SAYAN PATRA

Jotebhagaban
Panchberia, Daspur
Paschim Medinipur, West Bengal
India, PIN – 721146
Nationality – Indian

Mobile: +91 7319235250
E-mail: sayanpatra894@gmail.com
GitHub: https://github.com/PatraSayan
Portfolio: patrasayan.github.io
LinkedIn: sayan-patra-06320b28a

EDUCATION

INDIAN INSTITUTE OF TECHNOLOGY BOMBAY, INDIA August 2025
Master of Science (MS) Major in Biotechnology
CGPA: 9.36/10

MIDNAPORE COLLEGE (AUTONOMOUS) July 2023
VIDYASAGAR UNIVERSITY, INDIA
Bachelor of Science (B.Sc.)
Major: Microbiology Minor: Chemistry, Zoology
CGPA: 9.58 /10

PANCHBERIA RAMCHANDRA SMRITI SIKSHA MANDIR, June 2020
WBCHSE, INDIA
Higher Secondary Education (Discipline: Science)
Major Courses: Physics, Chemistry, Mathematics, Biological Sciences, English, Bengali
Percentage: 96.20 % (WBCHSE)

JOTEBHAGABAN HIGH SCHOOL, WBBSE, INDIA May 2018
Matriculation Examination
Major Courses: Life Science, Physical Science, Mathematics, History, Geography, English, Bengali
Percentage: 92.00% (WBBSE)

SCHOLARSHIP

❖ **Department of Science and Technology, Govt. of India** 2021 – 2025
Awarded **DST INSPIRE Scholarship** for ranking in the top 1% students in the higher secondary examination.

❖ **Indo-U.S. Science and Technology Forum, Department of Biotechnology, Govt. of India** 2024
Awarded **Khorana Scholarship** as one of 75 students nationwide for Summer Research at the **University of Illinois Urbana-Champaign, US.**

RESEARCH EXPERIENCES

❖ *Postgraduate Research Experiences*

MULTI-OMICS-BASED STUDY TO EXPLORE THE THERAPEUTIC POTENTIAL OF REPURPOSED DRUG BY TARGETING PI3K/AKT/mTOR PATHWAY IN GROUP 3 MEDULLOBLASTOMA
Master's Thesis Advisor: Dr. Sanjeeva Srivastava, IITB, India August 2024 – May 2025

- Determined the IC50 drug concentration of NGI-1 on Group 3 medulloblastoma (HD-MB03) cells and validated receptor tyrosine kinase and glycolytic protein downregulation by Western blot.
- A comprehensive multi-omics analysis—including proteomics, metabolomics, and lipidomics—was conducted to gain mechanistic insights into the effects of NGI-1 on the HD-MB03 cell line.
- Proteomics Investigation revealed cell cycle arrest after NGI-1 treatment. Molecular checkpoints of G1 phase, S Phase, and G2-M transition were downregulated after the NGI-1 treatment. The integrative multi-omics pathway analysis revealed the downregulation of sugar metabolism, S-adenosylmethionine synthesis, polyamine synthesis, endoplasmic reticulum-to-lysosome protein transport, membrane lipid remodeling, and the PI3K-AKT-mTOR Pathway. Whereas, the Unfolded protein response, Sphingosine synthesis, Phosphatidylglycerol, and Triglycerides were upregulated. Overall, the study revealed cell cycle arrest, lysosomal dysfunction, endoplasmic reticulum, and mitochondrial stress.

TRANSCRIPTOMICS LANDSCAPE OF MEDULLOBLASTOMA: IDENTIFYING THE SIGNIFICANT MOLECULAR SIGNALS IN SUBGROUP CLASSIFICATION

Master's Course Project Advisor: Dr. Saket Choudhary, IITB, India October 2024 – December 2024

- Accessed publicly available RNA-seq data from the GEO database and performed differential expression analysis using DESeq2.
- Conducted PCA clustering, enrichment analysis (enrichR), and identified subgroup-specific up-/down-regulated genes.
- Analyzed chromosomal distribution of highly upregulated genes and immune enrichment using xCell.
- Applied logistic regression for molecular classification and evaluated performance via confusion matrix, ROC curve, and classification report.

