Dinesha V. Hegde

Curriculum Vitae

Center for Space Plasma & Aeronomic Research
The University of Alabama in Huntsville
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Research Interests

Heliophysics & Space Weather — Magnetohydrodynamic modeling of the solar wind, coronal mass ejections (CMEs), and stream interaction regions; geometric reconstruction of CMEs; characterization of interplanetary CME flux-ropes and shocks; uncertainty quantification; and machine learning applications in heliophysics for space weather prediction.

Education

Dec 2025 — **Ph.D. in Space Science**, The University of Alabama in Huntsville, Huntsville, AL, USA.
Dissertation — Modeling Solar Wind in the Inner Heliosphere with Quantified Uncertainties.
Advisor — Dr. Nikolai Pogorelov
Dec 2022 — **M.S. in Space Science**, The University of Alabama in Huntsville, Huntsville, AL, USA.
Jul 2018 — **M.Sc. in Physics**, University of Mysore, Mysuru, India.
Jun 2016 — **B.Sc. in Physics, Chemistry, and Mathematics**, Yuvaraja's College, University of Mysore, Mysuru, India.

Work Experience

Sep 2025 – Present — **Research Associate III, S2**, Center for Space Plasma and Aeronomic Research, The University of Alabama in Huntsville, AL, USA.
Aug 2020 – Aug 2025 — **Graduate Research Assistant**, Department of Space Science, The University of Alabama in Huntsville, AL, USA.
Sep 2019 – May 2020 — **Graduate Teaching Assistant**, Department of Mathematics, The University of Alabama in Huntsville, AL, USA.
Jan 2019 – Sep 2019 — **Research Assistant**, Department of Sun & Heliosphere, Max Planck Institute for Solar System Research, Göttingen, Germany.

Internships

Jan–Jul 2017 — **Research Intern**, Department of Materials Science, University of Mysore, Mysuru, India.
May–Jul 2016 — **Summer Research Fellow**, Stars & Galaxies Group, Indian Institute of Astrophysics (IIA), Bengaluru, India.
Dec 2015 — **Research Intern**, Space Science Division, Indian Space Research Organisation (ISRO), Bengaluru, India.
May–Jul 2015 — **Research Intern**, Physical Sciences Lab, Jawaharlal Nehru Planetarium (JNP), Bengaluru, India.

Research Grants

Sep 2025 – Present — **Exploring the Potential of Artificial Intelligence Foundation Models in Space Weather Prediction**, NASA MSFC-UAH Cooperative Agreement, **Role: Co-Investigator**.
Aug 2021 – Feb 2025 — **Modeling Space Weather with Quantified Uncertainties**, NASA ROSES Future Investigators in NASA Earth and Space Science and Technology (FINESST) Grant, **Role: Future Investigator**; Amount: $135,000.

Awards, Fellowships, & Honors

Oct 2025 **Featured Young Researcher**, Indian Network for Dynamical and Unified Solar Physicists (INDUS) Newsletter, Issue 27.

Aug 2023 **Outstanding Student Poster Award**, SHINE Conference 2023, Stowe, VT, USA.

Aug 2022 **American Astronomical Society (AAS) Solar Physics Division Studentship Award**.

Aug 2021 **NASA FINESST Grant Recipient**.

May 2016 **Indian Academy of Sciences (IAS) Summer Research Fellowship**.

Jun 2013 **Karnataka Science & Technology Academy Merit Scholarship**.

Research Visits

Program **Indo–U.S. Science and Technology Forum (IUSSTF) Joint Virtual Center**

Project Understanding CME propagation and its internal structure in interplanetary space to predict B_z.

Jan 2024 Krea University, Sri City, India (two weeks)

Jun 2023 NASA Goddard Space Flight Center, Greenbelt, MD, USA (one week)

Aug 2022 Indian Institute of Astrophysics, Bengaluru, India (two weeks)

Summer Schools

Summer 2023 **International Space Weather Camp** - 2023 at Hermanus, South Africa and Huntsville, USA

Summer 2021 **NASA Heliophysics Summer School** - 2021 (Online)

Publications

In Prep **Hegde, D. V.**, Kim, T. K., Pogorelov, N. V., Jones, S. I., and Arge, C. N., Modeling of Solar Wind Stream Interaction Regions Using Synchronic Photospheric Magnetic Field Boundary Conditions: Validation at Earth and STEREO-A. *The Astrophysical Journal*.

