

Jax Wysong

Education

- Expected May 2026 **Master of Science, Mathematics**, South Dakota State University, Brookings, SD, *Cumulative GPA: 4.00/4.00*
Thesis: *Solving Nonlinear PDEs in Parallel using the Space-Time Finite Element Method.*
- May 2024 **Bachelor of Science, Physics & Mathematics (Honors)**, South Dakota State University, Brookings, SD, *Cumulative GPA: 3.905/4.00*
Van D. & Barbara B. Fishback Honors College.

Publications

- J. Wysong, S. Overvaag, H. Lim, and J.-H. Kim, *Numerical Investigations of Stable Dynamics in the Presence of Ghosts*, arXiv, submitting soon (2025).
- G. Baker, J. Wysong, S. Valloppilly, P. Shand, P. Lukashev, P. Kharel, *Synthesis, Crystal Structure, and Magnetic Properties of CoMoFeAl and Related Compounds*, AIP Advances 13, 025213 (2023).
- P. Lukashev, J. Wysong, S. McFadden, G. Baker, B. Schmidt, P. Shand, P. Kharel, *Electronic, Magnetic, and Structural Properties of NiFeMnAl*, Journal of Physics: Condensed Matter 36, 08580 (2023).
- J. Wysong and G. Baker, *Structural and Magnetic Properties of Heusler Alloys: FeCrMn_{1-x}V_xAl*, Journal of Undergraduate Research, Vol. 18, Article 5 (2023).
- G. Baker, M. Wieberdink, J. Wysong, *Development of Spintronic Materials by Stoichiometric Engineering of CoFeVAl*, Journal of Undergraduate Research, Vol. 18, Article 2 (2023).
- P. Lukashev, L. Stuelke, Z. Pottebaum, Y. Moua, G. Baker, J. Wysong, M. Flesche, S. Valloppilly, P. Shand, P. Kharel, *Experimental and Theoretical Investigation of FeCrVAl and Related Compounds*, Phys. Scr. 98, 015801 (2022).

Presentations

- 2021 **An Overview of the LUX-ZEPLIN (LZ) Dark Matter Experiment**. SD EPSCoR Symposium, Brookings, SD. Poster Presentation.
- 2021 **An Overview of the LUX-ZEPLIN (LZ) Dark Matter Experiment**. National Physics REU Poster Symposium. Poster Presentation.
- 2022 **Electronic Band Structure and Magnetism of FeCrVAl, FeCr_{0.5}Mn_{0.5}VAl, FeCr_{0.5}Co_{0.5}VAl**. APS March Meeting. Poster Presentation.
- 2022 **Electronic Band Structure and Magnetism of FeCrVAl, FeCr_{0.5}Mn_{0.5}VAl, FeCr_{0.5}Co_{0.5}VAl**. URSCAD, Brookings, SD. Poster Presentation.
- 2022 **A Study on HPC Implementation of Dynamically Stable Ghost-Ridden Systems**. SD EPSCoR Symposium. Poster Presentation.
- 2022 **A Study on HPC Implementation of Ghost-Ridden Systems**. APS Four Corners Section Meeting. Poster Presentation.
- 2023 **Magnetism and Electronic Band Properties of Ni–Fe–Mn–Al Heusler Alloys**. APS March Meeting, Las Vegas, NV. Poster Presentation.
- 2023 **Studying Ghosts in Field Theory with the Fully Implicit Spacetime FEM**. APS April Meeting, Minneapolis, MN. Poster Presentation.

- 2023 **Ion Heating in Magnetic Reconnection**. LANL Computational Physics Workshop. Oral and Poster Presentations.
- 2024 **Effect of Mn Doping on Magnetic/Electronic Properties of CoFeVAl**. APS March Meeting, Minneapolis, MN. Oral Presentation.
- 2024 **The Spacetime FEM to Investigate Ghost-Ridden Systems**. APS April Meeting, Sacramento, CA. Poster Presentation.
- 2024 **Solving a Ghost System with Space-Time FEM**. MAA North Central Section Meeting, Sioux Falls, SD. Oral Presentation.

