Somayeh Khakpash

Postdoctoral Researcher at University of Delaware
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Education and Professional Appointments

LSSTC Catalyst Fellow at Rutgers University
Research Fellow 2020-present
Advisor: Prof. Charles Keeton

University of Delaware
Postdoctoral Researcher 2020-present
Advisor: Prof. Federica Bianco

Lehigh University
Ph.D. Physics 2017- 2020
M.S. Physics 2015- 2016
Advisor: Prof. Joshua Pepper

Sharif University of Technology
B.A. Physics 2010-2015

Research interests

Microlensing: Microlensing was the focus of my dissertation work: I develop algorithms to extract features from the microlensing light curves and use the features to detect, classify and characterize the events in a fast and efficient way. I am the coordinator of the Rubin LSST TVS microlensing subgroup whose key activities include providing critical scientific input to Rubin Observatory to determine a final survey strategy for LSST that would benefit the microlensing science and ensure the scientific community develops tools to study microlensing in the LSST era.

Time domain astronomy: As a member of the KELT survey I work on light curves of variable stars, eclipsing binaries, and exoplanet candidates. As part of my postdoctoral research, I have focused on analyzing light curves of unusual supernovae, creating data-driven templates for subclasses of stripped-envelope supernovae to ultimately identify usual and unusual stellar explosions photometrically. Additionally, the focus of my microlensing work is on photometric classification.

Machine learning (ML): As a Rubin LSSTC Data Science Fellow, I have been trained in the development of ML methods and their application on large data samples of astrophysical time series and images. The core thrust of my research is in the development of innovative methods to classify microlensing events, variable stars, and transients from their light curves. I am a member of the Rubin LSST TVS classification and characterization subgroup, and member of a K2 mission project aimed at developing models for photometric classification of K2 lightcurve and evaluating impact of cadence degradation on the classification.

Large surveys: I am a member of the Roman and Rubin communities. In Rubin, I have taken leadership community roles in the Science Collaborations. I have worked extensively on simulated Roman data, and I have a comprehensive knowledge of how the Roman telescope will play a pivotal role in the future of the exoplanetary explorations and challenges could hinder its goals.

Skills

Programming Software: Python, C++, MATLAB, LaTeX

Awards and Honors

- **LSSTC Catalyst Fellowship**, September 2022 - present
- AAS FAMOUS Travel Grant, Jan 2019
- **LSSTC Data Science Fellowship Program**: Two-year program to teach data science skills to astronomy graduate students, September 2017 - June 2019.
- Lehigh University, College of Arts and Sciences Dean's Summer Fellowship 2017, 2020

Refereed Publications

1. **Khakpash, S**., Pepper, J., Penny, M., Gaudi, S., and Street, R., 2021 "Classifying High-cadence Microlensing Light Curves I; Defining Features". *The Astronomical Journal, 161(3), p.23.*
2. **Khakpash, S.**, Penny, M. and Pepper, J., 2019. "*A Fast Approximate Approach to Microlensing Survey Analysis*". *The Astronomical Journal*, *158*(1), p.9.
3. Romy Rodríguez Martínez, B Scott Gaudi, Joseph E Rodriguez, George Zhou, 2020, including **Khakpash, S.** *"KELT-25 b and KELT-26 b: A Hot Jupiter and a Substellar Companion Transiting Young A Stars Observed by TESS*". *The Astronomical Journal, 160(3), p.111*.
4. F Davoudi, SJ Jafarzadeh, A Poro, O Basturk, S Mesforoush, 2020, including **Khakpash, S. "**Light curve analysis of ground-based data from exoplanets transit database". *New Astronomy, 76, p. 101305.*
5. Johns, D., Reed, P., Rodriguez, J., Pepper, J., 2019, including **Khakpash, S**. "*KELT-23b: A Hot Jupiter Transiting a Near-Solar Twin Close to the TESS and JWST Continuous Viewing Zones*". *The Astronomical Journal, 158(2),p.14*.
6. Rodriguez, J.E., Eastman, J.D., Zhou, G., Quinn, 2019, including **Khakpash, S**. "*KELT-24b: A 5M_J Planet on a 5.6 day Well-Aligned Orbit around the Young V= 8.3 F-star HD 93148*". *The Astronomical Journal, 158(5),p.15*.

