Pranav Mishra

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Student Researcher
Michael Roberts Lab
Dickinson College
28 North College Street, Carlisle, PA 17013.

Education

Dickinson College, Carlisle, PA
Bachelor of Science, Computer Science & Mathematics EGD: May 2025
GPA: 4.0/4.0
Senior Research: *Bioinformatic Analysis of Gene Regulatory Networks in Human Leukemia Cell Lines using RNA-Seq Data*

Research Experience

Student Researcher, Dickinson College September 2024-present
Data Analytics
Advisors: Dr. Jeffrey Forrester, Dr. Michael Roberts
Title: *Bioinformatic Analysis of Gene Regulatory Networks in Human Leukemia Cell Lines using RNA-Seq Data*

- Querying and downloading raw RNA-seq data FASTQ files of HL-60 cells under PMA-induced time-series experiments from the Sequence Read Archive (SRA) using the SRA toolkit.
- Aligning raw RNA-seq data using the *subjunc* function of R's *Rsubread* library to the hg38 human genome and using the *featureCounts* function to produce exon-junction counts matrices.
- Using DEXSeq to perform differential exon usage analysis across different time points to understand the time-series variation in splicing of HL-60 transcripts.

Student Intern, OHSU Knight Cancer Institute June – August 2024
Biomedical and Bioinformatics Research Internship and Training Experience (B-BRITE)
Advisors: Dr. Stephen Coleman, Nicole Szczepanski & Dr. Galip Gürkan Yardimci
Title: *Summarizing the transcriptomic landscape of a non-small cell lung cancer atlas via representative subset selection*

- Used Seurat to visualize the heterogeneity of cell types and differentially expressed genes in a publicly available scRNA-seq atlas of non-small cell lung cancer - via the creation of UMAP and MA plots.

- Scaled and improvised the submodular feature-based subset selection algorithm of Python's apricot library to select representative cell-subsets of the atlas.
- Demonstrated the substantial preservation (~>50%) of cell-type distribution and differentially expressed genes in the subsets comprising 2% through to 10% of the complete atlas size.
- Won award for outstanding poster at the OHSU Knight Cancer Institute Internship Symposium.

Student Researcher, Dickinson College January-May 2024
Data Analytics
Advisors: Dr. Jeffrey Forrester, Dr. Michael Roberts
Title: *Bioinformatic Analysis of Leukemia Transcriptomes*

- Queried and processed bulk RNA-seq data of Acute Myeloid Leukemia (AML) samples gathered as a part of the paper titled "Integrative Analysis of Drug Response and Clinical Outcome in Acute Myeloid Leukemia" from cBioPortal.
- Performed gene set enrichment analysis (GSEA) to identify pathways enriched in NRAS-mutant AML samples.
- Performed differential gene expressional analysis (DGEA) using DESeq2 to identify potential biomarkers of survival in NRAS-mutant AML samples.

Student Researcher, Dickinson College September-December 2023
Data Analytics
Advisor: Dr. Eren Bilen
Title: *Improving object recognition models in detecting rattlesnakes in images*

- Applied histogram equalization in Python to preprocess the input images of a YOLOv3 model to improve their root-mean-square contrast.
- Analyzed the relationships between the saturation, contrast and brightness of images and the improvement of the average precision (aP) of the YOLOv3 model for those images.

Data Analytics Intern September 2023 - February 2024
Lehigh Valley Justice Institute

- Used R's dplyr and ggplot2 libraries to analyze DUI related crash data from Franklin Country for the years 2013-2022 to determine trends in crash rates across age, biological sex and other demographic parameters.
- Assisted in drafting a report to aid the Franklin/Fulton Drug and Alcohol Administration in developing equitable drug reinforcement and rehabilitation strategies.

Student Researcher, Dickinson College May-July 2023
Economics
Advisor: Dr. Xiaozhou Ding
Topic: *Analyzing the relationship between the urbanization of cities and the enrollment of the colleges in them across the United States*

- Utilized *dplyr* to isolate college enrollment metrics from the Integrated Postsecondary Education Data System (IPEDS) for approximately 2000 American higher education institutions, and merged college location data from the National Historical Geographic Information System (NHGIS) with the IPEDS data.
- Performed single variable linear regression between the enrollment growth rates and the initial year enrollment to determine a decreasing enrollment growth trend in colleges from 1980 to 2019.

Student Researcher, IISER Pune May-August 2022
Data Science
Advisor: Dr. Amit Apte
Topic: *Understanding Uniform Manifold Approximation and Projection (UMAP) and applying it to a dataset of monsoon across South Asia over a period of 21 years*

- Learned and applied elementary concepts of dimensionality reduction to visualize regional fluctuations in rainfall across South Asia under the guidance of Dr. Amit Apte.
- Interpreted and presented qualitative trends in rainfall fluctuation via the creation of filled contour plots in Python.

