

# Bioinformatics Summer Internship 2024

**With Hands-On-Training +  
Project / Dissertation**

**Exclusively Crafted For B.Sc., M.Sc., B.Tech  
M.Tech. B.Pharm, M.Pharm, & Ph.D. Students**

**Duration: 30 days, 3 Months & 6 Months  
Project / Dissertation  
STARTS 1st April 2024**



Get ready to unlock the mysteries of life as the **Bioinformatics Summer Internship 2024, BGTI 4.0**, is finally here! With the aim to foster the next generation of bioinformatics leaders, the internship program offers a unique opportunity for students and professionals alike to dive into the exciting world of computational biology. With hands-on training and guidance from seasoned professionals, interns will gain practical experience in cutting-edge techniques and tools used in bioinformatics. So, if you're ready to take your first steps toward a career in bioinformatics, join us for a summer of discovery, innovation, and growth!



# 30-Days, 3 Months & 6 Months Hands-on Summer Internship

**START DATE: 4th APRIL 2024**

**Session  
No.**

**Unit No. and Topic**

## **UNIT-1: Introduction: Why Learn Bioinformatics?**

**DAY-1** Ice-breaking Session on Bioinformatics Global  
Tools and Techniques

**DAY-2** Scope & Opportunities in Bioinformatics: India &  
Abroad

**DAY-3** Understanding Key Terminology in Bioinformatics  
Databases

## **UNIT-2: Deciphering molecules at the sub-molecular level**

**Day 4** Carbohydrates and Proteins  
**Demo on tools: Cheminformatics**

**Day 5** Lipids and Nucleic acids  
**Demo on tools: ChemDraw & ChemSketch**

**Session  
No.**

**Unit No. and Topics**

## **UNIT-3: Bioanalytics: Understanding the patterns of life**

- Day 6** Primary Sequences – DNA, RNA, and Proteins  
**Demo on tools: NCBI, EMBL, DDBJ, and SBI**
- Day 7** Secondary Structures – DNA, RNA, and Proteins  
**Demo on tools: GORV, Swiss model, I-TASSER, Phyre2**
- Day 8** Tertiary Structures – Stability, folding, and misfolding  
**Demo on tools: Protein Data Bank (PDB), EMBL and SBI**
- Day 9** Biochemical and Metabolic pathway analysis  
**Demo on tools: KEGG database and Cytoscape**

## **UNIT-4: Biocomputing- Computer-Aided Drug Design (CADD)**

- Day 10** Introduction, Drug discovery pipeline: Target identification and validation, Lead identification and optimization, Virtual screening  
**Demo: IMPPAT and Dr. Duke's Phytochemical and Ethnobotanical databases for Phytochemistry Research.**



# Program Module

**Day 11** ADMET Studies for the lead optimization.  
**Demo on tools:** SWISS-ADME, Analysis, and Interpretation Boiled-Egg Model

**Day 12** Introduction to protein and modelling concepts, types, homology modelling, and the ab-initio method.  
**Demo on tools:** PDB tools, Swiss ExPaSy

**DAY 13** Constructing a Phylogenetic Tree-  
**Demo on tools:** ClustalW, Clustal Omega

**DAY 14** QSAR Studies and Interpretation of Docking  
**Demo on Molecular docking software:** Patchdock, Autodock, ClusPro web server

**DAY 15** Introduction to Molecular Dynamics and Simulation (MDS).

## Unit-5: Biomimetics: Driving Deeper

**DAY 16** Pre-clinical (Bacterial, Fly, Plants, and Murine models), Human Clinical Trials for drug discovery, Functional genomics, and Comparative genomics.  
**Demo on the tool: Differential expression analysis on bacterial genome.**

**Day 17** Protein-protein interaction network, STRING, Network terminology, Pathway enrichment analysis  
**Demo on the tool: STRING and Cytoscape.**

**Day 18** Human Genome project, Bacterial Genomics, Human Microbiome, and Epigenetics  
**Demo on database: Ensembl Bacteria, MicrobiomeDB**

**DAY 19** Sanger sequencing, Next Generation Sequencing: DNA Sequencing, RNA Sequencing. miRNA Analysis.  
**Demo on the tool: Databases: dbSNP, Clinvar, Genome browsers: UCSC and Ensembl**

## Unit-6: Pening Down: Publish or Perish

**DAY 20** Publication types, formats, and journals  
**Demo on the tool: Elsevier, Springer, Wiley, MDPI, and Bentham Sciences**

**DAY 21** Research made easy with Artificial Intelligence (AI & ML)  
**Demo on the tool: Applications of ChatGPT in BioResearch**

