Joy Prokash **Debnath**

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Education

Bachelor of Science (B.Sc.) in Biochemistry and Molecular Biology (BMB) *Sylhet 3114, Bangladesh*

Shahjalal University of Science and Technology (SUST) *Feb 2020 – Aug 2025*

CGPA : 3.58 out of 4.00 [Graduation delayed due to the COVID-19 pandemic]

Fellowship

National Science and Technology (NST) Fellowship

BSc (Honours) Research Fellowship, Ministry of Science and Technology (MoST), Dhaka, Bangladesh *Sep 2025*

Received **approx. $1200** from the MoST to support undergraduate research thesis work.

Publications & Manuscripts

1. Debnath, J.P., Hossen, K., Khandaker, M. S., Dev, P. C., Sarker, S., & Hossain, T. (2025). **Identification of potential biomarkers for 2022 Mpox virus infection: a transcriptomic network analysis and machine learning approach.** *Scientific Reports, 15*(1), 2922. [doi]

Published @ **Scientific Reports**, Nature Publishing Group UK *Jan 2025*

2. Sayed, S. B., Rabbi, M. A., **Debnath, J.P.**, Hossen, K., & Ghosh, A. (2025). **Genome-wide identification and characterization of m6A regulatory genes in Soybean: Insights into evolution, miRNA interactions, and stress responses.** *Plos one, 20*(7), e0328773. [doi]

Published @ **Plos One**, Public Library of Science *Jul 2025*

3. Debnath, J.P., Hossen, K., Khandaker, M. S., Majid, S., Islam, M. M., Arefin, S., Dev, P. C., Sarker, S., & Hossain, T. (2025). **omicML: an integrative tool of bioinformatics and machine learning algorithms to identify transcriptomic biomarkers. bioRxiv,684517.** [doi]

Published @ **bioRxiv**; Submitted @ **Bioinformatics**, Oxford University Press; Gui @ [omicml.org] *Oct 2025*

4. Debnath, J. P., Hossain, T.* and Rahman, P.* (2025). **Deep neural profiling reveals RAP1GAP2 as a latent regulator of tumor tnvasion in Oropharyngeal Carcinoma.**

Defended & Presented @ Undergraduate Thesis, Poster, BMB, SUST *Oct 2025*

Published @ Zenodo; Manuscript Under Revision

5. Hossen, K.†, **Debnath, J. P.**†, Datta, U., and Ghosh, A.*. **BioSalT: a multigene machine learning model for early salinity stress detection in *Solanum lycopersicum.***

Manuscript In Preparation; GitHub @ [BioSalT] *Oct 2025*

Conference

1. Khandaker, M. S., Islam, S. M. R. U., **Debnath, J. P.**, Hossen, K., Razib, S. F. A., Dey, B. P., & Razib, S. F. A. (2025). **Molecular screening of Head and Neck Squamous Cell Carcinoma patients for Human Papillomavirus.**

Presented @ **11th Wuhan International Symposium on Modern Virology & Viruses 2025**, Wuhan, China

Accepted @ **IPVS 2025 – International Papillomavirus Conference**, Bangkok, Thailand *Sep 2025*

Published @ **NCBI GenBank**; GitHub @ [HNSCC-HPV]

Research Experience

1. Undergraduate Research Assistant *BMB, SUST*

Supervisor: **Dr. Tanvir Hossain** *Oct 2022 – Jul 2024*

Responsibilities and Experience

- Implemented a full RNA-seq workflow in bash for gene quantification from GEO/SRA FASTQ files and applied statistical models such as edgeR, limma, and DESeq2 to get DEGs.
- Constructed collective dynamics of gene networks to reveal functional modules and hub genes enriched in biological pathways.
- Benchmarked fifteen supervised learning models in PyCaret and utilized the best-fitted classifier to validate the biomarkers based on discriminatory power.
- Constructed a multi-source gene expression database with DE matrices and used MLPRegressor for training DeepFoldChange.

GitHub @ Mpox-Project, Biomarker-Discovery, Bulk-RNA-seq, DeepFoldChange

2. Undergraduate Research Assistant *BMB, SUST*

Supervisor: **Dr. Ajit Ghosh** *Nov 2023 – Oct 2025*

Responsibilities and Experience

- Extracted RNA from plant samples, quantified by nanodrop, and performed PCR with EF1α (housekeeping) and target-gene primers to confirm cDNA synthesis and primer specificity simultaneously, and visualized bands on agarose gel electrophoresis.
- Validated candidate biomarkers by qRT-PCR, calculating relative log2 fold change from Ct values via the ΔΔCt method.
- Profiled conserved domains and motifs of m6A regulators; built phylogenies with 1000-bootstrap in MEGA, and visualized in iTOL.

