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David A. Simon

Curriculum Vitae

LinkedIn
Google Scholar
Orcid

EDUCATION

University of Oxford, Wolfson College — Expected June 2025

- DPhil in Astrophysics

University of Oxford, Pembroke College — June 2021

- MSc in Mathematical and Theoretical Physics

Boston University — May 2020

- B.A. in Physics *with honors* and Mathematics

EXPERIENCE

Dynamical Modelling of Galactic Kinematics using Neural Networks — January 2024 - Present

- Made a convolutional neural network and multi-layer perceptron machine learning model that predicts galaxy kinematics to within 1% accuracy
- Sped up the running time of the architecture over previous models by a factor of 300
- Decreased training set generation time by a factor of 20
- Skills: PyTorch, GPU Cluster, Machine Learning

Recovering the Line of Sight Velocity Distribution of Early-Type Galaxies — July 2023 - Present

- Initialized and ran N-body simulations mimicking early type galaxies using a super computer
- Created mock photometry/integral field observations of the galaxies with realistic noise and systematics
- Developed a set of community standards for measuring galaxy kinematics
- Skills: Statistics, Super Computing, Simulations, Jupyter

Oxford Strategy Group Consulting — April 2023 - June 2023

- Studied different data monetization strategies for a major online media company
- Designed, issued, and analyzed a survey that studied customer preferences
- Skills: MS Office, Market Research, Data Monetization

Measuring the Supermassive Blackhole in M87 — October 2021 - March 2023

- Determined the mass of the supermassive black hole in M87 to be 25% larger than previously believed
- Pioneered a new technique to measure the stellar density of galaxies revealing a discrepancy with previous assumptions of a factor of 2
- Developed new modeling techniques allowing for realistic dynamical modeling of galaxy kinematics
- Skills: MCMC, Python, Differential Equations, LaTeX

Quasi Normal Modes and Black Holes — October 2020 - June 2021

- Modified existing mathematical methods to study a black hole quasinormal model toy model
- Numerically solved and created visualizations of quasinormal modes
- Skills: Mathematica, Data Visualization, Special Functions

LEADERSHIP

Undergraduate Learning Assistant, *Boston University* September 2018 - May 2020

- Ran weekly discussion sections with a graduate teaching fellow for 5 undergraduate physics courses
- Wrote weekly discussion worksheets used by ∼40 students
- Hosted weekly office hours and end of term review sessions
- Conducted and evaluated interviews with learning assistant applicants.

Peer Mentoring, *Boston University* September 2018 - May 2020

- Mentored 7 physics and mathematics undergraduate students
- Helped students create short and long term goals and implemented a plan to achieve them
- Evaluated academic progress and identified new habits and resources that improved performance

Cosmos and Canvas: Using Data Visualization to Explore and Communicate Your Science, *Astrophysics Department, Oxford* December 2022

- I organized and attended this one day workshop which taught astrophysicists how to take raw astrophysical observations and colorize them for public outreach and improved visual literacy.

PRESENTATIONS

Oral Presentations

- Machine Learning for Astrophysics 2024 Conference July 2024
  Dynamical Modelling of Galactic Kinematics using Neural Networks
- Invited Talk, *Tsinghua University* April 2024
  Dynamical Modelling of Galactic Kinematics using Neural Networks
- Invited Talk, *Shanghai Astronomical Observatory* April 2024
  Dynamical Modelling of Galactic Kinematics using Neural Networks
- Invited Talk, *Shanghai Jiaotong University* April 2024
  Dynamical Modelling of Galactic Kinematics using Neural Networks
- Invited Talk, *Nanjing University* March 2024
  Dynamical Modelling of Galactic Kinematics using Neural Networks
- European Astronomical Society Annual Meeting July 2023
  Revealing the Stellar Center of M87 with Integral Field Spectroscopy: Effects on the Black Hole Mass

Poster Presentations

- European Astronomical Society Annual Meeting July 2024
  Dynamical Modelling of Galactic Kinematics with Neural Networks
- European Astronomical Society Annual Meeting July 2024
  Recovering the Line of Sight Velocity Distribution and Mass Distribution in Simulated Early-Type Galaxies
- National Astronomy Meeting June 2023
  Anchoring Black Hole Relations in the Local Universe: The Case of M87