Yueying Ni

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Education

Carnegie Mellon University — Pittsburgh, PA
Ph.D. in Physics — *Sep. 2017 – present*

Fudan University — Shanghai, China
B.S. in Physics — *Sep. 2013 – June 2017*

Research Interests

High-z galaxies and quasars: cosmological hydrodynamic simulations, constrained Gaussian realizations, growth of early quasars, galaxy evolution, AGN feedback, the dynamics of SMBH

Deep Learning: generative model, super-resolution simulations

Alternative dark matter: astrophysical probes of Fuzzy Dark Matter (FDM) model

Works in progress

Asterix Simulation

- Launching a new large-volume cosmological hydrodynamic simulation (on TACC Frontera Supercomputer) to study the epoch of re-ionization as well as the formation of galaxy and quasars at $z > 2$. Asterix will also provide us a training suite of cosmological hydrodynamic simulation for machine learning models.

Super resolution simulation

- Use super resolution generative models to generate high-resolution realizations conditioned on low-resolution simulation outputs. Currently working on applying the model to hydro simulations.

Highlight Work

BlueTides Simulation

- Run BlueTides simulation (the largest ever cosmological hydrodynamic simulation) down to $z = 6.5$ with the full capacity of BlueWater Supercomputer, using 4M node-hours of computer allocation.

Early quasar growth

- Develop publicly available code *GaussianCR* to implement the constrained realization technique on Gaussian random field.
- Probe the relation between the initial density peaks and the growth of most massive super massive black holes in cosmological simulations.

Publications

First Author Papers

Y. Ni, T. Di Matteo and Y. Feng, *Not all peaks are created equal: the early growth of Supermassive Black Holes*, *arXiv e-prints* (2020) arXiv:2012.04714 [2012.04714]

Y. Ni, T. Di Matteo, R. Gilli, R. A. C. Croft, Y. Feng and C. Norman, *QSO obscuration at high redshift (z ¿ 7): predictions from the BLUETIDES simulation*, MNRAS **495** (2020) 2135 [1912.03780]

Y. Ni, M.-Y. Wang, Y. Feng and T. Di Matteo, *Predictions for the abundance of high-redshift galaxies in a fuzzy dark matter universe*, MNRAS **488** (2019) 5551 [1904.01604]

Y. Ni, T. Di Matteo, Y. Feng, R. A. C. Croft and A. Tenneti, *Gas outflows from the z = 7.54 quasar: predictions from the BLUETIDES simulation*, MNRAS **481** (2018) 4877 [1806.00184]

Y. Ni, J. Jiang and C. Bambi, *Testing the Kerr metric with the iron line and the KRZ parametrization*, J. Cosmology Astropart. Phys. **2016** (2016) 014 [1607.04893]

Y. Ni, M. Zhou, A. Cárdenas-Avendaño, C. Bambi, C. A. R. Herdeiro and E. Radu, *Iron Kα line of Kerr black holes with scalar hair*, J. Cosmology Astropart. Phys. **2016** (2016) 049 [1606.04654]

Second Author Papers

Y. Li, **Y. Ni**, R. A. C. Croft, T. Di Matteo, S. Bird and Y. Feng, *AI-assisted super-resolution cosmological simulations*, *arXiv e-prints* (2020) arXiv:2010.06608 [2010.06608]

M. A. Marshall, **Y. Ni**, T. Di Matteo, J. S. B. Wyithe, S. Wilkins, R. A. C. Croft et al., *The host galaxies of $z = 7$ quasars: predictions from the BLUETIDES simulation*, MNRAS **499** (2020) 3819 [1912.03428]

K.-W. Huang, **Y. Ni**, Y. Feng and T. Di Matteo, *The early growth of supermassive black holes in cosmological hydrodynamic simulations with constrained Gaussian realizations*, MNRAS **496** (2020) 1 [1906.00242]

Other co-author Papers

M. A. Marshall, J. S. B. Wyithe, R. A. Windhorst, T. Di Matteo, **Y. Ni**, S. Wilkins et al., *Observing the host galaxies of high-redshift quasars with JWST: predictions from the BlueTides simulation*, *arXiv e-prints* (2021) arXiv:2101.01219 [2101.01219]

Talks

BlueWater Symposium June 2019
Talk: BlueTides simulation: first galaxies and QSOs at the cosmic dawn *Sunriver,OR*

Big eye in the early universe January 2019
Talk: High-z quasar outflows and obscuration *UCLA,CA*

Camels Project Meeting Jan 2021
Talk: Super resolution simulations *virtual, Flatiron Institute, CCA, NY*

Blackhole joint group meeting Oct 2020
Talk: Impact of large scale structures on the growth of early QSOs *virtual, CMU, PA*

Cosmology group meeting Nov 2020
Talk: Super resolution simulations *virtual, Harvard-CfA, MA*

Student Supervision

Kerry Jappe (BCs, CMU)
Cosmological simulation of the fuzzy dark matter *Oct. 2019 - Apr. 2020*

Service

Simulation data portal: BlueTides database (http://bluetides.psc.edu)

A project with Pittsburgh Supercomputing Center. Build the public available database that provides access and API for BlueTides simulation.

Code publicly available: GaussianCR (https://github.com/yueyingn/gaussianCR)

A python module that impose constraints on Gaussian primordial density field and generate initial condition for cosmological simulations.

Teachings

- 33-141 Physics I for Engineering Students, *Spring 2019*
- 33-104 Experimental Physics, *Fall 2018*
- 33-152 Matter and Interaction II, *Spring 2018*
- 33-121 Physics I for Science Students, *Fall 2017*

Press Releases

Evolving the early universe in 24 hours on Frontera, featured in TACC Press Releases (url: *https://www.tacc.utexas.edu/-/evolving-the-early-universe-in-24-hours-on-frontera*).

Simulations Show Webb Telescope Can Reveal Distant Galaxies Hidden in Quasars' Glare, featured in NASA's James Webb Space Telescope Science Release (url: *https://webbtelescope.org/contents/news-releases/2020/news-2020-51*).

Skills and Languages

Programming: Python, C/C++, PyTorch, bash

Simulation codes: MP-Gadget, FastPM

Languages: Mandarin (native), English