Kishansingh [Kishan] Rajput

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EDUCATION

Doctor of Philosophy (Ph.D.), University of Houston, Houston, TX — Jan 2023 - Dec 2026 (expected)
Adaptive Machine Learning for Particle Accelerators

Master of Science (M.S.), University of Houston, Houston, TX — Aug 2018 - May 2020
Advisor: Dr. Guoning Chen
Thesis: Anomaly Detection and Feature Alignment for Time Series Data
Awards: Outstanding MS Student Award, 2020

Bachelor of Engineering (B.E.), Gujarat Tech. University, Ahmedabad, India — Aug 2014 - May 2018

PROFESSIONAL APPOINTMENTS

Staff Computer Scientist II — Jul 2020 - Present
Thomas Jefferson National Accelerator Facility, Newport News, VA

- **PI:** Multi-objective optimization of heat load and trip rates using ML in Jefferson Lab's Continuous Electron Beam Accelerator Facility ($450K, Oct 2021 - Sept 2022). Funding Agency: Jefferson Lab Directed Research and Development
- **Team Lead:** Accelerator Prognostics for Spallation Neutron Source at Oak Ridge National Lab ($600K, Sept 2023 - Aug 2026). Funding Agency: Department of Energy (DOE), Basic Energy Research Program
- **Co-lead**: Mathematics and Algorithm Development for Nuclear Femtography Inference at Exascale Platforms ($5M, Oct 2022 - Sept 2027). Funding Agency: Scientific Discoveries through Advance Computing, DOE office of science
- **Project Lead**: ML-assisted Charged Particle Tracking at Jefferson Lab (0.5FTE Postdoc, Jan 2023 - Dec 2024), Fnding Source: Jefferson Lab Operations
- **Developer**: Optimization and Control Framework for Modern Compact Accelerators, ($1M, Oct 2023 - Sept 2025), DOE Accelerate Initiative
- **Developer**: Free Electron Laser tuning using ML-based Controller at Linac Coherent Light Source, SLAC National Lab, Stanford University,
- **Developer**: ML assisted Particle Identification in SoLID experiment at Jefferson Lab
- **Advisor**: Real Time Data Quality Monitoring with Artificial Intelligence at Jefferson Lab
- Mentoring young scientists, postdocs, and students at the lab.

Data Analytics Specialist — May 2019 - Aug 2019
Shell, Houston, TX

- Supported well engineers' team to develop production level solutions for problems associated with drilling with statistics, data visualization and Machine Learning.
- Improved detection/visualization of over/under gauge in oil well drilling and established correlation with other well logs to find potential cause and effects, which has potential to save millions of dollars.
- Developed a novel data science-based technique to detect surface formation transitions in earth crust based on gamma ray signal logs.
- Developed Encryption Agent to improve user experience by integrating systems running on different platforms/servers.

Graduate Research Assistant Aug 2018 - May 2020
University of Houston, Houston, TX

- Machine Assisted Human Development Lab (Dr. Ryan Kennedy)
  - Improved Recommender system for individual forecasting problems (IFP) using Python and R programming languages.
- Data Visualization and Modeling Group (Dr. Guoning Chen)
  - Developed a novel probabilistic envelope-based visualization and anomaly detection technique for time series data.
  - Devised visual analytical Framework based on the novel visualization technique for anomaly detection in oil well drilling and detection of damages in oil wells.
  - The developed system is currently being used in practice providing assistance to well engineers.
  - Evaluated the time series data analysis technique DTW for the surface formation mapping using gamma ray data for oil well drilling.
- Pattern Analysis Laboratory (Dr. Ricardo Vilalta)
  - Worked briefly on theoretical aspects of Explainable Deep Learning and Meta Learning
  - Teaching Assistant in graduate level Artificial Intelligence class

Software Developer / Data Analyst Aug 2015 - July 2018
Kilkenny Electronics, Ahmedabad, GJ, India

- Reduced operating cost of an educational institute by automating daily tasks including timekeeping, sending notifications, storing and sending grades, generating progress reports, keeping track of leaves and payroll by creating an ERP system using SQL and Java.
- Improved the follow-up process of an educational institute with students by creating an analytical tool to monitor the performance of individual students in exams. Developed an ERP system for the same.
- Mentored freelance developers and interns.

