

Yuzhe (Robert) Song

PhD Candidate in Physics

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Research Interests

High energy astrophysics, gamma-ray observation, stellar physics, cosmology, pulsars

Education

08/2017-07/2022	Doctor of Philosophy in Physics, CUNY Graduate Center , New York, United States Dissertation: “Stacking the Gamma-ray Sky to Search for Faint Astrophysical Populations” Advisor: Prof. Timothy A. D. Paglione (M.Phil., CUNY Graduate Center, 2021)
09/2014-08/2016	Master of Philosophy in Astrophysics, the University of Hong Kong , Hong Kong SAR Thesis: “Theoretical Study of Gamma-ray Emission from Pulsars” Supervisor: Prof. Kwong-Sang Cheng
09/2010-06/2014	Bachelor of Science in Astronomy, Nanjing University , Nanjing, China Thesis: “Analysis of Gamma-ray Pulsars Using a 2D Two-layer Outer Gap Model” Supervisor: Prof. Yongfeng Huang

Appointments

06/2021-Current	Committee Member, Committee for Sexual-Orientation & Gender Minorities in Astronomy, American Astronomical Society , United States
08/2018-Current	Adjunct Lecturer, CUNY York College , New York, United States
05/2019-08/2021	Workshop Coordinator & Mentor, AstroCom NYC Program , New York, United States
09/2016-05/2017	Instructional Assistant, Hong Kong University of Science and Technology , Hong Kong SAR
07/2013	Research Assistant, National Astronomical Observatories of China , Beijing, China Supervisor: Prof. Di Li

Skills

- Computing Skills: Python and related packages, *Fermi* Science Tools, Fermipy, Naima
- Languages: English (native fluency), Chinese (Mandarin, native fluency)
- Other: mentorship, communication, networking, public speaking, teaching, open pedagogy methods, event organisation, WordPress

Research Experience

03/2018-Current	Stacking <i>Fermi</i>-LAT data to detect gamma-rays from faint populations , Advisor: Prof. Timothy Paglione <ul style="list-style-type: none"> · Based on the <i>Fermi</i> likelihood analysis pipeline, I developed methods to stack residual maps and spatial and parameter-space likelihood profiles · Applied stacking methods to nearby flare stars and restricted their flare rates · Developed a temporal analysis pipeline which lead to the detection of the first gamma-ray emitting isolated main sequence star, TVLM 513 · Model fitting results with Naima shows the detected gamma-ray emission agrees with physical conditions of the star · Applied stacking methods to pulsars and discovered a new population of low spin-down luminosity pulsars that might emit gamma-rays · Applied stacking methods to globular clusters · Developed a toy model to validate the likelihood analysis and stacking methods.
03/2014-08/2016	Gamma-Ray Emissions from Pulsar Magnetosphere , Advisor: Prof. Kwong Sang Cheng <ul style="list-style-type: none"> · Used a stationary three-dimensional two-layer outer gap model to explain the phase-averaged spectrum and phase-resolved spectrum by <i>Fermi</i>-LAT data · Then developed it into non-stationary model, which fitted the results better · Added an Inverse-Compton Scattering component to explain the high energy tails of the spectrum of some powerful pulsars like Geminga
2013	Star Formation Area in Taurus , Advisor: Prof. Di Li <ul style="list-style-type: none"> · Blind-searched for bubbles (ring or arc structures) in the FCRAO data of $^{12}\text{CO}(J=1-0)$ and $^{13}\text{CO}(J=1-0)$ as candidates, produced channel maps, contour maps and P-V diagrams as criteria to select 37 bubbles · Calculated mass, momentum, energy and energy injection rate of the bubbles and compared with the turbulence of the clouds

