Amitesh Badkul

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Education

- **Bachelor of Engineering in Electrical and Electronics Engineering** — Hyderabad, India
- **Master of Science in Chemistry** — *August 2018 - Present*
  Birla Institute of Technology and Science, Pilani
  - Cumulative GPA: 7.575/10

Experience (Industry)

- **Summer Intern** — Noida, India
  Million Sparks Foundation — *June 2020 - August 2020*
  - Assisted in refactoring and cleaning the existing JavaScript code for a website.
  - Developed and improved educational content for educators.

  Technologies: Javascript, HTML and CSS.
  Theory: Web Development and Curating.

Experience (Research)

- **Research Assistant** — New York City, NY
  Department of Computer Science, Hunter College, the City University of New York — *June 2022 - Present*
  - Working on developing novel deep-learning algorithms for improving Portal CG for Chemical Protein Interaction under the supervision of **Dr Lei Xie**.
  - Successfully implemented residue-residue contact prediction for fine-tuning existing BERT-based protein descriptor and achieved an accuracy of **92.8%**.

  Libraries Used: RDkit, HuggingFace, Pandas, Numpy, Matplotlib, Seaborn.
  Theory: Chemical-Protein Interaction, BERT, Meta Learning.

- **Summer Research Intern** — remote
  School of Computing, Informatics, and Decision Systems Engineering, Arizona State University — *June 2022 - Present*
  - Designed a Long Short-Term Memory (LSTM)-based deep generative model with hydrogen-bonding groups for self-healing compounds with **98.43%** validity and **99.2%** uniqueness, under the supervision of **Dr Ashif Iquebal**.
  - Developing novel evaluation metrics for measuring thermodynamic stability.

  Libraries Used: RDkit, Pandas, Numpy, Matplotlib, Seaborn.
  Theory: Cheminformatics, Generative Models, Deep Learning.

- **Research Assistant** — Hyderabad, India
  Department of Pharmacology, BITS Pilani — *June 2021 - Present*
  - Rat eye pupillometry project under the supervision of **Dr Srinivas Prasad K**.
  - Developed novel algorithm for tracking and measuring the rat eye pupil in images and videos using image and video processing techniques.
  - Developed and trained machine learning models for tracking and measuring the rat eye pupil.

  Libraries Used: OpenCV, Scikit-image, Pandas, Numpy, DeepLabCut, Matplotlib.
  Theory: Pupillometry, Digital Image Processing, Deep Learning, and Convolutional Neural Networks.

- **Research Assistant** — Hyderabad, India
  Department of Chemistry, BITS Pilani — *August 2021 - May 2022*
  - Working under the supervision of **Dr. Durba Roy** in Molecular Dynamic Simulation.
  - Modelled a water box cube and carried out MD simulation for 20 nanoseconds.
  - Performed statistical analysis on the output position, velocity, and energy data obtained.

- Developed algorithm for calculating the Mean Square Displacement and Diffusion Coefficient of the water system.
- Explored the Reaction Center of Rhodobacter Sphaeroides.

Softwares Used: NAMD, VMD
Theory: Molecular Dynamic Simulation, Photosynthesis, Purple Bacteria

- **Research Assistant** Hyderabad, India
Department of Electrical and Electronics Engineering, BITS Pilani *February 2021 - April 2022*
  - Biomedical Imaging Project under the supervision of **Dr. Sudha Radhika**.
  - Fine-tuned various pretrained models such as ResNet, MobileNet, Xception, and VGG for classification of Chest X-Ray Scan (CXR) and achieved an accuracy of **97%**.
  - Developed CXR enhancement algorithm using image processing, and improved the accuracy of the previously fine-tuned model by **2%**.
  - Creation of a novel dataset by extraction of various statistical descriptors after performing wavelet transform on the RGB and gray channel individually.
  - Implementation of classification algorithms such as Multiclass Logistic Regression, Random Forests and XGBoost, obtaining 92%, 94% and 95% accuracy respectively.

  Libraries Used: Numpy, OpenCV, Scikit-image, Scipy, PyTorch, Keras, Tensorflow, Numpy, Matplotlib, Pywt
  Theory: Biomedical Imaging, Deep Learning, Deep Convolutional Neural Networks, and Wavelet Transform.

- **Research Intern** Kharagpur, India
Sensordrops Networks, IIT Kharagpur *December 2020 - March 2021*
  - Worked under the supervision of **Dr. Sudip Misra**, 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 using Python. Obtained accuracy of **92.3%**

  Libraries Used: DGL, Keras, Tensorflow, PyTorch Geometric, Tweepy, Twython, Networkx, Pandas, Numpy, Matplotlib.
  Theory: Natural Language Processing, Contact Tracing, Graph Neural Networks and IoT.

Skills

- **Programming Languages:** Python, MATLAB, R, Verilog, LaTeX, C, Bash, Java, Javascript, HTML, CSS
- **Software Skills:** NAMD, VMD, OpenCV, EMU8086, Microsoft Office Suite, Adobe Suite, AutoCAD.

publications

- Cai, T., Xie, L., Zhang, S., Chen, M., He, D., **Badkul, A.**, ... and Xie, L. (2022)., "End-to-end Sequence-Structure-Function Meta-learning Predicts Genome-Wide Chemical-Protein Interactions for Dark Proteins", PLoS Computational Biology **(Status: Submitted After Revision)**. [preprint]
- Sudip Misra, Senior Member, IEEE, Riya, **Amitesh Badkul**, "C-TaaS: A GNN-Based IoT Service for Tracking COVID-19 Carriers from Social Media Posts", CCGRID 2023 (The 23rd International Symposium on Cluster, Cloud and Internet Computing) **(Status: Under Review)**.

Scholarships

- Scholarship for Higher Education 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.
- Scholarship for Practice School - 1 (held in the summer of 2020), industry exposure program, given to the students with excellent performance **(grade 'A')** in the industry provided by **BITS Pilani**

Projects

- **CYP3A4 Inhibition Classifier**
  Personal Project *February 2022 - May 2022*
  - Curated and cleaned the datasets for improved accuracy of machine learning models.
  - Implemented machine learning algorithms like logisitic regression, random forests classifier, and XGBoost classifier on the the curated datasets.

  Libraries Used: RDKit, Numpy, Pandas, Sklearn, XGBoost, Seaborn, Matplotlib.
  Theory: Cheminformatics, Machine Learning, CYP3A4 Inhibition.

- **EEG Signal Analysis**
  Personal Project *March 2021 - May 2021*
  - Developed ML models based on supervised learning algorithms such as Artificial Neural Networks (ANNs), Support Vector Machines (SVMs), Random Forest, and Naive Bayes for classification of EEG Signals.
  - Hypertuned various parameters such as the loss function, the optimizer, the number of epochs, the learning rate to increase the efficiency of the developed models by 9%.

  Libraries Used: Numpy, Pandas, Sklearn, Keras, Tensorflow, PyTorch, Matplotlib.
  Theory: Machine Learning, Electroencephalogram (EEG) and Emotion Classification.

Personal Interests

- Computational Sciences, Sustainability Technology, Photography, Squash, Motorsports, Basketball, Volleyball