DECODING THE STRUCTURAL AND FUNCTIONAL SECRETS OF *Streptococcus pneumoniae* FtsZ PROTEIN: A HOLISTIC APPROACH THROUGH MOLECULAR CLONING TO SPECTROSCOPIC TECHNIQUES

MASTER'S iLab Project March 2024 – April 2024

Advisor: Dr. Prashant S. Phale, Dr. Anirban Banerjee, Dr. Ashutosh Kumar, IITB, India

- Cloned, expressed, and purified SpnFtsZ in *E. coli* BL21 (DE3 RIPL); confirmed ~47 kDa His-tagged protein by SDS-PAGE.
- Investigated polymerization via GTPase and light scattering assays; analyzed folding and stability of the protein using fluorescence spectroscopy, circular dichroism, and confocal microscopy.
- Examined reversible folding consistent with Anfinsen's principle and identified dual tryptophan fluorescence signatures indicating unique conformational states.

IN SILICO COMPARISON OF PRIMARY, SECONDARY, AND TERTIARY STRUCTURE OF BOTULINUM TOXIN B, BOTULINUM TOXIN F, AND TETANUS TOXIN AND DETERMINATION OF Zn BINDING RESIDUES IN BOTULINUM TOXIN F

Master's Course Project October 2023 – November 2023

Advisor: Dr. Prasenjit Bhaumik, IITB, India

- Conducted pairwise and multiple sequence alignments of Botulinum toxin types B & F and Tetanus toxin.
- Predicted and compared the secondary structure of Botulinum toxin F using ESPript 3, highlighting variations across helices, β-strands, and turns.
- Superimposed catalytic, translocation, and binding domains of each protein and found domain-specific RMSD (0.7–1.5 Å) and conserved functional features.

❖ *Summer Research Experience*

PREDICTING HIGHER-DIMENSIONAL FEATURES OF MOLECULAR DYNAMICS SIMULATIONS FROM LOWER-DIMENSIONAL REPRESENTATION USING DEEP NEURAL NETWORKS

Summer Research Internship Advisor: Dr. Diwakar Shukla, UIUC, US May 2024 –July 2024

- Took a simulated pentapeptide (Trp–Leu–Ala–Leu–Leu) with 25 × 500 ns MD trajectories; extracted atomic coordinates with MDTraj and reduced dimensionality into tIC space using Deeptime.
- Built a neural network with PyTorch (MLP, CNN) with a custom loss function combining coordinate and tIC MSE.
- Split data 60:20:20 for training, validation, and testing; fed tICs as input and atomic coordinates as label; mapped predicted coordinates onto tIC space and visualized reconstructed structures in VMD.

❖ *Undergraduate Research Experience*

ISOLATION OF PESTICIDE CYPERMETHRIN-TOLERANT BACTERIA FROM SOIL, DETERMINATION OF THEIR BIOCHEMICAL PROPERTIES, AND SCREENING OF THEIR PLASMID DNA

Bachelor's Thesis Project March 2023 – May 2023

Advisor: Dr. Saraja Chhettri, Midnapore College (Autonomous), India

- Isolated Cypermethrin-tolerant bacterial strains from soil samples using selective aseptic techniques.
- Characterized bacterial colonies through biochemical assays to determine metabolic properties and genus-level taxonomy.
- Extracted plasmid DNA via alkaline lysis to confirm the presence of plasmids to infer the genetic basis of Cypermethrin tolerance.

PUBLICATIONS

Pai, M. G. J., Singh, A., **Patra, S.**, Narang, D., Bapat, P., Bharambe, H. S., Shirsat, N., & Srivastava, S. (2026). Quantitative DIA-MS Uncovers Functional Impact of SMARCA4 Knockdown in Group 3 Medulloblastoma. Journal of Proteome Research. https://doi.org/10.1021/acs.jproteome.5c01137

Pai, M., **Patra, S.**, Narang, D., Singh, A., Rao, S., Moitra, T., & Srivastava, S. Proteomic Profiling of Indian Medulloblastoma FFPE Samples Reveals Distinct SHH and Non-WNT/Non-SHH Tumor Signatures. *PROTEOMICS - Clinical Applications (Wiley)* (Under Review, ID: 6168005)

Pai, M. J., **Patra, S.**, Bharambe, H., Shirsat, N., & Srivastava, S. (2025). Proteomic and Metabolomic Analysis of PCK2-dependent Alterations in Group 3 Medulloblastoma Cells. *Journal of Proteome Research* (Under Review, ID: pr-2025-011504)

Patra, S., Pai, M. G. J., Banerjee, N., & Srivastava, S. Integrated Multi-omics Analysis Reveals System-wide Change in Group-3 Medulloblastoma upon Oligosaccharyltransferase Inhibition. (In preparation)

