NP Artificial Intelligence Principal Investigators Exchange Meeting

December 4-5, 2024

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U.S. Department of ENERGY | Office of Science

Energy.gov/science

Outline:

- This Meeting
- Overview of DOE-SC and NP AI/ML initiative
- FY2021 Data Analytics AI/ML FOA and awards
- FY2023 Data, AI and ML FOA and Lab call
- FY2025 Data, AI and ML NOFO and Lab call
- PIER Plan
- Communications and Presentation Guidelines

DOE SC Statement of Commitment

- The DOE SC Diversity, Equity and Inclusion webpage: https://science.osti.gov/SWI/SC-Statement-of-Commitment/
- "The DOE Office of Science (SC) is fully committed to fostering safe, diverse, equitable, and inclusive work, research, and funding environments that value mutual respect and personal integrity. Effective stewardship and promotion of diverse and inclusive workplaces that value and celebrate a diversity of people, ideas, cultures, and educational backgrounds is foundational to delivering on the SC mission. The scientific community engaged in SC-sponsored activities is expected to be respectful, ethical, and professional.

- The DOE SC does not tolerate discrimination or harassment of any kind, including sexual or non-sexual harassment, bullying, intimidation, violence, threats of violence, retaliation, or other disruptive behavior in the federal workplace, including DOE field site offices, or at national laboratories, scientific user facilities, academic institutions, other institutions that we fund, or other locations where activities that we support are carried out…"

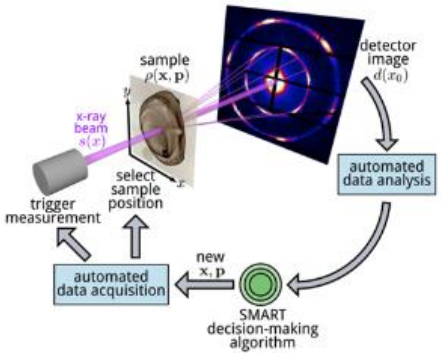
- If you are subject to or witness harassment or discrimination, please contact any of the NP PM present or our Division Director. You can also visit the following:
  How to Report a Complaint | U.S. DOE Office of Science (SC) (osti.gov)

Overview of AI/ML initiative

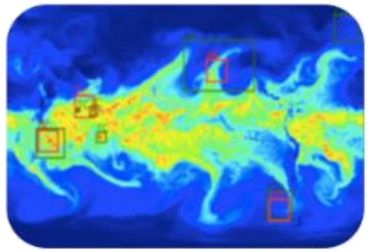
- Artificial Intelligence (AI) represents a paradigm shift for scientific high-performance computing. DOE and the Office of Science (SC) recognize the power that AI will have to accelerate progress in scientific research and missions. AI is one of the **current initiatives for SC** with focused efforts and fundings.
- Nuclear Physics (NP) — NP has been supporting applications of artificial neural networks in the analysis of nuclear physics data for decades.
- In FY2020 NP participated in a three SC program offices (BES,HEP and NP) Lab only funding opportunity call in Data science and AI/ML for SC accelerator and detector facilities.
- NP has published biennial NP only funding opportunity in FY2021, FY23 and this year for FY25-26 funding.
- An SC AI/ML working group with representation from all five SC Programs meets bi-weekly to discuss developments and coordination. I represent NP in this working group.

Artificial Intelligence in the Office of Science

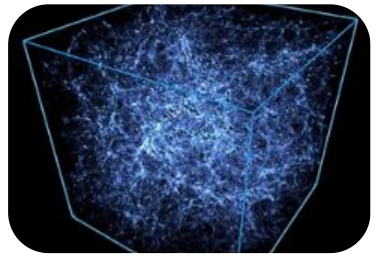
- AI for User Facilities and Advanced Technology
  - Optimize design of experiments and operations
  - Enable real-time analysis and integrated workflows
  - Predict and mitigate instrument and facility down time
  - Increase particle beam availability to users through optimization of beam tuning and risk reduction in accelerator machine protection
  - Create Self-driving instruments and experiments
- AI for Science
  - Accelerate scientific discovery through federated learning to gather broader insight via shared datasets
  - Develop surrogate models for expensive or time constrained experiments
  - Make sense of multi-modal, noisy data
  - Reduce time for complex scientific instrument calibration
- AI Tools
  - Incorporate uncertainty quantification and domain-knowledge
  - Increase robustness, interpretability and repeatability
  - Develop new storage and archival tools to make data FAIR (Findable, Accessible, Interoperable, and Reusable)
  - Develop privacy-preserving algorithms for use of AI in edge devices and to support biopreparedness research efforts



Autonomous experiments



Deep learning for extreme weather events



Analyze relationship between 10 billion galaxies in LSST

SC AI Roundtables Oct-Nov 2024 P-1

DOE-SC Roundtables: Transformational Science Enabled by Artificial Intelligence - October 28-31 & November 7-8, 2024

- High energy & nuclear physics (HEP, NP, BES, FES)
- Biosciences & environmental sciences (BER, BES)
- Materials and chemical sciences (BES)
- Fabrication science (FES, BES, HEP, NP)
- Fundamental energy research (BES, BER, FES)
- User facility science and operations (All DOE-SC)

Analogous to community input on "first science" for new/upgraded user facilities, roundtable participants will identify Priority Research Opportunities (PROs) for using evolving AI capabilities to address the most significant challenges associated with the different scientific themes.

