




# Amitesh Badkul

@ Email |  LinkedIn |  GitHub |  Website

## EDUCATION

### Birla Institute of Technology and Science, Pilani

*Master of Science in Chemistry*

*Bachelor of Engineering in Electrical and Electronics Engineering*

Hyderabad, India

August 2018 - June 2023

- **Thesis:** In-silico prediction of protein-ligand binding affinity using deep learning. [\[Link\]](#)

## PUBLICATIONS

- **Amitesh Badkul**, Li Xie, Shuo Zhang, and Lei Xie. (2023). “TrustAffinity: accurate, reliable and scalable out-of-distribution protein-ligand binding affinity prediction using trustworthy deep learning”, **NeurIPS 2023 Workshop on New Frontiers of AI for Drug Discovery and Development**
- Tian Cai, Li Xie, Shuo Zhang, Muge Chen, Di He, **Amitesh Badkul**, ... and Lei Xie. (2022)., “End-to-end Sequence-Structure-Function Meta-learning Predicts Genome-Wide Chemical-Protein Interactions for Dark Proteins”, **PLoS Computational Biology** [DOI: [10.1371/journal.pcbi.1010851](https://doi.org/10.1371/journal.pcbi.1010851)]
- **Amitesh Badkul**, Sonakshi Mishra, and Srinivasa Prasad Kommajosyula (2023)., “A Comparative Study of DeepLabCut and Other Open-Source Pupillometry Data Analysis Algorithms”, **Image and Vision Computing** [Status: Under Review]

## EXPERIENCE

### Graduate Center, CUNY

*Visiting Researcher (Supervisor: Dr. Lei Xie)*

New York City, USA

Aug 2022 – Present

- Developed a deep learning framework for predicting protein-ligand binding affinity, incorporating uncertainty. Achieved a Pearson correlation of **0.92** and MAE of **0.25** in OOD settings, surpassing state-of-the-art methods.
- Engineered and Integrated Multi-Task learning-based algorithms with Protein Language Models ([DISAE](#) and [ESM-2](#)) for enhanced chemical protein binding affinity prediction. Utilized deep learning techniques such as Transformers, RNNs, and CNNs, resulting in a Pearson correlation of **0.81** and MAE of **0.56**. [\[Thesis\]](#)

### Arizona State University

*Summer Research Intern (Supervisor: Dr. Ashif Iquebal)*

Tempe, USA

Jun 2022 – Aug 2022

- Analyzed large chemical datasets to identify the optimal dataset emphasizing compounds with hydrogen bonding.
- Optimized a generative model using LSTM and GRU architectures for self-healing compound generation.
- Trained a generative model yielding **98.43%** valid compounds, with a **higher ease** of synthesis on average. [\[Poster\]](#)

### Birla Institute of Technology and Science Pilani

*Undergraduate Research Assistant (Supervisor: Dr. Srinivas Prasad K)*

Hyderabad, India

Jun 2021 – Jun 2022

- Employed architectures such as MobileNet, ResNet, and EfficientNet to achieve accurate rat pupil measurements.
- Achieved minimal deviation from ground truth, outperforming other state-of-the-art image processing algorithms.

*Undergraduate Research Assistant (Supervisor: Dr. Durba Roy)*

Aug 2021 - Feb 2022

- Simulated a water box cube using Molecular Dynamics for 20 nsec and analyzed positional and energy data.
- Devised algorithms for Mean Square Displacement (MSD) and Diffusion Coefficient in water systems; investigated Rhodobacter Sphaeroides' Reaction Center. [\[GitHub\]](#) [\[Blog 1\]](#) [\[Blog 2\]](#).

*Undergraduate Research Assistant (Supervisor: Dr. Sudha Radhika)*

Feb 2021 - April 2022

- Optimized pretrained models (ResNet, MobileNet, etc) for CXR classification, achieving **97%** accuracy. Enhanced accuracy by **2%** with a CXR enhancement algorithm.
- Developed a novel dataset from CXR using statistical descriptors post wavelet transform. Achieved **97.46%** accuracy with XGBoost and Random Forest models. [\[GitHub\]](#)

### Sensordrops Networks, IIT Kharagpur

*Research Intern (Supervisor: Dr. Sudip Misra)*

Kharagpur, India

Dec 2020 – Feb 2021

- Developed a Graph Neural Networks (GNNs) based algorithm for Contact Tracing of COVID-19 patients.
- Created a novel Twitter dataset for training and testing. Used Twitter metadata as features and deployed the GNN model. Obtained accuracy of **92.31%**.

### Million Sparks Foundation

*Summer Intern*

Noida, India

Jun 2020 – Aug 2020

- Refactored and refined of existing JavaScript code leading to increased efficiency and usability.
- Developed and enhanced educational content, **benefiting over 20+ teachers** and elevating learning outcomes.

## PROJECTS

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### CYP3A4 Inhibition Classification | [GitHub](#)

- **Curated** and **cleaned** the datasets for improved accuracy of machine learning models.
- **Deployed** machine learning algorithms such as Random Forest, and XGBoost. **Achieved** an accuracy of 77%.

### CXR Bit Plane Classification | [GitHub](#)

- **Implemented** CXR classification on bit plane sliced CXRs using MobileNet model.
- **Obtained** a highest accuracy of 95% validating the fact that all layers of a CXR are equally important.

### Cdh23EC1 Analysis | [Blog](#)

- **Conducted** thorough and **extensive** analysis of the data obtained from the MD Simulation of Cdh23EC1 protein.
- **Programmed** functionalities+ for calculation of various properties - MSD, Radius of Gyration and more.

## SKILLS

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- **Programming Languages:** Python, MATLAB, R, Verilog,  $\text{\LaTeX}$ , C, Bash, Java, Javascript, HTML, CSS
- **Software Skills:** BLAST, NAMD, VMD, OpenCV, EMU8086, LTSpice, Microsoft Office Suite, Adobe Suite, AutoCAD
- **Languages:** Hindi (Native), English (Professional)
- **Libraries:** PyTorch, PyTorch Geometric, TensorFlow, Keras, OpenCV, RDkit, Scikit-Learn, Biopython, Numpy, Pandas, Matplotlib, Seaborn, DeepLabCut, Networkx, DGL, Pywt, Deepchem

## SERVICE

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- **Reviewer**, International Journal of Computational Biology and Drug Design 2023
- **Student Member**, IEEE Organization, BITS-Pilani, Hyderabad 2019-2022

## AWARDS & ACHIEVEMENTS

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- **Scholarship for Practice School - 1:** Industry exposure program, given to the students with excellent performance (highest grade - 'A') in the industry provided by BITS Pilani. 2020
- **Scholarship for Higher Education (SHE):** Recipient of Scholarship for Higher Education provided by the Indian Government for excellence in academics Higher Secondary School Board examination, given to the top 1% of students, held in month of March 2018 in India. 2018-2022