**DAY 22** Selection of the journal and indexing  
**Demo on the tool: Journal finder**



**Day 23** Submission, Revision, and re-submission process  
**Demo on tool: Editorial Manager**

## Unit-7: Proposal Writing and Grant Submission

**DAY 24** Structure and ingredients of proposal writing

**DAY 25** Networking and funding from (govt./ private/ industrial partners)

**DAY 26** Portals for grant submission and prerequisites

**DAY 27** Generating primary data for proposal and funding

## Unit-8: Launch Yourself

**DAY 28** Generating ideas, Start-ups, and Bioenterpreunship

**DAY 29** Live troubleshooting session

**DAY 30** Open Discussion

# About the Instructor



## Ms. Nilofer K Shaikh , PhD

With a strong background in big data analysis using computational approaches in cancer omics data, Ms. Nilofer K Shaikh brings a wealth of experience from MIT ADT University. Her expertise spans cancer research, drug design, molecular dynamics simulation, data mining, and various omics technologies. Proficient in Python, R, and computational methodologies, she has a deep understanding of genomics, metabolomics, proteomics, transcriptomics, pharmacogenomics, and AI for cancer treatment. Her skillset also includes machine learning, MySQL database management, and natural language processing (NLP)



# About the Instructor



## Dr. Prakrity Singh, PhD

Dr. Prakrity Singh, a dedicated computational biologist with a Ph.D., is passionate about using advanced computational techniques to solve complex biological problems as a Ph.D. Scholar (SRF) at CSIR-Indian Institute of Toxicology Research, Her research focuses on understanding atomic structures related to persistent organic pollutants and their impact on biological systems. Dr. Singh has contributed significantly to drug discovery and toxicity projects, with her work published in peer-reviewed journals. Her commitment to advancing scientific understanding, with applications in environmental protection and human health, underscores her trailblazing role in computational biology. Dr. Singh's expertise promises to shape the future of computational biology and its role in toxicology



# About the Instructor



## Mr. Prodyot Banerjee

Prodyot Banerjee is a seasoned professional in Computer-Aided Drug Designing, Bioinformatics Analysis, and Genomics, boasting rich experience from institutions like CSIR-IGIB, CSIR-CLRI, IIT Madras, and Delhi Technological University.

With an M.Tech in Bioinformatics from Delhi Technological University, Prodyot has excelled in research and development roles, presenting his work at prestigious venues like IIT Kharagpur. His research is published in esteemed journals such as IEEE and Frontiers in Pharmacology, with more underway. Prodyot's GATE 2019 qualification from IIT Madras underscores his dedication to both academic excellence and professional growth. With a proven track record and relentless pursuit of knowledge, he is a valuable asset in bioinformatics, genomics, and computer-aided drug design endeavors.



# Top Biopharma Companies Hiring in Bioinformatics Abroad



## ILLUMINA:

A leading developer of next-generation sequencing (NGS) technology. They hire bioinformaticians for roles in data analysis, software development, and product management

## Google Health

A division of Google focused on developing healthcare technologies. They hire bioinformaticians for roles in drug discovery, genomics research, and machine learning.

## Roche

A Swiss multinational pharmaceutical company. They hire bioinformaticians for roles in drug discovery, clinical research, and personalized medicine.

## Johnson & Johnson

An American multinational pharmaceutical and medical devices company. They hire bioinformaticians for roles in drug discovery, clinical research, and data science

## Pfizer

An American multinational pharmaceutical and biotechnology company. They hire bioinformaticians for roles in drug discovery, clinical research, and vaccines development.



## Gilead Sciences

An American biopharmaceutical company that develops antiviral medications. They hire bioinformaticians for roles in drug discovery, clinical research, and regulatory affairs

## Vertex Pharmaceuticals

An American biopharmaceutical company that develops treatments for cystic fibrosis and other rare diseases. They hire bioinformaticians for roles in drug discovery, clinical research, and personalized medicine.



## Amgen

An American multinational biopharmaceutical company that develops and markets innovative human therapeutics. They hire bioinformaticians for roles in drug discovery, clinical research, and manufacturing.



## Novartis

An American multinational pharmaceutical and biotechnology company. They hire bioinformaticians for roles in drug discovery, clinical research, and vaccines development.



## Celgene

An American biopharmaceutical company that develops and markets treatments for cancer and inflammatory diseases. They hire bioinformaticians for roles in drug discovery, clinical research, and personalized medicine.



