Maxwell A. Fine

Amsterdam, NL | max.fine@student.uva.nl | afinemax.github.io/afinemax1/ | github.com/afinemax

Education

University of Amsterdam (UvA) Sept 2023 – June 2025

Master of Science in Astronomy & Astrophysics

University of Toronto (UofT) Sept 2018 – May 2023

Honours Bachelor of Science (HBSc) in Physics & Astrophysics

Publications

Maxwell A. Fine, Cameron L. Van Eck, & Luke Pratley. (2023). "Correcting Bandwidth Depolarization by Extreme Faraday Rotation." *Monthly Notices of the Royal Astronomical Society*. ArXiv link.

Research Interests

Fast Radio Bursts (FRBs), radio astronomy, technosignatures (SETI), transients, pulsars, time-domain astronomy, multi-messenger astronomy, observational cosmology, scintillation, radio polarization, hydrogen mapping, cosmic magnetism, techniques, surveys, algorithms, instrumentation, and machine learning & data science in astronomy.

Technical Skills

Skilled in `Python`, `Bash`, `Linux`, with experience using packages such as `Astropy`, `Fetch`, `HEAsoft`, `Matplotlib`, `Numpy`, `Pandas`, `Presto`, `Pytorch`, `RM-TOOLS`, `Scikit-Learn`, `Scipy`, `TensorFlow`, and `Xspec`. Experienced in Bayesian analysis, time-series analysis, algorithm development, Convolutional Neural Networks (CNNs), Fourier analysis, signal processing, machine learning, deep learning, big data (Tb Scale), `Git`, `Docker`, and scientific computing. Experienced with `RaspberryPi` projects, and moderate knowledge in `C++`, `Julia`, `SQL`, `Kubernetes`, cloud computing (AWS), and High-Performance Computing (HPC) environments.

Research Experience

Deciphering the Local Environments of Repeating Fast Radio Bursts Using Scintillation Sept 2024 – Present

University of Amsterdam

Master's Thesis; Advisors: Prof. Ziggy Pleunis & Prof. Jason Hessels

- Using scintillation to study the local environments of repeating FRBs detected by CHIME, focusing on their emission size regions and investigating time variations in scintillation to probe local environments, including potential orbital periods.
- Member of the CHIME/FRB collaboration.
- Presented interim results of master's thesis to Prof. Masui's research group at the Massachusetts Institute of Technology (MIT), November 2024

Real-Time Detection Pipeline for Repeating Fast Radio Bursts Using the Dwingeloo Radio Telescope (DRT) June 2024 – August 2024

Astron & JIVE

Astron Summer Graduate Student Research Fellow; Advisors: Dr. Tammo Jan Dijkema & Prof. Jason Hessels

- Operated the 25m Dwingeloo Radio Telescope (DRT) and developed a real-time detection pipeline for repeating FRBs in `Python`; see the project's GitHub repository.
- Achieved data processing rates of $\sim$1 Gb/s.
- Detected a burst from FRB20240619D, showcasing the telescope's enduring scientific capabilities.

Multi-wavelength Search for Fast Radio Bursts with Swift/BAT May 2022 – April 2023

University of Toronto

AST425 Undergraduate Thesis; Supervisors: Dr. Ziggy Pleunis, Dr. Paul Scholz, & Prof. Bryan Gaensler

- Started as a SURP Summer Undergraduate Research Fellow (Summer 2022).
- Conducted a multi-messenger search for X-ray and gamma-ray counterparts to CHIME/FRBs using Swift/BAT.

- Developed a pipeline in `Python` using `HEAsoft` (written in `Bash`), and `XSPEC` for fluence modeling.

Gravitational Waves from Magnetar Giant Flares Dec 2021 – April 2022
PHYD01 Undergraduate Thesis; Advisors: Dr. Sarah Gossan & Prof. Bryan Gaensler *University of Toronto*

- Investigated the detectability of gravitational waves from magnetar giant flares using next-generation detectors.
- Modeled theoretical gravitational wave signals and analyzed telescope sensitivity curves.

Developing Robust Error Analysis for Radio Polarization Surveys May 2021 – August 2021
SURP Summer Undergraduate Research Fellow; Advisor: Dr. Cameron L. Van Eck *University of Toronto*

- Tested an error analysis pipeline for the Polarization Sky Survey of the Universe's Magnetism (POSSUM).
- Identified and implemented a correction for underestimated errors in the error analysis pipeline.
- Member of POSSUM collaboration for this project.

Hunting for Radio Sources in Extreme Magnetized Environments May 2020 – August 2020
SURP Summer Undergraduate Research Fellow; Advisor: Dr. Cameron L. Van Eck *University of Toronto*

- Created a novel Rotation Measure synthesis algorithm in for cases of extreme bandwidth depolarization.
- Contributed to the open-source `Python` package `RM-Tools` and co-authored a first-author paper published in *Monthly Notices of the Royal Astronomical Society*.
- Started as a summer research fellow, continued after as a part-time researcher until the publication of the paper in 2023.

