

Peter A. Craig

CONTACT INFORMATION

Peter Craig

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RESEARCH INTERESTS

Dynamical Astronomy, Cosmology and Gravitationally Lensed Supernovae: machine learning techniques, the potential of the Milky Way, the missing satellite problem, dark matter sub-structure, gravitational millilensing and microlensing, Hubble tension, galactic structure, kinematics in the Solar neighborhood, and dwarf galaxy interactions.

EDUCATION

Rochester Institute of Technology, Rochester, NY

Ph.D., Astrophysical Sciences and Technology, Expected June 2023

- Adviser: Dr. Sukanya Chakrabarti

M.S., Astrophysical Sciences and Technology, July 2020

- Thesis Title: “*Galaxies as Probes of the Universe: From Dynamical Models to the Inference of Cosmological Parameters*”
- Adviser: Dr. Sukanya Chakrabarti
- GPA: 4.0

Rensselaer Polytechnic Institute, Troy, NY

B.S., Physics and Mathematics, June 2018

- *Summa cum Laude* Dual Major in Physics and Mathematics
- GPA: 3.93

REFEREED JOURNAL PUBLICATIONS

- [1] Chakrabarti, S., Simon, J., **Craig, P.** et al. A non-interacting Galactic black hole candidate in a binary system with a main-sequence star , *AAS Journals* Accepted 2023 doi:10.3847/1538-3881/accf21
- [2] **Craig, P.**, Chakrabarti, S., Baum, S., and Lewis, B. An estimate of the mass of the Milky Way from the Magellanic Stream, *Monthly Notices of the Royal Astronomical Society* Accepted 2022 doi:10.1093/mnras/stac2308
- [3] **Craig, P.**, O’Connor, K., Chakrabarti, S. et al. A targeted search for strongly lensed supernovae and expectations for targeted searches in the Rubin era, *Monthly Notices of the Royal Astronomical Society*, Submitted 2023
- [4] **Craig, P.**, Chakrabarti, S., Newberg, H., and Quillen, A. Dynamically produced moving groups in interacting simulations, *Monthly Notices of the Royal Astronomical Society* 2021, Volume 505, Issue 2, pp 2561 - 2574 doi:10.1093/mnras/stab1431
- [5] Chakrabarti, S., Wright, J., Chang, P., Quillen, A., **Craig, P.** et al. Toward a Direct Measure of the Galactic Acceleration, *The Astrophysical Journal Letters* 2020, 902(1), L28
- [6] Gaspard, M., **Craig, P.**, Bergland, E., An Integro-Differential Model of Language Competition, *SIAM Undergraduate Research Online*, 12, 94-104, 2019

PAPERS IN PREPARATION

- [7] **Craig, P.**, Nugent P., Chakrabarti, S., Modelling the Effects of Microlensing on Gravitationally Lensed Supernovae

CONFERENCE
TALKS

- [1] **Craig, P.**, Chakrabarti, S., Sanderson, R., Nikhathar, F., Reino, S. Building an Acceleration Ladder with Tidal Streams and Pulsar Timing. In: *Towards Real-Time Galactic Dynamics*, July 25–29 2022. Lorentz Center, Leiden, NL
- [2] **Craig, P.**, Chakrabarti, S., Sanderson, R., Nikhathar, F., Reino, S. Building an Acceleration Ladder with Tidal Streams and Pulsar Timing. In: *AAS Division on Dynamical Astronomy meeting #53*, April 25–28, 2022. Flatiron Institute, New York, NY
- [3] **Craig, P.**, Newberg, H., Chakrabarti, S. Do Perturbations from Dwarf Galaxies Produce Moving Groups in the Milky Way Disk? In: *KITP Program Dynamical Models for Stars and Gas in Galaxies in the Gaia Era*, March 4–18, 2019. Santa Barbara, CA, USA.

