Torsha Majumder

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Education

Master of Science in Physics (Thesis), **The University of Lethbridge, Canada** **Jan. 2024 - Present**

Master of Science in Computer Science, **The University of Texas at Dallas, USA** **Aug. 2018 - May 2020**
Thesis: "*Ensembles of oblique decision trees*"

Bachelor of Technology in Information Technology, Maulana Abul Kalam Azad University of Technology, India
Final Year Project: *"Institutes Library Management System"* **Jul. 2013 – Jul. 2017**

Work Experiences

Graduate Research Assistant, **The University of Lethbridge**, Lethbridge, Alberta, Canada **Jan. 2024 – Present**

- Calibrating TES cryogenic detectors to optimize the detector's array performance
- Developing Python routines for data analysis, statistical analysis, and uncertainty quantification for spectral and visibility curve refinement

Sr. Data Scientist, **NU Energy India**, Kolkata, West Bengal, India **Aug. 2023 – Dec. 2023**

- Designed and implemented a React.js/Plotly Dash error analysis dashboard, integrated with Flask (Python) API for data, utilizing Isolation Forest for anomaly detection in electrical power generation, achieving a 30% downtime reduction

Data Scientist, **Verizon**, Sunnyvale, California, USA **Jun. 2021 – May 2023**

- Developed and deployed a scalable vendor recommendation system and forecasting model using Python, collaborative filtering, and Oracle DB on AWS SageMaker, optimized algorithms through A/B testing to increase recommendation accuracy by 25%
- Developed and deployed an end-to-end mailroom automation system by integrating OCR-based text preprocessing for accurate data extraction (NER), a ResNet-based deep learning model for document classification, MongoDB for metadata storage, and Boto3 for seamless AWS S3 integration, reducing manual effort by 15%
- Team lead for a 5-person FUZE Regulatory data analytics team in Florida, developing data-driven solutions to improve business outcomes

Software Engineer, **Centillion Infotech LLC**, Dallas, Texas, USA **Jul. 2020 – Feb. 2021**

- Developed RESTful APIs using Spring Boot for enterprise-level business products, increasing API efficiency by 12%
- Implemented comprehensive end-to-end test coverage, resulting in a 7% reduction in customer complaints

Data Analyst, **NU Energy India**, Kolkata, West Bengal, India **Jul. 2017 – Jul. 2018**

- Cleaned & analyzed data (electrical parameters) using Pandas (including regression analysis) obtained from energy audits of the Bureau of Energy Efficiency (India) and water audits from the Indian Railways and identified the losses in the energy generation and distribution systems, which resulted in a total savings of $10M/year

Research Experiences

The SNAD Team Collaboration **Apr. 2024 – Present**

- Analyzed the ZTF DR8 data release to identify potential Superluminous Supernovae (SLSN) candidates using the active learning Pineforest algorithm, which led to the discovery of 8 potential SLSNe
- Designing a self-supervised BERT-based transformer model with contrastive loss and clustering loss functions to detect anomalies in ZTF and LSST light curve

The University of Texas at Dallas, USA **Nov. 2021 – Present**

- Developed a probabilistic deep neural network to estimate initial values for a numerical solver in MCMC steps of inverse tidal evolution, aiming to match the current orbital period and eccentricity from the Kepler catalog. This approach improved solver convergence, achieving success in about 65% of instances.

Massachusetts Institute of Technology, USA **Oct. 2021 – Nov. 2023**

- Prepared an unsupervised machine-learning pipeline for TESS and PLAsTiCC transient light curves to perform data pre-processing and feature extraction for anomaly detection
- Created a data pipeline to identify transiting exoplanet signals and noise removal from the Kepler and TESS light curves
- Worked on DASH for automated spectral classification of supernovae and hosts, changed architecture from TensorFlow to Keras, applied batch processing, and evaluated performance on new transient classes like Kilonova, AGNs, and TDEs

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Teaching Experiences

Graduate Teaching Assistant, **The University of Lethbridge**, Lethbridge, Alberta, Canada **Jan. 2024 – Present**

- Winter Term: Introduction to Biophysics (PHYS 1050 L04, PHYS 1050 L06)
- Fall Term: Introduction to Biophysics (PHYS 1050 L04, PHYS 1050 L06)
- Spring Term: Introduction to Biophysics (PHYS 1050 L04, PHYS 1050 L06), Engineering Mechanics (ENGG 2060A)

Faculty Member, **2U Inc./ edX**, Sunnyvale, California, USA **Dec. 2020 – May 2023**

- Instructor for the data analytics and fintech bootcamp programs at universities in the USA and Australia

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Publications

1. **Majumder, T., Pruzhinskaya, M.V., Ishida, E. E. O., Malanchev, K. L., Semenikhin, T. A., *Superluminous supernova search with PineForest*. arXiv preprint, https://arxiv.org/abs/2410.21077**
2. **Majumder, T., Pruzhinskaya, M. V., Ishida, E. E. O., Malanchev, K. L., *Detection of Anomalous and Rare Transients using Contrastive Learning*, in prep, 2024.**
3. **Majumder, T. (2020). *Ensembles of oblique decision trees* [Master's Thesis, University of Texas, Dallas]. UTD Theses and Dissertations. URI: https://hdl.handle.net/10735.1/8818**
4. Schussler, J., Penev, K., **Majumder, T.**, Comprehensive Bayesian Modeling of Tidal Circularization of Kepler Eclipsing Binaries, in prep, 2024.
5. Huang, H., Muthukrishna, D., Nair, P., Zhang, Z., Fausnaugh, M., **Majumder, T.**, Ricker, G. Foley, R., Predicting the Age of Astronomical Transients from Real-Time Multivariate Time Series. 2023, Neural Information Processing Systems (NeurIPS 2023), arXiv:2311.17143.

Awards and Honors

- University of Lethbridge Graduate Research Award (ULGRA), 2024
- Awarded as the Associate Member of the Institute of Engineers (India) in Computer Science and Engineering in 2017
- Awarded for the best 2017 final-year project - *Institutes Library Management System* - by the institution (STCET)

Talks/Presentations

- **Deep Probabilistic Neural Network for Inverse Tidal Evolution** **Sep. 2024**
  --- The International Meeting on Eclipsing Binary Star Systems, Weihai, Shandong, China
- **Unsupervised classification and anomaly detection of TESS transients** **Sep. 2022**
  --- TESS Science Talk, Massachusetts Institute of Technology, Cambridge, MA, USA

Skills

Programming Languages: Python, MATLAB, R, SQL, JAVA, C, HTML/CSS, JavaScript, LabVIEW, Bash

Softwares/ Packages: Scikit-Learn, SciPy, TensorFlow, PyTorch, Keras, Pandas, Astropy, Matplotlib, PySpark, NLTK, spaCy, OpenAI, Google AI Studio

Technologies: Machine Learning, Deep Learning, Transformers (CLIP, BERT), LLMs (GPT, Gemini), RAG, React.js, Flask

Certifications: Astronomy: Exploring Time and Space, Computer Vision, Linear Algebra, AWS: Cloud Security, Tableau, Google Cloud Big Data and Machine Learning, Amazon SageMaker