Kiyan Tavangar

825 West End Ave Apt 9B, New York, NY 10025
Phone: 646-249-6786 E-Mail: k.tavangar@columbia.edu

Education

PhD Student at Columbia University **September 2022 - present**

Advisors: Kathryn V. Johnston, Melissa Ness

Provost Scholar at the University of Chicago, Chicago, IL **Graduated: 06/21**

Astrophysics B.S. (Honors, Cum Laude), Mathematics B.S.

GPA: 3.74
Primary Major (Astrophysics) GPA: 3.85

Research Interests:

Dark matter, Local Group, near-field cosmology, stellar streams, galactic dynamics, Milky Way astrophysics, gravitational lensing, dark energy, stellar populations

Research Experience

Research with Prof. Kathryn Johnston at Columbia University **September 2022 - present**

Understanding Milky Way disk dynamics by analyzing the formation and evolution of phase space spirals in the disk. I use the infrastructure from the B-BFE collaboration to understand the changes in phase space spiral morphology across space and time in simulations and data.

Research with Prof. Melissa Ness at Columbia University **September 2023 - present**

Understanding halo dissolution in the Milky Way using empirical methods. I use APOGEE spectra reference labels to predict the Gaia RVS spectral features for halo stars with *The Cannon*. I will combine this chemical work with some dynamical tagging to see if I can quantify how much substructure is in the halo.

Research with the CATS Collaboration **November 2022 – present**

The Community Atlas of Tidal Streams (CATS) collaboration is making density models of Milky Way stellar streams in a homogenous way for the benefit of the astronomical community. This includes selecting member stars in a generalized and automated way for all streams (which I am leading) and creating morphological membership probability models (which is based on my work with Adrian Price-Whelan at the CCA).

Guest Researcher at the Flatiron Institute CCA **September 2021 – April 2022**

Worked primarily with Dr. Adrian Price-Whelan on stellar streams in the Gaia EDR3 data, with a focus on GD-1. Developed tools for a purer selection of stream stars including new techniques for isochrone and proper motion selections. We also ran some models of stream sub halo interactions to determine the cause of the spur.

Research with Prof. Alex Drlica-Wagner at the University of Chicago **January 2019 - June 2021**

Searching for previously undetected ultra-faint dwarf galaxies and stellar streams in new data of sky surveys. Conducted an extensive analysis of the Phoenix stream by creating a statistical model to determine the track, width, and intensity along the stream, finding unexpected small scale density deviations.

Research with Prof. Michael Gladders at the University of Chicago **January 2020 - June 2021**

Research with ChicagO Optically selected strong Lenses – Located At the Margins of Public Surveys collaboration (COOL-LAMPS), focused on the detection of new strong gravitational lenses. Created source models for the selected targets using Galfit. Converted raw data from the Nordic Optical Telescope into usable spectra. Helped publish an analysis on the brightest redshift 5 galaxy in the universe to date.

Teaching Experience

Mentor in StreamTeamTNG program **January 2023 - present**

StreamTeamTNG is an extracurricular program designed to teach undergraduates interested in astronomy about how to do research effectively. It uses example projects in stellar streams to teach in the basics in working with simulations and data, reading papers, and making presentations. I designed most of the assignments and led some of the group meetings.

Teaching Assistant for undergraduate *Galaxies* course **Fall 2022**

Course for Astronomy or Astrophysics majors (usually third years). I hosted office hours weekly

Teaching Assistant for undergraduate *Stars and Atoms* course **Spring 2023**

Course for non-majors of all years. I hosted office hours weekly and helped design the final project.

