

Accelerator ML Living Review

Summary Statistics

per_year: 10
per_category: 16
per_venue/journal: 3
per_keyword: 14
monthly_trends: 73

Papers

Geoff: The Generic Optimization Framework & Frontend for Particle Accelerator Controls

Penelope Madysa, Sabrina Appel, Verena Kain, Michael Schenk (2025)
arXiv

Towards Agentic AI on Particle Accelerators

Antonin Sulc, Thorsten Hellert, Raimund Kammering, Hayden Hoschouer, Jason St. John (2025)
arXiv

Acceleration of Multi-Scale LTS Magnet Simulations with Neural Network Surrogate Models

Louis Denis, Julien Dular, Vincent Nuttens, Mariusz Wozniak, Benoît Vanderheyden, Christophe Geuzaine (2025)
arXiv

Application Of Large Language Models For The Extraction Of Information From Particle Accelerator Technical Documentation

Qing Dai, Rasmus Ischebeck, Maruisz Sapinski, Adam Grycner (2025)
arXiv

Accelerating Transformers in Online RL

Daniil Zelezetsky, Alexey K. Kovalev, Aleksandr I. Panov (2025)
arXiv

Towards generalizable deep ptychography neural networks

Albert Vong, Steven Henke, Oliver Hoidn, Hanna Ruth, Junjing Deng, Alexander Hexemer, Apurva Mehta, Arianna Gleason, Levi Hancock, Nicholas Schwarz (2025)
arXiv

TrackFormers Part 2: Enhanced Transformer-Based Models for High-Energy Physics Track Reconstruction

Sascha Caron, Nadezhda Dobрева, Maarten Kimpel, Uraz Odyurt, Slav Pshenov, Roberto Ruiz de Austri Bazan, Eugene Shalugin, Zef Wolffs, Yue Zhao (2025)
arXiv

FusionMAE: large-scale pretrained model to optimize and simplify diagnostic and control of fusion plasma

Zongyu Yang, Zhenghao Yang, Wenjing Tian, Jiyuan Li, Xiang Sun, Guohui Zheng, Songfen Liu, Niannian Wu, Rongpeng Li, Zhaohe Xu, Bo Li, Zhongbing Shi, Zhe Gao, Wei Chen, Xiaoquan Ji, Min Xu, Wulyu Zhong (2025)
arXiv

A Surrogate model for High Temperature Superconducting Magnets to Predict Current Distribution with Neural Network

Mianjun Xiao, Peng Song, Yulong Liu, Cedric Korte, Ziyang Xu, Jiale Gao, Jiaqi Lu, Haoyang Nie, Qiantong Deng, Timing Qu (2025)
arXiv

TrackFormers Part 2: Enhanced Transformer-Based Models for High-Energy Physics Track Reconstruction

Caron, Sascha, Dobрева, Nadezhda, Kimpel, Maarten, Odyurt, Uraz, Pshenov, Slav, Bazan, Roberto Ruiz de Austri, Shalugin, Eugene, Wolffs, Zef, Zhao, Yue (2025)
InspireHEP

Fast, accurate, and precise detector simulation with vision transformers

Favaro, Luigi, Giammanco, Andrea, Krause, Claudius (2025)
InspireHEP

The promise of artificial intelligence-assisted radiotherapy for prostate cancer in Morocco: a transformational opportunity

Fadila Kouhen, Meryem Naciri, Hanae El Gouache, Nadia Errafiy, Abdelhak Maghous (2025)
OpenAlex

A Supervised Machine Learning Framework for Multipactor Breakdown Prediction in High-Power Radio Frequency Devices and Accelerator Components: A Case Study in Planar Geometry

Asif Iqbal, John Verboncoeur, Peng Zhang (2025)
arXiv

Integration of Machine Learning-Based Plasma Acceleration Simulations into Geant4: A Case Study with the PALLAS Experiment

A. Sytov, K. Cassou, V. Kubytskyi, M. Lenivenko, A. Huber (2025)
arXiv

Optimisation of the Accelerator Control by Reinforcement Learning: A Simulation-Based Approach

Anwar Ibrahim, Denis Derkach, Alexey Petrenko, Fedor Ratnikov, Maxim Kaledin (2025)
arXiv

A Hybrid Neural Network for High-Throughput Attosecond Resolution Single-shot X-ray Pulse Characterization

Jack Hirschman, Benjamin Mencer, Razib Obaid, Amanda Shackelford, Ryan Coffee (2025)
arXiv

Physics-Informed Super-Resolution Diffusion for 6D Phase Space Diagnostics

Alexander Scheinker (2025)
arXiv

Optimizing Beam-Plasma Interactions Through Jitter Analysis Using Start-to-End Simulations

Robin Hwang (2024)
arXiv

Virtual Pulse Reconstruction Diagnostic for Single-Shot Measurement of Free Electron Laser Radiation Power

Till Korten, Vladimir Rybnikov, Peter Steinbach, Najmeh Mirian (2024)
arXiv

Harnessing Machine Learning for Single-Shot Measurement of Free Electron Laser Pulse Power

Till Korten, Vladimir Rybnikov, Mathias Vogt, Juliane Roensch-Schulenburg, Peter Steinbach, Najmeh Mirian (2024)
arXiv

Data-Driven Gradient Optimization for Field Emission Management in a Superconducting Radio-Frequency Linac

Steven Goldenberg, Kawser Ahammed, Adam Carpenter, Jiang Li, Riad Suleiman, Chris Tennant (2024)
arXiv

Data-Driven Discovery of Beam Centroid Dynamics

Liam A. Pocher, Irving Haber, Thomas M. Antonsen Jr., Patrick G. O'Shea (2024)
arXiv

Microsecond-Latency Feedback at a Particle Accelerator by Online Reinforcement Learning on Hardware

Luca Scomparin, Michele Caselle, Andrea Santamaria Garcia, Chenran Xu, Edmund Blomley, Timo Dritschler, Akira Mochihashi, Marcel Schuh, Johannes L. Steinmann, Erik Bründermann, Andreas Kopmann, Jürgen Becker, Anke-Susanne Müller, Marc Weber (2024)
arXiv