Complements focus of ASCR AI workshops

Slide courtesy of Sharon Stephenson, NP

SC AI Roundtables Oct-Nov 2024 P-2

DOE-SC Roundtables : **"Transformational Science Enabled by Artificial Intelligence".**

- SC commissioned a set of Scientific Roundtables to identify and prioritize the scientific challenges with the highest potential for impact through applications of AI.

"Charge" to RT

- "The roundtables are charged to develop a set of [P]riority [R]esearch [O]pportunities [PROs] consistent with the missions of the Department, in which scientific impact will be uniquely enabled and/or significantly accelerated by the coordinated development of AI tools and methods, and to highlight the path to pursue these scientific questions in the context of the DOE-SC programs."

- "The PROs will be collectively described in a Roundtable Report that describes the transformational potential for AI to advance high priority scientific challenges associated with DOE-SC programs. The co-chairs of each roundtable will lead the development of a chapter in the report. Background information will be included based existing assessments and reports (no additional factual status document will be required.) The report is expected to be completed in December 2024. (Text box: courtesy of Eric Colby, ARDAP)

NP Lab AI-ML proposals Lab-20-2261

- This was a SC Laboratory call from BES, HEP and NP allowing 2 proposals per user facilities.
- NP received 3 proposals in accelerators and 2 in experiments and detectors, a total of 5 Proposals

PI Name	SC Lab	Proposal Title	FY 2020 Award ($K)	Total Award ($K)
David Lawrence	TJNAF	A.I. Assisted Experiment Control and Calibration		
Christopher Tennant	TJNAF	AI for Improved SRF Operation at CEBAF		
Brahim Mustapha	ANL	Use of Artificial Intelligence to Optimize Accelerator Operations and Improve Machine Performance		
		Total ($K)	**1,000**	**3,000**

- These were 3 –year awards, FY20-22 funding
- Chris Tennant is giving a talk tomorrow on his work from this call. Other two award works were completed.

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- PIER Plan
- Communications and Presentation Guidelines

Awards: NP AI/ML FY2021 DE-FOA-0002490 (subject of Last year's meeting)

	Awards for NP FY2021 FOA on Data Analytics and … SC_FOA_0002490		
Award #	Institution	Proposal Title	Principal Investigator
1 *Talk Today*	MIT NJIT FNAL LANL	Intelligent experiments through real-time AI: Fast Data Processing and Autonomous Detector Control for sPHENIX and future EIC detectors Lead Institution	Roland, Gunther Yu, Dantong Tran, Nhan Liu, Ming Xiong
2	UNC	Deep Learning for Germanium-Based Neutrinoless Double Beta Decay Searches	Gruszko, Julieta
3	LBNL	Machine Learning Optimization Upstream and Downstream of the Accelerator: The Cases of VENUS and GRETA	Crawford, Heather
4 *Talk Tomorrow*	LLNL UC, Riverside LBNL	AI-driven detector design for the EIC Lead Institution	Angerami, Aaron Arratia, Miguel Nachman, Benjamin
5 *Talk Today*	ANL- ATLAS	Autonomous Optimization of the Secondary Beam Production and Delivery at the ATLAS In-Flight Facility	Hoffman, Calem
6	ANL-ATLAS	Modern Data Analytics for the Large Gamma-Ray Spectrometers: GRETINA/GRETA and Gammasphere via Machine Learning and Optimization	Carpenter, Michael
		Total 2-year Awards ($k)	**5,680**

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NP AI/ML FOA DE-FOA-0002875 FY2023

- FOA: DE-FOA-0002875
- Issue Date: Nov 9, 2022
- Proposals due: Jan 11, 2023
- No LOIs or preapplications

- Main part of this meeting with 15 presentations from this FOA

DEPARTMENT OF ENERGY (DOE)
OFFICE OF SCIENCE (SC)
NUCLEAR PHYSICS (NP)

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR AUTONOMOUS OPTIMIZATION AND CONTROL OF ACCELERATORS AND DETECTORS

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002875

FOA TYPE: INITIAL
CFDA NUMBER: 81.049

FOA Issue Date:	November 9, 2022
Submission Deadline for Applications:	January 11, 2023, at 11:59 PM Eastern Time

FY 2023 NP AI/ML FOA- P1

General approach: Application of AI/ML tools and methods for **experiments, simulation, theory and accelerator operation to expand scientific outreach**

Technical areas and scope for FY2023 FOA

- Efficiently extract critical and strategic information from large complex data sets,
- Address the challenges of autonomous control and experimentation,
- Efficiency of operation of accelerators and scientific instruments,
- AI for data reduction of large experimental data.

