





Deep Patel

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EDUCATION

Indian Institute of Technology, Jodhpur

Bachelor's in Computer Science

May 2024

Current CGPA: 8.04/10.0

RESEARCH & PUBLICATION

Connectivity-map analysis of temporal transcriptomes from a meditation retreat provide links to immune inflammation through multiple neuroactive pathways

Indian Institute of Technology Jodhpur — August, 2022 to August, 2023

- Analyzed the Bulk RNA-seq data obtained from PBMC of 106 individuals and got the expression of genes and LNC RNA.
- Developed an algorithm which maintain the conservenss of Trasposable elements while mapping and alignment of raw reads with hg38 genome (Human Genome).
- Created connectivity map from the dataset of differentially expressed gene and LNC-RNA using clue.io.
- Invented a *Doubly heat map* which I used to visualize the connectivity map data.
- We look for motif enrichment in the Alu region in the promoter region of upregulated and downregulated genes. For motif enrichment I used different regressor like Linear, Blackforest regressor and Lasso & Ridge regressor.
- Have developed a pipeline which returns the comple gene ontology results of the given set of genes.
- *Submitted and accepted in PNAS Brief with Dr. Mitali Mukerji as 1st Author and Deep Patel as 2nd Author*
- This article is also deposited at Bioarxiv and can be found there by the title name.

Standardized Annotation of ORF

Indian Institute of Technology Delhi & Jodhpur — August, 2022 to October, 2022

- Developed a algorithm which can check whether the ORF (Open Reading Frame) lies in the region of Transposable element or lies in proximity of any Transposable element.
- Using REST API from UCSC Genome browser, I developed a desktop app which can fetch out the basic details like the co-ordinates of ORF, genes, Transcription Factor, GTEx Tissue Expression Values, enhancer, promoter and many more.
- Using that desktop app, we fetched out the details of ORF and used this details for statistical analysis.
- We used T-test and randomization statistical analysis for finding the distribution of Alu elements across the standardized annotated ORFs.
- This research work was done under the supervision of Dr. Ishann Gupta and Dr. Mitali Mukerji, along with them Prakrithi Mukund was involved for sc-RNA seq analysis of lung cancer dataset.

FELLOWSHIP

MITACS GRI — CANADA

University of British Columbia, Vancouver — May, 2023 to August, 2023

- Working under *Dr. Denise Daley* at the Denise lab in HLI at St. Paul Hospital (affiliated under UBC Vancouver Campus). The work is based on the methylation data of Asthamatic patients across British Columbia and Quebec region. The sample were mostly collected from the chord blood of the women who were either smoking or non smoking.
- I developed the methylation clock from that dataset and have used Elastic net regressor for predicting the age from the methylation data.
- Annotated the processed cpg containing methylation data by including the eQTL positions, TAD regions, clinVAR (clinical significance), marking the enhancer & promoter region. Beside this I developed a pipeline which can fetch, clean and organise the GEO & TCGA raw methylation data.

TECHNICAL SKILLS

Programming: C/C++, Java, Python, R, JavaScript, MATLAB, HTML/CSS, \LaTeX , bash, SQL

Machine & Deep learning tools: Scikit-Learn, Numpy, Pandas, Matplotlib, Seaborn, Pytorch, Tensorflow, Keras, OpenCV

Bioinformatics tools: ChIP-seq*, Hi-C*, RNA-seq data types, Cell-Ranger, STAR, Scanpy, Seurat, samtools, bedtools

Tools: Git/GitHub, Unix Shell, Node.js, VS Code, Atom

EXPERIENCES

Summer Research Internship — 2022

Indian Institute of Technology, Delhi — May, 2022 to August, 2022

- Worked under the supervision of Dr. Ishaan Gupta at FUNGEL lab in IIT Delhi. My aim was to find the role of Transposable element (especially Alu Family & LTR Family) in cardiac differentiation of induced human pluripotent stem cells.
- Analyzed the single-cell RNA seq data (which was obtained from single-cell RNA sequencing during cardiac hPSC differentiation). Basically I executed the program of scTE which maintains the conserverness of Transposable elements in raw reads.
- By using Scanpy module, I developed UMAP plots and trajectory reconstruction of single cells through a cardiac differentiation timecourse.
- Alongside I got introduced to the Nanopore technology and the mechanism of working of Oxford Nanopore tech.

