Xinlun CHENG

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EDUCATION

School of Data Science, University of Virginia Jun 2021 – May 2022

- MS Data Science (Residential);

Department of Astronomy, University of Virginia Aug 2019 – Present

- Astronomy PhD student; Major GPA: 4.0/4.0

Department of Physics, Tsinghua University Aug 2014 – Jul 2018

- Bachelor of Science in Physics; Major GPA: 3.7/4.0; Rank: 10^{th}/100

AWARD & FELLOWSHIP

Jefferson Fellow 2022 – 2024

Dean's MS-PhD Fellowship in Data Science 2021 – 2022

PUBLICATION

Bozsik, S., **Cheng, X.**, Kuncham, M., Mitchell, E. (alphabetical ordering) 2022, IEEE Systems and Information Engineering Design Symposium (SIEDS)

Title: Democratizing Housing Affordability Data: Open Data and Data Journalism in Charlottesville, VA

Policy Track Best Paper Award

Cheng, X., Choi, Y., Olsen, K., Nidever, D., Majewski, S., Monachesi, A., Besla, G., Muñoz, C., Anguiano, B., Almeida, A., Muñoz, R., Lane, Ri., Nitschelm, C. 2022, ApJ, 95, 11

Title: Kinematical Analysis of Substructure in the Southern Periphery of the Large Magellanic Cloud

Cheng, X., Anguiano, B., Majewski, S. R., Hayes, C., Arras, P., Chiappini, C., Hasselquist, S., de Andrade Queiroz, A. B., Nitschelm, C., García-Hernández, D. A., Lane, R. R., Roman-Lopes, A., & Frinchaboy, P. M. 2020, ApJ, 905, 49

Title: Exploring the Galactic Warp through Asymmetries in the Kinematics of the Galactic Disk

Anguiano, B., Majewski, S. R., Hayes, C. R., Allende Prieto, C., **Cheng, X.**, Bidin, C. M., Beaton, R. L., Beers, T. C., & Minniti, D. 2020, AJ, 160, 43

Title: The Stellar Velocity Distribution Function in the Milky Way Galaxy

Cheng, X. 2020, RAA, 20, 2

Title: Search for strong galaxy-galaxy lensing in SDSS-III BOSS

Cheng, X., Liu, C., Mao, S., & Cui, W. 2019, ApJL, 872, L1

Title: Ripple Patterns in In-plane Velocities of OB Stars from LAMOST and Gaia

TALK & PRESS RELEASE

IEEE Systems and Information Engineering Design Symposium (SIEDS) Apr 28, 2022

- Presentation on Conference Paper
- Policy Track Best Paper Award

AAS Press Release Jan 15, 2021
237th AAS Meeting

- Press release of the research on Galactic Warp
- Interviewed by Russell Bahorsky from School of Art & Science
- Picked up by multiple media around the world in many different languages: phys.org, IFL Science, science springs, SYFY WIRE, Europa Press (Spanish), CanalTech (Brazil), RIA (Russian), etc.

AAS Talk Jan 12, 2021
237th AAS Meeting

Science Talk Oct 26, 2020
Institute of Advanced Study, Princeton

RESEARCH EXPERIENCE

Graduate Research Assistant Jun 2022 – Present
Advisor: Professor Steve Majewski
Department of Astronomy, University of Virginia
Searching for White Dwarf Main Sequence (WDMS) Binary Systems with Neural Network

- Millions of low resolution stellar spectra from Gaia Data Release 3
- ~700 confirmed WDMS systems with both high and low resolution spectra as training setting-up
- Data augmentation with synthetic training data
- Developing a two-headed neural network to classify WDMS systems and fit orbital parameters
- Interpreting the decision making process of the trained model through visualization methods

Graduate Research Assistant May 2022 – Present
Advisor: Professor Stephen Baek
School of Data Science, University of Virginia
Accelerating Spin Dynamics Numerical Simulation with Physics-Aware Neural Network

- Accelerating quantum mechanics simulation with neural network
- Developing a neural network for inference of force that would preserve SO(3) rotational symmetry in the underlying physics system
- Developing a physics-aware neural network that could replace the traditional FEM numerical solver for the spin dynamics problem

Graduate Research Assistant Sep 2021 – Apr 2022

Advisor: Professor Jonathan Kropko
School of Data Science, University of Virginia

Democratizing Housing Affordability Data: Open Data and Data Journalism in Charlottesville, VA

- Combing multiple data sources, including Census, Charlottesville Open Data Portal and Bureau of Labor Statistics
- Coding and hosting an interactive dashboard to visualize the dataset
- Experience with UI design and user testing

Graduate Research Assistant May 2020 – Mar 2022
Advisor: Professor Steve Majewski
Department of Astronomy, University of Virginia

Kinematical Analysis of Substructure in the Large Magellanic Cloud

- Millions of stars from Gaia Early Data Release 3
- Examined the kinematical structures of the Large Magellanic Cloud
- Collaboration with research group from NMSU, STScI and NOAO
- Paper published in ApJ

Graduate Research Assistant Mar 2020 – Present
Advisor: Professor Steve Majewski
Department of Astronomy, University of Virginia

Density Map of the Milky Way Galaxy

- Millions of stars from Gaia Data Release 3
- Computed intrinsic velocity dispersion by removing the contribution from uncertainty of individual stars
- Combined Jeans Equation and Poisson Equation to measure the surface density of any given point in our Galaxy
- Compared to models of visible matter to extract the distribution of dark matter
- Paper in preparation for publish