Awards & Fellowships

ASTRON Summer Research Fellowship (€2,500 + Housing), ASTRON,The Netherlands Summer 2024

- Selected for a competitive fellowship for graduate students to conduct research at ASTRON, the Netherlands institute for radio astronomy. The fellowship was 3 months, from mid June to mid August.

SURP Research Fellowship ($28,595 in Total), Department of Astronomy, University of Toronto Summers 2020, 2021, 2022

- Selected three years in a row for a competitive research fellowship program for undergraduate students. The fellowship was four months each summer, from May 1st to August 31st.

John Pounder Prize in Astronomy (3rd Year, $200), University of Toronto Fall 2021

- Awarded to a full-time student entering the third year of a physical sciences program for having the highest grades in second-year astronomy courses.

NSERC Undergraduate Student Research Award ($6,000), Canadian Institute for Theoretical Astrophysics Spring 2021

- Awarded by the Natural Sciences and Engineering Research Council of Canada (NSERC) to support my second undergraduate research fellowship.

Student Excellence and Leadership Award ($250), University of Toronto July 2020

- Awarded by the Department of Physical & Environmental Sciences (DPES) for academic excellence and community leadership. Recognized as a 'role model student', awarded to no more than one physics student per year.

John Pounder Prize in Astronomy (2nd Year, $300), University of Toronto Fall 2019

- Awarded to a full-time student entering the second year of a physical sciences program for having the highest grades in first-year astronomy courses.

Teaching Experience

Teaching Assistant (TA), University of Toronto
UofT PHYA10: Introduction to Physics I for the Physical Sciences Fall 2021, Fall 2020
UofT PHYA22: Introduction to Physics II for the Life Sciences Winter 2021
UofT PHYA11: Introduction to Physics I for the Life Sciences Fall 2020

- Led weekly 2-hour practical sessions for ∼10-15 students.
- Marked assignments and exams.

Facilitated Study Group (FSG) Leader, University of Toronto

UofT PHYA10: Introduction to Physics I for the Physical Sciences — Fall 2020, Fall 2019
UofT PHYA21: Introduction to Physics II for the Physical Sciences — Winter 2020

- Led & organized review sessions for midterms and finals.
- Ran weekly 3-hour review sessions for ∼10-15 students.
- Created practice problem sets for the review sessions, and attended lectures.

Volunteer Physics Tutor, UofT Physics Study Centre 2019-2022

- Provided 3 hours per week of free tutoring to students in first- and second-year physics and astronomy courses.

Talks

Nov 2024

Presented interim results of master's thesis to Prof. Masui's research group at the Massachusetts Institute of Technology (MIT)

Invited speaker, St. Johns River State College, Florida — Guest Lecture — Nov 2024

Conferences and Workshops Attended

Scintillometry Workshop 2024 (University of Central Florida) — Oct 2024

Fast Radio Burst follow-up workshop (University of Toronto) — April 2023

Leadership in Student Organizations

Executive & Co-founder, University of Toronto Amateur Astronomy Society (UTAAS) 2022–2023

- Co-founded UTAAS and organized outreach activities, including a Perseid meteor shower field trip and regular "sidewalk" astronomy telescope viewings in downtown Toronto.
- Visit the UTAAS Instagram for more information.

Director for Physics, UofT Scarborough Campus Student Union 2021–2022

- Represented physics students at monthly student union meetings and planned initiatives such as the Fall 2020 Climate Strike.
- Coordinated between the student union and department association; contributed to organizing the university's "frosh" week.
- Elected Position

Director for Physics & Astrophysics, UofT Environmental & Physical Sciences Student Association 2018–2020

- Organized events such as student-faculty mixers, career advice panels on, and workshops on applying to internships.
- Managed the Physics Study Center, which provides free tutoring to students in first- and second-year physics and astronomy classes.
- Elected Position

Public Outreach

Volunteer, 25m Dwingeloo Radio Telescope (DRT) Summer 2024

- Conducted public tours and demonstrations at the DRT, explaining the history of radio astronomy and leading observations of the 21cm H line and a pulsar.
- Learn more at the Dwingeloo Radio Telescope website.

Workshop Assistant, Age of the Universe Summer 2023

- Developed a Jupyter Notebook to teach high school students about the Cosmic Microwave Background (CMB) as part of an astronomy workshop led by Dr. Simran Nerval.
- Details available at the Age-of-The-Universe workshop.

Astrotours Volunteer, Dunlap Institute 2022–2023

- Engaged with the public at monthly public lectures, operated optical telescopes, and answered astronomy-related questions.

Earth Hour Volunteer, Dunlap Institute Winter 2019

- Delivered presentations on the Moon's formation and Human landing sites during the institute's Earth Hour event, using a giant inflatable Moon as a visual aid.