Ramiz A. Qudsi, Ph.D.

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Professional Summary

Data Scientist and Research Engineer with 10+ years of experience designing and implementing robust, scalable data foundations and scientific pipelines in rigorous R&D environments. Expert in cloud-native Python development, deploying AI/ML algorithmic solutions, and automating complex multi-modal data ingestion. Proven track record of serving as the primary technical translator between domain scientists, AI/ML experts, and engineering teams to transform raw experimental data into predictive insights. Strong advocate for setting high technical standards in code quality, architecture, and CI/CD automation to accelerate the scientific design-make-test cycle.

Technical Skills

Languages: Python, IDL, MATLAB, Bash, Linux CLI

Data Science & Machine Learning: PyTorch, RAG, Scikit-learn, Pandas, NumPy, SciPy; Time-Series Analysis, Modeling, and Forecasting, LLM

Cloud & DevOps: AWS (S3), Git, CI/CD (GitHub Actions), Docker, Workflow Automation

Software Engineering: Unit Testing, Sphinx Documentation, Data Visualization, ETL Pipeline Design

Domain Standards: NASA/ISTP-compliant CDF Generation, SPDF Archive Integration, SpacePy, pySpedas

Experience

Mercor | Subject Matter Expert - Physics 2026 – 2026
OpenAI Feather

- Provided advanced domain expertise in physics to evaluate and improve model reasoning and output.
- Conducted comprehensive corrections and analytical feedback for complex physics problems.
- Analyzed complex physics problem sets for validity and precision, ensuring all model training data met rigorous, human-audited quality bars.

Blue Ghost Lander (LEXI) | Lead Data Scientist[AWS S3, Pandas, SciPy, SpacePy] 2021 – 2025
$100M+ NASA / Firefly Aerospace Lunar Mission Flight and Ground Software

- Led end-to-end development and deployment of flight and ground software for the LEXI Telescope (*Lunar Environment heliospheric X-ray Imager*).
- Developed mission-critical on-board control software to manage telescope configuration, door actuation, and high-voltage thresholding during lunar operations.
- Built a data processing streamline to extract, clean, transform and load (ETL) raw spacecraft telemetry being streamed in an S3 bucket into structured, analysis-ready datasets in near real-time.
- Developed a Python package for the spacecraft data access, processing, and visualization, enabling reproducible science workflows and published it under GPLv3 on PyPI (`lexi-xray`).
- Primary maintainer of the package, added bug-fixes and features based on user feedback. Provided enhancements to ensure compatibility with mission updates across 3 releases.
- Authored NASA/ISTP-compliant CDF datasets for seamless integration with SPDF archives.
- Collaborated with 30+ engineers and scientists to deliver analysis tools and maintain operational readiness across the mission lifecycle.

Helio-Physics AI/ML Ready Dataset | Principal Investigator[Scikit-learn, Pandas, pySpedas] 2023 – 2025
NASA-funded Solar Wind Prediction Project AI/ML Dataset Development

- Proposed, and secured NASA funding to develop ML-driven solar wind propagation models and datasets for space weather forecasting.
- Led a research team developing a deep learning model based on sequence-to-sequence RNN model for solar wind propagation using WIND spacecraft data, validated against MMS data.
- Achieved ∼25% improvement in mean squared error (MSE) compared to existing OMNI datasets using model fine tuning.
- Delivered AI/ML-ready datasets to NASA/SPDF for public release, advancing data accessibility and interoperability.

Prediction of X-lines | **Lead-Investigator** [Pandas, SpacePy, SciPy, pySpedas] 2021 – 2025
NASA-funded Study on Reconnection X-lines Methodology Development

- Conducted quantitative tests of magnetic reconnection X-line hypotheses by comparing various model predictions with in-situ MMS observations of X-line locations at Earth's dayside magnetopause.
- Developed reproducible Python workflows to evaluate the accuracy of reconnection models and identify whether prediction errors arise from hypothesis assumptions or implementation approximations.
- Secured additional NASA funding to enhance the developed software, implement new features and release on PyPi.
- The project advances understanding of magnetospheric dynamics and supports future reconnection prediction frameworks.

