Brookings, SD

Jax Wysong

605-214-6146
Jax.Wysong@jacks.sdstate.edu

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, submitted (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.

2022 **Structural and Magnetic Properties of $Co_{1.5}Mo_{0.5}FeAl$ Alloy**. MMM–Intermag Conference, Minneapolis, MN. Poster Presentation.

2023 **Synthesis and Magnetic Properties of CoMoFeAl**. APS March Meeting, Las Vegas, NV. Oral 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 **Development of Novel Spintronic Materials**. URSCAD, Brookings, SD. Poster Presentation.

2023 **Ion Heating in Magnetic Reconnection**. LANL Computational Physics Workshop. Oral and Poster Presentations.

2023 **Exploring Stable Dynamics of Field Theory with Ghosts Using the Spacetime FEM**. APS Prairie Section Meeting, Columbia, MO. Poster Presentation.

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 – Aug. 2023 **Computational Physics Workshop Student**, *Los Alamos National Laboratory*, Los Alamos, NM

- 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 – Aug. 2022 **Undergraduate Researcher, PLAINS REU**, *South Dakota State University, Dept. of Mathematics*, Brookings, SD

- 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 – May 2024 **Undergraduate Research Assistant, Materials Science**, *South Dakota State University, Dept. of Physics*, Brookings, SD

- 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 – Aug. 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 – Present **Graduate Teaching Assistant**, *South Dakota State University, Dept. of Mathematics*, Brookings, SD

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 – May 2024 **University Physics I & II Tutor**, *SDSU Dept. of Physics*, Brookings, SD

- Helped students prepare for exams through problem-solving demonstrations.
- Taught study strategies and recommended supplemental resources.

Jan. 2021 – Dec. 2021 **University Physics I & II Tutor**, *Wintrode Student Success Center*, Brookings, SD

- Held weekly 1-hour tutoring sessions for small groups.
- Prepared lessons, practice problems, and mock exam reviews.

Leadership & Outreach

Aug. 2025 – May 2026 **Math Circle Volunteer**, *Jefferson High School*, Sioux Falls, SD
Monthly outreach with graduate students and faculty to conduct engaging math activities for high school students.

Aug. 2023 – Dec. 2023 **Physics II Lab Teaching Assistant**, *SDSU Dept. of Physics*, Brookings, SD
Assisted students with E&M experiments; prepared weekly labs.

May 2023 – Present **Student Research Mentor**, *South Dakota State University*, Brookings, SD
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 – May 2024 **Sigma Phi Epsilon Fraternity**, Brookings, SD
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