In Prep **Hegde, D. V.**, Kim, T. K., Pogorelov, N. V., Jones, S. I., Arge, C. N., Ensemble Modeling of the Solar Wind Flow with Boundary Conditions Governed by Synchronic Photospheric Magnetograms. II. Multipoint Quantitative Performance Evaluation. *The Astrophysical Journal.*

Apr 01, 2026 Raza, S., **Hegde, D. V.**, Singh, T., and Pogorelov, N. V., On the Prediction of CME Magnetic Fields Using Upstream In-Situ time-series data: A Machine Learning Approach. *Journal of Physics: Conference Series*. ASTRONUM-2025(under review)

Mar 05, 2026 Kuznetsova, M., Reiss, M., Henley, E., ... **Hegde, D. V.**, ... & Stegeman, Luke., Assessment of Space Weather Modeling Capabilities and Transition to Operations. *Advances in Space Research* DOI:10.1016/j.asr.2026.03.027

Mar 02, 2026 Roy, S., **Hegde, D. V.**, Schmude, J., ... & Ramachandran, R., SuryaBench: Benchmark Dataset for Advancing Machine Learning in Heliophysics and Space Weather Prediction. *Scientific Data* DOI:10.1038/s41597-026-06552-5

Aug 18, 2025 Roy, S., Schmude, J., Lal, R., Gaur, V., ..., **Hegde, D. V.**, ... & Ramachandran, R., Surya: Foundation Model for Heliophysics. *arXiv preprint:* arXiv:2508.14112

Jul 21, 2025 **Hegde, D. V.**, Kim, T. K., Pogorelov, N. V., Jones, S. I., Arge, C.N., Ensemble Modeling of the Solar Wind Flow with Boundary Conditions Governed by Synchronic Photospheric Magnetograms. I. Multipoint Validation in the Inner Heliosphere. *The Astrophysical Journal* DOI:10.3847/1538-4357/addf33

Feb 26, 2025 Singh, T., **Hegde, D. V.**, Kim, T. K., Pogorelov, N. V., Magnetohydrodynamic Simulation of a Coronal Mass Ejection Observed During the Near-radial Alignment of Solar Orbiter and Earth. *The Astrophysical Journal* DOI:10.3847/1538-4357/adb1ac

Sep 30, 2024 Roy, S., Singh, T., Freitag, M., Schmude, J., Lal, R., **Hegde, D. V.**, ... & Ramachandran, R., AI Foundation Model for Heliophysics: Applications, Design, and Implementation. *arXiv preprint* arXiv:2410.10841

Apr 01, 2024 Pogorelov, N.V., Arge, C.N., Caplan, R.M., ..., **Hegde, D. V.**, ... & Turtle, J., Space Weather with Quantified Uncertainties: Improving Space Weather Predictions with Data-Driven Models of the Solar Atmosphere and Inner Heliosphere. *Journal of Physics: Conference Series* DOI:10.1088/1742-6596/2742/1/012013

Nov 16, 2023 Kumar, S., **Hegde, D. V.**, Srivastava, N., Pogorelov, N. V., Gopalswamy, N., Yashiro, S., Rotation of a Stealth CME on 5 October 2012 Observed in the Inner Heliosphere. *The Astrophysical Journal* DOI:10.3847/1538-4357/ad011f

Aug 23, 2023 Raouafi, N.E., Hoeksema, J.T., Newmark, J.S., ... **Hegde, D. V.**, ... & Chatzistergos, T., Firefly: The Case for a Holistic Understanding of the Global Structure and Dynamics of the Sun and the Heliosphere. *Bulletin of the AAS* DOI:10.3847/25c2cfeb.c647a83d

Apr 09, 2018 **Hegde, D. V.**, Bhavanishankar, M.C., Kariyappa, G.G., Urs, T.G., Basavaraju, N.M., Dasaiah, M. and Rudrappa, S., Studies on physical properties of wine palm and Roselle natural fibers. *Journal of Natural Fibers, Taylor & Francis Group.* DOI:10.1080/15440478.2018.1455619

Invited Talks

Jan 12, 2026 Hegde, D. V., Introduction to SuryaBench Dataset, *Surya Science Workshop*, Boulder, CO, USA, (Online)

Sep 24, 2025 Hegde, D. V., Magnetohydrodynamic Modelling of the Solar Wind with Quantified Uncertainties: Multipoint Validation in the Inner Heliosphere, *Indian Network for Dynamical & Unified Solar Physicists (INDUS) seminar series-24* (Online).