Large-Scale Trends in the Heliosphere | **Co-Investigator** [Pandas, SciPy, SpacePy] 2022 – 2024
NASA Living With a Star (LWS) Tools and Methods Program Data Analysis and Development

- Co-Investigator on a NASA-funded effort compiling and synthesizing historical in-situ spacecraft datasets into a validated, ML-ready dataset of solar wind parameters spanning the heliosphere.
- Responsible for data analysis, cross-mission standardization, and development of the final unified dataset.
- Implemented scalable data validation and harmonization methodologies, ensuring consistency across multi-decade heliospheric observations.
- The project provides a high-quality, open-access dataset used for heliophysics modeling and ML research across NASA and academic institutions.

PlasmaPy | **Developer** [Docker, PlasmaPy, NumPy] 2019 – 2022
NSF/DOE-funded Open Source Scientific Python Ecosystem Two-Fluid Dispersion Solver Development

- Led development of the analytical two-fluid dispersion solver using NumPy and Astropy.
- Contributed the feature to PlasmaPy, an open source library widely used by the space-physics community for plasma physics.
- Built isolated development environment in docker container to allow for dependency management and easy on-boarding of researchers attending the workshop.
- Improved CI/CD process for the PlasmaPy library by enhancing the build process to run only for the files with implicit or explicit dependencies to the committed changes, reducing the build time significantly.
- Mentored PhD candidate and undergraduate students to develop numerical solvers for plasma dispersion equations using AstroPy, NumPy, and the in-built functionalities of PlasmaPy.

Microkinetics & Turbulence | **Lead Researcher** 2015 – 2021
PhD Research on Plasma Microphysics and Turbulence

- Conducted multi-scale computational studies on turbulence–microphysics interactions in space plasmas, resulting in several peer-reviewed publications.
- Designed high-performance numerical models and analyzed terabyte-scale datasets using Python and Matlab.
- Research funded by NASA, NSF, and the University of Delaware.

Soil Moisture Measurement Using Passive Remote Sensing | **Lead Scientist** [Matlab] 2012 – 2015
Indian Space Research Organisation (NRSC) Methodology Development

- Developed algorithms for soil moisture estimation from passive microwave remote sensing data.
- Led data calibration and validation efforts using ground-based measurements.

Education

Ph.D., Physics | University of Delaware 2015 – 2021
Dissertation on "*On the interplay between microkinetics and turbulence in space plasmas*"

B-Tech, Physics | Indian Institute of Space Science and Technology 2008 – 2012
Minor in Applied Mathematics

Complete List of Peer-Reviewed Publications

Publication Order

[1] A. Dujakovich, B. M. Walsh, G. Cucho-Padin, E. Atz, K. Gendreau, J. Hare, C. B. Markwardt, C. O'Brien, F. S. Porter, **R. Qudsi**, D. G. Sibeck, "Exploring a Terrestrial X-Ray Source and Auroral Emissions Using NICER," *Journal of Geophysical Research (Space Physics)*, vol. 131, no. 2, e2025JA034213, e2025JA034213, Feb. 2026. DOI: 10.1029/2025JA034213.

[2] Carson P. Brown, Bennett A. Maruca, Vaishali Prabakaran, **Ramiz A. Qudsi**, B. M. Walsh, B. L. Alterman, Philip A. Isenberg, "Evaluating the Parker Model With the Trans-Heliospheric Survey," *Geophysical Research Letters*, vol. 52, no. 12, e2025GL115186, e2025GL115186, Jun. 2025. DOI: 10.1029/2025GL115186.

[3] Catriana K. Paw U, Brian Walsh, **Ramiz Qudsi**, Meghan LeMay, Cadin Connor, Luisa Capannolo, Sam Busk, Rousseau Nutter, Kip D. Kuntz, Frederick Scott Porter, Hyunju K. Connor, Dennis Chornay, "Magnetic charged particle diverters' performance across space plasma environments," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 11, 044006, p. 044 006, Oct. 2025. DOI: 10.1117/1.JATIS.11.4.044006.

[4] Hyangpyo Kim, Hyunju K. Connor, Jaewoong Jung, Brian M. Walsh, David Sibeck, Kip D. Kuntz, Frederick S. Porter, Catriana K. Paw U, Rousseau A. Nutter, **Ramiz Qudsi**, Rumi Nakamura, Michael Collier, "Estimating the subsolar magnetopause position from soft X-ray images using a low-pass image filter," *Earth and Planetary Physics*, vol. 8, no. 1, pp. 173–183, Jan. 2024. DOI: 10.26464/epp2023069.

