Abel Gurung

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Education

University of Southern Mississippi — Hattiesburg, MS
Major: *Mathematics* — Expected Graduation: May 2024
Minor: *Computer Science* and *Biological Sciences*

Internship

Chan Zuckerberg Biohub, San Francisco — San Francisco, CA
Theory and Data Science Intern — May 2023 – November 2023

- Studied the developmental trajectories of single cells using Single-cell RNA sequencing (scRNA-seq) and RNA velocity
- Developed a novel method to find the transition path of developmental trajectories with defined initial and final states
- Created a method to compute macrostate transition probabilities based on microstate transitions

Baylor College of Medicine — Houston, TX
Biomedical Research Assistant — June 2022 - August 2022

- Studied how the Integrator complex regulates gene expression
- Compared the efficacy of CRISPR-based cytosine base editors (CBEs) to introduce stop codons within genes encoding Integrator subunits and analyzed effects on expression of Integrator regulated genes.
- Performed DNA extraction from E. coli, transfection of HEK293FT cells, total RNA extraction, cDNA preparation, qPCR, western blot, and KLD cloning

Research Experience

University of Southern Mississippi — Hattiesburg, MS
Machine Learning Research Assistant
Project: Modelling the Open Probability of Ion Channels on Cell/Organelle's Membrane — August 2022 – Present

- Built a deep neural network that models the probability of ion channels opening as accurately as traditional ODE models with less information
- Improve the model's performance by fine-tuning the neural network architecture and hyperparameters

Bioinformatics Research Assistant
Project: Post-translational gene regulation through small regulatory RNAs — *February 2022 – June 2022*

- Collected single-nucleus RNA (snRNA) genomic data of crop pests to study the role of RNA interference (RNAi)
- Developed an algorithm to identify adapter sequences in unfiltered small nucleus RNA datasets
- Preprocessed genome data for further analysis and interpretation

Project: Global Gene Regulation of Virulence Staphylococcus Aureus — September 2021 - February 2022

- Studied the effects of antimicrobial agents in different media for Staphylococcus Aureus
- Performed RT-PCR, gel-electrophoresis, and preparation of growth media

Work Experience

Telenutrition Center — Hattiesburg, MS
Full-Stack Engineer — November 2021- December 2023

- Maintain and upgrade health application used by researchers to collect data from participants
- Built features to make interaction between researchers and participants more accessible
- Utilized Vue.js for front-end development and Ruby on Rails for back-end services, integrating USDA API to enhance the application with comprehensive nutritional information.

Presentation

Gurung, Abel; "Modelling the Open Probability of Ion Channels using Deep Neural Network" (2024) Oral presentation presented at Mathematical Association of America (**MAA**) LA-MS

Gurung, Abel; "Investigating Cell Fate Trajectories Using Kinetic Monte Carlo" (2023) Oral presentation presented at Chan Zuckerburg Biohub Internship Symposium

Gurung, Abel; "Modelling the Open Probability of Ion Channels using Deep Neural Network" (2023) Oral presentation presented at University of Southern Mississippi and University of Southern Alabama

Gurung, Abel; "Testing the efficacy of cytosine base editors for making targeted mutations in the Integrator complex" (2022) Oral presentation presented at Baylor College of Medicine Smart Program

Honors & Awards

- University of Southern Mississippi Undergraduate Research Symposium – **1st Place** April 2024
- Mathematical Association of America (**MAA**) LA-MS – **3rd Place – Student Paper Competition** March 2024
- Eagle SPUR Research Grant November 2023
  - Received **$1000** research grant for Modeling Ion Channels using Machine Learning
- USM + VOXO Hackathon - Tech for Social Impact – **1st Place** November 2023
  - Created an application to better inform consumers about the food they consume
- Wright W. Cross Fellowship
  - Competitive Scholarship awarded to students doing research in Mathematics August 2023
- University of Southern Mississippi Undergraduate Research Symposium – **1st Place** April 2023
  - Title: "Modelling the Open Probability of Ion Channels on Cell/Organelle's Membrane"
- 3rd Annual VJ Canizaro, MD Health Summit Research Abstract – **1st Place** March 2023
  - Title: "Modelling the Open Probability of Ion Channels on Cell/Organelle's Membrane"
- Wright W. Cross Fellowship
  - Competitive Scholarship awarded to students doing research in Mathematics August 2022
- Academic Excellence Scholarship – Merit based scholarship that covers full-tuition August 2021

Open-Source Contributions

PlateParser – Parse semi-structured microplate data

PlateChain – LLM for parsing semi-structured microplate data

CellRank – Dynamics from multi-view single-cell data

Personal Project

Fine-tuned GPT-2 June 2020 - December 2020

- Fine-tuned GPT-2 model to mimic literature authors

Skills & Interest

- Python
- C++
- JavaScript
- SQL
- Stochastic Modeling
- TensorFlow
- Vue
- React
- Machine Learning
- Pytorch
- Keras
- Ruby on Rails