Design and development of advanced Al-Ti-V alloys for beampipe applications in particle accelerators

Kamaljeet Singh, Kangkan Goswami, Raghunath Sahoo, Sumanta Samal (2025)
arXiv

Machine Learning for Reducing Noise in RF Control Signals at Industrial Accelerators

M. Henderson, J. P. Edelen, J. Einstein-Curtis, C. C. Hall, J. A. Diaz Cruz, A. L. Edelen (2024)
arXiv

Surrogate Models studies for laser-plasma accelerator electron source design through numerical optimisation

G. Kane, P. Drobniak, S. Kazamias, V. Kubytskyi, M. Lenivenko, B. Lucas, J. Serhal, K. Cassou, A. Beck, A. Specka, F. Massimo (2024)
arXiv

Beamline Steering Using Deep Learning Models

Dexter Allen, Isaac Kante, Dorian Bohler (2024)
arXiv

Beam-based Identification of Magnetic Field Errors in a Synchrotron using Deep Lie Map Networks

Conrad Caliori, Adrian Oeftiger, Oliver Boine-Frankenheim (2024)
arXiv

Time-inversion of spatiotemporal beam dynamics using uncertainty-aware latent evolution reversal

Mahindra Rautela, Alan Williams, Alexander Scheinker (2024)
arXiv

Linac_Gen: integrating machine learning and particle-in-cell methods for enhanced beam dynamics at Fermilab

Abhishek Pathak (2024)
arXiv

Towards latent space evolution of spatiotemporal dynamics of six-dimensional phase space of charged particle beams

Mahindra Rautela, Alan Williams, Alexander Scheinker (2024)
arXiv

Automated Anomaly Detection on European XFEL Klystrons

Antonin Sulc, Annika Eichler, Tim Wilksen (2024)
arXiv

Accelerator beam phase space tomography using machine learning to account for variations in beamline components

Andrzej Wolski, Diego Botelho, David Dunning, Amelia E. Pollard (2024)
arXiv

Large Language Models for Human-Machine Collaborative Particle Accelerator Tuning through Natural Language

Jan Kaiser, Annika Eichler, Anne Lauscher (2024)
arXiv

Accelerating Cavity Fault Prediction Using Deep Learning at Jefferson Laboratory

Monibor Rahman, Adam Carpenter, Khan Iftekharuddin, Chris Tennant (2024)

arXiv

Efficient 6-dimensional phase space reconstruction from experimental measurements using generative machine learning

Ryan Roussel, Juan Pablo Gonzalez-Aguilera, Auralee Edelen, Eric Wisniewski, Alex Ody, Wanming Liu, Young-Kee Kim, John Power (2024)

arXiv

A conditional latent autoregressive recurrent model for generation and forecasting of beam dynamics in particle accelerators

Mahindra Rautela, Alan Williams, Alexander Scheinker (2024)

arXiv

Synthesizing Particle-in-Cell Simulations Through Learning and GPU Computing for Hybrid Particle Accelerator Beamlines

Ryan T. Sandberg, Remi Lehe, Chad E. Mitchell, Marco Garten, Andrew Myers, Ji Qiang, Jean-Luc Vay, Axel Huebl (2024)

arXiv

Anomaly Detection of Particle Orbit in Accelerator using LSTM Deep Learning Technology

Zhiyuan Chen, Wei Lu, Radhika Bhong, Yimin Hu, Brian Freeman, Adam Carpenter (2024)

arXiv

Machine-learning approach for operating electron beam at KEK Se^-/e^+ injector Linac

Gaku Mitsuka, Shinnosuke Kato, Naoko Iida, Takuya Natsui, Masanori Satoh (2024)

arXiv

Cheetah: Bridging the Gap Between Machine Learning and Particle Accelerator Physics with High-Speed, Differentiable Simulations

Jan Kaiser, Chenran Xu, Annika Eichler, Andrea Santamaria Garcia (2024)

arXiv

Beyond PID Controllers: PPO with Neuralized PID Policy for Proton Beam Intensity Control in Mu2e

Chenwei Xu, Jerry Yao-Chieh Hu, Aakaash Narayanan, Mattson Thieme, Vladimir Nagaslaev, Mark Austin, Jeremy Arnold, Jose Berlioz, Pierrick Hanlet, Aisha Ibrahim, Dennis Nicklaus, Jovan Mitrevski, Jason Michael St. John, Gauri Pradhan, Andrea Saewert, Kiyomi Seiya, Brian Schupbach, Randy Thurman-Keup, Nhan Tran, Rui Shi, Seda Ogrenci, Alexis Maya-Isabelle Shuping, Kyle Hazelwood, Han Liu (2023)

arXiv

Robust Errant Beam Prognostics with Conditional Modeling for Particle Accelerators

Kishansingh Rajput, Malachi Schram, Willem Blokland, Yasir Alanazi, Pradeep Ramuhalli, Alexander Zhukov, Charles Peters, Ricardo Vilalta (2024)

arXiv

Machine Learning For Beamline Steering

Isaac Kante (2023)

arXiv

Variational Autoencoders for Noise Reduction in Industrial LLRF Systems

J. P. Edelen, M. J. Henderson, J. Einstein-Curtis, C. C. Hall, J. A. Diaz Cruz, A. L. Edelen (2023)

arXiv

Uncertainty Aware Deep Learning for Particle Accelerators

Kishansingh Rajput, Malachi Schram, Karthik Somayaji (2023)

arXiv

Resilient VAE: Unsupervised Anomaly Detection at the SLAC Linac Coherent Light Source

Ryan Humble, William Colocho, Finn O'Shea, Daniel Ratner, Eric Darve (2023)

arXiv

Time-drift Aware RF Optimization with Machine Learning Techniques

R. Sharankova, M. Mwaniki, K. Seiya, M. Wesley (2023)

arXiv

Distance Preserving Machine Learning for Uncertainty Aware Accelerator Capacitance Predictions

