

Devina Mohan

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EDUCATION

University of Manchester

PhD Astronomy and Astrophysics

Manchester, UK
Jul 2022 - Dec 2025

University of Manchester

Master's by Research Astronomy and Astrophysics awarded with Distinction

Manchester, UK
Sept 2020-Sept 2021

Guru Gobind Singh Indraprastha University

Bachelor of Technology in Electronics and Communications Engineering; First Division, CGPA: 7.86/10

New Delhi, India
Aug 2016-Sept 2020

RESEARCH EXPERIENCE

- **[PhD Research] Finding rare and scientifically interesting objects in unlabelled data by combining Bayesian neural networks and self-supervised learning embeddings (Jan 2025 - Present) :**
 - So far I have focused on supervised classification with a small dataset of radio galaxies (of the order 10^3). I am now exploring how we can combine larger unlabelled datasets such as Radio Galaxy Zoo (of the order 10^5) in a self-supervised learning (SSL) setting and Bayesian neural networks to find interesting objects.
- **[PhD Research] Evaluating approximate Bayesian inference for deep learning classification of radio galaxies (July 2022 - 2024) :**
 - Supervisor: [Professor Anna Scaife](#)
 - Used Hamiltonian Monte Carlo (HMC) to recover posteriors for neural network parameters for radio galaxy classification. Ran HMC chains for 232,444 parameters of a CNN model for 200,000 steps on A100s.
 - Compared the posteriors obtained from different approximations to the Bayesian posterior, including Variational Inference (VI), last-layer Laplace approximation (LLA), Deep Ensembles and MC Dropout to the HMC posterior
 - Evaluated the posterior predictive distribution obtained from HMC, VI, LLA, Deep Ensembles and MC Dropout for the following criteria: predictive performance, uncertainty quantification and robustness to out-of-distribution and distribution-shifted data
 - Datasets used: MiraBest Batched Dataset; MIGHTEE dataset; Galaxy MNIST
- **[Master's Research] Bayesian Deep Learning for Morphological Classification of Radio Galaxies (Sept 2020-Sept 2021) :**
 - Supervisor: [Professor Anna Scaife](#)
 - Implemented a Bayesian Convolutional Neural Network (CNN) for binary classification of radio galaxies into Fanaroff-Riley Type I and Type II (FRI/FRII). Used variational inference as an approximate Bayesian inference technique for neural networks using the Bayes by Backprop (BBB) algorithm.
 - Wrote custom BBB layers in PyTorch
 - Quantified predictive, epistemic and aleatoric uncertainty in subsets of the dataset using posterior variances obtained through the posterior predictive distribution.
 - Investigated weight pruning techniques based on SNR and Fisher information to reduce computational and storage cost at deployment.
 - Examined model misspecification and likelihood misspecification in the BBB model.
 - Dataset used: MiraBest Batched Dataset
 - [Link to thesis](#)

PUBLICATIONS

[1] Evaluating Bayesian deep learning for radio galaxy classification

D. Mohan, A. M. M. Scaife. *Proceedings of the Fortieth Conference on Uncertainty in Artificial Intelligence*, PMLR 244:2587-2597, 2024.

[2] MCMC to address model misspecification in Deep Learning classification of Radio Galaxies

D. Mohan, A. Scaife. *Sixth Workshop on Machine Learning and the Physical Sciences*, NeurIPS 2023

[3] Quantifying Uncertainty in Deep Learning Approaches to Radio Galaxy Classification

D. Mohan, A. M. M. Scaife, F. Porter, M. Walmsley, M. Bowles; *Monthly Notices of the Royal Astronomical Society* 511 (3)

[4] Weight Pruning and Uncertainty in Radio Galaxy Classification

D. Mohan, A. Scaife. *Fourth Workshop on Machine Learning and the Physical Sciences*, NeurIPS 2021

[5] Zoobot: Adaptable Deep Learning Models for Galaxy Morphology

Walmsley et al. *Journal of Open Source Software* 8 (85), 5312

CONTRIBUTED TALKS

1st Workshop on Advances in Post-Bayesian methods at UCL <i>Challenges in practical Bayesian deep learning: A Case Study in Radio Galaxy Classification</i>	London, UK May, 2025
European Astronomical Society Annual Meeting <i>Machine Learning prospective in Astrophysics: challenges, limitations, failures, and potentials</i> ¹	Krakow, Poland July, 2023
RAS National Astronomy Meeting <i>Deep and Shallow learning in the era of large galaxy surveys and simulations session</i> ¹	Cardiff, UK July, 2023
ML X Astrophysics Symposium at Center for Computational Astrophysics (CCA), Simons Foundation <i>A Symposium to Explore the Intersection of Astrophysics and Machine Learning</i>	New York, USA May, 2023
Alan Turing Institute AI Fellows Day <i>Uncertainty quantification in deep learning predictions of radio galaxy classification</i>	Cambridge, UK Dec, 2022
RAS National Astronomy Meeting <i>Techniques3: The Future of Machine Learning in Astronomy</i>	Warwick, UK Jul, 2022
RAS National Astronomy Meeting (virtual) <i>Overcoming bias and incompleteness in astronomy: statistical methods for the big data era</i>	Bath, UK Jul, 2021

