SIJIN CHEN

University Observatory Munich, Germany

Sijin.Chen@campus.lmu.de (49)15252301084 GitHub Homepage

EDUCATION

Ludwig-Maximilians-Universität München, Germany *10/2022 - present*

- Master of Science in Astrophysics
- Main Courses: Formation and Evolution of Cosmic Structures (1.0 – Excellent), Cosmology and Large-Scale Structure (1.0 – Excellent), The Origin and Emergence of Structure in the Universe (1.0 – Excellent), Hydrodynamics (1.3 – Excellent), Gravitational Dynamics (simulation of N-body system), From Data to Insights (Bayesian inference and AI), Machine Learning

Jilin University, China *09/2018 - 06/2022*

- Bachelor of Science in Physics, overall grade: 90.30/100 (5% in rank)
- Main Courses: Analytical Mechanics (96/100), Quantum Mechanics I and II (96/100 and 92/100), Thermodynamics and Statistical Physics (93/100), Electrodynamics (99/100), Particle Physics (93/100), Solid State Physics I and II (92/100 and 91/100), Computational Physics A (90/100)

University of Cambridge, UK

- 2022 Cambridge Academic Programme of Quantum Computing *01/2022 - 02/2022*
- 2021 Cambridge Academic Programme of Statistical Physics *07/2022*

RESEARCH EXPERIENCE

Master Thesis: Cosmological Constraints with Weak Lensing Scattering Transform *10/2023 – present*

Advisor: Dr. Stella Seitz & Zhengyangguang (Laurence) Gong

- Wavelet convolution on weak lensing convergence maps.
- Performed cosmological parameter forecast with Fisher analysis using scattering coefficients (mean value of modulus of convolved maps).
- Captured non-Gaussian information.
- Developed neural network-based emulators trained on CosmoGridV1 simulations to predict scattering coefficients for different cosmologies. Used these emulators to perform MCMC sampling and obtained posterior distributions, thereby deriving precise cosmological forecasts.
- Implemented the emulators trained in different tomographic bins and cosmologies with noise to conduct a tomographic analysis, and derived cosmological constraints on observational data.

RSD Effect on Projected Three-Point Statistics *08/2024 – present*

Advisor: Dr. Stella Seitz & Dr. Anik Halder

- Exploring how RSD of galaxies affects the projected three-point statistics.
- Currently focusing on quantifying the impact of RSD on the integrated three-point correlation function (i3PCF) and to gain insights into galaxy clustering and cosmological parameters.

Bachelor Thesis: Time-Dependent Kinetic Study of Positron-Hydrogen Collisions *12/2021 – 04/2022*

Advisor: Prof. Liguang Jiao

- Investigated the positron-hydrogen scattering problem using time-dependent wave function evolution and the five-point formula on a position grid.
- Applied FFTs to kinetic energy in momentum space, then transform back to position space for potential calculations using a symmetric split of energy terms.
- Simulated and tracked wave functions, showing positronium formation at high energies and independent scattering at low energies.

Influence of Target Membrane Material on Neutron Tube and Its Service Life *05/2020 - 11/2020*

Advisor: Prof. Jingbin Lu

- Explored the influence of target membrane material and its Deuterium-Tritium surface layer on neutron yield and

neutron tube lifespan.
- Mixed rare earth elements into titanium membrane material to enhance alloy properties and hydrogen storage, used SRIM for energy loss, calculated neutron yield, and compared performance with scandium to find the optimal doping metal.
- Concluded that lutetium-titanium alloy has the highest neutron yield at a doping mass ratio of 0.2.

COURSE PROJECTS

Gravitational Dynamics *04/2023 - 08/2023*
- In gravitational dynamics simulations, explored capturing a meteorite at the Sun's Lagrangian point 4 by setting the particle's initial state to move it there, rotating around the Sun like Jupiter.
- Concluded that circular motion is only possible when the total energy equals the minimum effective potential energy, meaning no radial motion, and any small deviation disrupts the perfect circular orbit.

Hydrodynamics *10/2022 - 02/2023*
- In hydrodynamical simulations, investigated how nozzle throat shape affects particle acceleration and speed changes before and after passing through the nozzle.
- Concluded that nozzle shape has little impact on velocity, energy, pressure, and density, but a narrower gap can significantly affect acceleration, with choking occurring if the gap is too narrow and long.

Computational Physics *10/2021 - 12/2021*
- Derived the algebraic expression of the electromagnetic field excited by the magnetic dipole source in the homogeneous medium and the corresponding integral expression from Maxwell equations and Hertz formula.
- Used the cubic spline fitting integration method and Gauss-Legendre integration method separately and combined them to calculate the integral expression of the electric field and magnetic field in cylindrical coordinates with MATLAB.
- Compared the accuracy of the results of these three calculations with the results of algebraic calculations and the cubic spline fitting showed the best accuracy.

TALKS

- **Ringberg OPINAS conference**: *"Scattering transform on cosmological parameter constraints"* *03/2024*

HONORS & AWARDS

- **Canada Mitacs Globalink Research Internship Scholarship** *10/2021*
- **First Prize Scholarship**, Jilin University (Top 5%) *09/2021*
- **Merit Student** *06/2020*
- **Outstanding Student Leader** *05/2020*
- **Outstanding Volunteer** *10/2019*
- **Second Prize Scholarship**, Jilin University (Top 10%) *09/2019*

COMPUTER SKILLS

- Python: 4 and a half years experience including master thesis project. Numerical course projects, data handling in Astrophysical Lab, and statistical analysis including Bayesian analysis.
- C/C++: 2 years of experience with bachelor's course project and simulations in gravitational dynamics course.
- MATLAB: 1 year of experience utilizing MATLAB for computational physics coursework and bachelor thesis project.
- Other computational skills: LaTeX, Mathematica, Origin, MS packages
- Often-used Packages: `PyTorch`, `emcee`, `ChainConsumer`