Sihao Cheng (程思浩)
Curriculum Vitae / December, 2021

email: s.cheng@jhu.edu
mobile: +1-443-207-1532
citizenship: China
https://sihaocheng.github.io
ORCID: 0000-0002-9156-7461

POSITIONS

Visiting fellow, Centre of Data Science, *École Normale Supérieure*, France 2021–present
Postdoc fellow, Physics and Astronomy, *Johns Hopkins University*, USA 2021–present

EDUCATION

Ph.D. & M.A., Physics and Astronomy, *Johns Hopkins University*, USA 2017–2021
Thesis title: Cosmology and Astrophysics with the Scattering Transform
advisor: Brice Ménard

B.Sc. (with Honors), Astronomy, *Peking University*, China 2012–2016
advisor: Eric W. Peng

RESEARCH INTEREST

I use innovative and interdisciplinary ideas to analyze survey data and acquire new physical understandings. My work led to the discovery of a special population of stars shining out of gravitational sedimentation and the cosmological applications of a new statistic that borrows ideas from deep learning. I am working on observational cosmology, stellar physics, and extrasolar planets.

AWARDS

2020 Outstanding Publication in Astrostatistics Award Jan 2021
Wu-Si Scholarships and Lin-Qiao Prize at Peking University 2014 – 2015
Gold Medals of international astronomical olympiads (IOAA, IAO, & APAO) 2008 – 2011

GRANT & TELESCOPE TIME

6 nights on 3.5m APO telescope 2019-2020
IAU travel grant for Symposium No.357, 1,000 euro Oct 2019
travel grant for white dwarf conference, 850 euro July 2019

MENTORING & TEACHING EXPERIENCE

Mentoring undergrad student: Vedant Chandra (currently a PhD student at CfA) 2019-2020
Teaching assistant, Johns Hopkins University, Stars & the Universe 2019
Teaching assistant, Johns Hopkins University, Physics I & II 2017–2018

REFERENCES

Prof. Brice Ménard, Johns Hopkins University	menard@jhu.edu
Prof. Marc Kamionkowski, Johns Hopkins University	kamion@jhu.edu
Assoc. Prof. Yuan-Sen Ting, Australian National University	yuan-sen.ting@anu.edu.au
Prof. Stéphane Mallat, Collège de France	stephane.mallat@ens.fr

TALKS & PRESENTATIONS

Contributed Talk, *Debating the potential of machine learning in astronomical surveys* IAP, Paris	Oct 2021
Contributed Talk, *Learn the Universe – an ML x Cosmology Workshop*, CCA	Aug 2021
Invited Talk, *White Dwarfs from Physics to Astrophysics*, KITP	Mar 2021
Contributed Talk, *Cosmology from Home*	Aug 2020
Contributed Talk, *IAU Symposium No.357 on White Dwarfs*, Hilo, Hawaii	Oct 2019
Contributed Talk, *The Beginnings and Ends of Double White Dwarfs*, Copenhagen	July 2019

Cosmology group meeting at Perimeter Institute	Dec 2021
Seminar at CEA Paris-Saclay	Dec 2021
Cosmology journal club at Harvard	Nov 2021
Data Science Seminar at École Normale Supérieure, Paris	Nov 2021
Cosmology seminar at University of California, Berkeley	Sept 2021
HotSci Seminar at STScI,	July 2021
Cosmology group meeting at Ohio State University	July 2021
Science coffee at STScI	July 2021
LSST DESC telecon	Jun 2021
Seminar at the German Center for Cosmological Lensing	May 2021
Cosmology group meeting at University of Edinburgh	May 2021
Seminar at Shanghai Jiao Tong University	Apr 2021
Cosmology group meeting at CfA	Mar 2021
Lunch talk at Peking University	Mar 2021
Seminar at Tsinghua University	Mar 2021
Colloquium (with Brice Meńard) at University of British Columbia	Mar 2021
Cosmology group meeting at Leiden	Jan 2021
Cosmology seminar at IPMU	Jan 2021
Cosmology seminar at IAP	Dec 2020
Lunch talk at University of Virginia/NRAO	Nov 2020
Euclid US telecon	Nov 2020
Cosmology/machine learning journal club at Fermilab	Oct 2020
Seminar at DIRAC, University of Washington	Oct 2020
(**invited**) Cosmology seminar at Duke University	Oct 2020
Seminar at Columbia University	Oct 2020
Astrophysics and Cosmology Seminar at University of Arizona	Sep 2020
Wine & Cheese seminar at Johns Hopkins University	Sep 2020

