ZHENGHAO XU

xuzhenghao@pku.edu.cn
https://zhenghaoxu.github.io
(+86)-18901520015

No.5 Yiheyuan Road,
Peking University, Beijing,
P.R.China 10087

EDUCATION EXPERIENCE

Tsinghua University Research Assistant 2019 - Present
Institute of Advanced Study

Peking University B.S. with Honour 2015 - 2019
School of Mathematical Science
Major in Scientific & Engineering Computational Mathematics

MIT Visiting Student 2018
Massachusetts Institute of Technology
Department of Physcis & MIT Kavli Institute (MKI)

RESEARCH INTEREST

Computational Magneto-Hydrodynamics Simulations with Multi-scale Physical Process
Applications of Deep Learning in Astrophysical Data from Observations and Simulations

RESEARCH EXPERIENCE

Morphology and Evolutions of Young Stellar Objects in M17 Jun 2017 - Feb 2018
Department of Physics, Peking University
Advisor: Prof. Richard de Grijs, Macquarie University (present)

Computational MHD & Athena++ Code Development Group Feb 2018 - Present
Insititute for Advance Study, Tusinghua University
Advisor: Prof. Xuening Bai, Tsuinghua University

Predicting Dark Matter Distribution Pixelwisely by Deep Learning Jun 2018 - Present
MIT Kavli Institute, MIT
Advisor: Prof. Mark Vogelsberger, MIT

- Data from the largest and most complex cosmological simulation IllustrisTNG at redshift 0.
- Only taking Gas & Stellar properties as input, outputting the distribution of Dark Matter.
- Unsupervised Deep Neural Networks extract the nonlinear transformation relationship.
- Applying the fine-tuned models to the observation, making predictions which unable before.

SKILLS

Programming Languages: Python, MATLAB, C++, Linux, LaTeX, Mathematica, R
Machine Learning: Tensorflow, PyTorch, Keras, Scikit-Learn
Mathematical Expertise: Numerical Mathematics, Computational Fluid Dynamics, Statistics & Data Analysis

SELECTED COURSE PROJECTS

Images Classifier by Convolutional Neural Network and traditional methods, CNN beating all the other methods, up to 99% high accuracy on test dataset.

Stock Trading AI, using Deep Reinforcement Learning, with Dual Double Deep Q-Network, be able to profit without any prior human knowledge.

Multi-Grid Preconditioner Conjugate Gradient Numerical PDE Solver, using both **Finite Different Scheme and Finite Element Scheme**, in the best case, will reduce the time complexity from $O(n^3/2)$ to $O(n)$.

Eigensystem Solver by Inverse-free preconditioned Krylov Subspace Method , excellent even when singular values are extremely close to zero.

Navier-Stokes Fluid Simulator, one with Quasi-Spectral Method, the other with Second Order Godunov Scheme Finite Volume Method, high-accuracy and high-performance.