White Papers

1. Street, R.A., Lund, M.B., Donachie, M., **Khakpash, S.**, 2018. "*Unique Science from a Coordinated LSST-WFIRST Survey of the Galactic Bulge". arXiv preprint arXiv:1812.04445*
2. Street, R.A., Lund, M.B., **Khakpash, S.**, Donachie, 2018. "*The Diverse Science Return from a Wide-Area Survey of the Galactic Plane*". *arXiv preprint arXiv:1812.03137*.
3. Jennifer C Yee, Jay Anderson, Rachel Akeson, Etienne Bachelet, 2018, including **Khakpash, S**. "White Paper: Exoplanetary Microlensing from the Ground in the 2020s". *arXiv preprint arXiv:1803.07921*

Attended Conferences and Workshops

- Rubin Observatory Project & Community Workshop, Aug 2022, Tucson AZ
- BOOM Workshop, July 2022, Urbana-Champaign, IL
- American Astronomical Society Meeting, Jan 2022, Virtual
- University of Delaware Data Science Symposium, Nov 2021, Newark DE
- Rubin Observatory Project & Community Workshop, Aug 2021, Virtual
- American Astronomical Society Meeting, Jan 2021, Virtual
- Exoplanet Demographics, Nov 2020, Virtual
- Rubin Observatory Project & Community Workshop, Aug 2020, Virtual
    - Member of the Scientific Organizing Committee
- LSST TVS-SMWLV Workshop, Oct 2019, Newark, DE
    - Member of the Scientific Organizing Committee
- Central Pennsylvania Consortium Conference, Apr 2019, Gettysburg, PA
- International Microlensing Conference, Jan 2019, Nashville, TN
- American Astronomical Society Meeting, Jan 2019, Seattle, WA
- American Astronomical Society Meeting, Jan 2018, Washington DC
- LSST Transients and Variable Stars Science Collaboration Workshop, Jun 2018, Bethlehem, PA
    - Member of the Local Organizing Committee
- Sagan Exoplanet Workshop: Microlensing in the Era of WFIRST, Aug 2017, Pasadena, CA
- KELT Workshop, Jun 2017, Bethlehem, PA
- KELT Workshop, Aug 2016, Nashville, TN
- Astrophilly Conference, Aug 2016, Philadelphia, PA
- Astronomy Summer School, Aug 2013, Karaj, Iran

Contributed Talks and Posters

- **Poster** at Rubin Observatory Project & Community Workshop, Aug 2022, Tucson AZ
- **Talk** at American Astronomical Society Conference, Jun 2022, Virtual
- **Poster** at the University of Delaware Data Science Symposium, Nov 2021, Newark DE
- **Talk** at Rubin Observatory Project & Community Workshop, Aug 2020, Virtual
- **Talk** at LSST TVS-SMWLV Workshop, Oct 2019, Newark, DE
- **Talk** at Central Pennsylvania Consortium Conference, Apr 2019, Gettysburg, PA
- **Talk** at International Microlensing Conference, Jan 2019, Nashville, TN
- **Talk** at American Astronomical Society Conference, Jan 2019, Seattle, WA
- **Poster** at American Astronomical Society Conference, Jan 2018, Washington DC
- **Talk** at KELT Workshop, Aug 2016, Nashville, TN

Invited Talks

- BOOM Workshop, July 2022, Urbana-Champaign, IL
- Laboratório Interinstitucional de e-Astronomia (LIneA), June 2022, Virtual
- Center for Astrophysics at Harvard, Mar 2021, Virtual
- University of Delaware, Nov 2019, Newark, DE
- Pennsylvania State University, Oct 2019, State Collage, PA
- The Lehigh Valley Amateur Astronomical Society (LVAAS), Mar 2019, Allentown, PA

Teaching Experience

- Guest Lecturer for “Data Science for Physical Sciences”, Fall 2021
- Co-instructor for “Modern Astrophysics II”: An upper-level undergraduate course in galaxies and cosmology, with Professor Pepper, Spring 2019
- Teaching assistant for “Introduction to Astronomy”, Fall 2018
- Instructor for Physics Lab I, Fall 2015 & 2016 & 2019, Spring 2019
- Instructor for Physics Lab II, Spring 2017 & 2018
- Instructor for Concepts in Physics Lab, Spring 2016

Outreach and Service

- Serving in the SOC of the International Microlensing Conference, Sep 2022, Paris, France
- Serving in the SOC of the University of Delaware Data Science Symposium, Nov 2021, Newark, DE
- Co-organizer and presenter at a series of virtual talks about “doing research in astronomy for junior researchers” in Farsi, 2020
- Serving in NASA mission review panel
- Serving in the SOC of the Rubin Observatory Project & Community Workshop, Aug 2020, Virtual
- Serving in the SOC of the LSST TVS-SMWLV Workshop, Oct 2019, Newark, DE
- Serving in the LOC of the LSST TVS Science Collaboration Workshop, Jun 2018, Bethlehem, PA
- Writer at an astrophysical literature website written in Farsi (staryab.com), Since 2016