Cosmology journal club at University of Oxford	Sep 2020
Euclid Modelling working group	Sep 2020
Astrocoffee at Weizmann Institute of Science	Aug 2020
LSST DESC weak lensing mass mapping working group	Aug 2020
Astrophysics/Cosmology Seminar at University of Sussex	July 2020
Compact object journal club, STScI	Apr 2020
Lunch Seminar at Indiana University, Bloomington, IN	Mar 2020
CTC seminar at University of Maryland, College Park, MD	Mar 2020
Thunch seminar at Princeton University and astro-coffee at IAS, Princeton, NJ	Feb 2020
Seminar at Boston University, Boston, MA	Feb 2020
(**invited**) The Stars & Planets Seminar at CfA, Cambridge, MA	Feb 2020

Poster, *Statistical Challenges in Modern Astronomy VII*, online	Jun 2021
Poster, *Where the Earth Meets the Sky*, online	May 2021
Poster, 2019 Spring Symposium: *The Deaths and Afterlives of Stars*, STScI	Apr 2019

PUBLICATIONS

First-author papers:

How to quantify fields and textures? A guide to the scattering transform
Introduced the scattering transform in a non-technical way and showed new interesting interpretations of this estimator
Sihao Cheng and Brice Ménard, 2021, arXiv:2112.01288

Weak lensing scattering transform: dark energy and neutrino mass sensitivity
Visualised what the statistics see from a lensing map, and emphasised the importance of robustness
Sihao Cheng and Brice Ménard
2021, *MNRAS*, 507, 1012

A new approach to observational cosmology using the scattering transform
Introduced to observational cosmology a new statistic inspired by Convolutional Neural Nets, and demonstrated that it has CNN-level performance
Sihao Cheng, Yuan-Sen Ting, Brice Ménard, and Joan Bruna
2020, *MNRAS*, 499, 5902

Double White Dwarf Merger Products among High-mass White Dwarfs
Measured the white dwarf merger rate with unprecedented high precision using a novel kinematic method
Sihao Cheng, Jeffrey D. Cummings, Brice Ménard, and Silvia Toonen
2020, *ApJ*, 891, 160

A Cooling Anomaly of High-mass White Dwarfs
Discovered a special type of stars that shine out of gravitational sedimentation using Gaia data

Sihao Cheng, Jeffrey D. Cummings, and Brice Ménard
2019, *ApJ*, 886, 100

Meteor spectral observation with DSLR, normal lens and prism
Sihao Cheng and Simiao Cheng
2011, *JIMO*, 39, 39

Contributing-author papers:

Forever young white dwarfs: when stellar ageing stops
Camisassa, M. **et al.**
I interpreted the simulation results
2021, *A&A Letters*, 649, 7

An Increase in Small-planet Occurrence with Metallicity for Late-type Dwarf Stars in the Kepler Field and Its Implications for Planet Formation
Cicero X. Lu, Kevin C. Schlaufman, and **Sihao Cheng**
I participated in the statistical analysis and writing
2020, *AJ*, 160, 253

Multi-Gigayear White Dwarf Cooling Delays from Clustering-Enhanced Gravitational Sedimentation
Evan B. Bauer, Josiah Schwab, Lars Bildsten, and **Sihao Cheng**
We together developed the idea, and I interpreted the simulation result
2020, *ApJ*, 902, 93

A Gravitational Redshift Measurement of the White Dwarf Mass–Radius Relation
Vedant Chandra, Hsiang-Chih Hwang, Nadia L. Zakamska, and **Sihao Cheng**
I proposed and conducted the debias process and wrote part of the paper
2020, *ApJ*, 899, 146

Carbon star formation as seen through the non-monotonic initial–final mass relation
Marigo, P. **et al.**
I conducted the conversion between white dwarfs photometry and physical parameters
2020, *Nature Astronomy*

Conference proceeding:

Two delays in white dwarf evolution revealed by *Gaia*
Sihao Cheng
2019, *Proceedings of IAU*, 15 (S357), 175

Software:

`ST.py`

`WD_models`