine-tuning using QLoRA, allowing easy integration into company's data discovery pipeline
- Performed comprehensive validation of disease-associated regulatory networks through functional enrichment analysis

- **Senior Associate Data Scientist: Publicis Sapient** *Jul 2022 - Jul 2023*
 - Led a cross-functional team to create an AI-driven solution, securing a major client and increasing revenue by 15%
 - Engineered a self-attention transformer-based recommendation system, boosting prediction accuracy by 25%
 - Developed customer segmentation models using advanced clustering algorithms, enhancing targeted marketing strategies
 - Optimized machine learning workflows by implementing end-to-end CI/CD pipeline on AWS, improving agile development
- **Data Science Intern: Publicis Sapient** *May 2021 - Jul 2021*
 - Designed GAN-inspired ML architecture for anomaly detection of ECG data (F-score of 0.6)
 - Analyzed data and interpreted anomalies by implementing SHAP and plotted graphs using Plotly

PROJECTS

- **Drug-target Binding Affinity Prediction** ([code](#)) *Sep 2024 - Dec 2024*

This project focused on developing a deep learning model to predict drug-target binding affinities, enabling drug repurposing

 - Developed a custom pipeline to convert SMILES string into drug graph and ESM3 sequence embeddings into protein graphs
 - Performed feature engineering to include amino acid and atom properties as node features to enhance input information
 - Building a novel graph neural network architecture with attention mechanisms to predict binding affinity
- **Protein Stability Prediction** ([code](#)) *Feb 2024 - Apr 2024*

This project aimed to predict protein thermostability, a critical property for understanding protein evolution and engineering

 - Designed a convolutional neural network (CNN) architecture tailored for processing protein sequence (spearman corr 0.7)
- **Bacterial Outbreak Investigation (Centers for Disease Control and Prevention)** ([code](#)) *Jan 2024 - Mar 2024*

Conducted in-depth analysis of bacterial outbreak using Next-Generation Sequencing (NGS) samples provided by CDC

 - Implemented Nextflow pipeline for read cleaning, quality control, and genome assembly of illumina paired-end reads ([code](#))
 - Compared ab-initio and homology methods for structural and functional annotation of bacterial genes
 - Identified the bacterial strain causing the outbreak and source of the outbreak by characterizing functional profiles

SKILLS

- **Programming Languages:** Bash, Python, R, SQL
- **Bioinformatics Tools:** Bedtools, BLAST, Biopython, DESeq2, Immcantation, Kallisto, Pysam, Samtools, Seurat
- **Data Science:** Matplotlib, Numpy, OpenCV, Pandas, Plotly, Pytorch, Scikit-learn, SHAPly
- **Cloud computing & DevOps:** AWS, Docker, Git, Linux, Nextflow
- **Certifications:** Introduction to Statistics by Stanford University (Sep 2022)

SCIENTIFIC OUTREACH

- **K-12 Science Volunteer: Bioengineering Biosciences United Graduate Students Group, Georgia Tech** *Oct 2024 - Nov 2024*
 - Mentored a team of students on hands-on engineering design project to build a model artificial lung
 - Guided students in scientific inquiry, fostering critical thinking and problem-solving skills
- **Head of Biosciences arm: Technex, IIT (BHU) Varanasi** *Aug 2019 - Mar 2021*
 - Led a team of 20 students to conduct workshops and information sessions on biosciences
 - Developed Malar-AI, an automated malaria detector app using blood smear images through computer vision
 - Launched online COVID awareness program and successfully achieved a footfall of over 2000 students

AWARDS

- Computational Biology Faculty Research Award (x2) - Fall, Spring *Jan, Aug 2024*
- IIT BHU Academic Award for outstanding undergraduate student in BME department *Oct 2022*
- Best Poster in Indo-U.S. Conference on Bioengineering and Regenerative Medicine (ICBR-2020) *Feb 2020*

CO-CURRICULAR ACHIEVEMENTS

- Secured a top 3 position representing India among 50 international teams at the Hult Prize Regionals *Kuala Lumpur 2019*
- 1st place in the Women's Carom Championship at IIT BHU's national-level university sports festival *India 2019*
- 1st place in National Dance Battle - Solo and Group *India 2018*