PATENTS

Patra, S., Pai, M. G. J., Halder, A., & Srivastava, S. Assessment of Agents and Targeting N-Linked Glycosylation in Group 3 Medulloblastoma (Submitted)

SKILLS

Wet Lab Skills:

- Proteomics
- Metabolomics
- Lipidomics
- LC-MS Analysis
- Colorimetric Techniques
- Western Blotting
- Mammalian Cell Culture
- Cell Proliferation Assay (MTT Assay)
- Bacterial Cloning
- PCR
- Restriction Digestion
- DNA Ligation
- SDS PAGE
- Agarose-Gel Electrophoresis
- Protein-Quantification (BCA, Bradford Assay)
- Protein Expression
- Protein Purification
- Affinity Chromatography
- Size-Exclusion Chromatography
- Thin-layer Chromatography
- Fluorescence Spectroscopy
- Circular Dichroism
- UV-Vis Spectroscopy
- ATR-FTIR
- Genomic DNA Isolation
- Plasmid DNA Isolation
- Bacterial Plating

Software and Web-Tool-Skills:

- FragPipe
- DIA-NN
- Compound Discoverer
- Lipid Search
- Orange
- Perseus
- VMD
- Metaboanalyst 6.0
- ImageJ
- Skyline
- Reactome
- Omics Net
- STRING
- GSEA
- WINCOOT
- PyMol
- Cluster Omega
- Cluster X2
- BLAST
- Primer Designing
- ExPASy
- Swiss Model
- Marvin Sketch
- EMBOSS
- ChEMBL
- PDB
- Mascot Search Engine
- Microsoft Office (Excel, PowerPoint, Word)
- Canava
- Sequence Alignment
- AlphaFold

Programming Language and Key Library:

- Python
- R
- C
- C++
- HTML
- CSS
- JavaScript
- MDTraj
- PyTorch
- TensorFlow
- Keras
- Matplotlib
- Scanpy
- SciPy
- OpenCV
- NLTK
- Gensim
- Transformers
- Pandas
- NumPy
- Seaborn
- Scikit-Learn
- BiocManager
- ComplexHeatmap
- DESeq2
- EnrichR
- Seurat
- GenomicRanges
- Gviz
- DEP
- dplyr
- Ggplot2
- GEOquery
- Ggrepel
- Tidyverse
- UpSetR
- Conda
- Linux
- MySQL
- Deeptime
- Data Structure and Algorithm

Language: English (**IELTS 2025 - 7.5**) Hindi Bengali

PERSONAL PROJECTS

Exploratory Data Analysis and Diagnosis Classification of Breast Cancer Using Logistic Regression

Retrieved a breast cancer dataset from Kaggle and conducted exploratory data analysis (correlation, pair plots, and scatter plots) to assess the relation among tumor features. Applied logistic regression for cancer diagnosis classification, achieving 93.85% accuracy, with model performance evaluated using a confusion matrix and classification report.

Created Computational Biology Portfolio
Link - https://patrasayan.github.io/SayanPatra.github.io/

Created my own comprehensive portfolio showcasing skills in bioinformatics, omics data analysis, highlighting expertise in Python, R, C++, C, HTML, CSS, JavaScript, and data-driven biological research.

MNIST Handwritten Digit Classification Using Deep Learning

Developed Deep Learning architecture of Multilayer Perceptron (MLP), Recurrent Neural Network (RNN), and Convolutional Neural Network (CNN), and classified the MNIST handwritten dataset using each architecture and achieved 97.97%, 98.29%, and 99.15 % accuracy in MLP, RNN, and CNN, respectively.

Single-cell Transcriptomics Data Analysis of Mouse Brain Cells

Acquired a single-cell RNA seq count matrix and metadata of mouse brain cells from Kaggle. Constructed an Anndata object, performed quality control, CPM normalization, and data scaling. The normalized data was clustered using PCA, t-SNE, and UMAP for dimensionality reduction, followed by unsupervised clustering using K-means and Leiden algorithms. Performed a T-test across the clusters to get key marker genes across cell clusters and visualized a heatmap of known marker genes for each cell cluster.

