ABHIRUPA GHOSH

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RESEARCH KEYWORDS

Computational Biology and Bioinformatics | Microbial Genomics | Metagenomics | Infectious Diseases | Antimicrobial Resistance | Respiratory Diseases | One Health | Transcriptomics | Machine Learning | Comparative Genomics

EDUCATION

2017 – Present	**PhD**, Biophysics, Molecular Biology and Bioinformatics, University of Calcutta (Work done at Bose Institute under the guidance of Dr. Sudipto Saha)
2014 – 2016	**MTech**, Bioinformatics, Maulana Abul Kalam Azad University of Technology, WB, Kolkata (CGPA – 8.38/10)
2010 – 2014	**BTech**, Biotechnology, Haldia Institute of Technology, affiliated to West Bengal University of Technology, Kolkata (CGPA – 8.52/10)

RESEARCH EXPERIENCES

May 2024 – Present

Postdoctoral Research · CU Anschutz · Supervisor – Dr. Janani Ravi

May 2017 – May 2024

Doctoral Research · DBT-BINC funded · Bose Institute · Supervisor - Dr. Sudipto Saha
Thesis Title: "***In-silico* Analyses Of Drug-Resistant Gene-Mutations in Mycobacterium tuberculosis, ESKAPE And Other Bacterial Species.**"

- Developed a database of drug-resistant gene mutations across bacterial species.
- Studied the evolution and molecular effects of drug-resistant gene mutations.
- Developed a machine learning-based prediction model for drug-resistant tuberculosis.
- Studied the taxonomic and functional signatures along with drug-resistant gene-mutation patterns in the human microbiome.

July 2015 – June 2016

MTech Project · Bose Institute · Supervisor - Dr. Sudipto Saha
Thesis Title: "**Prediction of Potential Small Chemical Protein-Protein Interaction Modulators against Bcl2-Bax using Machine Learning Techniques**"

- Developed machine learning-based high-throughput screening of small molecules for targeting the protein-protein interaction Bcl2/Bak.
- Validated the screened molecules using Protein-ligand docking.

August 2013 – April 2014

BTech Project · Haldia Institute of Technology · Supervisor – Dr. Tarun Kanti Mandal
Thesis Title: "**Designed Ligands as Probe for Podophyllotoxin Binding Site of Tubulin**"

- Designed and docked molecules to Tubulin protein at target site using AutoDock.

May 2013 – June 2013

Summer Project under BTech curriculum · University of Kalyani · Supervisor - Dr. Angshuman Bagchi
Thesis Title: "**Identification and Characterization of DsrK Protein from its Sequence**"

- Characterized the sequences of DsrK to identify the conserved region and polymorphisms across Proteobacteria.

TOOLS AND DATABASES

MCDR-MTB - Multiclass Classification of Drug Resistance in MTB clinical isolates	Analysed preliminary data and developed an ML-based model and implemented it as a standalone tool and webserver
PPIMpred - Prediction of Protein-Protein Interaction Modulators	Curated the data and developed the ML-based model
MDPD - Microbiome Database of Pulmonary Diseases	Developed the analysis pipeline and accessory scripts
BCSCdb - Biomarker of Cancer Stem Cell Database	Developed the database and web-based interface
DRAGdb - Drug Resistance Associated Genes database	Curated and developed the web-based database

SKILLS

Coding: R and PERL Programming; Application of Python packages; Shell scripting; Database development using MySQL; Webpage development and design using HTML, PHP, and CSS;

Omics data handling: Whole genome sequencing, Metagenomics, and Transcriptomics data analysis; MinION sequencing;

Other Computational Expertise: Pairwise and Multiple sequence alignment; Protein-ligand Docking; Molecular Dynamics Simulation using GROMACS; Application of Machine Learning Algorithms; Pathway and Network analysis using Cytoscape and Ingenuity Pathway Analysis;

PUBLICATIONS (Research Articles: 14; Review: 1; Book Chapters: 2)