Steven Goldenberg, Malachi Schram, Kishansingh Rajput, Thomas Britton, Chris Pappas, Dan Lu, Jared Walden, Majdi I. Radaideh, Sarah Cousineau, Sudarshan Harave (2023)

arXiv

Learning to Do or Learning While Doing: Reinforcement Learning and Bayesian Optimisation for Online Continuous Tuning

Jan Kaiser, Chenran Xu, Annika Eichler, Andrea Santamaria Garcia, Oliver Stein, Erik Bründermann, Willi Kuroпка, Hannes Dinter, Frank Mayet, Thomas Vinatier, Florian Burkart, Holger Schlarb (2023)

arXiv

From Compact Plasma Particle Sources to Advanced Accelerators with Modeling at Exascale

Axel Huebl, Remi Lehe, Edoardo Zoni, Olga Shapoval, Ryan T. Sandberg, Marco Garten, Arianna Formenti, Revathi Jambunathan, Prabhat Kumar, Kevin Gott, Andrew Myers, Weiqun Zhang, Ann Almgren, Chad E. Mitchell, Ji Qiang, David Grote, Alexander Sinn, Severin Diederichs, Maxence Thevenet, Luca Fedeli, Thomas Clark, Neil Zaim, Henri Vincenti, Jean-Luc Vay (2023)

arXiv

Forecasting Particle Accelerator Interruptions Using Logistic LASSO Regression

Sichen Li, Jochem Snuverink, Fernando Perez-Cruz, Andreas Adelmann (2023)

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Learning Electron Bunch Distribution along a FEL Beamline by Normalising Flows

Anna Willmann, Jurjen Couperus Cabada, Yen-Yu Chang, Richard Pausch, Amin Ghaith, Alexander Debus, Arie Irman, Michael Bussmann, Ulrich Schramm, Nico Hoffmann (2023)

arXiv

Physics-constrained 3D Convolutional Neural Networks for Electrodynamics

Alexander Scheinker, Reeju Pokharel (2023)

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Identification of Magnetic Field Errors in Synchrotrons based on Deep Lie Map Networks

Conrad Caliri, Adrian Oeftiger, Oliver Boine-Frankenheim (2023)

arXiv

Data-driven Science and Machine Learning Methods in Laser-Plasma Physics

Andreas Döpp, Christoph Eberle, Sunny Howard, Faran Irshad, Jinpu Lin, Matthew Streeter (2023)

arXiv

Applications of Differentiable Physics Simulations in Particle Accelerator Modeling

Ryan Roussel, Auralee Edelen (2022)

arXiv

Prior-mean-assisted Bayesian optimization application on FRIB Front-End tuning

Kilean Hwang, Tomofumi Maruta, Alexander Plastun, Kei Fukushima, Tong Zhang, Qiang Zhao, Peter Ostroumov, Yue Hao (2022)

arXiv

Neural Networks as Effective Surrogate Models of Radio-Frequency Quadrupole Particle Accelerator Simulations

Joshua Villarreal, Daniel Winklehner, Daniel Koser, Janet Marie Conrad (2024)

arXiv

Fault Prognosis in Particle Accelerator Power Electronics Using Ensemble Learning

Majdi I. Radaideh, Chris Pappas, Mark Wezensky, Pradeep Ramuhalli, Sarah Cousineau (2022)
arXiv

Machine learning-based analysis of experimental electron beams and gamma energy distributions

M. Yadav, M. Oruganti, S. Zhang, B. Naranjo, G. Andonian, Y. Zhuang, Ö. Apsimon, C. P. Welsch, J. B. Rosenzweig (2023)
arXiv

Review of Time Series Forecasting Methods and Their Applications to Particle Accelerators

Sichen Li, Andreas Adelmann (2022)
arXiv

Automatic setup of 18 MeV electron beamline using machine learning

Francesco Maria Velotti, Brennan Goddard, Verena Kain, Rebecca Ramjiawan, Giovanni Zevi Della Porta, Simon Hirlander (2022)
arXiv

Diagnostics for Linac Optimization With Machine Learning

R. Sharankova, M. Mwaniki, K. Seiya, M. Wesley (2022)
arXiv

Transverse phase space tomography in the CLARA accelerator test facility using image compression and machine learning

Andrzej Wolski, Mark A. Johnson, Matthew King, Boris L. Militsyn, Peter H. Williams (2022)
arXiv

Next Generation Computational Tools for the Modeling and Design of Particle Accelerators at Exascale

Axel Huebl, Remi Lehe, Chad E. Mitchell, Ji Qiang, Robert D. Ryne, Ryan T. Sandberg, Jean-Luc Vay (2022)
arXiv

Using Kernel-Based Statistical Distance to Study the Dynamics of Charged Particle Beams in Particle-Based Simulation Codes

Chad E. Mitchell, Robert D. Ryne, Kilean Hwang (2022)
arXiv

Neural Network Solver for Coherent Synchrotron Radiation Wakefield Calculations in Accelerator-based Charged Particle Beams

Auralee Edelen, Christopher Mayes (2022)
arXiv

Adaptive Machine Learning for Time-Varying Systems: Towards 6D Phase Space Diagnostics of Short Intense Charged Particle Beams

Alexander Scheinker, Spencer Gessner (2022)
arXiv

Differentiable Preisach Modeling for Characterization and Optimization of Accelerator Systems with Hysteresis

R. Roussel, A. Edelen, D. Ratner, K. Dubey, J. P. Gonzalez-Aguilera, Y. K. Kim, N. Kuklev (2022)
arXiv

Explainable Machine Learning for Breakdown Prediction in High Gradient RF Cavities

Christoph Obermair, Thomas Cartier-Michaud, Andrea Apollonio, William Millar, Lukas Felsberger, Lorenz Fischl, Holger Severin Bovbjerg, Daniel Wollmann, Walter Wuensch, Nuria Catalan-Lasheras, Marçà Boronat, Franz Pernkopf, Graeme Burt (2022)
arXiv