INVITED TALKS AND LECTURES

- **Invite Talk: Robust Machine Learning for Particle Accelerators** at International Conference on the Application of Accelerators in Research and Industry (CAARI), Fort Worth, TX, July-2024 (upcoming)
- **Invite Talk: Composable Optimization and Control Toolkit for Scientific Applications** at Software Infrastructure for Advance Nuclear Physics Computing, Newport News, VA, June-2024 (upcoming)
- **Invited Talk: Machine Learning for Prognostics and Optimization of Particle Accelerators** at AI and Visualizing Large Dataset Workshop, Princeton University, New Jersey, June 2024
- **Invited Talk: Machine Learning to Improve Accelerator Operation at SNS** at 4th ICFA Beam Dynamics Mini-Workshop on Applications of ML for Particle Accelerators, South Korea, March-2024
- **Guest Lecture: Machine Learning for Anomaly Detection in Particle Accelerators** at Old Dominion University Graduate Class in Physics (PHYS 755), Norfolk, VA, Fall 2023
- **Tutorial: Machine Learning Model Up-keep and Continual Learning** at 4th ICFA Beam Dynamics Mini-Workshop on Applications of ML for Particle Accelerators, South Korea, March-2024
- **Tutorial: Hands on Reinforcement Learning** at 3rd ICFA Beam Dynamics Mini-Workshop on Applications of Machine Learning for Particle Accelerators, Chicago, Nov-2022 (talk)

INTERNATIONAL CONFERENCE/WORKSHOP ORGANIZATION

- **Program Chair:** AI for Robust Engineering and Science 2024, Richland, WA, May-2024
- **Scientific Organizing Committee:** 4th ICFA Beam Dynamics Mini-Workshop on Applications of ML in Particle Accelerators, Gyeongju-si South Korea, March-2024
- **Session Chair:** Field Summaries at 4th ICFA Beam Dynamics Mini-Workshop on Applications of ML in Particle Accelerators, Geyongju-si, South Korea, March-2024
- **Scientific Organizing Committee:** AI for Robust Engineering and Science, April-2023
- **Session Chair:** Assured Digital Twins Session in AI for Robust Engineering and Science, April-2023
- **Organizing Committee:** AI4EIC International Hackathon-2022, College of William and Mary, Williamsburg, VA
- **Organizing Committee:** Jefferson Lab AI/ML Hackathon, 2021, Thomas Jefferson National Accelerator Facility, Newport News, VA

PEER REVIEWS

- **DOE Office of Science:** FY 2023 Accelerator Stewardship and Accelerator Development Comparative Review Panel
- **DOE Office of Science:** Small Business Innovation Research (SBIR) FY23 Phase-1 release 2
- **DOE Office of Science:** FY 2024 Accelerator Stewardship and Accelerator Development applications Review Panel
- **Journal:** Machine Learning: Science and Technology
- **Journal:** Journal of Physics A: Mathematical and Theoretical
- **Journal:** Journal of Computational and Cognitive Engineering
- **Conference:** 2nd International Conference on Computer Technology and Information Science

CONFERENCE PRESENTATIONS

- Talk: Machine Learning Applications at Spallation Neutron Source Accelerator at 4th ICFA Beam Dynamics Mini-Workshop on Applications of Machine Learning in Particle Accelerators
- Talk: Uncertainty Aware Machine Learning Models for Particle Physics Applications at CHEP 2023
- Poster: Uncertainty Aware ML for Particle Accelerators at NeurIPS, ML for Physical Science Workshop - Dec, 2022
- Talk: Uncertainty Aware Machine Learning at 3rd ICFA Beam Dynamics Mini Workshop on ML for Particle Accelerators - Nov, 2022
- Talk: Uncertainty aware anomaly detection to predict errant beam pulses in the SNS accelerator and GradCAM Analysis at Accelerator Reliability Workshop (ARW) - Oct, 2022
- Tutorial: Machine Learning Lifecycle at AI4EIC Hackathon 2022
- Flash Talk: Robust Digital Twin for Risk Averse Controller at Artificial Intelligence for Robust Engineering and Science (AIRES), 2022
- Talk: Uncertainty Aware ML-based Models for Accelerator Studies at EIC Software: AI WG Meeting 2022
- Talk: Uncertainty Quantification for Rare Events in Scientific Applications at AI@DOE Roundtable 2022
- Talk: Anomaly detection/Online data quality monitoring at AI4EIC-Exp Workshop, 2021

- Talk: Hydra: Layer-wise Relevance Propagation at Advancing Medical Care through Discoveries in Physical Sciences, 2021