Sep 23, 2025 Hegde, D. V., Magnetohydrodynamic Modelling of the Solar Wind with Quantified Uncertainties: Multipoint Validation in the Inner Heliosphere, *Parker Solar Probe Working Group on Large Scale Structures (PSP-WG-LSS) meeting* (Online).

Feb 13, 2025 Hegde, D. V., Evaluating Ensemble MHD Modeling of the Ambient Solar Wind with Multi-Spacecraft In-Situ Observations. *COSPAR International Space Weather Action Teams (ISWAT) Working Meeting*, Cape Canaveral, FL, USA

Jun 26, 2024 Hegde, D. V., MHD Modeling of the Ambient Solar Wind: Multi-Spacecraft Validation in the Inner Heliosphere, *International Space Weather Camp (ISWC)*, Huntsville, AL, USA

May 20, 2024 Hegde, D. V., MHD Modeling of the Ambient Solar Wind with Quantified Uncertainties: Multi-Spacecraft Validation in the Inner Heliosphere, *Space Weather With Quantified Uncertainties (SWQU): User Meeting*, Huntsville, AL, USA

Jan 16, 2024 Hegde, D. V., Magnetohydrodynamic Modeling of 2018 August 20 Slow Coronal Mass Ejection and Solar Wind Interaction, *Indo-US Science & Technology Forum (IUSSTF) meeting*, Krea University, Sri City, Andhra Pradesh, India

Nov 10, 2023 Hegde, D. V., Multi-Spacecraft Validation of an Empirically Data-driven Ensemble MHD Model of Solar Wind in the Inner Heliosphere, *CSPAR Seminar*, Huntsville, AL, USA

Jun 09, 2023 Hegde, D. V., Magnetohydrodynamic Modeling of 2018 August 20 Slow Coronal Mass Ejection and Solar Wind Interaction, *IUSSTF Meeting*, NASA GSFC, Greenbelt, MD, USA

Aug 30, 2022 Hegde, D. V., Improving Solar Wind Predictions Using Multi-Point Observations, *IUSSTF Meeting*, IIA, Bengaluru, India

Conference Talks

Dec 15–19, 2025 Hegde, D. V. & Surya Team, SuryaBench: New Benchmark Dataset for Advancing Machine Learning Applications in Heliophysics and Space Weather, *American Geophysical Union (AGU) Fall Meeting*, New Orleans, LA, USA

Oct 19–24, 2025 Hegde, D. V. & Surya Team, SuryaBench: Benchmark Dataset for Advancing Machine Learning Applications in Heliophysics and Space Weather, *Data, Analysis, and Software in Heliophysics (DASH)/International Heliophysics Data Environment Alliance (IHDEA) 2025* , San Antonio, TX, USA

Jul 13–18, 2025 Hegde, D. V. & Surya Team, SuryaBench: Full-Resolution Benchmark Dataset from the Solar Dynamics Observatory for Machine Learning Applications in Heliophysics, *International Conference on Numerical Modeling of Space Plasma Flows (ASTRONUM)*, Madison, WI, USA

Dec 09–13, 2024 Hegde, D. V., Roy, S., Singh, T., Gaur, V., Lal, R., Lin, H., Schmude, J., Pogorelov, N.V., Maskey, M., and Ramachandran, R., Downstream Applications of Helio Foundation Models in Space Weather-Specific Problems. *AGU Fall Meeting*, Washington, D.C, USA

Mar 25–29, 2024 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Jones, S. I., and Arge, C. N., MHD Modeling of the Ambient Solar Wind with Quantified Uncertainties: Multi-Spacecraft Validation in the Inner Heliosphere, *21st Annual International Astrophysics Conference (AIAC)*, Turin, Italy

Dec 11–15, 2023 Hegde, D. V., Singh, T., Kim, T.K. and Pogorelov, N.V., Magnetohydrodynamic Modeling of a Coronal Mass Ejection Encounter During Solar Orbiter and Wind's Near-Radial Alignment. *AGU Fall Meeting*, San Francisco, CA, USA

Dec 12–16, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Use of Multi-Spacecraft Observations to Validate Data-Driven MHD Models of the Solar Wind, *AGU Fall Meeting*, Chicago, IL, USA

Oct 30–Nov 5, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Validation of Data-Driven MHD Models of the Solar Wind Using Multi-Spacecraft In-Situ Observations, *20th AIAC*, Santa Fe, NM, USA

