Xinlun CHENG

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EDUCATION

Department of Astronomy, University of Virginia *Aug 2019 – May 2024*

- Astronomy PhD student; Major GPA: 4.0/4.0; top 1

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

- MS Data Science (Residential); Major GPA: 3.9/4.0

Department of Physics, Tsinghua University *Aug 2014 – Jul 2018*

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

EXPERIENCE

Postdoctoral Research Associate, School of Data Science, University of Virginia *Jul 2024 – Present*

Supervisor: Professor Stephen Baek

- Develop new mathematical formulations and computation algorithms for physics-informed machine learning
- Manage projects, mentor graduate and undergraduate students and develop proposals

PROJECTS

Physics-Aware Recurrent Convolutional Neural Network *Aug 2023 – Present*

- Design and train neural network with novel network architecture and better performance than state-of-art
- Accelerate fluid dynamics simulation for the client with deep learning in multiple applications

Accelerating Spin Dynamics Numerical Simulation with Physics-Aware Neural Network *May 2022– Aug 2023*

- Accelerated numerical simulation for the client with deep learning, by at least ten times than traditional method
- Developed a neural network that preserves important physics properties of the system for the first time

Searching for White Dwarf Main Sequence (WDMS) Binary Systems with Deep Learning *Sep 2021 – May 2024*

- Solved the limited labelled training set problem and improve the ability of generalization of a deep learning model
- Adopted pretraining-finetuning paradigm in astronomy for the first time
- Queried large dataset with millions of entries with SQL and analyzed data with statistical models

Democratizing Housing Affordability Data: Open Data and Data Journalism in Charlottesville, VA *Sep 2021 – Apr 2022*

- Created an interactive dashboard for Charlottesville Tomorrow from multiple data sources
- Applied UI design and user testing of software product for the client
- Hosted on client's website, the first ever such product on its website and widely used by the community

Milky Way and large Magellanic Cloud Kinematics and Dynamics *Aug 2019 – May 2024*

- Data mining with large astronomical databases, such as Gaia and SDSS APOGEE
- Merged data-driven modelling and traditional physical models in data analysis
- Discovered interesting phenomena for the first time and challenged previous theoretical explanations

FELLOWSHIPS & AWARDS

- Jefferson Fellow *2022 – 2024*
- Dean's MS-PhD Fellowship in Data Science *2021 – 2022*

PUBLICATIONS

1. **Cheng, X.**, Nguyen, P., et al. 2024, *IJMF*, 104, 877

Physics-Aware Recurrent Convolutional Neural Networks for Modeling Multiphase Compressible Flows

2. Nguyen, P., **Cheng, X.**, et al. 2024, *ICML*
   PARCv2: Physics-Aware Recurrent Convolutional Neural Networks for Spatiotemporal Dynamics Modeling
3. **Cheng, X.**, Anguiano, B., et al. 2024, *MNRAS*, 527, 959
   The surface mass density of the Milky Way: does the traditional KZ approach work in the context of new surveys?
4. Muñoz, C., Monachesi, A., Nidever, D., Majewski, S., **Cheng, X.**, et al. 2023, *A&A*, 680, A79
   Chemo-dynamical tagging in the outskirts: The origins of stellar substructures in the Magellanic Clouds
5. **Cheng, X.**, Zhang, Sheng., et al. 2023, *Physical Review Research*, 5, 3, 033188
   Convolutional neural networks for large-scale dynamical modeling of itinerant magnets
6. Bozsik, S., **Cheng, X.**, Kuncham, M., Mitchell, E. (alphabetical ordering) 2022, *IEEE Systems and Information Engineering Design Symposium (SIEDS)*
   Democratizing Housing Affordability Data: Open Data and Data Journalism in Charlottesville, VA
7. **Cheng, X.**, Choi, Y., et al. 2022, *ApJ*, 928, 95
   Kinematical analysis of substructure in the southern periphery of the large magellanic cloud
8. **Cheng, X.**, Anguiano, B., et al. 2020, *ApJ*, 905, 49
   Exploring the Galactic Warp through Asymmetries in the Kinematics of the Galactic Disk
9. Anguiano, B., Majewski, S., Hayes, C., Prieto, C., **Cheng, X.**, et al. 2020, *ApJ*, 160, 43
   The stellar velocity distribution function in the milky way galaxy
10. **Cheng, X.**, 2020, *RAA*, 20, 002
    Search for strong galaxy-galaxy lensing in SDSS-III BOSS
11. **Cheng, X.**, Liu, C., et al. 2019, *ApJL*, 872, L1
    Ripple patterns in in-plane velocities of OB stars from LAMOST and Gaia
12. **Cheng, X.**, Zhang, Y., et al. 2013, *MNRAS*, 429, 4, 2773
    Optical observations of BL Lac object ON 231 (W Comae) during 2010 March–April

TEACHING EXPERIENCE

Instructor *July 2023 – Sept 2023*
ASTR 1280: The Origin of Almost Everything
Department of Astronomy, University of Virginia

Teaching Assistant *Jan 2021 – May 2021*
ASTR 3130: Observational Astronomy
Department of Astronomy, University of Virginia

Teaching Assistant *Sep 2020 – Dec 2020*
ASTR 1210: Introduction to the Night Sky and Solar System
Department of Astronomy, University of Virginia

Teaching Assistant *Jan 2020 – May 2020*
ASTR 3130: Observational Astronomy
Department of Astronomy, University of Virginia

Teaching Assistant *Sep 2019 – Dec 2019*
ASTR 1210: Introduction to the Night Sky and Solar System
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