[5] C. O'Brien, B. M. Walsh, Y. Zou, **R. Qudsi**, S. Tasnim, H. Zhang, D. G. Sibeck, "PRIME-SH: A Data-Driven Probabilistic Model of Earth's Magnetosheath," *Journal of Geophysical Research Machine Learning and Computation*, vol. 1, no. 3, e2024JH000235, e2024JH000235, Sep. 2024. DOI: 10.1029/2024JH000235.

[6] Catriana K. Paw U, Brian M. Walsh, **Ramiz Qudsi**, Sam Busk, Cadin Connor, Dennis Chornay, Hyunju K. Connor, Kip D. Kuntz, Rousseau Nutter, F. Scott Porter, "Simulation of the charged particle deflection from the sweeping magnet array in the Lunar Environment heliospheric X-ray imager," *Review of Scientific Instruments*, vol. 95, no. 12, 123301, p. 123 301, Dec. 2024. DOI: 10.1063/5.0230759.

[7] B. M. Walsh, K. D. Kuntz, S. Busk, T. Cameron, D. Chornay, A. Chuchra, M. R. Collier, C. Connor, H. K. Connor, T. E. Cravens, N. Dobson, M. Galeazzi, H. Kim, J. Kujawski, C. K. Paw U, F. S. Porter, V. Naldoza, R. Nutter, **R. Qudsi**, D. G. Sibeck, S. Sembay, M. Shoemaker, K. Simms, N. E. Thomas, E. Atz, G. Winkert, "The Lunar Environment Heliophysics X-ray Imager (LEXI) Mission," *Space Science Reviews*, vol. 220, no. 4, 37, p. 37, May 2024. DOI: 10.1007/s11214-024-01063-4.

[8] E. Johnson, B. A. Maruca, M. McManus, K. G. Klein, E. R. Lichko, J. Verniero, K. W. Paulson, H. DeWeese, I. Dieguez, **R. A. Qudsi**, J. Kasper, M. Stevens, B. L. Alterman, L. B. Wilson, R. Livi, A. Rahmati, D. Larson, "Anterograde Collisional Analysis of Solar Wind Ions," *The Astrophysical Journal*, vol. 950, no. 1, 51, p. 51, Jun. 2023. DOI: 10.3847/1538-4357/accc32.

[9] Bennett A. Maruca, **Ramiz A. Qudsi**, B. L. Alterman, Brian M. Walsh, Kelly E. Korreck, Daniel Verscharen, Riddhi Bandyopadhyay, Rohit Chhiber, Alexandros Chasapis, Tulasi N. Parashar, William H. Matthaeus, Melvyn L. Goldstein, "The Trans-Heliospheric Survey. Radial trends in plasma parameters across the heliosphere," *Astronomy and Astrophysics*, vol. 675, A196, A196, Jul. 2023. DOI: 10.1051/0004-6361/202345951.

[10] **Ramiz A. Qudsi**, Brian M. Walsh, Jeff Broll, Emil Atz, Stein Haaland, "Statistical Comparison of Various Dayside Magnetopause Reconnection X-Line Prediction Models," *Journal of Geophysical Research (Space Physics)*, vol. 128, no. 10, e2023JA031644, e2023JA031644, Oct. 2023. DOI: 10.1029/2023JA031644.

[11] Riddhi Bandyopadhyay, **Ramiz A. Qudsi**, S. Peter Gary, William H. Matthaeus, Tulasi N. Parashar, Bennett A. Maruca, Vadim Roytershteyn, Alexandros Chasapis, Barbara L. Giles, Daniel J. Gershman, Craig J. Pollock, Christopher T. Russell, Robert J. Strangeway, Roy B. Torbert, Thomas E. Moore, James L. Burch, "Interplay of turbulence and proton-microinstability growth in space plasmas," *Physics of Plasmas*, vol. 29, no. 10, 102107, p. 102 107, Oct. 2022. DOI: 10.1063/5.0098625. arXiv: 2006.10316 [physics.space-ph].

[12] Haley DeWeese, Bennett A. Maruca, **Ramiz A. Qudsi**, Alexandros Chasapis, Mark Pultrone, Elliot Johnson, Sarah K. Vines, Michael A. Shay, William H. Matthaeus, Roman G. Gomez, Stephen A. Fuselier, Barbara L. Giles, Daniel J. Gershman, Christopher T. Russell, Robert J. Strangeway, James L. Burch, Roy B. Torbert, "Alpha Particle Temperature Anisotropy in Earth's Magnetosheath," *The Astrophysical Journal*, vol. 941, no. 1, 12, p. 12, Dec. 2022. DOI: 10.3847/1538-4357/ac9791.

