

EDUCATION

M.S. in Biotechnology

Indian Institute of Technology Roorkee
Advisor: Prof. Jitin Singla

2021 – 2023

Roorkee, India

B.S. in Biophysics

Panjab University

2018 – 2022

Chandigarh, India

- Graduated with Honors and summa cum laude
- Major: Biophysics | Minor Elective: Computer Science
- Class Rank - 1

RESEARCH EXPERIENCE

Computational Cell Structural Biology Lab | Research Fellow & Master Thesis

Department of Biosciences and Bioengineering, Indian Institute of Technology Roorkee
Advisor: Jitin Singla

Jan 2024 – Present

Roorkee, India

- Extended previous work by utilizing a random walk-based method to enhance contact maps, highlighting structural features of transient IDP conformations.
- Reformulated the problem within a graph-theoretical framework, leveraging graph algorithms to model the dynamic behavior of IDPs with greater precision.
- Architecting and implementing a hypergraph neural network to capture complex interaction networks within IDPs, aiming to improve predictive modeling of protein dynamics.
- Creating custom algorithms to identify transient conformations, aiming to discover therapeutic target discovery for IDPs.

Master Thesis

Jan 2021 – May 2023

- Performed extensive long-timescale molecular dynamics simulations of IDPs using both all-atom and coarse-grained models, generating a comprehensive dataset.
- Developed a pipeline to back-map coarse-grained simulations to all-atom representations reducing computational cost and simulation time.
- Applied advanced unsupervised machine learning algorithms, to identify and characterize structural ensembles of IDPs, revealing novel conformational states.

Bioorganic Chemistry Laboratory | Indian Academy of Sciences Summer Fellow

Jawaharlal Nehru Centre for Advanced Scientific Research
Advisor: Prof. Thimmaiah Govindaraju

Jan 2021 – May 2022

Bangalore, India

- Conducted genomic expression assays to elucidate the role of oxidative stress in Alzheimer's disease pathogenesis.
- Optimized protocols for differentiating induced pluripotent stem cells (iPSCs) into neuronal cell lines using small-molecule regulators.
- Developed and cultured 3D neuronal spheroids and engineered 3D hydrogels to support them, enhancing the physiological relevance of in vitro models.
- Designed primers and molecular probes for gene expression validation. Performed molecular expression analyses using quantitative PCR, dynamic light scattering, and live-cell fluorescence imaging, identifying upregulation of key genes linked to A β 42 accumulation.

Molecular Endocrinology Lab | Research Assistant

Department of Biosciences and Bioengineering, Indian Institute of Technology Roorkee
Advisor: Prof. Parha Roy

Jan 2021 – May 2022

Roorkee, India

- Explored the Anti-Cancer Effects of Natural Products by culturing and maintaining HeLa, HaCaT, and SiHa cell lines.
- Conducted In-Silico Analysis of chemical compounds to identify potential molecular targets against cervical cancer, utilizing bioinformatics tools and databases.
- Developed and evaluated Plant-Based Adhesives for wound healing and clinical applications, presenting an eco-friendly alternative to petroleum-based products.

CONFERENCES AND PRESENTATIONS

Selected to participate in an advanced microscopy workshop by ZEISS

Jan 2021 – May 2022

HONORS AND AWARDS

Qualified GATE Life Sciences

May 2023

Ranked 307 out of 44,904 registered candidates (top 0.68%) and awarded monthly funding for a Research Fellow position by the Ministry of Human Resource Development, Government of India.

Indian Academy of Sciences Summer Research Fellowship

May 2023

Awarded the prestigious Summer Research Fellowship by The Indian Academy of Sciences to pursue fully funded summer research in Alzheimer's Project.

The DBT Fellowship

Feb 2023

Awarded monthly fellowship by The Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India

Panjab University Gold Medal

May 2023

Awarded Panjab University Gold Medal for securing the highest GPA in B.Sc (Hons.) Biophysics by the Vice President of India.

Biophysics Society - Certificate of Merit

May 2023

Awarded Certificate of Merit for securing 1st Position in B.Sc. (Hons) 2nd year by the President of Biophysics Society and Chairperson Department of Biophysics.

PUBLICATIONS

1. Dogra S, Arora A, Aggarwal A, **Passi G**, Sharma A, Singh G, Barnwal RP. Mucormycosis Amid COVID-19 Crisis: Pathogenesis, Diagnosis, and Novel Treatment Strategies to Combat the Spread. *Frontiers in Microbiology*, 12, 794176 (2022). doi: 10.3389/fmicb.2021.794176.
2. Kaur J, Sharma A, **Passi G**, Dey P, Khajuria A, Alajangi HK, Jaiswal PK, Barnwal RP, Singh G. Nanomedicine at the Pulmonary Frontier: Immune-Centric Approaches for Respiratory Disease Treatment. *Immunological Investigations*, 53(3), 295–347 (2024). doi: 10.1080/08820139.2023.2298398.
3. Khajuria A, Alajangi H, Singh J, **Passi G**, Barnwal RP, Singh G, Kaur IP. Applications of Nanotechnology in Converging the Biomarker Science for Advancement in Cancer Detection and Treatment. *Handbook of Oncobiology: From Basic to Clinical Sciences*, 1–30 (2023). doi: 10.1007/978-981-99-2196-6_75-2.

TEACHING EXPERIENCE

Machine Learning and Deep Learning (BE 350) | Teaching Assistant

Indian Institute of Technology Roorkee

Roorkee, India

Instructor: Jitin Singla

- Helped students learn programming, complete labs, and develop individual research projects.
- Led weekly discussion sections, held office hours, graded projects, and exams.

SKILLS

Programming: Python, Machine Learning Algorithms, Graph Algorithms, Hypergraph Neural Networks, Molecular Dynamics Simulations

Software & Tools: Quantitative PCR, Dynamic Light Scattering, Live-cell Fluorescence Imaging, Zeiss Microscopy Suite (Multi-photon, Confocal, Spinning Disk, Atomic Force, Time-lapse), Bioinformatics Tools and Databases, Molecular Dynamics Simulation Software

Document Creation: Microsoft Office Suite, LaTeX