· Google Scholar · ResearchGate · ORCiD

Papers

1. Raja TV, Alex R, Singh U, Kumar S, Das AK, Sengar G, Singh AK, **Ghosh A**, Saha S, Mitra A. Genome-wide identification and annotation of SNPs for economically important traits in Frieswal™, newly evolved crossbred cattle of India. 3 Biotech. 2023 Sep;13(9):1-1.
2. **Ghosh A**, Saha S. Meta-analysis of sputum microbiome studies identifies airway disease-specific taxonomic and functional signatures. Journal of Medical Microbiology. 2022 Dec 16;72(12):001617.
3. Gaur D, Kumar N, **Ghosh A**, Singh P, Kumar P, Guleria J, Kaur S, Malik N, Saha S, Nystrom T, Sharma D. Ydj1 interaction at nucleotide-binding-domain of yeast Ssa1 impacts Hsp90 collaboration and client maturation. PLoS Genetics. 2022 Nov 9;18(11):e1010442.
4. Firdous S, **Ghosh A**, Saha S. BCSCdb: a database of biomarkers of cancer stem cells. Database. 2022 Sep 16;2022.
5. Mahatha AC, Banerjee SK, **Ghosh A**, Lata S, Saha S, Basu J, Kundu M. A systems approach to decipher a role of transcription factor RegX3 in the adaptation of Mycobacterium tuberculosis to hypoxic stress. Microbiology. 2022 Aug 18;168(8):001229.
6. Chaudhary D, Singh A, Marzuki M, **Ghosh A**, Kidwai S, Gosain TP, Chawla K, Gupta SK, Agarwal N, Saha S, Kumar Y. Identification of small molecules targeting homoserine acetyl transferase from Mycobacterium tuberculosis and Staphylococcus aureus. Scientific reports. 2022 Aug 13;12(1):1-6.
7. Mishra A, Behura A, Kumar A, **Ghosh A**, Naik L, Mawatwal S, Mohanty SS, Mishra A, Saha S, Bhutia SK, Singh R. Soybean lectin induces autophagy through P2RX7 dependent activation of NF-κB-ROS pathway to kill intracellular mycobacteria. Biochimica et Biophysica Acta (BBA)-General Subjects. 2021 Feb 1;1865(2):129806.
8. Mahatha AC, Mal S, Majumder D, Saha S, **Ghosh A**, Basu J, Kundu M. RegX3 Activates whiB3 Under Acid Stress and Subverts Lysosomal Trafficking of Mycobacterium tuberculosis in a WhiB3-Dependent Manner. Frontiers in microbiology. 2020 Sep 16;11:572433.
9. **Ghosh A^**, Saran N^, Saha S. Survey of drug resistance associated gene mutations in Mycobacterium tuberculosis, ESKAPE and other bacterial species. Scientific Reports. 2020;10. (^ joint first author)
10. Chakravorty D^, **Ghosh A^**, Saha S. Computational approach to target USP28 for regulating Myc. Computational Biology and Chemistry. 2020 Apr 1;85:107208. (^ joint first author)
11. Mohammed S, Vineetha NS, James S, Aparna JS, Babu Lankadasari M, Maeda T, **Ghosh A**, Saha S, Li QZ, Spiegel S, Harikumar KB. Regulatory role of SphK1 in TLR7/9-dependent type I interferon response and autoimmunity. FASEB J. 2020 Mar;34(3):4329-4347.
12. Majumdar S^, **Ghosh A^**, Saha S. Modulating interleukins and their receptors interactions with small chemicals using in silico approach for asthma. Current Topics in Medicinal Chemistry. 2018 May 1;18(13):1123-34. (^ joint first author)
13. Mawatwal S, Behura A, **Ghosh A**, Kidwai S, Mishra A, Deep A, Agarwal S, Saha S, Singh R, Dhiman R. Calcimycin mediates mycobacterial killing by inducing intracellular calcium-regulated autophagy in a P2RX7 dependent manner. Biochimica Et Biophysica Acta (BBA)-General Subjects. 2017 Dec 1;1861(12):3190-200.
14. Jana T, **Ghosh A**, Das Mandal S, Banerjee R, Saha S. PPIMpred: a web server for high-throughput screening of small molecules targeting protein–protein interaction. Royal Society Open Science. 2017 Apr 19;4(4):160501.
15. Sarkar D, Patra P, **Ghosh A**, Saha S. Computational framework for prediction of peptide sequences that may mediate multiple protein interactions in cancer-associated hub proteins. PLoS One. 2016 May 24;11(5):e0155911.

Book Chapters

1. **Ghosh A**, Firdous S, Saha S. Bioinformatics for Human Microbiome. Advances in Bioinformatics. S. Singh (ed.) Springer Singapore, pp 333-350 (2021).
2. Bhattacharjee S, **Ghosh A**, Saha B, Saha S. Machine Learning in Genomics. Machine Learning and Systems Biology in Genomics and Health. S. Singh (ed.) Springer Singapore, pp. 69-90 (2022).

AWARDS AND ACHIEVEMENTS

2022	First Prize for platform presentation at the 20th PULMOCON
2019	Best Poster (Bronze) and Travel Fellowship at the 18th International Conference of Bioinformatics (InCoB)
2017	30th Rank in Bioinformatics National Certification (BINC) and received Fellowship for pursuing PhD
2016	3rd Rank in MTech Bioinformatics from MAKAUT, WB
2014	Best oral presentation in the event 'Ideas' of PRAYUKTI'14, the techno-management fest organized by Haldia Institute of Technology, Haldia

CONFERENCES ATTENDED

2022	• Students' symposium on "Recent Trends in Natural Sciences, Bose Institute · Oral · "**Survey of antimicrobial resistance gene mutations associated with pulmonary diseases**" · Kolkata, India

- 20th PULMOCON · Poster and Platform · "**Specific sputum microbiome signatures were identified in airway diseases**" · Kolkata, India

2021 Health Informatics Summit · e-Poster · "**DRAGdb: Drug Resistance Associated Genes database**" · Online

- INDIA|EMBO symposium 'Human Microbiome: Resistance and Disease' · Poster · "**Identifying drug-resistant gene-mutation signatures in lung microbiome of antibiotic exposed individuals.**" · Kalyani, India

2019

- 18th InCoB · Poster · "**Prediction of drug resistance in MTB using Machine learning algorithms**" · Jakarta, Indonesia

2017 International Symposium on Systems, Synthetic & Chemical Biology · Poster · "**Homoplasy and Pleiotropic properties of antibiotic resistant genes in Mycobacterium tuberculosis.**" · Kolkata, India

WORKSHOP AND COURSE ATTENDED

2018 NIBMG Summer School - Training Workshop on Systems Biology · Kalyani, India

2015 DAT204x: Introduction to R Programming · Microsoft Corporation through edX