Krzysztof Suberlak

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Interests

Active optics, variability, data mining. As part of the Vera Rubin Observatory Commissioning Team, I ensure via simulations that the Active Optics System will perform according to the science requirements. I also pursue time-domain quasar research, and spectroscopic follow-up. I am passionate about teaching and sharing astronomy.

Education

PhD Astronomy, University of Washington, Seattle, WA. 2013 – 2019
Thesis: Quasar Variability as seen by Large Optical Sky Surveys.
Advisor: Prof. Željko Ivezić

MPhys Physics, University of Oxford, United Kingdom. 2008 – 2012
Advisors: Prof. Mark Sullivan and Dr. Fraser Clarke.

Selected Research Experience

Vera C. Rubin Observatory Commissioning: Postdoctoral Scholar 2019 - present

Rubin Observatory Active Optics System - testing and development of the wavefront estimation pipeline:

- SITCOMTN-108: Active Optics System Simulations Using opSim and imSim
- SITCOMTN-085: Donut stacking vs pairing for wavefront sensing estimation
- SITCOMTN-072: Sensitivity Matrix Calculation for Auxiliary Telescope
- SITCOMTN-046: AOS Algorithm for Wavefront Estimation
- Detailed explanation of the structure of the wavefront estimation pipeline
- SITCOMTN-044: The Active Optics System Algorithm and Centroid Offsets
- SITCOMTN-038: AuxTel data analysis: images to Zernikes
- Adapted the wavefront estimation code to use auxiliary telescope images
- Evaluated the accuracy of the WCS solution for using reference catalogs
- Used realistic simulations of the defocal and in-focus images seeded with the GAIA DR2 catalog to test the system performance with realistic levels of stellar crowdedness
- Improved the Instrument Signature Removal process for simulated images

LSST Crowded Fields: DM Subsystem Science Team 2018
Comparing the results of LSST stack processing of DECAPS data to the state-of-the-art pipeline in areas of high stellar density

- Analyzed the processed images and source catalogs, identified figures of merit
- Made recommendations concerning photometric accuracy and astrometric precision (DMTN077 "LSST Fall 2017 Crowded Fields Testing")

LSST Prototype Data Access Center: DM Subsystem Science Team 2017

- Tested the functionality of PDAC
- Made recommendations for the DM-SST team, summarized in the report DMTR022 "Prototype Data Access Center: User Report"

eScience Data Science for Social Good Jun 2015 – Aug 2015
Summer work at the University of Washington eScience Institute, with Dr. Ariel Rokem and Dr. Bryna Hazelton on a Gates Foundation project "Predictors of Permanent Housing for Homeless Families"

- Cleaned the heterogeneous datasets describing homeless shelters in King, Pierce and Snohomish counties
- Developed python code with hierarchical clustering to define families based on coincidence of entry times and IDs

Computer skills

Python open data science stack (NumPy, SciPy, AstroPy, Pandas, Matplotlib, Scikit-learn, iPython, Jupyter-Lab, AstroML, etc.); Github (**version control**); **UNIX** based systems; **LSST science pipelines**; Database manipulation: **SQL**, Apache-Spark, AXS, Dask, LSD; Collaboration tools: **Jira**, **Confluence**, Docushare, **LaTeX**, Zenodo.

Publications

Suberlak, K.L., Ivezić, Ž., MacLeod, C.L. "Improving Damped Random Walk parameters for SDSS Stripe 82 Quasars with Pan-STARRS1." The Astrophysical Journal 907:96 (26pp) 2021

Suberlak, K.L., Ivezić, Ž., MacLeod, C.L., Graham, M., Branimir, S. "Solving the puzzle of discrepant quasar variability on monthly time-scales implied by SDSS and CRTS data sets." Monthly Notices of the Royal Astronomical Society, Volume 472, Issue 4, p.4870-4877 2017

Honors And Awards

- UW Data Science Postdoctoral Fellow $2000 for research-related expenses (2023)
- UW Jacobsen Award: awarded $1700 to cover ApJ page charges (2019)
- Data Intensive Research in Astrophysics and Cosmology (DIRAC) at the University of Washington: DIRAC Institute Fellow (2016-present)
- RAS Travel Grant : awarded $475 "Support to attend the International Max Planck Research School 2016: Astrostatistics & Data Mining" (2016)
- University of Washington eScience Institute Data Science for Social Good Fellow (2015)
- Fellow of the Royal Astronomical Society (2008-present)

Professional Presentations

- Presentation: "AuxTel as an AOS pathfinder". Tucson, August 2023.
- Presentation: "Revealing Changing-Look Quasar Candidates in SDSS Stripe82 with SDSS, PS1, ZTF, and LSST data." Charlottesville, July 2023.
- Presentation: "Spectroscopic Follow-up of Changing-Look Quasars in SDSS Stripe 82." Naples, June 2023.
- Presentation: "Status of PhoSim as an AOS simulator" (virtual). August 2022.
- Presentation: "PhoSim Rotation in the AOS simulations (virtual). March 2022.
- Poster: Statistical Challenges in Modern Astronomy VII Conference (virtual). June 2021.
- Final Exam: Thesis Defense "Quasar Variability as seen by Large Optical Sky Surveys". University of Washington, Seattle, WA. December 13, 2019
- Presentation: Seminar "Towards LSST Science: improving variability parameters for SDSS Stripe 82 Quasars with Pan-STARRS1". National Institute for Nuclear Research, Warsaw, Poland. September 24, 2019
- Presentation: Lunch Seminar "Towards LSST Science: long term quasar variability and processing of crowded fields". Seattle, WA. April 16, 2019
- Poster: Astrophysical Frontiers in the Next Decade and Beyond: Planets, Galaxies, Black Holes, & the Transient Universe. Portland, OR. June 26, 2018
- Poster: "Bayesian inference in forced photometry" at Northwest Astronomy Meeting, Bellingham, WA. October 29, 2016
- Poster: "What to do with negative fluxes?" at the intermediate Palomar Transient Factory (iPTF) Summer School, California Institute of Technology. Pasadena, CA. July 18, 2016
- Poster: "Solving the puzzle of discrepant quasar variability on monthly time-scales implied by SDSS and CRTS datasets." 227^{th} American Astronomical Society Meeting. Kissimmee, FL. January 6, 2016.
- Poster: "New Constraints on Quasar Variability based on 8,000 SDSS Stripe 82 Quasars with both SDSS and CRTS Lightcurve Data." 225^{th} American Astronomical Society Meeting. Seattle, WA. January 6, 2015.