Mixed Diagnostics for Longitudinal Properties of Electron Bunches in a Free-Electron Laser

J. Zhu, N. M. Lockmann, M. K. Czwalińska, H. Schlarb (2022)
arXiv

A Neural Network Model of a Quasi-Periodic Elliptically Polarizing Undulator in Universal Mode

Ryan Sheppard, Cameron Baribeau, Tor Pedersen, Mark Boland, Drew Bertwistle (2022)
arXiv

Physics-informed neural network method for modelling beam-wall interactions

Kazuhiro Fujita (2022)
arXiv

Anomaly Detection in Particle Accelerators using Autoencoders

Jonathan P. Edelen, Nathan M. Cook (2021)
arXiv

Input Beam Matching and Beam Dynamics Design Optimization of the IsoDAR RFQ using Statistical and Machine Learning Techniques

Daniel Koser, Loyd Waites, Daniel Winklehner, Matthias Frey, Andreas Adelman, Janet Conrad (2021)
arXiv

Neural Networks for ID Gap Orbit Distortion Compensation in PETRA III

Bianca Veglia, Ilya Agapov, Joachim Keil (2024)
arXiv

Time-Delayed Koopman Network-Based Model Predictive Control for the FRIB RFQ

Jinyu Wan, Shen Zhao, Wei Chang, Yue Hao (2024)
arXiv

Uncertainty Aware ML-based surrogate models for particle accelerators: A Study at the Fermilab Booster Accelerator Complex

Malachi Schram, Kishansingh Rajput, Karthik Somayaji Peng Li, Jason St. John, Himanshu Sharma (2022)
arXiv

Quantifying Uncertainty for Machine Learning Based Diagnostic

Owen Convery, Lewis Smith, Yarin Gal, Adi Hanuka (2021)
arXiv

Uncertainty Quantification for Virtual Diagnostic of Particle Accelerators

Owen Convery, Lewis Smith, Yarin Gal, Adi Hanuka (2021)
arXiv

Adaptive Latent Space Tuning for Non-Stationary Distributions

Alexander Scheinker, Frederick Cropp, Sergio Paiagua, Daniele Filippetto (2021)
arXiv

Adaptive deep learning for time-varying systems with hidden parameters: Predicting changing input beam distributions of compact particle accelerators

Alexander Scheinker, Frederick Cropp, Sergio Paiagua, Daniele Filippetto (2021)
arXiv

Recurrent Neural Networks for anomaly detection in the Post-Mortem time series of LHC superconducting magnets

Maciej Wielgosz, Andrzej Skocze[■], Matej Mertik (2017)
arXiv

Using LSTM recurrent neural networks for monitoring the LHC superconducting magnets

Maciej Wielgosz, Andrzej Skocze[■], Matej Mertik (2017)
arXiv

Coincident Learning for Beam-based RF Station Fault Identification Using Phase Information at the SLAC Linac Coherent Light Source

Jia Liang, William Colocho, Franz-Josef Decker, Ryan Humble, Ben Morris, Finn H. O'Shea, David A. Steele, Zhe Zhang, Eric Darve, Daniel Ratner (2025)

arXiv

Using Convolutional Neural Networks to Accelerate 3D Coherent Synchrotron Radiation Computations

Christopher Leon, Petr M. Anisimov, Nikolai Yampolsky, Alexander Scheinker (2025)

arXiv

Explainable physics-based constraints on reinforcement learning for accelerator controls

Jonathan Colen, Malachi Schram, Kishansingh Rajput, Armen Kasparian (2025)

arXiv

Accelerator system parameter estimation using variational autoencoded latent regression

Mahindra Rautela, Alan Williams, Alexander Scheinker (2024)

arXiv

Long Short-Term Memory Networks for Anomaly Detection in Magnet Power Supplies of Particle Accelerators

Ihar Lobach, Michael Borland (2024)

arXiv

Leveraging Prior Mean Models for Faster Bayesian Optimization of Particle Accelerators

Tobias Boltz, Jose L. Martinez, Connie Xu, Kathryn R. L. Baker, Zihan Zhu, Jenny Morgan, Ryan Roussel, Daniel Ratner, Brahim Mustapha, Auralee L. Edelen (2025)

arXiv

Optimizing Dynamic Aperture Studies with Active Learning

D. Di Croce, M. Giovannozzi, E. Krymova, T. Pieloni, S. Redaelli, M. Seidel, R. Tomás, F. F. Van der Veken (2024)

arXiv

Neural Network Prior Mean for Particle Accelerator Injector Tuning

Connie Xu, Ryan Roussel, Auralee Edelen (2022)

arXiv

Applications of object detection networks at high-power laser systems and experiments

Jinpu Lin, Florian Haberstroh, Stefan Karsch, Andreas Döpp (2022)

arXiv

A Neural Network approach to reconstructing SuperKEKB beam parameters from beamstrahlung

S. Di Carlo, G. Bonvicini, N. A. Althubiti, R. Ayad, E. De La Cruz-Burelo, I. Domínguez, B. O. El Bashir, H. Farhat, J. Flanagan, R. Gillard, S. Izaguirre Gamez, K. Kanazawa, K. Kumara, D. Liventsev, P. L. M. Podesta-Lerma, D. Ricalde-Herrmann, D. Rodriguez Perez, G. Tejeda-Muñoz, M. Tobiyama I. Heredia de la Cruz (2022)

arXiv

Optimizing a Superconducting Radiofrequency Gun Using Deep Reinforcement Learning

David Meier, Luis Vera Ramirez, Jens Völker, Bernhard Sick, Jens Viefhaus, Gregor Hartmann (2022)

arXiv

Uncertainty aware anomaly detection to predict errant beam pulses in the SNS accelerator

Willem Blokland, Pradeep Ramuhalli, Charles Peters, Yigit Yucesan, Alexander Zhukov, Malachi Schram, Kishansingh Rajput, Torri Jeske (2021)

arXiv

Adaptive Machine Learning for Time-Varying Systems: Low Dimensional Latent Space Tuning

