Maxwell A. Fine

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Education

PhD in Physics & Astrophysics — McGill University (in progress)
MSc in Astronomy & Astrophysics — University of Amsterdam
HBSc in Physics & Astrophysics — University of Toronto

Summary

Astrophysics researcher with 5+ years of experience building numerical models and performance-sensitive Python pipelines. Strong background in statistical inference, time-series analysis, Bayesian modeling, and Monte Carlo simulation. Proven experience designing real-time systems processing high-throughput streaming data. Seeking quant research and trading roles.

Technical Skills

- **Languages:** Python, Bash, Julia
- **Numerical & ML:** NumPy, SciPy, Pandas, PyTorch, Scikit-learn, TensorFlow
- **Statistics & Modeling:** Bayesian inference, time-series analysis, stochastic modeling, signal processing, Clustering, Convolutional Neural Network (CNN)
- **Systems & DevOps:** Linux, Git, Docker, AWS, Kubernetes, Slurm
- **Data & Pipelines:** TB-scale data processing, real-time analytics pipelines, performance-sensitive systems

Publications & Awards

- One first-author paper
- Contributed to four publications in collaboration with CHIME/FRB and ASTRON teams.
- Recipient of various academic and research awards totaling $40,000.
- Presented research at the Massachusetts Institute of Technology (MIT), and and Laboratoire d'Astrophysique de Marseille.

Experience

Graduate Summer Research Fellow   June 2024 – August 2024
Advisors: Dr. Tammo Jan Dijkema & Prof. Jason Hessels   *Astron & JIVE*

- Developed a real-time FRB detection pipeline for the Dwingeloo Radio Telescope, processing streaming data at ~1 Gb/s see the project's GitHub repository. Used clustering and a CNN.
- Detected a burst from FRB20240619D, telescope now apart of FRB follow-up campaigns, see associated paper here.

PhD Researcher   Sept 2025 – Present *McGill*
CHIME/FRB Collaboration; Advisors: Prof. Vicky Kaspi & Prof. Jason Hessels   *University*

- Performed statistical analysis of >10,000 fast radio bursts (FRBs), bright, millisecond-scale radio flashes of unknown extragalactic origin, identifying correlations properties between using Python and Bayesian modeling
- Leading analysis of FRB property correlations for the 4th CHIME Repeating FRB Catalog.
- Maintainer and lead developer of the CHIME/FRB exposure pipeline, tracking on-source time, telescope downtime, and calibrating sensitivity using a pulsar reference catalog.

Research Intern   May 2022 – April 2023
Supervisors: Dr. Ziggy Pleunis, Dr. Paul Scholz   *University of Toronto*

- Conducted multi-messenger search for X-ray and gamma-ray counterparts to CHIME/FRBs using Swift/BAT.
- Developed a data analysis pipeline in `Python` with `HEAsoft` (Bash) and `XSPEC` for fluence modeling.

Research Intern (2x)   May 2020 – August 2021
Advisor: Dr. Cameron L. Van Eck   *University of Toronto*

- Created a novel RM synthesis algorithm for sources with extreme bandwidth depolarization, contributing to the open-source `RM-Tools` Python package.
- Co-authored first-author paper published in *Monthly Notices of the Royal Astronomical Society*.
- Improved error analysis pipeline for the POSSUM survey, fixing underestimated polarization uncertainties.