CONFERENCE
POSTERS

- [4] **Craig, P.**, Newberg, H., Chakrabarti, S. Do Perturbations from Dwarf Galaxies Produce Moving Groups in the Milky Way Disk? In: *American Astronomical Society, AAS Meeting #231*, January 8–12, 2018. National Harbor, MD, USA.
- [5] **Craig, P.**, Newberg, H., Chakrabarti, S. Do Perturbations from Dwarf Galaxies Produce Moving Groups in the Milky Way Disk? In: *Astronomical Society of New York Fall 2017 Meeting*, November 10–11 2017. Schenectady, NY, USA.

SUCCESSFUL
PROPOSALS

- [1] Co-Principal Investigator, “Finding Black Holes Around Luminous Companions”, APF 2022, Awarded 20 hours
- [2] Co-Principal Investigator, “Fundamental Galactic parameters from Direct Acceleration Measurements”, VLT/ESPRESSO 2021, Awarded 35 hours
- [3] Co-Principal Investigator, “Lensed Supernovae at Low Redshift”, LCO Proposal 2019, Awarded 100 hours
- [4] Co-Principal Investigator, “Lensed Supernovae at Low Redshift”, LCO Proposal 2019, Awarded 205 hours
- [5] Co-Principal Investigator, “Lensed Supernovae at Low Redshift”, LCO Proposal 2018, Awarded 200 hours

AWARDS

- 1-year DOE Office of Science Graduate Student Research (SCGSR) Program at Lawrence Berkeley National Laboratory December 2021 - November 2022
- Inducted into the Phi Kappa Phi honor society 2021
- RPI Founders award 2017

RESEARCH
PROJECTS

- Simulating the spectra of strongly lensed supernovae with the effects of gravitational microlensing
- Building an acceleration analog to the distance ladder using pulsar timing and stellar streams
- Running hydrodynamic simulations of the Magellanic Stream to dynamically estimate the mass of the Milky Way
- Conducting a survey to search for supernovae in strongly lensed galaxies
- Analyzing hydrodynamic simulations to study moving groups in the Milky Way

TEACHING
EXPERIENCE

Rochester Institute of Technology, Rochester, NY

Teaching Assistant

August 2018 to May 2019

- Introduction to Special Relativity
 - Fall 2018
 - Responsible for 1-hour recitation sessions once a week, along with writing problems and assisting with exam grading
- Electricity and Magnetism
 - Spring 2018
 - Responsible for grading all homework assignments

Rensselaer Polytechnic Institute, Troy, NY

Tutoring

August 2016 to May 2018

- I worked for the RPI drop-in tutoring center to tutor differential equations and multivariable calculus

Rochester Chess Center, Rochester NY

Chess Teaching

August 2018 to March 2020

- Taught chess to young students at local elementary schools

STUDENT
MENTORING

- Mentored undergraduates as part of a University of Hawaii REU program
- Taught undergraduate students how to produce and analyze difference images to search for strongly lensed supernovae

PROGRAMMING
SKILLS

Programming Languages and Analysis Techniques

- Very experienced with python and C++
- Experienced with C, UNIX shell scripting, and SQL/ADQL
- Familiar with MATLAB and Fortran
- Very experienced with hydrodynamic simulations (GIZMO), data analysis and MCMC methods
- Experienced with machine learning techniques, image analysis, difference imaging and algorithm development

OUTREACH

- Public Observing at the MSU Observatory 2023 to 2024
- Astronomy on Tap in Lansing 2023 to 2024
- Star parties in the Adirondacks and at an independent school 2020 to 2022
- Designed astronomy demos and presented at Imagine RIT 2019
- Rensselaer Astropysical Society President / Vice President 2016 to 2018
 - Organized and ran outreach events
 - Ran public observing every Saturday night at the Hirsch observatory
- Outreach Coordinator for the RPI Society of Physics Students 2016
 - Organized and ran outreach events, helped with designing and building demonstrations