

Aaron Ouellette

Curriculum Vitae

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Education

- 2020– **Ph.D. in Physics**, GPA: 3.93/4, University of Illinois at Urbana-Champaign (UIUC).
- 2019–2020 **M.Sc. in Physics**, GPA: 4.0/4, Rensselaer Polytechnic Institute (RPI), Troy, NY.
- 2016–2019 **B.Sc. in Physics**, GPA: 3.96/4, RPI.

Research Interests

- **Cosmology and Astrophysics**
Focus on: Large-Scale Structure, Galaxy Formation and Evolution
- **Data Analysis and Machine Learning**
- **Simulations and High Performance Computing**

Research Experience

- 2020– **Graduate Student, UIUC.**
 - Working with Prof. Gilbert Holder on ways to constrain galaxy formation models using topological data analysis.
 - Worked with Prof. Matias Carrasco Kind on using machine learning and high-performance computing to understand the evolution of galaxy clusters.
- June–Aug 2019 **SRP Intern, Argonne National Lab (ANL)**, Cosmological Physics and Advanced Computing (CPAC) Group.
 - Worked with Matthew Becker using compressed sensing to improve image inpainting algorithms for weak lensing analysis. Developed an inpainting algorithm based on sparse representation using wavelets.
- 2018–2020 **Undergrad and Masters student, RPI.**
 - Studied spiral structure in simulations of disk galaxies with Prof. Heidi Newberg. Specifically focused on the effects of merging dwarf galaxies on the evolution of the spiral structure.

Publications

- Ouellette, A., Holder, G., Kerman, E., "Topological data analysis reveals differences between simulated galaxies and dark matter haloes," in *MNRAS*, vol. 523, no. 4, pp. 5738-5747, Aug, 2023.

Work Experience

May – Aug 2021 **Data Science Intern**, *Gies College of Business (UIUC)*.

- Worked on a project for the College of Agriculture to visualize the effects of climate change on agriculture and interstate trade. *Languages and frameworks used*: Python, Javascript, Flask, leaflet, d3.js.

Teaching Experience

2020– **Grad T.A.**, *UIUC*, Courses taught: PHYS 212 (Intro E&M), PHYS 211 (Intro Mechanics), PHYS 214/213 (Quantum and Thermal Physics), PHYS 325 (Classical Mechanics).

2021–2022 **Private Tutoring**, Met weekly with a student over Zoom to help with Modern Physics, Classical Mechanics, and Quantum Mechanics..

2019–2020 **Grad T.A.**, *RPI*, Courses taught: Intro E&M, General Physics, Cosmology.

2018–2019 **Undergrad T.A.**, *RPI*, Courses taught: Quantum Physics 1 and Quantum Mechanics.

2017 **I-PERSIST Mentor**, *RPI*, Mentored two groups of ~ 10 first year physics majors to help them adjust to college and succeed in physics..

Relevant Courses

- ASTR 506 (UIUC) Galaxies
- ASTR 510 (UIUC) Computational Astrophysics
Completed a final project on the convergence properties of cosmological N-body simulations.
- ASTR 596 (UIUC) Seminar class on AI and Big Data in Astronomy
- PHYS 515 (UIUC) General Relativity
- ASTR 4960 (RPI) Galactic Structure
- PHYS 4810 (RPI) Computational Physics
Completed a final project on numerical methods for N-body simulations.

Activities

- Attended Michigan Cosmology Summer School, Jun 5-9 2023.
- APS April Meeting 2023, present poster *Topological data analysis reveals differences between galaxies and halos*.
- UIUC Astrofest, presented poster *Future evolution of dark matter halos in a Lambda CDM universe*, Apr 23 2022

- Penn State Summer School in Statistics for Astronomers XVI, Jun 1-5 2021.
- UIUC Astrofest, presented poster, Apr 23 2021.
- Michigan Cosmology Summer School, Jun 1-5 2020.
- ANL, presented poster, Aug 2019.
- ANL HEP Division Young Scientist Symposium, gave talk, Aug 2019.

Honors & Awards

- ICASU-CAPS Fellowship (2023) – one year fellowship funded jointly by the Illinois Center for Advanced Studies of the Universe and the Center for AstroPhysical Surveys
- DAP Travel Grant to present at the APS April Meeting (2023)
- Won the Astrofest Graduate Student Poster Prize (2022)
- Travel Award to attend Penn State Astrostatistics Summer School and virtual SCMA VII conference (2021)
- Sigma Pi Sigma Honor Society membership (2018)
- Rensselaer Medal Scholarship (2016)

Computer Skills

- **OS**
Linux, Windows
- **Languages**
Python, C++, Matlab, Shell, L^AT_EX
- **Other**
High-Performance Computing (MPI, HPC cluster usage), Tensorflow, Keras, PyTorch

Languages

- **English** Native
- **Russian** Mostly proficient