GitHub @ BioSalT, Genome-Wide

3. Research Assistant

CHRF, Dhaka

Supervisor: **Preonath Chondrow Dev**

Jun 2024 – Present

Responsibilities and Experience

- Developed omicML (GUI) for biologist (non-programmers) to build biomarker algorithms using transcriptomic data.
- Developing a computational model integrating electrophysiology and transcriptomics data for epilepsy (from the Allen Brain Atlas) to explain how gene expression patterns relate to the electrical properties of neurons.
- Analyzing brain MRI and surface based brain morphometry data to study the structure and function of the brain.

GitHub @ omicML-raw, Celltypes-Patchseq, Neuroimaging, Allen-Brain

4. Remote Research Intern

AIBN, UQ, Australia

Advisor: **Dr. Tanvir Hossain**

Feb 2025 – Aug 2025

Responsibilities and Experience

- Conducted bulk ncRNA-seq analysis on cancer cell lines, including ADMSC, BMMSC, HeLa, MCF7, MDAMB231, TM6, A549, H1975.
- Analyzed the expression profiles of Y and U glycoRNAs to examine their significance in extracellular vesicles (EVs), epithelial–mesenchymal transition (EMT) and in lung cancer.
- Filtered ncRNAs utilizing ncRNAtools part of RNAcentral API and selected best features by RFE-RF for ML analysis.
- Discovered nc-markers of EMT, EV, and lung cancer and common among all and analyzed their qRT-PCR validation result.

Project

- **Chip development for efficient glycoRNA isolation and marker-based cancer detection. GitHub** @ [glycoRNA]

5. Research Assistant

BMU, Dhaka

Supervisor: **Dr. S M Rashed Ul Islam**

Nov 2024 – Present

Responsibilities and Experience

- Detected malignant samples of HNSCC by hispopathology, followed by multiplex and nested PCR to screen HPV.
- Utilized sanger sequencing of L1 viral gene and immunohistochemistry of host proteins (upregulated by HPV) for further validation.
- Conducting molecular techniques to validate cancer-specific biomarkers retrieved through a multi-omics approach, including WGCNA, scRNA-seq, and proteomics.

Onging Project

- **Machine learning-driven identification and quantitative validation of cancer-specific biomarkers across multiple carcinomas of different anatomic sites**, Ongoing Research. [Collaborators]. **GitHub** @ scRNA-seq

6. Research Assistant

BUET; BMU; SUST

Supervisor: **Papia Rahman**

Mar 2025 – Present

Responsibilities and Experience

- Utilized DeepProfile framework for Oropharyngeal Carcinoma, integrating 26 GEO datasets and reduced the dimension with PCA for Variational Autoencoder (VAE) model training.
- Streamlined Integrated Gradients (IG), ensemble latent feature learning and TCGA survival benchmarking.
- Synthesized Ag-deposited Ni/rGO nanoparticles and evaluated their peroxidase mimicking, glucose-sensing efficiency, antibacterial, and antioxidant properties.

Ongoing Collaborative Research

- **Synthesis and application of Ag-deposited Ni/rGO nanospheres in glucose sensing, antibacterial properties, and antioxidant activity**, Funded by SUST Research Center. **GitHub** @ Deep-Neural-Profiling

Skills

Molecular Techniques	PCR, scRNA-seq, Immunohistochemistry, Western blot, SDS-PAGE, Protein Expression Chromatography, Sanger sequencing, Gel Electrophoresis
Computational Biology	Multi-Omics, Single-Cell Transcriptomics, Computational Neuroscience Neuroimaging, Machine Learning, Deep Learning
DevOps/Frameworks	AWS (EC2), Docker, FastAPI, Postman, HTML5, GitHub Actions, Linux (bash, git)
Programming	R, Python, Node.js, JAVA, LaTeX

Extracurricular Activity

KIN (A Voluntary Organization) [kinsust.org]

SUST, Bangladesh

General Member

Dec 2021 - Jun 2025

- Taught music, musical instruments, and mathematics to the children of KIN School.
- Donated blood more than 7 times and collected winter clothes to distribute to the helpless people.
- Actively served as a volunteer in the charity book fair, film fest, charity poster, charity t-shirt, and charity wristband.

References

Dr. Tanvir Hossain

Assistant Professor, BMB, SUST,

Sylhet. [Profile]

Email: tanvir-bmb@sust.edu

Preonath Chondrow Dev

Research Officer, Genomics Team,

CHRF, Bangladesh. [Profile]

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