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NSF RET DATA3 Product (DP) References 2023-2025

Teacher authors are bolded, student authors are italicized.

NSF RET DATA3 Work Products (WP)

Work products in each category are listed oldest first. RET DATA3 participants are identified in boldface, and K-12 and undergraduate students in italics.

Juried Publications and Presentations by PI Team and Partners about Space Weather or AI

[WP1] K.G. Herbert, V.K. Anu, S. Robila, S. Hagiwara, R.A. Goldstein, M. Shin, J.T.L. Wang , and T.J. Marlowe. "K-12 Teachers and Data Science: Learning Interdisciplinary Science through Research Experiences." *Proceedings of the American Association of Engineering Education*, (ASEE 2024), Portland, Oregon, June 2024.

[WP2] *V.R Gazula*, K.G. Herbert, Y. Abduallah, J.T.L. Wang., "Interpretable Deep Learning for Solar Flare Prediction, *the 36th IEEE International Conference on Tools with Artificial Intelligence (IEEE ICTAI)*, Herndon, Virginia, October 28-30th, 2024

[WP3] K.G. Herbert. "STEM Communication and the Scientific Workforce: How Investing in K-12 Computer Science Teacher Education Expands STEM Research and Industry Capabilities." Charles H. Franke Memorial Lecture, Petersheim Academic Exposition, Seton Hall University, April 25, 2025.

[WP4] *A.O. Rawashdeh*, J.T. L. Wang, K.G. Herbert “Explainable Artificial Intelligence in Deep Learning-Based Solar Storm Predictions”, *38th Florida Artificial Intelligence Research Society Conference (FLAIRS ’38*), May 2025.

Juried Publications (with additional presentations for the venue and NJECC noted) by RET Teacher Participants

[WP5] **T. Samaras**, T.J. Marlowe, K.G. Herbert, V.K. Anu, S. Hagiwara, and S.A. Robila. “Interdisciplinary Synergy: Resources for Embedding Plugged and Unplugged Computer and Data Science Activities into the K-12 Curriculum.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP6] **A. Brantley**, K.G. Herbert, V.K. Anu, S. Hagiwara, S.A. Robila, and J.T.L. Wang. “Understanding Space Weather Through Storytelling Data Visualization.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP7] **E. Douglass, A. Cannella**, K.G. Herbert, V. Anu, S. Hagiwara, T. Marlowe, and S. Robila. “Design and Implementation of a STEAM Robotics Lesson on the Spotted Lanternfly: Engineering a Computer Science Solution.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP8] **M.M.S. Menichella**, S.A. Robila, K.G. Herbert, and T. Marlowe. “Creating a Cross Curricular Resource for Solar Weather History and Its Impact on Daily Life.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP9] **C. Drozdowski**, T.J. Marlowe, K.G. Herbert, V.K. Anu, S. Hagiwara, and S.A. Robila. “The APP Method: Self-Regulation Strategies Giving POWER to Computer Science Students.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP10] **S. Emeghara**, S. Hagiwara, S. Robila, K.G. Herbert, T. Marlowe, and V.K. Anu. “A Cyber-Physical Systems Approach to Teaching Solar Weather Topics in Middle School.” *Proceedings of the IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

[WP11] **T. Samaras,** T.J. Marlowe, K.G. Herbert, V.K. Anu, S.Hagiwara; and S.A. Robila. “Interdisciplinary Synergy: Resources for Embedding Plugged and Unplugged Computer and Data Science Activities into the K-12 Curriculum.” *Proceedings of the ISTELive 24 EdTech Conference (International Society for Technology in Education)*, Denver CO, June 2024.

[WP12] **A. Williams-Nash**, S. Hagiwara, K.G. Herbert, T. Marlowe, R. Goldstein, and V. Anu. “Preparing K-8 Teachers to Teach and Infuse Computer Science Across All Subjects.” *Proceedings of the ACM Special Interest Group in Computer Science Education (SIGCSE) Technical Symposium 2025, Pittsburgh, PA, February 26-March 1, 2025.* Also presented at NJECC Teacher Event, March 11 2025.