Jul 16 – 24, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Solar Wind Simulations along the Parker Solar Probe Trajectory, *44th COSPAR Scientific Assembly* (Virtual)

Conference Posters

Aug 12–16, 2024 Hegde, D. V., Singh, T., Kim, T. K., Pogorelov, N. V., MHD Modeling of the Ambient Solar Wind with Quantified Uncertainties: Multi-Spacecraft Validation in the Inner Heliosphere, *Solar Heliospheric and INterplanetary Environment (SHINE) Conference*, Juneau, AK, USA

Aug 12–16, 2024 Hegde, D. V., Solar Wind, tutorial poster(invited), *SHINE Conference*, Juneau, AK, USA

Aug 06–12, 2023 Hegde, D. V., Singh, Talwinder., Kim, T. K., Pogorelov, N. V., Magnetohydrodynamic Simulation of the Coronal Mass Ejection on August 20, 2018, and Solar Wind Interaction, *SHINE Conference*, Stowe, VT, USA

Jun 12–16, 2023 Hegde, D. V., Singh, Talwinder., Kim, T. K., Pogorelov, N. V., Magnetohydrodynamic Modeling of 2018 August 20 Slow Coronal Mass Ejection and Solar Wind Interaction, *16th International Solar Wind Conference - 2023*, Pacific Grove, CA, USA

Apr 17–21, 2023 Hegde, D. V., Singh, Talwinder., Kim, T. K., Pogorelov, N. V., Modeling of the Coronal Mass Ejection that Triggered the Third Largest Geomagnetic Storm of Solar Cycle 24, *Space Weather Workshop - 2023*, Boulder, CO, USA

Mar 09–10, 2023 Hegde, D. V., Singh, Talwinder., Kim, T. K., Pogorelov, N. V., Magnetohydrodynamic Simulation of the 2018 August 20 Coronal Mass Ejection using HelioCubed, *SWQU Spring Meeting*, MIT, Boston, MA, USA

Aug 08–12, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Improving Solar Wind Predictions Using Multi-Point Observations, *Triennial Earth-Sun Summit (TESS)*, Bellevue/Seattle, WA, USA

Jun 27–Jul 1, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Improving Solar Wind Predictions Using Multi-Satellite In-Situ Observations, *SHINE Conference*, Honolulu, HI, USA

Jun 21–24, 2022 Hegde, D. V., Kim, T. K., Pogorelov, N. V., Arge, C. N., and Jones, S. I., Solar Wind Simulations along the Parker Solar Probe Trajectory, *PARKER TWO*, Laurel, MD, USA

Dec 13–17, 2021 Hegde, D. V., Kim, T., Pogorelov, N., Arge, C., and Jones, S., Solar Wind Simulations along the Parker Solar Probe Trajectory, *AGU Fall Meeting*, New Orleans, LA, USA

Aug 03–05, 2021 Hegde, D. V., Kim, T., Pogorelov, N., Arge, C., and Jones, S., Solar Wind Simulations along the Parker Solar Probe Trajectory, *SHINE Conference*, Virtual

Apr 20–22, 2021 Hegde, D. V., Kim, T., Pogorelov, N., Arge, C., and Jones, S., Solar Wind Simulations along the Parker Solar Probe Trajectory, *Space Weather Workshop*, Virtual

Mar 06–10, 2017 Hegde, D. V., Subramaniam, A., Sagar, Ram., Nayak, P. K., Gaps in the Main Sequence of Star Clusters in the Large Magellanic Cloud, *35^{th} Annual Meeting of Astronomical Society of India (ASI)*, Jaipur, India

Professional Services

2026– Reviewer for *The Astrophysical Journal* (ApJ)

2025– Active member, COSPAR–International Space Weather Action Teams (ISWAT), O1–O2: *Quantification of Uncertainties in Space Weather Forecasts*

2025 Program Committee Member and Reviewer, Solar-Stellar Astronomy Big Data (SABID-2025) Workshop, IEEE International Conference on Data Mining (ICDM)

2023, 2024 Reviewer for student posters and oral presentations, Outstanding Student Presenter Contest, AGU Fall Meeting

Professional Memberships

2021– American Geophysical Union (AGU)

Skills

Programming	Python, C++, IDL, MATLAB
Data Analysis	Parker Solar Probe, Solar Orbiter, STEREO, Wind, ACE, SDO
Modeling	MS-FLUKSS, OFT, SWIG, GCS
ML/AI	scikit-learn, PyTorch