Alexander Scheinker (2021)

arXiv

Fast, efficient and flexible particle accelerator optimisation using densely connected and invertible neural networks

Renato Bellotti, Romana Boiger, Andreas Adelmann (2021)

arXiv

Invertible Surrogate Models: Joint surrogate modelling and reconstruction of Laser-Wakefield Acceleration by invertible neural networks

Friedrich Bethke, Richard Pausch, Patrick Stiller, Alexander Debus, Michael Bussmann, Nico Hoffmann (2021)

arXiv

Improving Surrogate Model Accuracy for the LCLS-II Injector Frontend Using Convolutional Neural Networks and Transfer Learning

Lipi Gupta, Auralee Edelen, Nicole Neveu, Aashwin Mishra, Christopher Mayes, Young-Kee Kim (2021)

arXiv

A Novel Approach for Classification and Forecasting of Time Series in Particle Accelerators

Sichen Li, Mélissa Zacharias, Jochem Snuerink, Jaime Coello de Portugal, Fernando Perez-Cruz, Davide Reggiani, Andreas Adelmann (2021)

arXiv

Real-time Artificial Intelligence for Accelerator Control: A Study at the Fermilab Booster

Jason St. John, Christian Herwig, Diana Kafkes, Jovan Mitrevski, William A. Pellico, Gabriel N. Perdue, Andres Quintero-Parra, Brian A. Schupbach, Kiyomi Seiya, Nhan Tran, Malachi Schram, Javier M. Duarte, Yunzhi Huang, Rachael Keller (2021)

arXiv

Surrogate Modeling of the CLIC Final-Focus System using Artificial Neural Networks

J. Ogren, C. Gohil, D. Schulte (2021)

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Physics-Based Deep Neural Networks for Beam Dynamics in Charged Particle Accelerators

Andrei Ivanov, Ilya Agapov (2020)

arXiv

Introduction to Machine Learning for Accelerator Physics

Daniel Ratner (2020)

arXiv

Machine learning for design optimization of storage ring nonlinear dynamics

Faya Wang, Minghao Song, Auralee Edelen, Xiaobiao Huang (2019)

arXiv

Studies in Applying Machine Learning to LLRF and Resonance Control in Superconducting RF Cavities

Jorge Alberto Diaz Cruz, Sandra Biedron, Manel Martinez-Ramon, Salvador Sosa, Reza Pirayesh (2019)

arXiv

Hopfield Network based Control and Diagnostics System for Accelerators

N. Joshi, O. Meusel, H. Podlech (2018)

arXiv

The model of an anomaly detector for HiLumi LHC magnets based on Recurrent Neural Networks and adaptive quantization

Maciej Wielgosz, Matej Mertik, Andrzej Skoczko, Ernesto De Matteis (2017)

arXiv

Machine learning for analysis of plasma driven ion source

N. Joshi, O. Meusel, H. Podlech (2018)

arXiv

First Steps Toward Incorporating Image Based Diagnostics Into Particle Accelerator Control Systems Using Convolutional Neural Networks

A. L. Edelen, S. G. Biedron, S. V. Milton, J. P. Edelen (2016)

arXiv

Neural Networks for Modeling and Control of Particle Accelerators

A. L. Edelen, S. G. Biedron, B. E. Chase, D. Edstrom, S. V. Milton, P. Stabile (2016)

arXiv

Harnessing the Power of Gradient-Based Simulations for Multi-Objective Optimization in Particle Accelerators

Kishansingh Rajput, Malachi Schram, Auralee Edelen, Jonathan Colen, Armen Kasparian, Ryan Roussel, Adam Carpenter, He Zhang, Jay Benesch (2024)

arXiv

Developing Robust Digital Twins and Reinforcement Learning for Accelerator Control Systems at the Fermilab Booster

D. Kafkes, M. Schram (2021)

arXiv

Accelerator Real-time Edge AI for Distributed Systems (READS) Proposal

K. Seiya, K. J. Hazelwood, M. A. Ibrahim, V. P. Nagaslaev, D. J. Nicklaus, B. A. Schupbach, R. M. Thurman-Keup, N. V. Tran, H. Liu, S. Memik (2021)

arXiv

BOOSTR: A Dataset for Accelerator Control Systems

Diana Kafkes, Jason St. John (2021)

arXiv

Model-free and Bayesian Ensembling Model-based Deep Reinforcement Learning for Particle Accelerator Control Demonstrated on the FERMI FEL

Simon Hirilaender, Niky Bruchon (2022)

arXiv

Autonomous Control of a Particle Accelerator using Deep Reinforcement Learning

Xiaoying Pang, Sunil Thulasidasan, Larry Rybarcyk (2020)

arXiv

AI-Assisted Transport of Radioactive Ion Beams

Sergio Lopez-Caceres, Daniel Santiago-Gonzalez (2025)

arXiv

Bayesian Optimization Algorithms for Accelerator Physics

Ryan Roussel, Auralee L. Edelen, Tobias Boltz, Dylan Kennedy, Zhe Zhang, Fuhao Ji, Xiaobiao Huang, Daniel Ratner, Andrea Santamaria Garcia, Chenran Xu, Jan Kaiser, Angel Ferran Pousa, Annika Eichler, Jannis O. Lubsen, Natalie M. Isenberg, Yuan Gao, Nikita Kuklev, Jose Martinez, Brahim Mustapha, Verena Kain, Weijian Lin, Simone Maria Liuzzo, Jason St. John, Matthew J. V. Streeter, Remi Lehe, Willie Neiswanger (2024)

arXiv

Turn-Key Constrained Parameter Space Exploration for Particle Accelerators Using Bayesian Active Learning