Winter Research Internship — 2022-2023

Indian Institute of Science, Bangalore — November, 2022 to March, 2023

- Worked under the supervision of Dr. Debnath Pal & Deepa Maheshwari in IISc Bangalore. The project was about developing a webapp which can give 3D view of differential networks.
- By using Scanpy module, I developed UMAP plots and trajectory reconstruction of single cells through a cardiac differentiation timecourse.
- Alongside I got introduced to the Nanopore technology and the mechanism of working of Oxford Nanopore tech.

ACADEMIC PROJECTS

Building PintOS

Indian Institute of Technology, Jodhpur — September, 2022 to December, 2022

- This was the part of the final project for the Operating system course and my team have secured highest grade for this project.
- Our aim was to build and add some extra features in pintOS. So, we developed a code for performing some mathematical calculation and before it we have implemented the functionalities like "wait queueing", "virtual memory

Music Genre classification — August 2021 to December, 2022

Indian Institute of Science, Bangalore — November, 2022 to March, 2023

- Built a Web application for IIT Jodhpur students that can predict the genre of the music with the accuracy of 89% and can recommend the music of the same genre to the user.
- Implemented various classification algorithm like Decision Tree Classifier, Random Forest Classifier, XGBoost and LGBM.
- Performed hyper-parameter tuning for all ML-classifiers.
- The above work is meant to be submitted for publication in 2023 and yet it's not accepted.

RL Based Game Implementation — August 2021 to December, 2022

Indian Institute of Science, Bangalore — November, 2022 to March, 2023

- We developed a basic Reinforcement learning (RL) based algorithm for a single player game (which have multiple obstacle and the player have to dodge). For that algorithm we built a neural network which learns every move of the player and assign the point on the basis of deaths and being alive.
- This small project was the part of the course Advanced Artificial Intelligence. Beside this, we also developed several markov model based algorithm for several problems (like catching thief on the basis of its movement), various time series based algorithm and much more.

WEEKLY SUPERVISED CLASSIFICATION OF HER2

Indian Institute of Technology, Jodhpur — Feb, 2022 to April, 2022

- Implementation of the "Weakly-Supervised Classification of HER2 Expression in Breast Cancer Haematoxylin and Eosin Stained Slides", by Sara P. Oliveira, João Ribeiro Pinto, Tiago Gonçalves, Rita Canas-Marques, Maria J. Cardoso, Hélder P.Oliveira and Jaime S. Cardoso.
- Optimized the algorithm by adding an extra hidden layer and convolution layer
- Performed hyper-parameter tuning for the number of epochs and the number of layers
- Technologies Used: OpenCV, Tensorflow, Scipy, Pytorch, Keras

COURSEWORK

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| • Advanced Artificial Intelligence | • Introduction to Biology | • Pattern Recognition & ML |
| • System Biology | • Distributed Database | • Software Engineering |
| • Bioimaging | • Operating Systems | • Calculus and Linear Algebra |
| • Database Management System | • Data Structure and Algorithm | • Intro to Blockchain |

RESPONSIBILITIES

IGEM— 2023

Project Lead, Dry Lab—IIT Jodhpur — October, 2022

AI Club

Member — IIT Jodhpur

INTEREST

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| • Computational Biology | • Transposable Element |
| • System Biology | • Hiking |
| • Deep Learning | • Kayaking |
| • Machine Learning | • Playing Violin |

LANGUAGES

- English
- Hindi
- Gujarati
- Marathi