WEBINAR AND WORKSHOPS

- Attended "**Illuminate Oncology Town Hall 2.0"** organized by "**Sir H.N. Reliance Foundation Hospital & Research Centre"** February 2025
- Participated in **"Introduction to Omics and Its Role in Clinical Research"** conducted by the **Graduate School of Science.** April 2024
- Attended **"Workshop on Communication Skills"** conducted by **Biosciences and Bioengineering, IIT Bombay**. January 2024
- Participated in **"DECODE PROTEOMICS WITH R PROGRAMMING"** organized by the **NyBerMan Bioinformatics Europe**. October 2023
- Participated in **"Idea, Invention, Innovation – How companies are born and how they die"** conducted by **Biosciences and Bioengineering, IIT Bombay**. October 2023
- Attended **"Design Workshop using CANVA"** conducted by **Biosciences and Bioengineering, IIT Bombay.** October 2023
- Attended **"Demonstration and Brief Training for Flow Cytometer"** conducted by the **Society for Innovation & Entrepreneurship, IIT Bombay.** September 2023
- Participated in **"Analytical Techniques to Study from Biomolecules to Tissues (ASTBT-2021)"** organized by the **Indian Institute of Information Technology, Allahabad.** June 2021

POSTER PRESENTATION

Presented a poster on **"Lipidomics Study Reveals Potential of AKT/mTOR Signaling Downregulation and Induction of Programmed Cell Death Via N-Linked Glycosylation Inhibition in Group-3 Medulloblastoma"** in **Advances in Proteomics Technologies 2025 (APT 2025)** conducted by **Proteomics Lab, Biosciences and Bioengineering, IIT Bombay.** February 2025

SCHOLASTIC ACHIEVEMENTS

- Secured band **7.5** in IELTS Academic 2025 2025
- Secured **AIR 93** in **CSIR-UGC-NET Life Science**, December 2024. 2025
- Secured **AIR 18** in **IIT JAM 2023** in **Biotechnology.** 2023
- Secured **AIR 73** in **GATE Biotechnology(BT) 2023**. 2023
- Secured **AIR 309** in **GATE Life Science (XL) 2023.** 2023
- Qualified **TIFR GS 2023** in **Biology.** 2023
- Secured **AIR 40** in **GATB.** 2023
- **Silver Medalist** of **B.Sc. Microbiology 2023** in **Midnapore College**. 2023
- Secured **3rd Position** in **Panchberia Ramchandra Smriti Siksha Mandir** during HS. 2020
- Secured **1st Position** in **Jotebhagaban High School** during **Matriculation Examination**. 2018

POSITION OF RESPONSIBILITY

- **Web Team Co-Ordinator | Symbiotek Council | BSBE Department | IIT Bombay** 2024

Coordinated on building and maintaining the Official Website of Genvision 2024 of Bioscience and Bioengineering of the Indian Institute of Technology, Bombay, using HTML, CSS.

- **Logistic Team Coordinator | Symbiotek Council | BSBE Department | IIT Bombay** 2024

Coordinated the logistics work of Genvision 2024 of Bioscience and Bioengineering of the Indian Institute of Technology, Bombay.

- **Event Coordinator and Teacher Assistantship – Organizing Team | APT-2025 | Proteomics Lab | IIT Bombay** 2025

Actively engaged in organizing the APT-2025 and assisted the Workshop – "Advances in 4D Proteomics" with Dr. Jaran Jainhuknan, Bruker, and "Mass Spectrometry and Big Data Analysis (AI/ML)" with Dr. Graham Roy Ball, Anglia Ruskin University, UK.

COURSES

MS Biotechnology

Proteomics: Principles and Techniques, Introduction to Computational Multomics, Genomics and Proteomics, Mathematical and Numerical Methods for Biologists, Bioinformatics, Cell Biology, Molecular Biology, Genetics, Biochemistry and Bioenergetics, Biological Thermodynamics and Kinetics, Analytical Biochemistry, Microbiology, Genetic Engineering, Biomolecular Spectroscopy, Molecular Immunology, Molecular Enzymology, Research Methodology and Scientific Communication Skills, Protein engineering, Cell Signaling

B.Sc. Microbiology

Bacteriology, Virology, Microbial Physiology and Metabolism, Microbial Genetics, Cell Biology, Molecular Biology, Biochemistry, Environmental Microbiology, Food and Dairy Microbiology, Industrial Microbiology, Medical Microbiology, Recombinant DNA Technology, Instrumentation and Biotechniques, Microbial Biotechnology, Immunology, Biosafety and Intellectual Property Rights, Microbial Analysis of Air and Water