Ryan Roussel, Juan Pablo Gonzalez-Aguilera, Young-Kee Kim, Eric Wisniewski, Wanming Liu, Philippe Piot, John Power, Adi Hanuka, Auralee Edelen (2021)

arXiv

SPIRAL2 Cryomodules Models: a Gateway to Process Control and Machine Learning

Adrien Vassal, Adnan Ghribi, François Millet, François Bonne, Patrick Bonnay, Pierre-Emmanuel Bernaudin (2021)

arXiv

Predicting Beam Transmission Using 2-Dimensional Phase Space Projections Of Hadron Accelerators

Anthony Tran, Yue Hao, Brahim Mustapha, Jose L. Martinex Marin (2022)
arXiv

Machine Learning for Orders of Magnitude Speedup in Multi-Objective Optimization of Particle Accelerator Systems

Auralee Edelen, Nicole Neveu, Yannick Huber, Mattias Frey, Christopher Mayes, Andreas Adelmann (2020)
arXiv

Particle Motion in Hamiltonian Formalism

Yannis Papaphilippou (2024)
arXiv

Machine learning assisted non-destructive transverse beam profile imaging

Zhanibek Omarov, Selcuk Haciomeroglu (2021)
arXiv

GAIA: A General AI Assistant for Intelligent Accelerator Operations

Frank Mayet (2024)
arXiv

AI-Enabled Operations at Fermi Complex: Multivariate Time Series Prediction for Outage Prediction and Diagnosis

Milan Jain, Burcu O. Mutlu, Caleb Stam, Jan Strube, Brian A. Schupbach, Jason M. St. John, William A. Pellico (2025)
arXiv

Subgroup-Specific Risk-Controlled Dose Estimation in Radiotherapy

Paul Fischer, Hannah Willms, Moritz Schneider, Daniela Thorwarth, Michael Muehlebach, Christian F. Baumgartner (2024)
arXiv

Automated GI tract segmentation using deep learning

Manhar Sharma (2023)
arXiv

Domain Adaptation of Automated Treatment Planning from Computed Tomography to Magnetic Resonance

Aly Khalifa, Jeff Winter, Inmaculada Navarro, Chris McIntosh, Thomas G. Purdie (2022)
arXiv

Superconducting radio-frequency cavity fault classification using machine learning at Jefferson Laboratory

Chris Tennant, Adam Carpenter, Tom Powers, Anna Shabalina Solopova, Lasitha Vidyaratne, Khan Iftekharuddin (2020)
arXiv

Generative Adversarial Networks (GAN) for compact beam source modelling in Monte Carlo simulations

David Sarrut, Nils Krah, Jean-Michel Létang (2019)
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Machine learning applied to single-shot x-ray diagnostics in an XFEL

A. Sanchez-Gonzalez, P. Micaelli, C. Olivier, T. R. Barillot, M. Ilchen, A. A. Lutman, A. Marinelli, T. Maxwell, A. Achner, M. Agåker, N. Berrah, C. Bostedt, J. Buck, P. H. Bucksbaum, S. Carron, Montero, B. Cooper, J. P. Cryan, M. Dong, R. Feifel, L. J. Frasinski, H. Fukuzawa, A. Galler, G. Hartmann, N. Hartmann, W. Helml, A. S. Johnson, A. Knie, A. O. Lindahl, J. Liu, K. Motomura, M. Mucke, C. O'Grady, J-E. Rubensson, E. R. Simpson, R. J. Squibb, C. Sâthe, K. Ueda, M. Vacher, D. J. Walke, V. Zhaunerchyk, R. N. Coffee, J. P. Marangos (2016)
arXiv

Action-Attentive Deep Reinforcement Learning for Autonomous Alignment of Beamlines

Siyu Wang, Shengran Dai, Jianhui Jiang, Shuang Wu, Yufei Peng, Junbin Zhang (2024)

arXiv

Virtual Scientific Companion for Synchrotron Beamlines: A Prototype

Daniel Potemkin, Carlos Soto, Ruipeng Li, Kevin Yager, Esther Tsai (2023)

arXiv

Image Segmentation using U-Net Architecture for Powder X-ray Diffraction Images

Howard Yanxon, Eric Roberts, Hannah Parraga, James Weng, Wenqian Xu, Uta Ruett, Alexander Hexemer, Petrus Zwart, Nickolas Schwarz (2023)

arXiv

Closing the loop: Autonomous experiments enabled by machine-learning-based online data analysis in synchrotron beamline environments

Linus Pithan, Vladimir Starostin, David Mareš, Lukas Petersdorf, Constantin Völter, Valentin Munteanu, Maciej Jankowski, Oleg Kononov, Alexander Gerlach, Alexander Hinderhofer, Bridget Murphy, Stefan Kowarik, Frank Schreiber (2023)

arXiv

Artifact Identification in X-ray Diffraction Data using Machine Learning Methods

Howard Yanxon, James Weng, Hannah Parraga, Wenqian Xu, Uta Ruett, Nicholas Schwarz (2022)

arXiv

Predictive Hydrodynamic Simulations for Laser Direct-drive Implosion Experiments via Artificial Intelligence

Zixu Wang, Yuhan Wang, Junfei Ma, Fuyuan Wu, Junchi Yan, Xiaohui Yuan, Zhe Zhang, Jie Zhang (2025)

arXiv

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James Giroux, Cristiano Fanelli (2025)

arXiv

Unsupervised Particle Tracking with Neuromorphic Computing

Emanuele Coradin, Fabio Cufino, Muhammad Awais, Tommaso Dorigo, Enrico Lupi, Eleonora Porcu, Jinu Raj, Fredrik Sandin, Mia Tosi (2025)

arXiv

An efficient search-and-score algorithm for ancestral graphs using multivariate information scores

Nikita Lagrange, Herve Isambert (2024)

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Loss function to optimise signal significance in particle physics

Jai Bardhan, Cyryn Neeraj, Subhadip Mitra, Tanumoy Mandal (2024)

