Milan Anand Raj

Third Year Undergraduate
Department of **Biological Sciences and Bioengineering**
Department of **Computer Science and Engineering**
Indian Institute of Technology Kanpur

manandraj20
manandraj20@iitk.ac.in
+91-7667411016
Milan Anand Raj

EDUCATION

Year	Qualification	Institute	Performance
2020-2024	B.Tech Biological Sciences and Bioengineering	Indian Institute of Technology, Kanpur	9.3/10
2020	CBSE, Grade XII	Chinmaya Vidyalaya, Bokaro	96.40%
2018	JAC, Grade X	Deoghar Public School, Deoghar	96.20%

SCHOLASTIC ACHIEVEMENTS

- Recipient of **Academic Excellence Award**, given to the top 10% meritorious students at IIT Kanpur at IIT Kanpur
- Secured **99.8** percentile among 1.5 million candidates in Joint Entrance Examination (JEE) Mains, the national entrance exam for engineering
- Secured **All India Rank 337** among the 73 thousand pan India applicants in West Bengal (**WB**) **JEE 2020**, the state entrance exam for engineering
- Secured **All Jharkhand Rank 7** in Jharkhand Academic Council (**JAC**) **10th Board 2018** among the 4.3 Lakh students
- Completed the 4^{th} semester of the engineering undergraduate programme at with a Semester Performance Index of **10**
- Scored an Outstanding (**A***) grade in **Introduction to Biotechnology** and **Introduction to Political Philosophy**

AREAS OF EXPERTISE

Computational Biology, Genomics, Bioinformatics, Cancer Biology, Medicine and Healthcare, Deep Learning, Statistical Modeling

WORK EXPERIENCES

Benchmarking of integration methods for omics data | May'22-Present

SURGE | Dr. Hamim Zafar, Indian Institute of Technology Kanpur

- **Compared** the predictive power of **DestVI, CARD, and AutogeneS** for predicting cell proportions across tissue location
- **Created** pipelines for the probabilistic models in **R** or **Python** to make it easier to use the command shell to execute them
- **Generated** simulated stRNA datasets using the GANs of the models **DestVI, Cell2Location** and **Seurat**
- **Implemented Transfer Learning** on the models trained on standard scRNA reference datasets to cut down **GPU** usage

Quantitative Modelling | Oct'22-Present

ML and research intern | TenSixty Biosciences, Boston, USA

Objective	**Quantitative framework** for characterizing the evolutionary history of mammalian gene expression at cell-level resolution
Strategy	Use sc RNA-seq data across several tissues from 19 mammalian species to show that expression evolution across mammals is accurately modeled by the **Ornstein–Uhlenbeck** process, a commonly proposed model of continuous trait evolution Apply this model to identify expression pathways under neutral, **stabilizing**, and directional selection.
Results	Quantify the extent of **stabilizing selection** on a gene's expression, parameterize the distribution of each gene's optimal expression level Detect deleterious expression levels in single cell expression data from individual patients.

CF-Stress Clone | May'22-July'22

SnT Council | Indian Institute of Technology Kanpur

- **Implemented customizable no-code tool** to generate the smallest possible counter example for failing codeforces submissions
- **Rendered dynamic HTML content** on the web browser with the dynamic data being generated by the **C++ generators**
- **Used NGINX** as a web server, **reverse proxy** and load balancer to help maximise performance and stability of the website
- **Queued** submissions to be stress tested later using **Redis Queue** to design an API to close requests as quickly as possible

AI modulator design for CFTR protein | Jan'23-Present

ML and research intern | TenSixty Biosciences, Boston, USA

Objective	Create **AI** generated **CFTR modulator** molecules that bind to the damaged CFTR at the cell surface and hold the gate open, allowing chloride to flow through
Approach	• Train a **neural network** on CheMBL small molecules to make new molecules • Use **transfer learning** to fine tune the neural network on known CFTR binders • Generate new AI molecules using the **generative AI** model • Virtually screen the molecules for CFTR binding affinity with **AutoDock Vina** and **pymol**
Results	We could generate 10 new novel molecules with binding affinity close to **Elexacaftor** against the CFTR