POSTERS

40th Conference on Uncertainty in Artificial Intelligence (UAI 2024) <i>D. Mohan, A. Scaife. Evaluating Bayesian deep learning for radio galaxy classification</i>	Barcelona, Spain July, 2024
6th Symposium on Advances in Approximate Bayesian Inference (AABI 2024) <i>D. Mohan, A. Scaife. Evaluating approximate Bayesian inference for radio galaxy classification</i>	Vienna, Austria July, 2024
NeurIPS Workshop on Machine Learning and the Physical Sciences <i>D. Mohan, A. Scaife. MCMC to address model misspecification in Deep Learning classification of Radio Galaxies</i>	New Orleans, USA Dec, 2023
NeurIPS Workshop on Machine Learning and the Physical Sciences <i>D. Mohan, A. Scaife. Weight Pruning and Uncertainty in Radio Galaxy Classification</i>	virtual Dec, 2021

TRAINING AND INTERNSHIPS

Research Analyst at Center for Computational Astrophysics (CCA), Simons Foundation <i>Internship on exploring galaxy morphology as a probe of dark matter using high resolution simulations and deep learning</i>	New York, USA Sept 2024 - Jan 2025
Nordic Probabilistic AI School <i>An intermediate to advanced level summer school with a focus on probabilistic machine learning</i>	Copenhagen, Denmark June 17-21, 2024
ML + GPU Training organised by HEP Software Foundation <i>Hands-on training on using GPUs for machine learning on Kaggle</i>	Virtual Nov 2-9, 2020
IGDTUW-IIT Delhi (Project Intern) <i>Tested ML/DL models for biomedical image processing to find anomalies in images captured by wireless capsule endoscopy</i>	New Delhi, India Jun 2019 - Aug 2019
MobileComm Technologies (India) Pvt. Ltd. (Trainee) <i>Technology Understanding (RF Communication, Deployment of 3G Networks, 4G)</i>	New Delhi, India Dec 2018 - Jan 2019
RailTel Corporation of India (Trainee) <i>Basics of Data Networks at Gurgaon Data Center, Transmission Technologies (SDH, PDH) at NOC, New Delhi</i>	Gurgaon, India Jun 2018 - Jul 2018
IQB Technologies Pvt. Ltd. (Trainee) <i>Embedded Systems (implemented on ATmega16) and Robotics</i>	New Delhi, India Jun 2017 - Aug 2017

LEADERSHIP ACTIVITIES

- Organiser of ML Journal Club at Jodrell Bank Centre for Astrophysics (JBCA), University of Manchester (2022-Present)
- Joint Secretary at BVPIEEE, the IEEE Student Branch of Bharati Vidyapeeth's College of Engineering (BVCOE) (2018-19)
- Vice-Chairperson of BVPIEEE-RAS, the Robotics and Automation Society of BVPIEEE (2018-19)
- Sponsorship Head for WIEHack'18 (an all women 24-hour development hackathon) at BVCOE (Oct 2018)
- Chapter Representative for BVPIEEE-RAS (2017-18)

PROFESSIONAL SERVICE

- Reviewer for Uncertainty in AI Conference (2025)

SKILLS

- **Languages:** Python, C/C++, Embedded C, VHDL, SQL, MATLAB
- **Technologies:** Deep Learning (PyTorch), Arduino, Raspberry Pi
- **Astronomy Softwares:** CASA

TEST SCORES

- **TOEFL (Nov 2019):** R 29 L 30 S 25 W 27
- **GRE (Sept 2019):** V 162 Q 168 AWA 5.0

OTHER ACTIVITIES

- Co-authored a [blog](#) on Ada Lovelace and the application of machine learning to astronomy for the Department of Physics and Astronomy Blog at the University of Manchester. (Oct 2021)

UNDERGRADUATE PROJECTS

- **Photometric Redshift Estimation of Quasars using Machine Learning (Jan 2020-April 2020):** Tested supervised learning methods
- **Classification of glitches in LIGO data using DL (Sept 2019-Nov 2019):** Implementation of a CNN model
- **Biomedical Image Processing (Jun-Jul 2019):** Built models to detect anomalies in videos captured by wireless capsule endoscopy
- **Cryptosystem Identifier (Mar 2018):** An SVM based classifier to distinguish between Simple Substitution and Vigenere cipher encrypted text
- **Autonomous Control of PlutoDrone (Oct 2017-Jan 2018):** The design was implemented through ROS(Robot Operating System) in Python
- **Self-Balancing Bot (Aug-Sept 2017):** A two-wheeled self-balancing structure based on MEMS MPU 6050 accel-gyro sensor
- **Wireless motion commands to 4-wheeled bot (Nov-Dec 2016) :** RFID was used to control the direction of rotation of motors