[13] Nikos Sioulas, Zesen Huang, Marco Velli, Rohit Chhiber, Manuel E. Cuesta, Chen Shi, William H. Matthaeus, Riddhi Bandyopadhyay, Loukas Vlahos, Trevor A. Bowen, **Ramiz A. Qudsi**, Stuart D. Bale, Christopher J. Owen, P. Louarn, A. Fedorov, Milan Maksimović, Michael L. Stevens, Anthony Case, Justin Kasper, Davin Larson, Marc Pulupa, Roberto Livi, "Magnetic Field Intermittency in the Solar Wind: Parker Solar Probe and SolO Observations Ranging from the Alfvén Region up to 1 AU," *The Astrophysical Journal*, vol. 934, no. 2, 143, p. 143, Aug. 2022. DOI: 10.3847/1538-4357/ac7aa2. arXiv: 2206.00871 [astro-ph.SR].

[14] Nikos Sioulas, Marco Velli, Rohit Chhiber, Loukas Vlahos, William H. Matthaeus, Riddhi Bandyopadhyay, Manuel E. Cuesta, Chen Shi, Trevor A. Bowen, **Ramiz A. Qudsi**, Michael L. Stevens, Stuart D. Bale, "Statistical Analysis of Intermittency and its Association with Proton Heating in the Near-Sun Environment," *The Astrophysical Journal*, vol. 927, no. 2, 140, p. 140, Mar. 2022. DOI: 10.3847/1538-4357/ac4fc1. arXiv: 2201.10067 [astro-ph.SR].

[15] C. L. Lentz, A. Chasapis, **R. A. Qudsi**, J. Halekas, B. A. Maruca, L. Andersson, D. N. Baker, "On the Solar Wind Proton Temperature Anisotropy at Mars' Orbital Location," *Journal of Geophysical Research (Space Physics)*, vol. 126, no. 10, e29438, e29438, Oct. 2021. DOI: 10.1029/2021JA02943810.1002/essoar.10506890.1.

[16] Bennett A. Maruca, Jeffersson A. Agudelo Rueda, Riddhi Bandyopadhyay, Federica B. Bianco, Alexandros Chasapis, Rohit Chhiber, Haley DeWeese, William H. Matthaeus, David M. Miles, **Ramiz A. Qudsi**, Michael J. Richardson, Sergio Servidio, Michael A. Shay, David Sundkvist, Daniel Verscharen, Sarah K. Vines, Joseph H. Westlake, Robert T. Wicks, "MagneToRE: Mapping the 3-D Magnetic Structure of the Solar Wind Using a Large Constellation of Nanosatellites," *Frontiers in Astronomy and Space Sciences*, vol. 8, 108, p. 108, Jul. 2021. DOI: 10.3389/fspas.2021.665885.

[17] **Ramiz Ahmad Qudsi**, "On the Interplay between Microkinetics and Turbulence in Space Plasmas," Ph.D. dissertation, University of Delaware, Department of Physics and Astronomy, Jan. 2021.

[18] Riddhi Bandyopadhyay, M. L. Goldstein, B. A. Maruca, W. H. Matthaeus, T. N. Parashar, D. Ruffolo, R. Chhiber, A. Usmanov, A. Chasapis, **R. Qudsi**, Stuart D. Bale, J. W. Bonnell, Thierry Dudok de Wit, Keith Goetz, Peter R. Harvey, Robert J. MacDowall, David M. Malaspina, Marc Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, K. G. Klein, M. Velli, N. Raouafi, "Enhanced Energy Transfer Rate in Solar Wind Turbulence Observed near the Sun from Parker Solar Probe," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 48, p. 48, Feb. 2020. DOI: 10.3847/1538-4365/ab5dae. arXiv: 1912.02959 [physics.space-ph].

[19] Riddhi Bandyopadhyay, W. H. Matthaeus, T. N. Parashar, R. Chhiber, D. Ruffolo, M. L. Goldstein, B. A. Maruca, A. Chasapis, **R. Qudsi**, D. J. McComas, E. R. Christian, J. R. Szalay, C. J. Joyce, J. Giacalone, N. A. Schwadron, D. G. Mitchell, M. E. Hill, M. E. Wiedenbeck, R. L. McNutt, M. I. Desai, Stuart D. Bale, J. W. Bonnell, Thierry Dudok de Wit, Keith Goetz, Peter R. Harvey, Robert J. MacDowall, David M. Malaspina, Marc Pulupa, M. Velli, J. C. Kasper, K. E. Korreck, M. Stevens, A. W. Case, N. Raouafi, "Observations of Energetic-particle Population Enhancements along Intermittent Structures near the Sun from the Parker Solar Probe," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 61, p. 61, Feb. 2020. DOI: 10.3847/1538-4365/ab6220. arXiv: 1912.03424 [physics.space-ph].