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Xihaier Luo, Samuel Lurvey, Yi Huang, Yihui Ren, Jin Huang, Byung-Jun Yoon (2024)

arXiv

Variable Rate Neural Compression for Sparse Detector Data

Yi Huang, Yeonju Go, Jin Huang, Shuhang Li, Xihaier Luo, Thomas Marshall, Joseph Osborn, Christopher Pinkenburg, Yihui Ren, Evgeny Shulga, Shinjae Yoo, Byung-Jun Yoon (2024)

arXiv

Inverse Surrogate Model of a Soft X-Ray Spectrometer using Domain Adaptation

Enrico Ahlers, Peter Feuer-Forsen, Gregor Hartmann, Rolf Mitzner, Peter Baumgärtel, Jens Viehhaus (2025)

arXiv

Online tuning and light source control using a physics-informed Gaussian process Adi

A. Hanuka, J. Duris, J. Shtalenkova, D. Kennedy, A. Edelen, D. Ratner, X. Huang (2019)
arXiv

Deep-learning real-time phase retrieval of imperfect diffraction patterns from X-ray free-electron lasers

Sung Yun Lee, Do Hyung Cho, Chulho Jung, Daeho Sung, Daewoong Nam, Sangsoo Kim, Changyong Song (2024)
arXiv

A Two-Stage Machine Learning-Aided Approach for Quench Identification at the European XFEL

Lynda Boukela, Annika Eichler, Julien Branlard, Nur Zulaiha Jomhari (2024)
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Beam Detection Based on Machine Learning Algorithms

Haoyuan Li, Qing Yin (2023)
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Weakly supervised learning for pattern classification in serial femtosecond crystallography

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arXiv

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Cong Wang, Eric Florin, Hsing-Yin Chang, Jana Thayer, Chun Hong Yoon (2023)
arXiv

Accurate and confident prediction of electron beam longitudinal properties using spectral virtual diagnostics

A. Hanuka, C. Emma, T. Maxwell, A. Fisher, B. Jacobson, M. J. Hogan, Z. Huang (2020)
arXiv

TempoRL: laser pulse temporal shape optimization with Deep Reinforcement Learning

Francesco Capuano, Davorin Peceli, Gabriele Tiboni, Raffaello Camoriano, Bedrich Rus (2023)
arXiv

A Start To End Machine Learning Approach To Maximize Scientific Throughput From The LCLS-II-HE

Aashwin Mishra, Matt Seaberg, Ryan Roussel, Fred Poitevin, Jana Thayer, Daniel Ratner, Auralee Edelen, Apurva Mehta (2025)
arXiv

TrackFormers: In Search of Transformer-Based Particle Tracking for the High-Luminosity LHC Era

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Combined track finding with GNN & CKF

Lukas Heinrich, Benjamin Huth, Andreas Salzburger, Tilo Wettig (2024)
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Boyang Yu, Nikolai Hartmann, Luca Schinnerl, Thomas Kuhr (2023)
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Andrea Coccaro, Francesco Armando Di Bello, Stefano Giagu, Lucrezia Rambelli, Nicola Stocchetti (2023)
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Lucio Anderlini, Matteo Barbetti, Denis Derkach, Nikita Kazeev, Artem Maevskiy, Sergei Mokhnenko (2022)
arXiv

Hybrid Quantum Classical Graph Neural Networks for Particle Track Reconstruction

Cenk Tüysüz, Carla Rieger, Kristiane Novotny, Bilge Demirköz, Daniel Dobos, Karolos Potamianos, Sofia Vallecorsa, Jean-Roch Vlimant, Richard Forster (2021)
arXiv

Graph Generative Models for Fast Detector Simulations in High Energy Physics

Ali Hariri, Darya Dyachkova, Sergei Gleyzer (2021)
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Beyond 4D Tracking: Using Cluster Shapes for Track Seeding

Patrick J. Fox, Shangqing Huang, Joshua Isaacson, Xiangyang Ju, Benjamin Nachman (2021)
arXiv

Fast Data-Driven Simulation of Cherenkov Detectors Using Generative Adversarial Networks

Artem Maevskiy, Denis Derkach, Nikita Kazeev, Andrey Ustyuzhanin, Maksim Artemev, Lucio Anderlini (2019)
arXiv

Accelerating the BSM interpretation of LHC data with machine learning

Gianfranco Bertone, Marc Peter Deisenroth, Jong Soo Kim, Sebastian Liem, Roberto Ruiz de Austri, Max Welling (2016)
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Radar Pulse Deinterleaving with Transformer Based Deep Metric Learning

Edward Gunn, Adam Hosford, Daniel Mannion, Jarrod Williams, Varun Chhabra, Victoria Nockles (2025)
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Paolo Notaro, Magdalini Paschali, Carsten Hopke, David Wittmann, Nassir Navab (2019)
arXiv

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Tim Smith (2016)
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Han-Qing Shi, Hai-Qing Zhang (2023)
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Matej Mertik, Maciej Wielgosz, Andrzej Skocze (2016)
arXiv

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Maliha Hossain, Balasubramanya T. Nadiga, Oleg Korobkin, Marc L. Klasky, Jennifer L. Schei, Joshua W. Burby, Michael T. McCann, Trevor Wilcox, Soumi De, Charles A. Bouman (2021)
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arXiv

AI-assisted Optimization of the ECCE Tracking System at the Electron Ion Collider

