Tarek Allam Jr.

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EDUCATION

PhD Applied Machine Learning [Astroinformatics] **09.2017 - 09.2022**
UCL, Centre for Doctoral Training in Data Intensive Science
Supervised by: Prof. Jason McEwen (Primary Advisor), Prof. Ofer Lahav, Prof. Denise Gorse
Thesis: **Efficient Deep Learning for Real-time Classification of Astronomical Transients**

MSc Computer Science **09.2014 - 09.2016**
UCL, Department of Computer Science, Engineering
Supervised by: Prof. Jason McEwen, Prof. Denise Gorse
Project: **Radio Interferometric Image Reconstruction for the SKA: A Deep Learning Approach**

MSci Astrophysics **09.2007 - 07.2011**
Royal Holloway, University of London, Department of Physics
Supervised by: Prof. Stuart Boogert
Project: **Analytical Methods of Stellar Spectra: Stellar Spectroscopy**

RECENT TECHNICAL EMPLOYMENT & EXPERIENCE

Machine Learning Researcher and Engineer **09.2017 - 09.2022**
Centre for Doctoral Training in Data Intensive Science & Industry, UCL, London.
Contributed to numerous collaborative projects including preparatory work for a large-scale community machine learning kaggle competition. Led the design and development of `astronet`, an open-source scientific research software package introduces novel efficient deep learning architectures for low-latency high-throughput multivariate time-series classification. It also contains a machine learning pipeline which uses `Apache Spark` and `polars` for big-data processing, as well as `tensorflow.datasets` and `tensorflow.distributed` for efficient distributed model training. The lightweight architectures currently implemented in `astronet` have been deployed into live production machine learning systems by way modern model compression techniques for real-time classification of astronomical alerts.

Machine Learning Researcher [TIN Internship] **05.2021 - 11.2021**
The Alan Turing Institute, London.
Conduct research into unsupervised probabilistic machine learning and scalable non-parametric inference techniques for sequential latent factor modelling using `numpyro`.

Research Software Engineer [PhD Internship] **08.2019 - 03.2020**
The Alan Turing Institute, London.
Working in collaboration with the National Air Traffic Service (NATS), reinforcement learning (RL) was used to investigate machine learning methods to support air traffic controllers. Development of a RESTful API using `flask` was completed to allow for integration of both open-source and proprietary simulators. This has been followed by development of RL agents using `OpenAI gym`.

Machine Learning Research Engineer [DSG Participant] **12.2019 - 12.2019**
The Alan Turing Institute, London.
Invited to explore point cloud segmentation techniques as part of the SenSat - Semantic and Instance Segmentation of 3D Point Clouds Project. Investigating both semantic and instance segmentation in order to recognise objects such as roads, buildings, cars, etc. in a large 3D urban environment to enable safer autonomous vehicles on the road, automated asset management in urban planning, and accurate digital twin simulations. Benchmark deep learning methods implemented using `pytorch`.

Graduate Teaching Assistant **09.2020 - 09.2021**
UCL, London. *University of Jordan*, Amman
Assisting with grading and lesson planning for SPCE038: Machine Learning with Big Data. Lead the migration of `tensorflow 1.x` to `tensorflow 2.x`. Coordinated infrastructure setup for delivery of course through `JupyterBook`.

Graduate Teaching Assistant **03.2020 - 06.2020**
London Business School, London.
Assisting with grading of: E517: Python for Finance, QDE-APP: Applied Python Programming and CA22: Basic Python, as well as teaching support for scientific and numerical packages of `pandas`, `numpy` and `scikit-learn`.

Data Scientist [PhD Internship] **01.2018 - 04.2018**
Transport for London (TfL), London.
Investigated a variety of machine learning methods for train failure predication, that would be robust to highly imbalanced time-series data. With high cost implications for false-positives, we looked at algorithmic trade-offs that optimised accuracy at a low false positive rate. This work was co-supervised by academics at UCL and data scientists at TfL.