[20] Rohit Chhiber, M. L. Goldstein, B. A. Maruca, A. Chasapis, W. H. Matthaeus, D. Ruffolo, R. Bandyopadhyay, T. N. Parashar, **R. Qudsi**, T. Dudok de Wit, S. D. Bale, J. W. Bonnell, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, N. Raouafi, "Clustering of Intermittent Magnetic and Flow Structures near Parker Solar Probe's First Perihelion—A Partial-variance-of-increments Analysis," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 31, p. 31, Feb. 2020. DOI: 10.3847/1538-4365/ab53d2. arXiv: 1912.03608 [physics.space-ph].

[21] S. Peter Gary, Riddhi Bandyopadhyay, **Ramiz A. Qudsi**, William H. Matthaeus, Bennett A. Maruca, Tulasi N. Parashar, Vadim Roytershteyn, "Particle-in-cell Simulations of Decaying Plasma Turbulence: Linear Instabilities versus Nonlinear Processes in 3D and 2.5D Approximations," *The Astrophysical Journal*, vol. 901, no. 2, 160, p. 160, Oct. 2020. DOI: 10.3847/1538-4357/abb2ac.

[22] Jia Huang, J. C. Kasper, D. Vech, K. G. Klein, M. Stevens, Mihailo M. Martinović, B. L. Alterman, Tereza Ďurovcová, Kristoff Paulson, Bennett A. Maruca, **Ramiz A. Qudsi**, A. W. Case, K. E. Korreck, Lan K. Jian, Marco Velli, B. Lavraud, A. Hegedus, C. M. Bert, J. Holmes, Stuart D. Bale, Davin E. Larson, Roberto Livi, P. Whittlesey, Marc Pulupa, Robert J. MacDowall, David M. Malaspina, John W. Bonnell, Peter Harvey, Keith Goetz, Thierry Dudok de Wit, "Proton Temperature Anisotropy Variations in Inner Heliosphere Estimated with the First Parker Solar Probe Observations," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 70, p. 70, Feb. 2020. DOI: 10.3847/1538-4365/ab74e0. arXiv: 1912.03871 [physics.space-ph].

[23] T. N. Parashar, M. L. Goldstein, B. A. Maruca, W. H. Matthaeus, D. Ruffolo, R. Bandyopadhyay, R. Chhiber, A. Chasapis, **R. Qudsi**, D. Vech, D. A. Roberts, S. D. Bale, J. W. Bonnell, T. Dudok de Wit, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, N. Raouafi, "Measures of Scale-dependent Alfvénicity in the First PSP Solar Encounter," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 58, p. 58, Feb. 2020. DOI: 10.3847/1538-4365/ab64e6.

[24] **R. A. Qudsi**, B. A. Maruca, W. H. Matthaeus, T. N. Parashar, Riddhi Bandyopadhyay, R. Chhiber, A. Chasapis, Melvyn L. Goldstein, S. D. Bale, J. W. Bonnell, T. Dudok de Wit, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, N. Raouafi, "Observations of Heating along Intermittent Structures in the Inner Heliosphere from PSP Data," *The Astrophysical Journal Supplement Series*, vol. 246, no. 2, 46, p. 46, Feb. 2020. DOI: 10.3847/1538-4365/ab5c19. arXiv: 1912.05483 [physics.space-ph].

[25] **Ramiz A. Qudsi**, Riddhi Bandyopadhyay, Bennett A. Maruca, Tulasi N. Parashar, William H. Matthaeus, Alexandros Chasapis, S. Peter Gary, Barbara L. Giles, Daniel J. Gershman, Craig J. Pollock, Robert J. Strangeway, Roy B. Torbert, Thomas E. Moore, James L. Burch, "Intermittency and Ion Temperature-Anisotropy Instabilities: Simulation and Magnetosheath Observation," *The Astrophysical Journal*, vol. 895, no. 2, 83, p. 83, Jun. 2020. DOI: 10.3847/1538-4357/ab89ad. arXiv: 2004.06164 [physics.space-ph].

Complete list of publication: **ADS**, **Google Scholar**