Workshops and Conferences

- Rubin Observatory Project and Community Workshop. Tucson, AZ. Aug 7-11, 2023
- New Era of AGN Science with the Vera C. Rubin LSST. Charlottesville, VA. July 24-26, 2023
- The Restless Nature of AGN: 10 years later. Variability as a probe of the central engine and its surroundings. Naples, Italy. June 26-30, 2023.
- Rubin Observatory Joint Technical Meeting. La Serena, Chile. March 8-15, 2023
- Rubin Observatory Project and Community Workshop. Marana, AZ. Aug 8-12, 2022
- Rubin Observatory Project and Community Workshop (virtual). Aug 7-13, 2021
- Statistical Challenges in Modern Astronomy VII Conference (virtual). June 7-10, 2021.
- Rubin Observatory Algorithms Workshop (virtual). Mar 17-19, 2020
- Rubin Observatory Project and Community Workshop (virtual). Aug 10-14, 2020
- LSST 2019 Project and Community Workshop. Tucson, AZ. Aug 12-17, 2019
- Large Synoptic Survey Telescope All-Hands Meeting. Tucson, AZ. Aug 14-18, 2017
- Detecting the Unexpected: Discovery in the Era of Astronomically Big Data. Space Telescope Science Institute, Baltimore, MD. Feb 27 - March 2, 2017
- Summer School 2016 Astrostatistics & Data Mining. International Max Planck Research School for Astronomy & Cosmic Physics at the University of Heidelberg, Germany. Sept 12-16, 2016

Teaching Experience

- Mentorship of a student project on "Extension of Quasar Baseline with the SDSS, PS1, and ZTF data." 2023
- Mentorship of a student project on "Combining quasar variability data from SDSS-PS1 with ZTF data for 40 changing-look quasar candidates" 2022
- Mentorship of a student project on "Multi-Band Reverberation Mapping of Active Galactic Nuclei from ZTF", including collaboration with Dr. Ying Zu (author of JAVELIN RM fitting engine), Shanghai Jiao Tong University 2021
- ASTR150 The Planets: Teaching assistant for three quarters (Winter 2013, Summer 2014 for Dr. Nicole Silvestri; Spring 2015 for Dr. Toby Smith)
- ASTR101 Introduction to Astronomy: Teaching assistant for eight quarters (Fall 2013, Fall 2015, Summer 2016, Autumn 2016 for Dr. Ana Larson ; Spring 2014, Spring 2016 for Dr. Chris Laws; Winter 2015, Winter 2016 for Dr. Oliver Fraser)

Undergraduate Research

Nicolaus Copernicus Astronomical Center, Poland, Research Associate Feb 2013 – Jul 2013
Research at the Polish Academy of Sciences with Dr. Agata Różańska

- Analyzed Active Galactic Nuclei spectra from the VIMOS Public Extragalactic Redshift Survey
- Developed a pipeline for fitting the spectral energy distribution

University of Oxford, Research Studentship Oct 2012 – Dec 2012
Research with Dr. Leigh Fletcher and Prof. Pat Irwin

- Analyzed the infrared atmospheric data of Jupyter
- Verified the possible depth of measurement using ethane spectral lines

Nicolaus Copernicus Astronomical Center, Poland, Summer Internship Jun 2012 – Aug 2012
Research at the Polish Academy of Sciences with Dr. Agata Różańska

- Analyzed Chandra x-ray data, performed spectroscopy and imaging of Sagittarius A*
- Investigated the spectroscopy of x-ray filaments, and examined the morphology of the region in various energy bands

University of Oxford, Masters Thesis Jan 2012 – Apr 2012
Measuring Expansion of the Universe with Supernovae with Dr. Fraser Clarke and Dr. Mark Sullivan

- Observed and reduced the imaging of newly discovered supernovae using the Oxford Wetton telescope
- Measured the Hubble constant using calibrated supernovae peak luminosities

University College of London, Nuffield Fellowship Jun 2011 – Aug 2011
Undergraduate Research at the Mullard Space Science Laboratory, UK, with Prof. Andrew Coates and Dr. Adam Masters

- Analyzed the location of Saturn's plasmapause using Cassini Plasma Spectrometer (CAPS) Electron Spectrometer (ELS) data

University of Oxford, AOPP Research Assistantship Jun 2010 – Aug 2010
Summer research internship with Dr. Neil Bowles and Dr. Ian Thomas at the University of Oxford Oceanic and Planetary Physics sub-department

- Performed laboratory measurements and data analysis supporting the Diviner instrument on the Lunar Reconnaissance Orbiter
- Determined the grain size distribution of the lunar soil equivalent, a necessary input for theoretical models of thermal emission of lunar regolith