[WP13] **T. Samaras**, K.G. Herbert, V.K. Anu, S. Hagiwara, R. A. Goldstein, S. Robila, J.T.L Wang, V. Oria, and T.J Marlowe. “Understanding Multidimensional Concepts through Game-Based Learning in the K-12 Curriculum.” *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025. Also presented at NJECC Teacher Event, March 11, 2025.

[WP14] **A. Cannella**, **E. Douglass**, K. Herbert, V. Anu, S. Hagiwara, T.J Marlowe, S. Robila, and R.A Goldstein “Integrating Computational Thinking and Engineering Design in STEM: Exploring Logistics and Societal Impact.” *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025. Also presented at NJECC Teacher Event, March 11, 2025.

[WP15] **A. Brantley**, K.G. Herbert, V. Anu, S. Hagiwara, S. Robila, R. Goldstein, J. Wang, and T.J Marlowe, “Space Explorers: A Web-based Platform to Support Space Weather Education Through Storytelling Data Visualization.” *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025.

[WP16] **L. Hazelman**, R. Goldstein, V. Anu, K.G. Herbert, S.Robila, S.Hagiwara, and T.J. Marlowe. ”Exploring Solar Weather through Gamified Folklore and Science with Scratch.” *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025. Also presented at NJECC Teacher Event, March 11, 2025.

[WP17] **M.M.S. Menichella**, S. Robila, K.G. Herbert, V. Anu, S. Hagiwara, R. Goldstein, and T.J. Marlowe. “Simplifying Space Weather for Students - A Cross-Curricular Resource for all Middle School Students, *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025.

[WP18] **J. Brown**, K.G. Herbert, V., R. Goldstein, S. Hagiwara, S. Robila, T.J. Marlowe. “Utilizing modern STEM tools and devices to promote space weather across K-12 grade levels: A work-in-progress report.*”* *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025. Also presented at NJECC Teacher Event, March 11, 2025.

[WP19] **J. Liporace**, K.G. Herbert, V. Anu, R. Goldstein, S. Hagiwara, S. Robila. and T.J. Marlowe. “Teaching AI to Non-STEM Students: A General Education Approach Using Space Weather and Low-Code Tools”, *Proceedings of the 15th Annual IEEE Integrated STEM Education Conference (IEEE ISEC)*, Princeton, NJ, March 15, 2025. Also presented at NJECC Teacher Event, March 11, 2025.

[WP20] **T. Samaras**, K. Herbert, V. Anu, S. Hagiwara. “Educated Guess: Unplugged/Hybrid Neural Networks Activities for K-12 Students.” Extended Poster Session and Paper, *ISTE Live 25: Inspiring Bold Innovation*, San Antonio, TX, June 29-July 1, 2025.

Juried Posters by RET Teacher Participants with Published Abstracts

[WP21] **E. Douglass,** K.G. Herbert-Berger, V.K. Anu, T.J. Marlowe, and S. Hagiwara. “Solar Weather, Simulation, and AI in Middle School: Developing a Case Study.” Poster with published abstract, *Proceedings of the ACM SIGCSE Technical Symposium 2024*, Portland, Oregon, March 2024. Also presented at NJECC Teacher Event, March 12, 2024.

Presentations by RET Teacher Participants without Publication

[WP22] **T. Samaras**, K.G. Herbert, S. Hagiwara, V.K, Anu, S. Robila, and J.T.L. Wang. “Building, Bridges and Providing Resources for Computer and Data Science Unplugged and Hybrid Activities.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP23] **M.M.S. Menichella**, K.G. Herbert-Berger, S. Hagiwara, V. Anu, S. Robila, and J.T.L. Wang, “Geek Camp 2023: An Overview of My Experience with MSU NSF RET DATA 3.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP24] **E. Douglass,** K.G. Herbert, S. Hagiwara, V.K. Anu, S. Robila, and J.T.L. Wang, “Solar Weather, Simulation, and AI in Middle School: Developing a Case Study.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP25] **S. Emeghara**, K.G. Herbert, V.K. Anu, S. Robila, S. Hagiwara, and J.T. L. Wang. “Using Arduino Sensors to Generate Solar Weather Data.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP26] **M. Binaday**, K.G. Herbert, V.K. Anu, S. Hagiwara, S. Robila, and J.T. L. Wang. “Teaching Data Visualization To Middle School Students Using Solar Data and Gamification” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP27] **C. Drozdowski**, K.G. Herbert, J.T. L. Wang, S. Hagiwara, V.K. Anu, **S. Emeghara**. “MSU RET Data Projects: Solar Weather, AI, and Self Regulation.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP28] **G. Rasmusson**, K.G. Herbert, V.K. Anu, S. Hagiwara, S. Robila, and Jason T.L. Wang. “The Influence of Solar Cycles on Human Activity.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP29] **N. Perry**, V. Anu, S. Hagiwara, S. Robila, J.T.L. Wang, and K.G. Herbert, “Exploring correlations among solar data parameters and among recent and legacy data.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP30] **A. Brantley**, K.G. Herbert, V.K. Anu, S. Hagiwara, S Robila, and J.T.L. Wang. “Learning AI through Solar Weather Storytelling Data Visualization.” RET DATA3 2023 Showcase, Montclair State University, August 11, 2023.

