

<https://www.ipac26.org/>



IPAC 2026

17th International
Particle Accelerator Conference

May 17 - 22
Deauville | Normandy | France

- Pre-press proceedings at <https://www.ipac26.org/prepress/> (not all papers; few if any slides yet)

AI/ML Satellite Meetings

Lunch satellite meetings on AI almost every day

- Tue General AI: Adnan Ghribi
 - 52 people in room (on floor)
 - Recording and participants list available <https://indico.cern.ch/event/1664807/>
 - Free discussion, e.g. roadmaps, value propositions
- Wed ARTIFACT: Adnan Ghribi/Adrian Oeftiger
 - Slides and participants list available <https://indico.cern.ch/event/1664808/>
- Thu NARAD/MOAT: Todd/Jean-Luc
 - Discussion of US Genesis, MOAT, NARAD efforts with European/Asian representatives
 - Followup discussion with Adnan/Todd/Jean-Luc to form international coordination group or working group

Tuesday May 19th	12:30 – 14:00	AI for particle accelerators INDICO Registration	By registration	Gilda
Wednesday May 20th	12:30 – 14:00	ARTIFACT – Network INDICO Registration	By registration	Gilda
Thursday May 21st	12:30 – 14:00	Improved interoperability between lattice descriptions, simulation tools, and operational accelerator data		Kane

IPAC'26 EIC Satellite Meeting (Todd now member of EIC Accelerator Collaboration Board)

- Weds May 20: **EIC project and synergies with the Future Circular Collider studies**
 - Interest in FCC-ee device testing at EIC (similar to LHC testing of e.g. BBQ tunemeter at RHIC)
 - Interest in CERN personnel collaboration/cross-training, e.g. sending CERN students to collaborate with EIC on commissioning and beam studies
 - Previous EIC–FCC joint working groups identified many common technical areas, but most became inactive → more focused relaunch
 - identify small number of concrete relevant topics with active champions/deliverables
 - Topical thrusts:
 - Beam dynamics, simulation, and benchmarking with new tools (e.g. Xsuite)
 - Polarization and spin dynamics (previous success: spin tracking in Xsuite/Xtrack between CERN/BNL)
 - RF, SRF, and crab cavities (ongoing collaboration on crab LLRF control aggressive requirements)
 - Interaction region and MDI
 - Diagnostics, controls, and AI-ready operation
 - Beam diagnostics, BPM stability, beam-based phase loops, kickers, instrumentation, controls, and AI-assisted commissioning/operation came up repeatedly. “AI-ready accelerator” needs a technical strategy: data infrastructure, controls readiness, diagnostics, and integration. JLab has US/DOE leadership in this area.
 - Magnets, vacuum, alignment, and hardware prototyping (ongoing collaborations)

Great AI/ML Visibility

Four Paradigms for Semantic Channel Finding

PARADIGM 1
Direct in-context lookup

MAG-DIPOLE1:RB
Dipole 1 field readback

MAG-DIPOLE3:RB
Dipole 3 field readback

MAG-CORROA:RB
Corrector 4 readback

MAG-QUAD03:SP
Quadrupole 3 setpoint

RF-CAVITY:PHVA
Cavity 1 RF phase

MAG-DIPOLE3:RB
Dipole 3 field readback

VAC-CAGE07:PH
Vacuum chamber 7 pressure

DVAG-BPM12:IX
BPM 12 horizontal position

DIAG-SCREEN:IMG
Screen camera image

Dictionary lookup. Every PV is paired with a plain-text description, and the whole list is dropped into the LLM's context.

PARADIGM 2
Hierarchical descent

Multiple-choice, top-down. A sequence of constrained LLM calls narrows the catalog down to the target PVs.

PARADIGM 3
Interactive agent (ReAct)

list_systems list_families
list_fields list_channels
+3 more

ORDERED PROMPTS

- list_families("SR")
= BPM, DIPOLE, QUAD...
- list_fields("DIPOLE")
= SP, RS, CMC
- list_channels("DIPOLE", "RB")
= 2 Pvs

The agent decides each step. To expose slices of the same catalog the agent reasons about each re and chooses the next call itself.

PARADIGM 4
Ontology-based search

CATALOG SCALE: hundreds of PVs
ABSTRACTION: literal — channels as named

AI/ML for Particle Accelerators: A Look Backward and Forward

Auralee Linscott Edelen
International Particle Accelerator Conference 2026
May 22, 2026

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Auralee Edelen (SLAC):
Invited plenary

Accelerator tuning: Algorithm based strategies

Gradient based

Evolutionary algorithm

Multi-objective Bayesian Optimization (MOBO)

Environmental Modelling and Software 114 (2019) 195–213
Swarm and Evolutionary Computation 44 (2019) 945–956

- Gradient based optimization: highly-efficient, **not capable of escaping local optimums**
- Genetic algorithms: capable of multi-objective optimizations finding global optimal, **low data efficiency**
- Multi-objective Bayesian optimization (MOBO): learns surrogate model of the objective and use it to choose next evaluation based on expected hypervolumn improvement
- Converge with **at least one order of magnitude less data points than evolutionary algorithms, making it ideal for online tunings when cost per evaluation is high**

SLAC

17th International Particle Accelerator Conference, Deauville, France
JACoW Publishing
ISBN: 978-3-95450-252-3
ISSN: 2673-5350
doi: 10.18429/JACoW-IPAC2026-WEV6003

MOONLIGHT ON THE SERENGETI: CASTING (DIGITAL) SHADOWS WITH SIMBA, PUMBA, LAURA AND FRIENDS

J. Jones*, A. Brynes, M. Johnson, M. King, N. Ziyen
ASTeC STFC Daresbury Laboratory, Daresbury, UK and The Cockcroft Institute, Daresbury, UK

Thorsten Hellert (LBNL):
talk on semantic channel
finding for agentic workflows

Fuhao Ji (SLAC): AI/ML at
SLAC MeV-UED

“Invited” champagne-section poster:
Daresbury team on integrated modeling,
ontology, workflow framework for e.g. CLARA