Research Positions

- Aug. 2022 – Present **M.S. Thesis Research: Space-Time FEM / Nonlinear PDEs / HPC**, *South Dakota State University, Dept. of Mathematics*, Brookings, SD
- Advisors: Dr. Jung-Han Kimn; Dr. Hyun Lim (LANL).
 - Implement parallel space-time FEM to solve nonlinear PDEs in 1+1 and 2+1 dimensions.
 - Utilize PETSc (DMDA, SNES) for mesh parallelization and nonlinear solvers.
 - Perform numerical investigations of ghost systems in physics field theories.
 - Future work:
 - develop physics-aware preconditioners for cheaper 3+1 simulations;
 - extend framework to additional PDE systems with undergraduate collaborators.
- June 2023 – **Computational Physics Workshop Student**, *Los Alamos National Laboratory*, Los Alamos, NM
- Aug. 2023
- Mentors: Dr. Ari Le, Dr. Adam Stanier.
 - Worked on ion heating in magnetic reconnection in Earth's magnetotail.
 - Performed simulations using hybrid particle-in-cell VPIC code on LANL clusters.
 - Attended lectures from LANL scientists.
- June 2022 – **Undergraduate Researcher, PLAINS REU**, *South Dakota State University, Dept. of Mathematics*, Brookings, SD
- Aug. 2022
- Gained experience with SDSU's HPC cluster.
 - Learned space-time finite element methods and PETSc.
 - Studied PDE-based ghost systems; continued work under Future Innovators Fellowship.
- Aug. 2021 – **Undergraduate Research Assistant, Materials Science**, *South Dakota State University, Dept. of Physics*, Brookings, SD
- May 2024
- Mentor: Dr. Parashu Kharel.
 - Synthesized Heusler alloys using arc-melting techniques.
 - Performed XRD structural analysis and magnetic measurement (Curie temperature, VSM).
 - Investigated potential Heusler alloy candidates for spintronic applications.
- May 2021 – **Undergraduate Research Assistant, Dark Matter**, *Black Hills State University REU (SURF)*, Lead, SD
- Worked on the LZ Dark Matter Experiment at Sanford Underground Research Facility.
 - Assisted with detector construction, background radiation calibration, and xenon/water filling.
 - Project goal: identify WIMP-induced scattering in liquid xenon.

Graduate Teaching Assistant

- Aug. 2024 – **Graduate Teaching Assistant**, *South Dakota State University, Dept. of Mathematics*, Brookings, SD
Present
- Courses:** Differential Equations, Advanced Engineering Math, Numerical Analysis; College Algebra; Survey of Calculus; Mathematical Reasoning; Calculus I & II.
- Lead recitations, labs, and office hours; assist students with coursework and projects.
 - Conduct supplemental instruction sessions and grade assignments/exams.

Additional Employment

- Jan. 2021 – **University Physics I & II Tutor**, *SDSU Dept. of Physics*, Brookings, SD
- May 2024 ○ Helped students prepare for exams through problem-solving demonstrations.
○ Taught study strategies and recommended supplemental resources.
- Jan. 2021 – **University Physics I & II Tutor**, *Wintrode Student Success Center*, Brookings, SD
- Dec. 2021 ○ Held weekly 1-hour tutoring sessions for small groups.
○ Prepared lessons, practice problems, and mock exam reviews.

Leadership & Outreach

- Aug. 2025 – **Math Circle Volunteer**, *Jefferson High School*, Sioux Falls, SD
- May 2026 Monthly outreach with graduate students and faculty to conduct engaging math activities for high school students.
- Aug. 2023 – **Physics II Lab Teaching Assistant**, *SDSU Dept. of Physics*, Brookings, SD
- Dec. 2023 Assisted students with E&M experiments; prepared weekly labs.
- May 2023 – **Student Research Mentor**, *South Dakota State University*, Brookings, SD
- Present Mentored an undergraduate in space-time FEM research; continued collaboration after REU.
- 2021 – 2024 **Society of Physics Students (SPS)**, *SDSU*, Brookings, SD
- Historian (2023–2024)
 - President (2022–2023)
 - Vice President (2021–2022)
- Jan. 2021 – **Sigma Phi Epsilon Fraternity**, Brookings, SD
- May 2024 Participated in philanthropy events; mentored younger fraternity members.

Recognitions

- Barry Goldwater Scholarship SDSU Nominee
- 2024 Schultz-Werth Senior Research Paper Award
- 2023/24 Future Innovators of America Undergraduate Fellowship
- Multiple scholarships from SDSU Physics Dept. and Honors College
- Sigma Pi Sigma Physics & Astronomy Honor Society (2023)

Skills

- Lab Arc-Melting; High Vacuum Annealing; XRD; Vibrating Sample Magnetometer
- Software SDSU “Innovator” Cluster; LANL Clusters; Origin
- Programming C, Python, PETSc, LaTeX, MATLAB