PROJECTS AND WORKSHOPS

Snippet Box Design | July'22

Guided Project

- **Learnt** how to organize web projects with files kept in proper folders and how to interact with **MySQL** efficiently
- **Improved** page load times by serving static assets with efficient **cache** policy and used **cookies** to identify the logged in user
- **Implemented middleware** to share functionalities to use for **http** requests before passing the **context** further to handlers
- **Generated** self-signed **TLS** certificate to establish an encrypted connection to an authenticated peer over an untrusted network

Connecting the first Search | April'22-July'22

Stamatics Club | IIT Kanpur

- **Learnt** how to solve standard problems on **DFS, DFS lowlink, BFS, articulation points and bridges**
- **Implemented** standard **shortest path** finding algorithms, **SCC Decomposition** algorithms and **top sort** algorithms
- **Applied Binary Indexed Tree** and **Disjoint Set Union** data structures to solve MST and range and point query problems
- **Read** the research paper on Efficient Range Minimum Queries using Binary Indexed Tree and implemented the data structure

Deep Learning | July'22

Neuromatch Academy

- **Participated** in the intensive three week online summer project of Neuromatch Academy for Computational Neuroscience and enjoyed making new connections from different cultures
- **Implemented** various **regularization** and **optimisation** techniques and visualized the differences in their performance
- **Learnt** how to work with the state-of-the-art **VAEs** and **GANs** and use them to reconstruct or generate new novel data
- **Learnt** the architecture of **RNN** model and used it to recognize patterns across time to solve **NLP** problems
- **Completed** the group project on how to increase robustness of Deep Learning models in particular **EfficientNet B7** model

PAPERS AND PRESENTATIONS

- **Participated** and prepared a presentation on **Biological Waste Water Treatment and Remediation** by reading a number of research papers from relevant studies and browsing the internet for the most recent water treatment technologies
- Prepared a summary of the workflow and the findings so far for the acclaimed undergraduate research internship programme **SURGE**, and submitted a final report of four pages
- Presented a final report on the creation of a computer-aided design model of a helicopter for the Manufacturing Techniques course that summarised the quantitative estimation of the materials needed and the manufacturing processes employed

RELEVANT COURSEWORK

~*COURSERA

Bioinformatics and Computational Biology	Neurobiology	Data Structures and Algorithm
Introduction to Political Philosophy	Fundamentals of Computing	Molecular Cell Biology
Biochemical Engineering	Biochemistry and Biochemical Engineering Lab	Molecular Cell Biology Lab
Organ System, Physiology and Anatomy	Introduction to Biotechnology	Biochemistry
Multi variable Calculus	Introduction to Linear Algebra	Probability and Statistics
The Data Scientist's Toolbox(*)	Introduction to Electronics	Introduction to Earth Sciences
Neural Networks and DL(*)	Basics of Machine Learning(*)	Algorithms of Graphs(*)

RELEVANT SKILLS

Languages: Python (proficient), C/C++ (proficient),Matlab (proficient), R(Proficient), Golang (Novice), Javascript (Novice)
Libraries: NumPy, Pandas, Matplotlib, Scikit-learn, ggplot2
Tools: Git, Github, VS Code, bash , Pymol , AutoDock, LaTeX
Language: English (proficient), Hindi (proficient)

POSITIONS OF RESPONSIBILITY

Senior Executive — Nov'20 - Mar'21

Events | Udghosh

- **Contacted 20+ Athletics Team** to register for events in Athletics and visited numerous schools to publicise Udghosh
- **Helped** in conduction of athletics events by **organising teams** for the events and clearing queries of players during the events

Academic Department Mentor — July'22 - Present

Academics and Career Council | IIT Kanpur

- **Conduct** workshops on academic awareness, providing guidance to students on how to effectively study for classes and develop a career in research
- Help students understand the numerous faculty initiatives and activities available in the **BSBE** department

EXTRA CURRICULAR ACTIVITIES

- Participated in SnT Code'22, the inter-hall Technical competition organised by Science and Technology council, IITK
- Represented IITK by competing in the 800m and 1500m athletics events at the intercollegiate sports festival **Udghosh'21**