[WP31] **E. Douglass. “**Space weather, Simulations, & AI in Middle School: Towards a Case Study.” NSF Virtual Conference Presentation, 2024.

[WP32] **M.M.S. Menichella**. “Creating a Cross Curricular Resource for Solar Weather History and Its Impact on Daily Life.” NSF Virtual Conference Presentation, 2024.

[WP33] **T. Samaras**. “Interdisciplinary Synergy: Resources for Embedding Plugged and Unplugged Computer and Data Science Activities into the K-12 Curriculum.” NSF Virtual Conference Presentation, 2024.

[WP34] **C. Drozdowski. “**The APP Method: Self-regulation Strategies giving power to Computer Science Students.” NSF Virtual Conference Presentation, 2024.

[WP35] A. Brantley, K.G. Herbert, V.K. Anu, R. Goldstein, S. Hagiwara, Stefan Robila, and J.T.L. Wang. “Learning AI through Space Weather Storytelling Data Visualization.” RET DATA3 2024 Showcase, Montclair State University.

[WP36] **L. Hazelman**, K.G. Herbert, V.K. Anu, R.A. Goldstein, S. Hagiwara, T.J. Marlowe, and J.T.L. Wang. “Space Weather Research in Oral Indigenous History.” RET DATA3 2024 Showcase, Montclair State University.

[WP37] **A. Cannella**, K.G. Herbert, R. Goldstein, S. Hagiwara, V.K. Anu, and T Marlowe*. “A Translation of Machine Learning to Predict and Mitigate Space Weather Emergency Response Systems for Grades 6-8.” RET DATA3 2024 Showcase, Montclair State University.

[WP38] **J. Liporace**, K.G. Herbert, V.K. Anu, R.A. Goldstein, S. Hagiwara,T.J. Marlowe, and J.T.L. Wang. “Using Solar Weather To Teach Machine Learning in Community College.” RET DATA3 2024 Showcase, Montclair State University.

[WP39] **E. Douglass**, K.G. Herbert, V.K. Anu, R.Goldstein, S. Hagiwara, S. Robila, J.T.L. Wang, and T Marlowe. “AI, Simulation, and Space Weather in Middle School: Developing and Evaluating Computer Science Learning Experiences.” RET DATA3 2024 Showcase, Montclair State University.

[WP40] **John Brown**, K.G. Herbert, V.K. Anu, R.A. Goldstein, S. Hagiwara, T.J. Marlowe, and J.T.L. Wang. “Data Coming Alive: Utilizing Modern STEM Tools & Devices to Promote Space Weather Awareness Across K-12 Grade Levels.” RET DATA3 2024 Showcase, Montclair State University.

[WP41] **A. Williams-Nash**, K.G. Herbert-Berger, V. Anu, R.A. Goldstein, S. Hagiwara, S. Robila, T. Marlowe, and J. Wang. “Interdisciplinary Data Sciences: A Space Weather Curriculum for K-8 Students.” RET DATA3 2024 Showcase, Montclair State University.

[WP42] **T. Samaras**, T.J. Marlowe, K.G. Herbert. “Educated Guess: Using Unplugged and Hybrid Game-Based Activities to Support Neural Networks Learning in the K-12 Computer and Data Science Curriculum.” RET DATA3 2024 Showcase, Montclair State University.

[WP43] **A. Brantley**. Space Explorers: “A Web-Based Platform for Space Weather Education.” *NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure.* June 5, 2025.

