Dr. Jiajun Zhang *Birthday: October 08, 1990*

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Summary

Senior Researcher, IBS

Dr. Zhang got his PhD degree in 2017 in The Chinese University of Hong Kong, under the supervision of Prof. Ming-Chung Chu. After that, he became a postdoc at Shanghai Jiao Tong University, collaborating with Prof. Jun Zhang. In 2019, he joined IBS CTPU as an senior researcher. He mainly contributed to N-body simulation to study the large scale structure of the Universe. Recently, he has developed N-body simulation code for Fuzzy Dark Matter model and Interacting Dark Energy model. His major interests include Cosmology, Large Scale Structure, Weak Gravitational Lensing, N-body simulation, Dark Matter and Dark Energy, 21cm Intensity Mapping etc. He is trying to build a bridge between new theoretical cosmological models and the new powerful observational instruments. Since 2019, Dr. Zhang joined BINGO collaboration, which aims to detect the 21cm Intensity Mapping. He was in charge of the mock map building for BINGO. He also joined Chinese Space Station Telescope collaboration for non-standard cosmology simulation. He has published 15 papers in Refereed journals and 3 more under review.

Working Experience

CTPU IBS — Daejeon, Korea
Senior Researcher — *2019 – now*

Shanghai Jiao Tong University — Shanghai, China
Postdoctral Researcher — *2017 – 2019*
Collaborate with Prof. Jun Zhang.

The Chinese University of Hong Kong — Hongkong, China
Teaching Assistant — *2013 – 2017*
Teaching exercise classes and judge homework for University Physics and Relativity.

National Tsing Hua University — Hsingchu, Taiwan, China
Lecturer — *2016-07-18 – 2016-07-21*
Teaching Mini School on Structure Formation and Cosmological N-body Simulation, see website.

Education

The Chinese University of Hong Kong — Hong Kong, China
PhD in Physics — *2013 – 2017*
Supervised by Prof. Ming-Chung CHU. Thesis title: Topics in dark matter astrophysics and cosmology.

Fudan University — Shanghai, China
Bachalor Degree of Science in Physics — *2009 – 2013*

Representative First Author Publication

1 *The parameter-free Finger-Of-God model and its application to 21cm intensity mapping*
Published in ApJ arXiv:1912.09695 I introduced a novel method to generate mock catalog for 21cm intensity mapping, which is more realistic than the previous work. I have also provided the model to calculate Finger-of-God effect and shot noise.

2 *Fully Self-Consistent Cosmological Simulation Pipeline for Interacting Dark Energy Models*
Published in PRD, 7 citations arXiv:1811.01519 I wrote a new N-body simulation code based on Gadget2, called ME-Gadget. This code is suitable for non-standard cosmological models, including Interacting Dark Energy model. Together with other tools developed by my collaborators, we finally built a self-consistent data analysis pipeline from theoretical models to observations including CMB, BAO, weak lensing, etc.

3 *The First Constraint from SDSS Galaxy-Galaxy Weak Lensing Measurements on Interacting Dark Energy Models*
Published in ApJL, 7 citations arXiv:1807.05522 With the pipeline we have built described in arXiv:1811.01519, we tested Interacting Dark Energy model with the SDSS imaging data. We achieved 8 times better constraints than previous works for Interacting Dark Energy models.

4 *Ultralight Axion Dark Matter and Its Impact on Dark Halo Structure in N-body Simulations*
Published in ApJ, 38 citations arXiv:1611.00892 In this work, I proposed a new simulation technique for Fuzzy Dark Matter. This N-body simulation code is modified from Gadget2 and called Axion-Gadget. It is now publicly available on Github.

5 *The Importance of Quantum Pressure of Fuzzy Dark Matter on Lyα Forest*
published in ApJ, 29 citations arXiv:1708.04389 With my newly proposed simulation code Axion-Gadget, I studied the effect of quantum pressure on Lyα forest for Fuzzy Dark Matter model. I described the method and results in this work.

Lectures

- Jul. 2016, Mini School on Structure Formation and Cosmological N-body Simulation, National Tsinghua University, Hsingchu

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Seminars

- May. 2019 Does Dark Matter interact with Dark Energy, USTC, Hefei
- Jan. 2019 Does Dark Matter interact with Dark Energy, Sun Yat-sen University, Zhuhai
- Dec. 2018 Cosmological simulations beyond LCDM, Kavli IPMU Tokyo University, Kashiwa
- Sep. 2018 Go beyond standard model with ME-Gadget, Liaoning Normal University, Dalian
- Aug. 2018 Does Dark Matter interact with Dark Energy, The Chinese University of Hong Kong, Hong Kong
- Aug. 2017 Is Fuzzy Dark Matter in tension with Lyman-alpha Forest, The National Astronomy Observatory of China, Beijing
- Apr. 2017 Invited seminar about Fuzzy Dark Matter, Academia Sinica, Taipei
- Mar. 2017 Invited seminar about Fuzzy Dark Matter, National Tsinghua Universiy, Hsingchu
- May. 2016 Percolation analysis for cosmic web with discrete points, The Purple Mountain Observatory, Nanjing

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Invited Conference Talks

- Nov. 2019 Brief Review of Fuzzy Dark Matter Cosmological Simulation, IBS-ICTP Workshop on ALPs, Daejeon
- Oct. 2019 The Halo Angular Momentum in Non-Standard Cosmology, GAMA 2019, Shanghai

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Highlight Work

Code publicly available: Axion-Gadget
github.com/liambx/Axion-Gadget a modified version of Gadget-2 for Fuzzy Dark Matter

Code publicly available: ME-Gadget-public
github.com/liambx/ME-Gadget-public a modified version of Gadget-2 for models beyond ΛCDM model

Member of BINGO collaboration, in charge of mock 21cm intensity map building. BINGO is an international collaboration, focusing on constructing a 40m radio telescope in Brazil. It aims at detecting 21cm Intensity Mapping signal and Baryon Acoustic Oscillations. It is also considered as a path finder for SKA 21cm Intensity Mapping project.

Member of CSST collaboration, participate in non-standard cosmology simulation.

Organize and Host the HOUYI workshop series
2nd in SWIFAR, Yunnan The first HOUYI workshop series was held in Yangzhou University Center for Gravity and Cosmology, and got named as HOUYI series, under the strong support of Prof. Bin Wang. It is a workshop for studying non-standard cosmology together within young people in China.