Pearse Murphy

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SUMMARY

Postdoctoral researcher/data scientist using **machine learning** (ML) to predict crop resilience to climate change from earth observation (EO) data. Previous achievements include the **end-to-end development** of a state-of-the-art outlier detection ML model to analyse anomalous solar radio emissions, contributing to open source software and six publications in leading academic journals. Extensive experience in **scientific computing**, **data analysis** and **data visualisation** with over 10 years of **software engineering** in **Python**. Seeking to apply my strong **technical**, **communication** and **problem solving** skills in a collaborative data science, or similar role.

EDUCATION

Trinity College Dublin and Dublin Institute for Advanced Studies **Dublin, Ireland**
Ph.D. Solar Physics *September 2017 - February 2022*

Trinity College Dublin **Dublin, Ireland**
B.A. (Mod.) Physics and Astrophysics *September 2013 - May 2017*

SKILLS

Programming and Markup Languages: Python, Bash, SQL, C, JavaScript, Rust, LaTeX, HTML
Libraries and Tools: Numpy, SciPy, Tensorflow, Matplotlib, PyTorch, scikit-learn, Pandas, Django, OpenCV, Git, Docker, Google Cloud
ML Architectures: CNN, UNET, Variational Autoencoders, Transformers, LSTM
Other: Oral and written communication, independently driven research, quick learner, problem solving, organised, self-starter, mentorship, time management, stakeholder management, collaboration, science outreach

WORK EXPERIENCE

Postdoctoral Researcher/Data Scientist
University of Galway, Galway, Ireland *May 2024 - Present*

- Rapidly learned how to use Pytorch and Google Earth Engine to analyse remote sensing EO data. Within my first month I had learned how to use new tools commonly used in EO data analysis.
- Performed extract, transform, load operations on EO data to mask and reshape geospatial data in a format suitable for an ML model that forecasts crop resilience from a time series of EO data.
- Optimised data analysis software resulting in a 20 times speed increase. I contributed to open source software to increase the computational efficiency so that code that once took days to run now takes minutes.
- Broadened my network of EO experts at the AI4Copernicus conference.

Postdoctoral Researcher
Observatoire de Paris, Meudon, France *April 2022 - April 2024*

- Developed and implemented a new ML model using TensorFlow to perform outlier detection for solar radio emissions. Significantly reduced the time to do so compared to existing manual methods from days to minutes. This work resulted in two peer-reviewed publications.
- Experimented with unsupervised ML methods for object segmentation such as Variational Autoencoders. While this saw some success, the time critical nature of the project required a different approach using manually labelled data.
- Designed and implemented a database of solar radio observations identified by ML model described above. The database can be queried with SQL and delivers solar radio data to the research community.
- Presented my research at prominent scientific conferences throughout Europe such as the International Workshop on Machine Learning and Computer Vision in Heliophysics. Tailored talks to audiences of mixed scientific and nonscientific backgrounds.

Ph.D. Researcher
Trinity College Dublin and Dublin Institute for Advanced Studies, Dublin, Ireland *September 2017 - February 2022*

- Used Python on High Performance Computing and Cloud platforms to analyse large, complex datasets. I transformed terabytes of raw radio astronomy data into scientific insight which resulted in two publications in prominent academic journals.
- Used Markov chain Monte Carlo and other statistical methods to model large volumes of data from the Sun. This lead to the publication of my first research paper.
- Designed unique data visualisation for complex datasets with Matplotlib. This allowed for more rigorous analysis of solar radio data in a way that had not been done before.
- Honed my oral communication skills by presenting to experts at international conferences and giving a wide variety of science outreach talks to members of the public from diverse backgrounds.

PUBLICATIONS

- Semantic Segmentation of Solar Radio Spikes at Low Frequencies The Open Journal of Astrophysics, vol. 7, id. 51 - 2024
- Automatic detection of solar radio bursts in NenuFAR observations Proceedings of the 9th International Workshop on Planetary, Solar and Heliospheric Radio Emissions - 2023
- First results from the REAL-time Transient Acquisition backend (REALTA) at the Irish LOFAR station Astronomy & Astrophysics, vol. 655, id. A16 - 2021
- LOFAR observations of radio burst source sizes and scattering in the solar corona Astronomy & Astrophysics, vol. 645, id. A11 - 2021

AWARDS AND ACHIEVEMENTS

- Winner of best short talk at the Irish National Astronomy Meeting - 2019
- Awarded gold medal for exceptional merit at degree examinations - 2017
- Recipient of the Irish Research Council Government of Ireland Postgraduate Scholarship - 2017

PERSONAL INTERESTS

Cycling, musical theatre, choral singing