C. Fanelli, Z. Papandreou, K. Suresh, J. K. Adkins, Y. Akiba, A. Albataineh, M. Amaryan, I. C. Arsene, C. Ayerbe Gayoso, J. Bae, X. Bai, M. D. Baker, M. Bashkanov, R. Bellwied, F. Benmokhtar, V. Berdnikov, J. C. Bernauer, F. Bock, W. Boeglin, M. Borysova, E. Brash, P. Brindza, W. J. Briscoe, M. Brooks, S. Bueltmann, M. H. S. Bukhari, A. Bylinkin, R. Capobianco, W. -C. Chang, Y. Cheon, K. Chen, K. -F. Chen, K. -Y. Cheng, M. Chiu, T. Chujo, Z. Citron, E. Cline, E. Cohen, T. Cormier, Y. Corrales Morales, C. Cotton, J. Crafts, C. Crawford, S. Creekmore, C. Cuevas, J. Cunningham, G. David, C. T. Dean, M. Demarteau, S. Diehl, N. Doshita, R. Dupre, J. M. Durham, R. Dzhygadlo, R. Ehlers, L. El Fassi, A. Emmert, R. Ent, R. Fatemi, S. Fegan, M. Finger, M. Finger Jr., J. Frantz, M. Friedman, I. Friscic, D. Gangadharan, S. Gardner, K. Gates, F. Geurts, R. Gilman, D. Glazier, E. Glimos, Y. Goto, N. Grau, S. V. Greene, A. Q. Guo, L. Guo, S. K. Ha, J. Haggerty, T. Hayward, X. He, O. Hen, D. W. Higinbotham, M. Hoballah, T. Horn, A. Hognmrtsyan, P. -h. J. Hsu, J. Huang, G. Huber, A. Hutson, K. Y. Hwang, C. Hyde, M. Inaba, T. Iwata, H. S. Jo, K. Joo, N. Kalantarians, G. Kalicy, K. Kawade, S. J. D. Kay, A. Kim, B. Kim, C. Kim, M. Kim, Y. Kim, Y. Kim, E. Kistenev, V. Klimenko, S. H. Ko, I. Korover, W. Korsch, G. Krintiras, S. Kuhn, C. -M. Kuo, T. Kutz, J. Lajoie, D. Lawrence, S. Lebedev, H. Lee, J. S. H. Lee, S. W. Lee, Y. -J. Lee, W. Li, W. B. Li, X. Li, X. Li, X. Li, X. Li, Y. T. Liang, S. Lim, C. -h. Lin, D. X. Lin, K. Liu, M. X. Liu, K. Livingston, N. Liyanage, W. J. Llope, C. Loizides, E. Long, R. -S. Lu, Z. Lu, W. Lynch, D. Marchand, M. Marcisovsky, P. Markowitz, H. Marukyan, P. McGaughey, M. Mihovilovic, R. G. Milner, A. Milov, Y. Miyachi, A. Mkrtchyan, P. Monaghan, R. Montgomery, D. Morrison, A. Movsisyan, H. Mkrtchyan, A. Mkrtchyan, C. Munoz Camacho, M. Murray, K. Nagai, J. Nagle, I. Nakagawa, C. Nattrass, D. Nguyen, S. Niccolai, R. Nouicer, G. Nukazuka, M. Nycz, V. A. Okorokov, S. Oresic, J. D. Osborn, C. O'Shaughnessy, S. Paganis, S. F. Pate, M. Patel, C. Paus, G. Penman, M. G. Perdekamp, D. V. Perepelitsa, H. Periera da Costa, K. Peters, W. Phelps, E. Piasetzky, C. Pinkenburg, I. Prochazka, T. Protzman, M. L. Purschke, J. Putschke, J. R. Pybus, R. Rajput-Ghoshal, J. Rasson, B. Raue, K. F. Read, K. Roed, R. Reed, J. Reinhold, E. L. Renner, J. Richards, C. Riedl, T. Rinn, J. Roche, G. M. Roland, G. Ron, M. Rosati, C. Royon, J. Ryu, S. Salur, N. Santiesteban, R. Santos, M. Sarsour, J. Schambach, A. Schmidt, N. Schmidt, C. Schwarz, J. Schwiening, R. Seidl, A. Sickles, P. Simmerling, S. Sirca, D. Sharma, Z. Shi, T. -A. Shibata, C. -W. Shih, S. Shimizu, U. Shrestha, K. Slifer, K. Smith, D. Sokhan, R. Soltz, W. Sondheim, J. Song, J. Song, I. I. Strakovsky, P. Steinberg, P. Stepanov, J. Stevens, J. Strube, P. Sun, X. Sun, V. Tadevosyan, W. -C. Tang, S. Tapia Araya, S. Tarafdar, L. Teodorescu, A. Timmins, L. Tomasek, N. Trotta, R. Trotta, T. S. Tveter, E. Umaka, A. Usman, H. W. van Hecke, C. Van Hulse, J. Velkovska, E. Voutier, P. K. Wang, Q. Wang, Y. Wang, Y. Wang, D. P. Watts, N. Wickramaarachchi, L. Weinstein, M. Williams, C. -P. Wong, L. Wood, M. H. Wood, C. Woody, B. Wyslouch, Z. Xiao, Y. Yamazaki, Y. Yang, Z. Ye, H. D. Yoo, M. Yurov, N. Zachariou, W. A. Zajc, W. Zha, J. Zhang, Y. Zhang, Y. X. Zhao, X. Zheng, P. Zhuang (2022)

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Stefanos Achlatis, Efstratios Gavves, Jan-Jakob Sonke (2025)

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Benjamin El-Zein, Dominik Eckert, Thomas Weber, Maximilian Rohleder, Ludwig Ritschl, Steffen Kappler, Andreas Maier (2024)

arXiv

Understanding error propagation in deep learning neural network (DNN) accelerators and applications

Guanpeng Li, Siva Kumar Sastry Hari, Michael B. Sullivan, Timothy Tsai, Karthik Pattabiraman, Joel Emer, Stephen W. Keckler (2017)

OpenAlex

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Lei Deng, Guoqi Li, Song Han, Luping Shi, Yuan Xie (2020)

OpenAlex

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Albert Reuther, Peter Michaleas, Michael Jones, Vijay Gadepally, Siddharth Samsi, Jeremy Kepner (2019)

OpenAlex

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Yiran Chen, Yuan Xie, Linghao Song, Fan Chen, Tianqi Tang (2020)

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[DL] A Survey of FPGA-based Neural Network Inference Accelerators

Kaiyuan Guo, Shulin Zeng, Jincheng Yu, Yu Wang, Huazhong Yang (2019)

OpenAlex

A Survey of FPGA-Based Neural Network Accelerator

Kaiyuan Guo, Shulin Zeng, Jincheng Yu, Yu Wang, Huazhong Yang (2017)

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