****Further experience available on request**

CONFERENCES & TALKS

- FINK Collaboration Workshop, 2022
  Talk: *"Time-series Transformers in Fink"*
- Statistical Challenges in Modern Astronomy VII, 2021
  Poster: *"Paying Attention to Astronomical Transients: Photometric Classification with the Time-Series Transformer"*
- International Biomedical and Astronomical Signal Processing (BASP) Frontiers, 2019
  Poster: *"Optimising the LSST Observing Strategy for Supernova Light Curve Classification with Machine Learning"*

AWARDS

- UCL Nomination for 2022 Schmidt Science Fellowship Application
  Proposal: *"Efficient Learned Image Reconstruction and Compression Algorithms for Real-time Medical Image Analysis"*
- Software Sustainability Institute Fellowship, 2020: £3,000
- Won Honorarium, LSST Cadence Hackathon, 2018: $1,500
- STFC Studentship Centre for Doctoral Training in Data Intensive Science, UCL, 2017
- Young Graduate Trainee, Scientific Data Processing, European Space Agency, 2017 (declined)
- 3rd Place in ATOS International IT Challange, 2015
- UCL Graduate Scholarship, MSc Computer Science 2014: £20,000

PUBLICATIONS

[1] **Allam Jr, Tarek** and J. D. McEwen, "An astronomical xception: Depthwise-separable convolutions for efficient photometric classification," In Prep., 2023.

[2] **Allam Jr, Tarek**, J. Peloton, and J. D. McEwen, "The tiny time-series transformer: Low-latency high-throughput classification of astronomical transients using deep model compression," In Prep., 2023.

[3] C. S. Alves, H. V. Peiris, M. Lochner, *et al.*, "Considerations for optimizing the photometric classification of supernovae from the rubin observatory," *The Astrophysical Journal Supplement Series*, vol. 258, no. 2, p. 23, 2022.

[4] **Allam Jr, Tarek** and J. D. McEwen, "Paying attention to astronomical transients: Photometric classification with the time-series transformer," *arXiv preprint arXiv:2105.06178*, 2021.

[5] A. Möller, J. Peloton, E. E. Ishida, *et al.*, "Fink, a new generation of broker for the lsst community," *Monthly Notices of the Royal Astronomical Society*, vol. 501, no. 3, pp. 3272–3288, 2021.

[6] K. Ponder, R. Hlozek, A. **Allam, T** Bahmanyar, *et al.*, "The photometric lsst astronomical time series classification challenge (plasticc): Final results," *AAS*, pp. 203–15, 2020.

[7] **Allam Jr, Tarek**, R. Biswas, R. Hlozek, *et al.*, "Optimising the lsst observing strategy for supernova light curve classification with machine learning," 2019.

[8] R. Hlozek, R. Kessler, **Allam, Tarek**, *et al.*, "The photometric lsst astronomical time series classification challenge (plasticc)," *AAS*, vol. 233, pp. 212–01, 2019.

[9] A. Malz, R. Hložek, **Allam Jr, Tarek**, *et al.*, "The photometric lsst astronomical time-series classification challenge plasticc: Selection of a performance metric for classification probabilities balancing diverse science goals," *The Astronomical Journal*, vol. 158, no. 5, p. 171, 2019.

[10] **Allam Jr, Tarek**, A. Bahmanyar, R. Biswas, *et al.*, "The photometric lsst astronomical time-series classification challenge (plasticc): Data set," *arXiv preprint arXiv:1810.00001*, 2018.

[11] M. Lochner, D. M. Scolnic, H. Awan, *et al.*, "Optimizing the lsst observing strategy for dark energy science: Desc recommendations for the wide-fast-deep survey," *arXiv preprint arXiv:1812.00515*, 2018.

[12] D. M. Scolnic, M. Lochner, P. Gris, *et al.*, "Optimizing the lsst observing strategy for dark energy science: Desc recommendations for the deep drilling fields and other special programs," *arXiv preprint arXiv:1812.00516*, 2018.

[13] **Allam Jr, Tarek**, "Radio interferometric image reconstruction for the ska: A deep learning approach," M.S. thesis, University College London, 2016.