Graduate Research Assistant Aug 2019 – Dec 2020
Advisor: Professor Steve Majewski
Department of Astronomy, University of Virginia

Exploring asymmetries in the kinematics of the Galactic disk with Gaia and APOGEE

- SDSS-IV Project 0722
- Converted observables to phase-space information
- Compared observation results to existing numerical simulation
- Built a simple warp model with Jeans equation
- Paper published in ApJ

Research Assistant May 2018 – Mar 2019
Advisor: Professor Chao Liu
National Astronomical Observatory of China

Galactic kinematics with OB stars from LAMOST-Gaia dataset

- Coded adaptive kernel density estimation (KDE) in Python
- Extracted kinematics structure from dataset with various methods
- Determined most possible theoretical explanation for observed ripples in radial velocity
- Paper published in ApJ Letter

Research Assistant Sep 2017 – Jul 2019
Advisor: Professor Shude Mao
Department of Physics, Tsinghua University
Confirmation of strong lensing candidates using CFHT Megacam

- Refined the candidate list from previous research experience during June 2017 - September 2017
- Wrote observation proposal and designed details (exposure time, sequence of observation, etc.) of observation
- Applied and approved for CFHT Megacam observation (18BS06) in September 2018 as the Principle Investigator
- Processed Megacam imaging data (coadding, psf, photometry and foreground removal)
- Paper published in RAA

Undergraduate Research Assistant Jun 2017 – Sep 2017
Advisor: Professor Jean-Paul Kneib
École Polytechnique Fédérale de Lausanne
Searching for galaxy-galaxy strong lensing candidates in SDSS-III BOSS

- Improved previous spectroscopic searching method
- Data-processing code exceeds 10 thousand lines of Python
- Searched through the entire database (~1.5 million galaxies) within 12 hours
- Compiled a list of most possible strong lensing candidates

Undergraduate Research Assistant Feb 2016 – May 2017
Advisor: Professor Charling Tao
Department of Physics, Tsinghua University
Searching for super-Eddington accreting black holes candidates in SDSS-III Reverberation Mapping campaign

- Built spectra decomposition programs from scratch in Python
- Extensive literature reading
- Compared Radius-Luminosity relationship with results from other researchers

Teaching

Lab Operator Sep 2020 – Dec 2020
Telescope Observation
University of Virginia
Lab operator for telescope observation nightlab. Due to Covid-19 pandanmic, the lab is remote only.

Teaching Assistant Sep 2020 – Dec 2020
ASTR 1210 Introduction to the Night Sky and Solar System

University of Virginia
Course instructor: Professor Trinh Thuan

Teaching Assistant Sep 2020 – Dec 2020
ASTR 1210 Introduction to the Night Sky and Solar System
University of Virginia
Course instructor: Professor Ed Murphy

Teaching Assistant Jan 2020 – May 2020
ASTR 3130 Observational Astronomy
University of Virginia
Course instructor: Professor Mike Skrutskie

Lab Operator Sep 2019 – Dec 2019
Constellation quiz night-lab
University of Virginia
Lab operator for constellation quiz night-lab. In charge of 10pm-11pm session every Monday and Thursday.

Teaching Assistant Sep 2019 – Dec 2019
ASTR 1210 Introduction to the Night Sky and Solar System
University of Virginia
Course instructor: Professor Ed Murphy

Teaching Assistant Sep 2019 – Dec 2019
ASTR 1210 Introduction to the Night Sky and Solar System
University of Virginia
Course instructor: Professor Zhi-Yun Li

Public Outreach

Telescope Operator Nov 2020
DSBK star party
University of Virginia
Took part in star party organized by Darker Sky Brighter Kids (DSBK) on Nov 14. In charge of operating the Celestron 14-inch telescope and live-streaming to DSBK Facebook.

Telescope Operator Nov 2019
McCormick Public Night
Took part in McCormick public night on Nov 3. In charge of operating 6-inch Alvin-Clack telescope and Meade 14-inch LX200, and observation target selection for the night.

Constellation Tour Guide Oct 2019
DSBK star party

Took part in star party organized by Darker Sky Brighter Kids (DSBK) on Oct 28. In charge of giving constellation tour to about 500 audiences. Also helped with telescope setting-up.

Member Sep 2019 – Present
Dark Sky Bright Kids (DSBK)
Member of outreach group Dark Sky Bright Kids.

- Operated telescopes during star party
- Planned weekly outreach activity during planning meeting

Kernel Member Jan 2015 – Present
Tsinghua Student Astronomy Association
Kernel member of Tsinghua Student Astronomy Association

- Operated the Association with other kernel members in the Management Council
- Organized on-campus and off-campus stargazing/telescope observations
- Led groups of students through multiple stargazing trips
- Organized public night for university observatory
- Shared stargazing and astrophotography knowledge with members and general public through online tutorials and offline lectures

SKILLS AND OTHERS

Programming: Experience in both scientific computation and data science

- MSDS: familiar with data mining, Bayesian machine learning, deep learning with both Tensorflow/Keras and PyTorch, can work in Python and R
- Multiple programming languages: Python, R, C++, Fortran, Java, Linux bash
- Developed reservation and check-in program for campus observatory
- Developed course selection helper program for better chance of obtaining hot courses
- Currently maintaining a planetarium software on Android, Stellarium

Astrophotography

- Planets, nebula and galaxies
- Star-trails

Language Skills

- Chinese (native), English (fluent)