LeetCode
Kolkata, WB, India
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Abhimanyu Borthakur

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EDUCATION

MS ECE, UCLA   **2024-2026**
B.Tech ECE, Manipal Institute of Technology   **2018-2022**

- CGPA: 9.24/10.0 (**3.94/4.0**) (Minor in Data Science: 10.0/10.0)
- Ranked 1st in the 7th semester with a GPA of 9.8/10
- Awarded a Certificate of Merit for being ranked 11th out of 228 finishing in the top 5%

ACCEPTED PUBLICATIONS AND CONFERENCE ABSTRACTS

- [*Published - 05 January 2024*] G. Bhatta, S. Gharat, **A. Borthakur** and A. Kumar, *Gamma-ray Blazar Classification using Machine Learning with Advanced Weight Initialization and Self-Supervised Learning Techniques*, **Monthly Notices of The Royal Astronomical Society**, (Link) (Code)

- [*Published - 23 November 2023*] S. Gharat, **A. Borthakur** and G. Bhatta, *Estimation of redshift and associated uncertainty of Fermi/LAT extra-galactic sources with Deep Learning*, **Monthly Notices of The Royal Astronomical Society**, (Link) (Code)

- [*Accepted - 31 October 2023*] S.Gharat, G.Bhatta and **A. Borthakur**, *Gamma Ray AGNs: Estimating Redshifts and Blazar Classification using Neural Networks with smart initialization and self-supervised learning*, **37th Conference on Neural Information Processing Systems (NuerIPS) @ ML4PS workshop**, (Paper #116)(Paper pdf) (Poster png)

- [*Published - 12 July 2023*] S.Gharat, B.Bose, **A. Borthakur** and R. Mazumder, *An Image Processing approach to identify solar plages observed at 393.37 nm by the Kodaikanal Solar Observatory*, **Royal Astronomical Society Techniques and Instruments,**(Link) (Code)

RESEARCH EXPERIENCE

Quantum Light-Matter Co-Operative (QLMC) @ UCLA   **October 2024 - Present**

Start-to-End (S2E) Modeling Framework for a high-powered laser system
Guide: Prof. Sergio Carbajo, UCLA

- Spearheading the software development of a digital twin for a high-powered laser system.
- Employed numerical and computational methods to integrate complex mathematical processes such as CPA and NLO into the modeling framework
- Developed, tested and deployed an end-to-end data generation framework.
- Generated data to train large machine learning models for inverse design to estimate instrumental parameters.

AI4Astro group @ CMINDS, IIT Bombay   **September 2022-January 2024**

Gamma Ray AGNs: Estimating Redshifts and Blazar Classification using Neural Networks with smart initialization and self-supervised learning
Guide: Prof. Gopal Bhatta, University of Zielona Góra, Poland

- Designed and implemented a novel neural network architecture to predict redshifts present in the 4LAC-DR3 catalog and achieved better results when compared to the existing regression models with correlation coefficient of 0.78 and an RMSE of 0.415.
- Extended the aforementioned network using variational inference to account for the uncertainty in making predictions for samples with unknown redshift values/ground truths.
- Proposed and implemented a lightweight neural network to classify BCU samples as either BLLacs or FSRQs with an accuracy of 93% and an F1-score of 0.914, while experimenting with techniques such as class weights and bias initialisation to combat class imbalance and deployed a webapp for the same on AWS EC2
- Identified research gaps in the existing literature and thus, explored and implemented various advanced techniques such as supervised and unsupervised greedy pre-training, and self-supervised learning with an accuracy and F1 score as high as 91.5% and 0.901, respectively.

An Image Processing approach to identify solar plages observed at 393.37 nm by the Kodaikanal Solar Observatory
Guide: Dr. Rakesh Mazumder, ARIES Nainital, India

- Designed a custom algorithm for semantic segmentation of solar plages and area calculation achieving a positive correlation of up to 97% between calculated and ground truth areas
- Integrated the algorithm with a Python webapp deployed on Streamlit with the BigQuery GCP service as a storage backend

School of Electrical Sciences @ Indian Institute of Technology, Goa **Summer 2021**

Efficient phase recovery with the help of a CNN
Guide: Prof. Sujit Kumar Sahoo, IIT Goa

- Provided an implementation for this paper in TensorFlow 2.x, which describes a CNN for phase retrieval (Code)
- Created a synthetic dataset of Intensity-Phase pairs in order to train the model

Department of ECE @ Manipal Institute of Technology, Manipal **Spring 2021**

Enhancing small object detection in the RefineDet architecture on a custom dataset
Guide: Prof. Akshatha KR, MIT Manipal

- Helped annotate around 4000 video frames with the aid of the Computer Vision Annotation Tool (CVAT) and wrote an efficient data ingestion pipeline in order to ingest the annotated data and train the model
- Implemented the RefineDet model from scratch in the TensorFlow 2.0 framework and proposed changes to the anchor-box initialisation technique in order to improve the performance of the base model.
- Improved performance using k-means clustering on the annotations in order to augment the initialisation of the anchor box aspect ratios and scales leading to an improvement in the mean average precision by 10.6%, while maintaining the speed of the original model.
- Final grade: A+

WORK EXPERIENCE

Searce Inc @ Pune, Maharashtra, India **January 2022 - September 2022**

Machine Learning Engineer
Manager: Dr. Muthukumaraswamy B, Associate Director - Applied AI

- Achieved the Google Cloud Professional Machine Learning Engineer Certificate within the first 6 months, recommended only for industry professionals with 3 or more years of experience.
- Developed a JSON file parsing algorithm for a US-based automation client and **co-led** the database design deliverable for the same on GCP Bigquery
- Built a custom OCR project for extracting fields from Income Tax Return Acknowledgement forms using YOLOv5 architecture, achieving an average extraction time of 3.43 s and mean average precision of 96.9% on the validation set and 92.1% on the test set
- Performed a literature review of various techniques for legal document summarization and developed Jupyter notebooks for the same
- Developed an object detection model for document localization on wooden surfaces, obtaining a mean average precision of 97.1% and used Google Cloud Vision API to extract barcodes from said documents

SKILLS

- **Languages:** C, C++, Python, Java, MATLAB, LabVIEW, R, RStudio, SQL
- **Frameworks:** OpenCV, TensorFlow, Scikit-Learn, PyTorch
- **Cloud:** GCP, AWS
- **Experiment tracking:** Weights and Biases, mlfow
- **Containerization:** Docker, Kubernetes
- **Version Control:** Git
- **Projects:** Portfolio
- **Certifications:** List of certifications
- **Courses and grades:** Transcript (BTech)
- **TOEFL:** Score report

REFERENCES

- **Prof. Sergio Carbajo, Assistant Professor - ECE, UCLA** (Site) (Mail)
- **Prof. Gopal Bhatta, Professor of Astropysics, University of Zielona Góra** (Site) (Mail)
- **Prof. Raviprakash Y, Professor of Physics, Manipal Academy of Higher Education** (Site) (Mail)
- **Prof. Akshatha KR, Assistant Professor – Senior Scale, ECE, Manipal Academy of Higher Education** (Site) (Mail)
- **Prof. Nakul Shetty, Assistant Professor – Senior Scale, ECE, Manipal Academy of Higher Education** (Site) (Mail)