[WP44] **A. Cannella,** and **E. Douglass.** “Space Weather, AI, and Machine Learning in Middle School.” NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure. June 5, 2025. *NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure.* June 5, 2025

[WP45] **J. Liporace.** “Teaching AI to Non-STEM Students: A General Education Approach Using Space Weather and Low-Code Tools.” *NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure.* June 5, 2025.

[WP46] **L. Hazelman.** “Exploring Solar Weather through Gamified Folklore with Scratch.” *NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure.* June 5, 2025.

[WP47] **T. Samaras**. “Understanding Multidimensional Concepts through Game-Based Learning in the K-12 Curriculum.” *NASA MIRO Conference 2025 K-12 Conference on Artificial Intelligence, Machine Learning, Space Weather and CyberInfrastructure.* June 5, 2025.

[WP48] **M.M.S. Menichella**, K.G. Herbert-Berger, R. G, V. Anu, S. Robila, J.T.L. Wang, and T. Marlowe. “Highlighting Helio Happenings: Creating a Cross Curricular Interactive Primary Resource of Space Weather’s Impact on Common Citizen Communication.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP49] **A. Cannella**, K.G. Herbert,V.K. Anu, R.A. Goldstein, S. Robila, J.T.L. Wang, and T.J. Marlowe. “Spotting the Storm: Using Data Science and Pattern Recognition to Simulate Sunspot Activity and Engage Middle School Learners in a Space Weather Alert System.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP50] **A. Brantley**, K.G. Herbert, V.K. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T.J. Marlowe. “Learning AI through Space Weather Storytelling Data Visualization.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP51] **E. Douglass**, K.G. Herbert, V.K. Anu, S. Robila, R. Goldstein, J.T.L. Wang, and T. Marlowe. “Space Weather, Machine Learning, and AI Simulations in Middle School: Implementing and Evaluating Computer Science Learning Experiences.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP52] **M.G. Sanvictores**, K.G. Herbert-Berger, V. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T. Marlowe. “Cultivating Resilience: Integrating Space Weather Monitoring into Climate Smart Agriculture for Middle School Learners.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP53] **J. Liporace**, K.G. Herbert-Berger, V. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T. Marlowe. “A Decentralized Space Weather Observation Network Using Low-Cost Sensors and Blockchain

Validation.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP54] **J. Brown**, K.G. Herbert-Berger, V. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T. Marlowe. “Coding The Cosmos: Inspiring K–12 Students with STEM Tools and Space Weather Science”, 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP55] **L. Hazelman**, K.G. Herbert, V.K. Anu, R.A. Goldstein, S.A. Robila, T.J. Marlowe, and J.T.L. Wang. “Gamifying Data Curation of Space Weather Events in Generational Stories.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP56] **C.D. Salters**, K.G. Herbert-Berger, V. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T. Marlowe. “Impact of Solar Storms on Mobile Network Connectivity.” 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

[WP57] **T. Samaras**, K.G. Herbert-Berger, V. Anu, R. Goldstein, S. Robila, J.T.L. Wang, and T. Marlowe. "Digging Deeper for a Stronger Foundation: Supporting Unplugged and Hybrid Game-Based Machine Learning Activities and Lessons in the K-12 Computer and Data Science Curriculum." 2025 NSF RET Virtual Poster Session, July 29-30 2025 and RET DATA3 2025 Showcase, July 31 2025.

Publications, Posters, and Presentations by K-12 and Undergraduate Students

[WP58] *L. Wu, I. Vitale,* C. Merrill, **C. Drozdowski**, T.J. Marlowe, and K.G. Herbert, “Understanding Solar Weather.” Poster presented at *IEEE Integrated STEM Education Conference,* Princeton NJ, March 2024.

[WP59] *S. Fraij, D. Carandang, K. De Jesus, Mariany Andrade, D. Baldera*, and K.G. Herbert. “Decoding Solar Storms Using AI and VR.” RET DATA3 2025 Showcase, August 2025.
D. Carandang, K. De Jesus, S. Fraij, D. Baldera, M. Andrade, and K.G. Herbert. “Navigating Solar Systems Using Virtual Reality and AI.” *MIT Undergraduate Research Conference*, Cambridge, MA, October 10-12, 2025.