Max Kurzner

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Professional Summary

PhD candidate in astrophysics seeking to transition into full-time empirical AI safety research. Strong Python and deep learning experience, including fine-tuning pretrained models, managing large-scale experiments, and rigorously evaluating model behavior under label scarcity, domain shift, and noisy real-world data. I focus on reliability, calibration, robustness, subgroup performance, and failure-mode analysis, and I am particularly interested in safety-relevant research on scalable oversight, adversarial robustness, and interpretability. I am comfortable working from ambiguous questions and imperfect data to design concrete, reproducible experiments and deliver clear, actionable results.

Languages, ML/Data Frameworks and Infrastructure

Programming & Data

Python (Expert): pandas, NumPy, matplotlib, scikit-learn

SQL (Experienced)

Bash/Unix (Experienced)

Version Control & Reproducibility

Git (Experienced)

Reproducible workflows and documentation using LaTeX

Machine Learning & Modeling

Supervised learning for structured and image data

CNN-based representation learning and transfer learning (ZooBot)

Deep learning model development, training, and evaluation using PyTorch (Experienced) and TensorFlow / Keras (Working proficiency)

Bayesian inference and uncertainty-aware modeling

Model evaluation and diagnostics, including calibration, bias assessment, and failure-mode analysis

Scientific & Numerical Computing

Numerical analysis and simulation using NumPy/SciPy (Expert), Astropy (Expert)

Julia, MATLAB (Working proficiency)

Education

University of Victoria, Victoria, BC, CA   September 2021 - [May 2026]
PhD in Astrophysics

Tufts University, Medford, MA, USA   May 2021
Master of Science in Astrophysics

Colgate University, Hamilton, NY, USA   May 2017
Bachelor of Arts in Astronomy & Physics

Research Experience

University of Victoria – Graduate Researcher   Victoria, BC | September 2021 -

Empirical Machine Learning for Large-Scale Image Classification in the Next Generation Virgo Cluster Survey (NGVS)

- Built and maintained Python data pipelines to process and analyze several thousand NGVS images with heterogeneous resolution, noise, and systematic artifacts, with scalability in mind for upcoming surveys containing millions of galaxy images
- Led end-to-end development and execution of deep learning-based image classification workflows using CNN-based representation learning and transfer learning (ZooBot) to address label scarcity and domain shift between training and target datasets
- Implemented rigorous model evaluation workflows, including calibration analysis, subgroup performance slicing, and confident-error diagnostics, to assess whether predictions are reliable enough for downstream use at scale rather than for one-off analysis.

Statistical Modeling and Uncertainty Analysis in the NGVS

- Conducted large-scale statistical analysis combining model fits and human annotations to estimate population-level properties, with a focus on quantifying uncertainty, parameter degeneracy, and robustness of conclusions.
- Applied Bayesian inference and Markov Chain Monte Carlo methods in Python to propagate uncertainty end-to-end and identify failure modes where conclusions were sensitive to modeling assumptions.

Tufts University – Graduate Researcher   Medford, MA | May 2020 - May 2021

Statistical Modeling of Synthetic Stellar Populations

- Implemented probabilistic simulation and statistical modeling workflows in Python to test sensitivity of downstream inferences to modeling assumptions and prior choices, emphasizing interpretability and reproducibility.

Selected Publications & Preprints

Kurzner, M.M., Côté, P., et al. (2025) The Next Generation Virgo Cluster Survey (NGVS). XL: The Morphological Properties of Virgo Cluster Galaxies, [The Astronomical Journal, Volume 170(6), 363](#)

- Large-scale morphological census combining visual classifications with non-parametric structural measurements and catalog properties across the full NGVS sample.

Kurzner, M.M., Spengler, C, Côté, P., et al. (In preparation) The Next Generation Virgo Cluster Survey (NGVS). XXIX. Analysis of the Complete Nuclear Star Cluster Sample

- Statistical modeling and uncertainty-aware inference to estimate population-level properties from heterogeneous measurements.

Kurzner, M.M., Côté, P., Fabbro, S, et al. (In preparation) Deep Learning and NGVS Morphology: A Practical Application of ZooBot

- Evaluation of CNN-based representation learning and fine-tuning strategies under domain shift and limited supervision, with an emphasis on label reliability and model behavior

Cantiello, M., et al. (including **Kurzner, M.M**), (2024) The Next Generation Virgo Cluster Survey (NGVS). III. A Catalog of Surface Brightness Fluctuation (SBF) Distances and the

Three-Dimensional Distribution of Galaxies in the Virgo Cluster, [The Astrophysical Journal, Volume 966(1), 145](#)
- Large collaborative analysis producing refined distance measurements to Virgo member galaxies using a consistent, uncertainty-aware inference framework.

Slivan, Stephen, M., Hosek Jr., **Kurzner, M.M.** et al. (2023) Spin vectors in the Koronis family: IV. Completing the sample of its largest members after 35 years of study, [Icarus Volume 394, article id. 115397.](#)
- Time-series analysis and long-baseline data integration to refine physical parameter estimates in noisy observational regimes

Professional Experience

Clinical Analyst - *Remedy Partners*   Norwalk, CT **|** October 2018 - August 2019
- Evaluated and developed analytical tools used by healthcare organizations to assess financial performance and risk, supporting high-stakes operational and clinical decision-making.
- Translated ambiguous clinical and operational requirements into clear, interpretable quantitative analyses, explicitly surfacing uncertainty and sensitivity to modeling assumptions.

Analyst - *Third Bridge Group*   New York, NY | May 2018 - September 2018
- Conducted primary research and competitive analysis to support client decisions on corporate strategy, product launches, and market entry.
- Rapidly synthesized input from subject-matter experts into concise, decision-relevant analyses under tight deadlines.

Actuarial Intern - *Tokio Millennium Re AG*   Stamford, CT | July 2017- November 2017
- Provided analytical support for probabilistic pricing and reserving models used to forecast loss development across insurance portfolios.
- Assessed model sensitivity to assumptions and historical data, supporting risk-aware decision-making under uncertainty.

Teaching and Communication

University of Victoria – Teaching Assistant   Victoria, BC| Fall 2021 –Spring 2024
- Led undergraduate astronomy laboratory sections (~20–30 students per section), teaching quantitative, statistical, and computational concepts to students with diverse technical backgrounds.
- Provided individualized mentoring and feedback, translating abstract mathematical and computational ideas into clear, actionable problem-solving strategies.

Tufts University – Teaching Assistant   Medford, MA | Spring 2020 –Spring 2021
- Supported instruction for undergraduate astronomy courses, including large introductory lectures (~100 students) and advanced small-section classes (~20 students), reinforcing quantitative reasoning and analytical problem-solving.

Public & Scientific Communication
- Presented technical results at international scientific conferences, including meetings of American Astronomical Society and the Physical Processes Shaping Galaxies conference (GASPISA 2024).

- Delivered public talks to community groups, university clubs, and public schools on galaxies, astronomy, and data-driven science.