Awards & Scholarships

2021	Honorable Mention, Chambliss Astronomy Student Achievement Award , 238 th Meeting of the American Astronomical Society (AAS)
2020	Award for Excellence in Teaching , CUNY Graduate Center Annual teaching award to three graduate students at CUNY Graduate Center
2017-2022	CUNY Science Scholarship , full scholarship to support study at CUNY Graduate Center
2014-2016	Postgraduate Scholarship , full scholarship to support study at the University of Hong Kong
2012	Social Practice Scholarship , Nanjing University Awarded for excellent service as president of the Amateur Astronomers Association at Nanjing University
2011	People's Scholarship, Social Work Scholarship , Nanjing University Awarded for top 20% students at Nanjing University
2011-2014	Class for Elite Students in Astronomy Scholarship , Nanjing University Awarded for top 30% students of the Dept. of Astronomy

Grants & Fellowships

2021-2022	Science Communication Fellow , CUNY Graduate Center (\$3,000)
2021	Early Research Initiative Pre-Dissertation Research Grant , CUNY Graduate Center (\$5,000)
2021	Doctoral Student Research Grant Round 16, CUNY Graduate Center (\$500)
2021	Fermi Guest Investigator Program, Cycle-14 , co-I, (PI: Prof. Joshua Tan), not funded
2020	Open Pedagogy Fellow , CUNY Graduate Center (\$1,000)
2020	FAMOUS Travel Grant , American Astronomical Society, \$500 travel grant for the 235th AAS Meeting
2019	Doctoral Student Research Grant Round 14, CUNY Graduate Center (\$800)

Teaching Experience

Adjunct Lecturer, Department of Earth & Physical Sciences, CUNY York College

2018-present	Introductory Astronomy Lab (ASTR141), fall and spring semesters Physics Lab (PHYS113), fall semesters only
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Instructional Assistant, Department of Physics, Hong Kong University of Science and Technology

Spring 2017	Capstone Project (Final Year Project, PHYS4191), General Physics w/ Calculus (PHYS1112), Energy & Related Environmental Issues (PHYS1003)
Fall 2016	Electric & Magnetism (PHYS3033), General Physics w/ Calculus (PHYS1112), Modern Physics Laboratory (PHYS2023)

TA, Department of Physics, University of Hong Kong

Spring 2016	Introduction to Relativity (PHYS2055)
Fall 2015	Physics by Inquiry (PHYS1240), Selected Topics in Astrophysics (PHYS4651)
Spring 2015	Cosmology (PHYS4653)
Fall 2014	Fundamental Physics (PHYS1250)

Mentoring Experience

2021-present	Co-mentor of Kayla Docher (Barnard College), AMNH Physical Sciences REU program
2021-present	Co-mentor of Keisi Kacanja (CUNY Hunter College), AstroCom NYC Program
2020-2021	Co-mentor of Vanessa Pinto (CUNY Hunter College), AstroCom NYC Program
2019-2020	Mentored a cohort of AstroCom NYC scholars on Classical Mechanics
2017	Mentor to physics students in the Capstone Project as part of their final year projects

Publications

1. Kacanja, K., Docher, K., Paglione, T., & **Song, Y.**, *Searching for Gamma-ray Halo Around Luminous Stars Using Stacking Methods*, in prep
2. Pinto, V., Paglione, T., **Song, Y.**, Zurek, D., & Tan, J., *Gamma-Rays from Globular Clusters*, in prep
3. **Song, Y.**, Paglione, T., Tan, J., & Lee-Georgescu, C., *A Large Population of Sub-Threshold Gamma-Ray Pulsars*, ApJ, in review
4. **Song, Y.**, & Paglione, T., *A Stacking Search for Gamma-Ray Emission from Nearby Flare Stars and the Periodic Source TVLM 513-46546*, 2020, ApJ, 900, 185S. [arXiv:2008.01143](https://arxiv.org/abs/2008.01143)
5. **Song, Y.**, Takata, J., & Cheng, K. S., *Theoretical Study of Gamma-Ray Pulsar*, 2016 JASS, 33(2), 69-73
6. Li, H., Li, D., Qian, L., Duo, X., Goldsmith, P. F., Noriega-Crespo, A., Wu, Y., **Song, Y.**, & Nan. R., *Outflows and Bubbles in Taurus: Star-formation Feedback Sufficient to Maintain Turbulence*, 2015 ApJS, 219 20L. [arXiv:1507.06512](https://arxiv.org/abs/1507.06512)

