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## Research Interests

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Multi-phase interstellar medium; Galactic magnetism; dust polarization; CMB Foreground

## Education

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**Ph.D.**, Physics, Stanford University Sept 2021 – Present  
Topic: Physics of the multi-phase interstellar medium with a special focus on the structure of the 3D Galactic magnetic field

**B.Sc.**, Physics & Math, University of Michigan Sept 2016 – June 2020  
Undergraduate thesis: “*Probing non-standard neutrino interactions with supernova neutrinos at Hyper-K*,” supervised by James D. Wells

## Research Experience

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**HI Emission Morphology with Scattering Transform**, Stanford University 2021 – Present  
• “*Probing the cold neutral medium through HI emission morphology with the scattering transform*” supervised by Susan Clark

**Machine Learning for Neutrino Reconstruction**, SLAC 2021 – 2022  
• “*Implicit Neural Representation as a Differentiable Surrogate for Photon Propagation in a Monolithic Neutrino Detector*” supervised by Kazu Terao and Hiro Tanaka  
• Developed a scalable, data-driven [photon library model](#) using neural scene representation networks

**Energy Reconstruction for the SNO+ Experiment**, University of Pennsylvania 2020 – 2021  
• A Fast GPU-Enabled Simulation-Based Energy Fitter for SNO+ supervised by Josh Klein  
• Developed a GPU-accelerated [photon tracking algorithm](#) for neutrino energy reconstruction

**Neutrino Phenomenology**, University of Michigan 2018 – 2020  
• “*Probing non-standard neutrino interactions with supernova neutrinos at Hyper-K*” supervised by James Wells  
• Developed simulation algorithm to look for non-standard neutrino self-interaction signatures in galactic supernova neutrino data

## Publications

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4. **Minjie Lei**, S. E. Clark, “*Probing the cold neutral medium through HI emission morphology with the scattering transform*,” 2022, [arXiv e-prints](#), [arXiv:2212.06182](#)
3. **Minjie Lei**, K. V. Tsang, et al., “*Implicit Neural Representation as a Differentiable Surrogate for Photon Propagation in a Monolithic Neutrino Detector*,” 2022, [arXiv e-prints](#), [arXiv:2211.01505](#)
2. **Minjie Lei**, Noah Steinberg, & James D. Wells, “*Probing non-standard neutrino interactions with supernova neutrinos at Hyper-K*,” 2020, *JHEP*, 01, 179
1. **Minjie Lei**, James D. Wells, “*Minimally modified  $A_4$  Altarelli-Feruglio model for neutrino masses and mixings and its experimental consequences*,” 2020, *Phys. Rev. D*, 102 (1), 016023

## Scientific Presentations

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Contributed Talks .....  
Dec. 2022    **Galactic Science and CMB Foregrounds**; Core to Core CMB Workshop series  
Apr. 2021    **APS April Meeting 2021**; American Physical Society

## Teaching and Mentorship

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Teaching Assistantships .....  
Winter 2023    **Stars and Planets in a Habitable Universe** (Physics 15)  
Fall 2019      **Honors Physics I - Mechanics** (Physics 160)  
Fall 2018      **Physics for the Life Sciences I** (Physics 135)  
Fall 2017      **Honors Physics I - Mechanics** (Physics 160)  
Student Mentorship .....  
2022-2023      **Amritpal Nijjar**, undergraduate at UCLA, Stanford PIE Program  
2020-2021      **Jackie Zhao**, High school student, Minds Matter Philadelphia