Student Researcher, Dickinson College November-December 2021
Computer Science
Advisor: Michael Skalak
Collaborating Students: Siddhartha Lamsal, Benjamin Warren
Title: *Whodunnit: The Passionate Pilgrim*

- Computed and compared the stylometric fingerprints of authors William Shakespeare, Bartholomew Griffin, Richard Barnfield and Christopher Marlowe to those found in the poems of "The Passionate Pilgrim".
- Validated the accuracy of different approached to determine the authorship of the unknown poems in the anthology by testing them on the known works and evaluating the accuracy.

Student Researcher, ARDE Pune March-July 2021
Data Science
Advisor: Dr. Rajendra Deodhar
Topic: *Classifying the quality of red wine based on phytochemical characteristics via the creation of a neural network model*

- Used the COUNTIF function in MS Excel to visualize the distribution of data representing the quality of red *Vinho Verde* wine samples from Northern Portugal.
- Created a neural network using MATLAB's *nnstart* tool to predict the quality of red wine based on 11 parameters with 75% accuracy

Student Researcher, IISER Pune September 2020-February 2021
Biology
Advisor: Dr. Pranay Goel

Topic: *Understanding and Applying Otsu's Thresholding Algorithm in MATLAB*

- Learned elementary concepts of image thresholding and ANOVA under the guidance of Dr. Pranay Goel via self-completed mathematical proofs.
- Implemented Otsu's Thresholding Algorithm in MATLAB to compute thresholding values and binarize sample grayscale images.

Work Experience

Peer Tutor, Quantitative Reasoning Center August 2022-Present
Dickinson College

- Providing one-on-one and walk-in tutoring to students in a variety of mathematics and computer science courses, including single and multivariable calculus, discrete mathematics, linear algebra, introductory python, object-oriented design in java, data structures and algorithms, probability and statistics and computability and complexity.
- Serving as a Quantitative Reasoning Advisor (QRA) for Probability and Statistics I - which involves pre-grading homework and holding office hours to clarify concepts and provide homework-help.

Resident Advisor August 2022-May 2023
Dickinson College

- Lead and organized events to encourage residents to connect with each other, with Dickinson College and the Carlisle community.
- Assist in conflict mediation, answer resident queries and work as the on-call RA during scheduled shifts to tend to lockouts and emergency calls.

Volunteering Experience

Notetaker January – May 2022
Dickinson College
Took, scanned and uploaded notes to assist students with accommodation-needs.

Volunteer June 2018 – January 2020
Viride, Pune
Helped pick-up, segregate and recycle trash on *Vetal-Tekdi*, a local hill in Pune to aid in community sanitation and environmental protection efforts.

Student Volunteer June 2018 – January 2020
Door Step School (NGO)
Created flashcards for the education of children from socioeconomically underprivileged backgrounds, maintained records of transactions and analyzed data using MS Excel.

Student Volunteer June – October 2016
The Akanksha Foundation

Taught elementary arithmetic to children from underprivileged backgrounds.

Awards and Honors

- Dean's List (All Semesters) 2024
- Phi Beta Kappa Membership 2024
- Best Poster Award, B-BRITE Summer Program 2024
- Upsilon Pi Epsilon membership 2024
- Pi Mu Epsilon Membership 2024
- Dickinson College Summer Internship Grant 2023
- Alpha Lambda Delta Membership 2022
- The Delaplaine McDaniel Prize 2022
- The Jane Hill Prize in Computer Science 2022
- The First Year Seminar Excellence in Writing Award 2022
- Presidential Scholarship, Dickinson College 2020

Skills & Certifications

- Certificates:
  - Python for Data Science, AI & Development
  - Data Analysis with Python
- Programming Languages:
  - High Proficiency: R, Java, Python, Shell, SQL
  - Intermediate Proficiency: HTML, CSS, JavaScript
  - Introductory Proficiency: C/C++, MATLAB
- Frameworks:
  - React
  - Node.js
  - Junit
  - Bootstrap
- Developer Tools:
  - HPC Clusters
  - Git
  - Docker
  - VS Code
  - Eclipse
  - Replit
  - Android Studio
  - Sequence Resource Archive (SRA) Toolkit
- Libraries:
  - Pandas
  - NumPy
  - Matplotlib
  - Seaborn
  - SciKit-Learn

    - Tensorflow
    - PyTorch
    - dplyr
    - ggplot2
    - seurat
    - apricot
    - DEXSeq
    - Rsubread
- Oratorical Skills: Fluent in English and Hindi