Talks & Conferences

11/2021	<i>A Large Population of Sub-Threshold Gamma-Ray Pulsars</i> , IAU Symposium 363
10/2021	<i>Will Stacking Fermi Data Enable Dark Matter Annihilation Signal Detection?</i> , Galaxy Formation Group Meeting, Center for Computational Astrophysics, Flatiron Institute
10/2021	<i>Stacking the Gamma-ray Sky to Search for Faint Astrophysical Populations</i> , Colloquium, Department of Physics & Astronomy, University of Louisville
06/2021	<i>A Large Population of Sub-Threshold Gamma-Ray Pulsars</i> , 238 th AAS Meeting, 2021AAS, 23812802S
01/2021	<i>Gamma-Rays from Globular Clusters</i> , co-author, 237 th AAS Meeting, 2021AAS, 23713002P
10/2020	<i>Detecting Gamma-ray Emission from Nearby Flare Stars</i> , Seminar for Laboratory of Atmospheric and Space Physics, University of Colorado, Boulder
01/2020	<i>Tentative Gamma-Ray Detection of Fast Rotating TVLM 513-46546</i> , 235 th 235 th Meeting, 2020AAS, 23528804S
01/2020	<i>Correlating White Light and Gamma-Ray Emission in Solar Flares</i> , co-author, 235 th AAS Meeting, 2020AAS, 23528804S
01/2020	<i>Gamma-rays from Jupiter</i> , co-author, 235 th AAS Meeting, 2020AAS, 23528804S
01/2016	<i>Theoretical Study of Gamma-ray Emission from Young Pulsars</i> , 6 th Fermi Asian Network (FAN) workshop

Community & Professional Service

Fall 2020	Physics & Astronomy tutor, Dept. of Earth & Physical Sciences, CUNY York College
2021-present	Member, Committee for Sexual-Orientation & Gender Minorities in Astronomy (SGMA) of AAS
2019-present	Mentor. Organizing weekly skill development workshops for undergraduate researchers at AstroCom NYC program and serving as a graduate student mentor for AstroCom NYC scholars.
2019-present	Member, AMNH Astrophysics Department Seminar Committee
08/2019	Student helper, CUNY Graduate Center Science Day & Orientation
2014-2015	Bass Singer, the Shun Hing College Schola Cantorum Choir of the University of Hong Kong
2013-2014	Bass Singer, the Nanjing University Choir
2013	Volunteer, the 2 nd Asia Youth Games, Nanjing
08/2012	Volunteer, the 28 th IAU General Assembly, Beijing
2011-2012	President of the Amateur Astronomers Association of Nanjing University

Professional Development & Training

2021 - 2022	Science Communication Fellow , CUNY Graduate Center. A year-long fellowship aims to train and prepare STEM graduate students to be effective science communicators who are skilled at engaging the general public.
2021 - 2022	Effective Practice Framework , Association of College and University Educators. A 25-week training for refining teaching practices with a nationally recognized Certificate in Effective College Instruction issued upon completion.
06/2021	Astrostatistics Summer School , Pennsylvania State University
2021	Machine Learning Class , Center for Computational Astrophysics, Flatiron Institute, taught by Prof. Viviana Acquaviva
08/2020	Open Pedagogy Fellow , CUNY Graduate Center. After participating in a CUNY faculty development workshop, I developed a zero-cost open educational resource syllabus for the introductory astronomy laboratory (ASTR141) at York College. It is also designed to fit the pandemic-era online learning.
07/2013	2nd Radio Astronomy Summer School , Guizhou University & National Astronomical Observatories of China

Membership

American Astronomical Society, American Physical Society