Selected Publications

1. **Tavangar** and Price-Whelan (in prep). *Inferring the density and membership of stellar streams with flexible models: The GD-1 stream in Gaia Data Release 3*
2. **Tavangar** et al (in prep). *Understanding correlations between the vertical phase space "snails" across the disk using BFEs and mSSA.*
3. Chiti & **Tavangar** et al (in prep). *DELVE-ing into the Milky Way's Globular Clusters: Detection of extra-tidal features in NGC5634 and NGC5897, and predicting detectability in upcoming surveys*
4. **Tavangar** et al 2021. *From the Fire: A Deeper Look at the Phoenix Stream. The Astrophysical Journal Volume 925*(2), 118. https://ui.adsabs.harvard.edu/abs/2022ApJ...925..118T/abstract
5. Li et al. (2021). S^5: The Orbital and Chemical Properties of One Dozen Stellar Streams. *The Astrophysical Journal, Volume 928*(1), 30. https://ui.adsabs.harvard.edu/abs/2022ApJ...928...30L/abstract
6. Ferguson et al. (2021). DELVE-ing into the Jet: a thin stellar stream on a retrograde orbit at 30 kpc. *The Astronomical Journal, Volume 163*(1), 18. https://ui.adsabs.harvard.edu/abs/2022AJ....163...18F/abstract
7. Stringer et al. (2021). Identifying RR Lyrae Variable Stars in Six Years of the Dark Energy Survey. *The Astrophysical Journal, Volume 911*(2), 109. https://ui.adsabs.harvard.edu/abs/2021ApJ...911..109S/abstract
8. Drlica-Wagner et al. (2021). The DECam Local Volume Exploration Survey: Overview and First Data Release. *The Astrophysical Journal Supplement Series, Volume 256*(1), 2. https://ui.adsabs.harvard.edu/abs/2021ApJS..256....2D/abstract
9. Khullar et al. (2020). COOL-LAMPS I. An Extraordinarily Bright Lensed Galaxy at Redshift 5.04. *The Astrophysical Journal, Volume 906*(2), 107. https://ui.adsabs.harvard.edu/abs/2021ApJ...906..107K/abstract
10. Shipp, Price-Whelan, **Tavangar**, et al. (2020). Discovery of Extended Tidal Tails Around the Globular Cluster Palomar 13. *The Astronomical Journal, Volume 160*(5), 244. https://ui.adsabs.harvard.edu/abs/2020AJ....160..244S/abstract

11. Mau, Cerny et al. (2020). Two Ultra-Faint Milky Way Stellar Systems Discovered in Early Data from the DECam Local Volume Exploration Survey. *The Astrophysical Journal, 890*(2), 136. https://arxiv.org/abs/1912.03301

Presentations

Understanding "Snails" in the Milky Way Disk. "Chicago-land structure formation aficionados" Group Meeting (University of Chicago), April 2023

Understanding "Snails" in the Milky Way Disk. CCA Dynamics Community Meeting, February 2023

Modeling GD-1 and the Spur in Gaia EDR3. Kavli Institute of Cosmological Physics Survey Science Group Meeting, February 2022

Stream Modeling of ATLAS and Phoenix in DES. Streams 21: Constraints on Dark Matter, February 2021

From the Fire: A Deeper Look at the Phoenix Stream. Southern Stellar Stream Spectroscopic Survey (S5) Telecon, November 2020

DES Year 6 and DECaLS Stream Analyses. DES Milky Way Working Group General Telecon, September 2020

DES and DECaLS Year 6 Stream Analyses. Kavli Institute of Cosmological Physics Survey Science Group Meeting, September 2020

Dwarf Galaxy and Stellar Stream Detection in DECaLS DR7. Kavli Institute of Cosmological Physics Survey Science Group Meeting, January 2020

Scientific Collaborations

Beyond Basis Function Expansion (B-BFE) Collaboration Student Member 2022-present

Community Atlas of Tidal Streams (CATS) 2022-present

Center for Computational Astrophysics (CCA) Dynamics Group at the Flatiron Institute 2021 - 2022

ChicagO Optically selected strong Lenses – Located At the Margins of Public Surveys Collaboration (COOL-LAMPS) Member 2020 – present

Southern Stellar Stream Spectroscopic Survey (S^5) Member 2020 – 2022

Dark Energy Survey (DES) Collaboration External Collaborator 2019 – present

DECam Local Volume Exploration Survey (DELVE) Student Member 2019 – present

Kavli Institute of Cosmological Physics Survey Science Group Member 2019 – 2021

Technical Proficiencies

- Experience writing open-source software
- Extensive knowledge of Python
- Working knowledge of MATLAB, Stan, and Scheme
- Experience in lensed source modeling
- Extensive experience in dynamical modeling
- Extensive experience using large datasets
- Three nights remote observing experience with the Blanco 4m Telescope for the DELVE survey

Other

University of Chicago Varsity Cross Country and Track & Field Teams — 2017 – present

- NCAA Division III All-Academic Men's Track & Field Team — 2020
- University Athletic Association (UAA) All-Academic Recognition — 2017, 2018, 2019, 2020, 2021
- Scoring member at conference championship — 2018, 2019

Private Violinist (Since age 5)

Fluent in French, Dual US and French citizen

Intermediate level in Spanish