Bioinformatics is a rapidly growing field that combines biology, computer science, mathematics, and statistics to analyze and interpret biological data, particularly from genomics, proteomics, and other high-throughput technologies. As technology advances and biological data becomes increasingly abundant, the demand for bioinformatics professionals continues to rise. Here are some key points regarding the career scope in bioinformatics:

# CAREER SCOPE in BIOINFORMATICS



## Interdisciplinary Nature



Bioinformatics is inherently interdisciplinary, requiring professionals to have a solid understanding of both biological sciences and computational techniques. This opens up diverse career opportunities in research institutions, pharmaceutical companies, biotechnology firms, healthcare organizations, and academia.

## Research Opportunities

Bioinformatics professionals are heavily involved in research aimed at understanding biological processes, such as genetics, evolution, disease mechanisms, and drug discovery. They work on projects ranging from genome sequencing and annotation to molecular modeling and systems biology



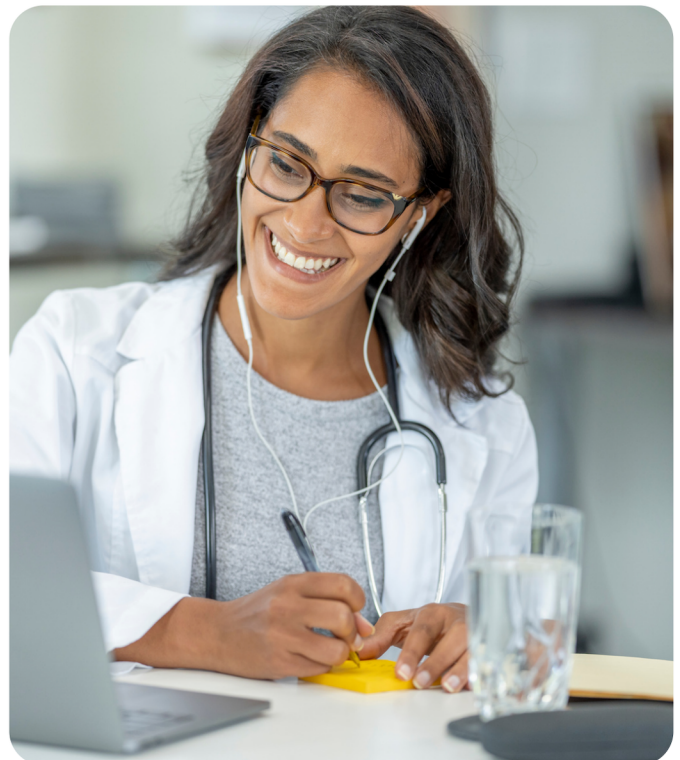
## Pharmaceutical and Biotechnology Industries



With the advancement of personalized medicine and the need for targeted drug development, pharmaceutical and biotechnology companies increasingly rely on bioinformatics to analyze large-scale biological data, identify drug targets, predict drug interactions, and optimize therapeutic outcomes.

## Healthcare and Clinical Applications

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## Academia and Education



Many bioinformatics professionals pursue careers in academia, where they teach courses, supervise research projects, and contribute to the advancement of knowledge in the field. They may also work in bioinformatics training programs and workshops to educate future generations of scientists

## Data Science and Big Data Analytic

The skills acquired in bioinformatics, such as data mining, machine learning, and statistical analysis, are highly transferable to other fields, including data science and big data analytics. Bioinformatics professionals often find opportunities in industries outside of biology, such as finance, marketing, and cybersecurity.



## Emerging Technologies



Rapid advancements in technologies like next-generation sequencing, single-cell analysis, and CRISPR-based genome editing continue to drive innovation in bioinformatics. Professionals in this field need to stay updated with the latest tools and methodologies to remain competitive and address new challenges in biological research.

## Global Impact

Bioinformatics has a global impact on various aspects of human health, agriculture, environmental conservation, and biotechnology. Professionals in this field have the opportunity to contribute to groundbreaking discoveries and solutions to global challenges





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# How This Internship Will Help You? And What You Will Learn?



Interns will learn how to use bioinformatics tools and software to interpret complex biological data, and develop the skills necessary to design and implement their own computational pipelines.



Dive into the refreshing side of science this summer with 30 days, 3 months & 6 months of Bioinformatics training! Get a complete 360-degree approach to Bioinformatics with LIVE practicals, assignments & projects



By the end of the program, interns will have gained hands-on experience with cutting-edge techniques and will be well-prepared to pursue a career in bioinformatics or related fields.



Troubleshooting sessions with seasoned professionals will ensure you have all the support you need to explore this exciting field.

**Whether you're a beginner or an experienced student, this internship program will give you a chance to sharpen your skills, learn from the best in the business, and gain hands-on experience with the latest bioinformatics tools and software. So, join us for a summer of discovery, growth, and fun!**