PEER-REVIEWED PUBLICATIONS

1. Rajput, K., Schram, M., Blokland, W., Alanazi, Y., Ramuhalli, P., Zhukov, A., Peters, C., and Vilalta, R. Robust errant beam prognostics with conditional modeling for particle accelerators. *Machine Learning: Science and Technology 5*, 1 (mar 2024), 015044

2. Jeske, T., Britton, T., Lawrence, D., and Rajput, K. Hydra: Computer vision for online data quality monitoring

3. Alanazi, Y., Schram, M., Rajput, K., Goldenberg, S., Vidyaratne, L., Pappas, C., Radaideh, M. I., Lu, D., Ramuhalli, P., and Cousineau, S. Multi-module-based cvae to predict hvcm faults in the sns accelerator. *Machine Learning with Applications 13* (2023), 100484

4. Allaire, C., Ammendola, R., Aschenauer, E.-C., Balandat, M., Battaglieri, M., Bernauer, J., Bondì, M., Branson, N., Britton, T., Butter, A., et al. Artificial intelligence for the electron ion collider (ai4eic). *arXiv preprint arXiv:2307.08593* (2023)

5. Goldenberg, S., Schram, M., Rajput, K., Britton, T., Pappas, C., Lu, D., Walden, J., Radaideh, M. I., Cousineau, S., and Harave, S. Distance preserving machine learning for uncertainty aware accelerator capacitance predictions. *arXiv preprint arXiv:2307.02367* (2023)

6. Brei, N., Mei, X., Rajput, K., and Lawrence, D. Phasm: A toolkit for creating ai surrogate models within legacy codebases

7. Schram, M., Rajput, K., NS, K. S., Li, P., John, J. S., and Sharma, H. Uncertainty aware machine-learning-based surrogate models for particle accelerators: Study at the fermilab booster accelerator complex. *Physical Review Accelerators and Beams 26*, 4 (2023), 044602

8. Rajput, K. Multi-objective optimization of cebaf heat load management and trip rates using ai/ml. Tech. rep., Thomas Jefferson National Accelerator Facility (TJNAF), Newport News, VA ..., 2023

9. Blokland, W., Rajput, K., Schram, M., Jeske, T., Ramuhalli, P., Peters, C., Yucesan, Y., and Zhukov, A. Uncertainty aware anomaly detection to predict errant beam pulses in the oak ridge spallation neutron source accelerator. *Physical Review Accelerators and Beams 25*, 12 (2022), 122802

10. Rajput, K., and Chen, G. Probabilistic envelope based visualization for monitoring drilling well data logging. In *VISIGRAPP (3: IVAPP)* (2022), pp. 51–62

11. Radaideh, I., Pappas, C., Lu, D., Walden, J., Cousineau, S., Britton, T., Rajput, K., Vidyaratne, L., and Schram, M. Progress on machine learning for the sns high voltage converter modulators. In *5th North American Particle Accelerator Conference (NAPAC'22), Albuquerque, NM, USA, 07-12 August 2022* (2022), JACOW Publishing, Geneva, Switzerland, pp. 715–718

12. Radaideh, M. I., Pappas, C., Walden, J., Lu, D., Vidyaratne, L., Britton, T., Rajput, K., Schram, M., and Cousineau, S. Time series anomaly detection in power electronics signals with recurrent and convlstm autoencoders. *Digital Signal Processing 130* (2022), 103704

13. Williamson, C., Lawrence, D., and Rajput, K. Recognition of sensitive terms in textual content using a relationship graph of the entire code and artificial intelligence on a subset of the code, Oct. 14 2021. US Patent App. 17/196,312

14. Britton, T., Lawrence, D., and Rajput, K. Ai enabled data quality monitoring with hydra. In *EPJ Web of Conferences* (2021), vol. 251, EDP Sciences, p. 04010

15. Rajput, K. *Anomaly Detection and Feature Alignment for Time Series Data.* PhD thesis, University of Houston, 2020

16. Rajput, K., and Mehta, V. An analytical study of hadoop and its components. *International Journal of Scientific Research and Development* (2017)

17. Rajput, K., and Oza, B. A comparative study of classification techniques in data mining. *International Journal of Creative Research Thoughts 5*, 3 (2017), 154–163

COMMUNITY SERVICE

- Place Award Judge: Science and Engineering Fair of Houston, 2019
- Volunteer Co-ordinator: National Service Scheme-India, 2016-2018

AWARDS AND HONORS

- Outstanding MS Student (Due to Thesis Research): Computer Science Department, University of Houston, 2020
- Computer Science Scholarship (Thesis): University of Houston, 2018