Application context and NP Major Projects

- Any proposed work that is not part of a current NP project including EIC can be submitted to this FOA.
- AI/ML for EIC application can be carefully drafted to ensure they would not overlap with approved EIC project scope. However, they can be related to enhancing scientific output of the EIC project.
- The above is also true about other major NP projects in Fundamental Symmetry or any other programmatic research areas of NP (Medium Energy, Heavy Ion, Nuclear Structure and nuclear astrophysics, etc.).

x

FY 2023 NP AI/ML FOA – P2

- **Solicitation S&T Scope:**
  - Research focused on data for autonomous optimization and control of accelerators and detectors relevant to current- or next-generation NP accelerator facilities.
  - Research on technical developments at the intersections between real-time machine learning and the control and optimization of accelerator systems operation and detector design using AI models
- **Program Planning/Context:**
  - Impart an acceleration of experimental and computational discovery by applying AI methods and techniques to address technical challenges in simulations, theory, control, data acquisition and analysis for NP accelerators and scientific instruments.
  - Provides support consistent with FY 2023 budget language for targeted investments to develop cutting-edge techniques based on AI of relevance to nuclear science research and accelerator facility operations.
- **Application Requirements:**
  - **Eligibility:** Universities/colleges, non-profit/ small business as collaborators, DOE/NNSA laboratories only;
  - **Award size/duration**: Up to $1M/year; up to 2-year awards
  - **Funding by Fiscal Year**: FY 2023 ~$8M, FY 2024 up to $8M - subject to budget appropriation
  - **Preproposals:** No Preproposals or Letters of Intent are required

NP AI/ML FY2023 DE-FOA-0002875Statistics

Applications and Awards

Total of 15 independent awards

Institutions	# of Applications	# of Awards	Fraction (#)	Requests (K$)	Award (K$)	Fraction (%)
Laboratories	22	8	36%	-	9,600	
Universities	16	7	44%	-	6,400	
Totals	**38**	**15**	**39%**	**47,200**	**16,000**	**34**

Application/Award Types

Type of Proposal	Submitted	Awarded	Fraction (%)
Collaborative	16	7	44
Single PI	22	8	36
Totals	**38**	**15**	39.4

Application/Award Topics (note the diverse areas)

Proposal Topic	Submitted	Awarded	Fraction (%)
Accelerator	11	4	50
Detectors	8	4	50
Experiments + EIC	15	5	33
Theory	4	2	50
Totals	**38**	**15**	39.4

NP AI/ML FY2023 DE-FOA-0002875Awards List-P1

Collaborations identified with same rows color. No significance to the choice of colors.

Award #	Topic Subj.	Institution	Project Title	PI and Co-PI
1	**Detector, SPHENIX**	**LANL** FNAL Georgia Tech MIT NJIT, NJ ORNL	**Intelligent Experiments Through Real-time AI: Fast Data Processing and Autonomous Detector Control for sPHENIX and Future EIC Detectors**	**Liu, Ming** Tran, Nhan Hao, Cong Roland, Gunther Yu, Dantong Schambach, Jo
2	**Accelerator**	**MSU** LANL	**Online Autonomous Tuning of the FRIB Accelerator Using Machine Learning**	**Ostroumov, Peter** Scheinker, Alexander
3	Detector ML	MSU	Machine Learning for Time Projection Chambers at FRIB	Wrede, Christopher
4	Experiment, LE	ANL	Modern Data Analytics for the Large Gamma-Ray Spectrometers: GRETINA/GRETA and Gammasphere via Machine Learning and Optimization - RENEWAL	Carpenter, Michael
5	Experiment, LE	VSU, Petersburg, VA **HBU**	Neural network classifier for analyzing measurements of fast neutrons for invariant mass spectroscopy	Redpath, Thomas

NP AI/ML FY2023 DE-FOA-000287Awards List-P2

6	Experiment AI			
		LBNL	**New approaches to Bayesian uncertainty quantification for Nuclear Science**	**Jacobs, Peter**
		Duke U		Mak, Simon
		Wayne SU, MI		Shen, Chun
7	**Theory ML**	**MSU**	**STREAMLINE Collaboration: Machine Learning for Nuclear Many-Body Systems**	**Lee, Dean**
		ANL		Lovato, Alessandro
		FNAL		Rocco, Noemi
		FSU		Piekarewicz, Jorge
		Ohio S U Columbus		Furnstahl, Richard
		Ohio U, Athens		Drischler, Christian
		ORNL		Hagen, Gaute
		UNC, Chapel Hill		Konig, Sebastian
		UTK		Papenbrock, Thomas
8	Accelerator AI Op	ANL	Use of artificial intelligence to optimize accelerator operations and improve machine performance	Mustapha, Brahim
9	**Theory, LQCD**	**UVA**	**EXCLAIM - EXCLusives via Artificial Intelligence and Machine learning**	**Liuti, Simonetta**
		MSU		Lin, Huey-Wen
		NMSU, New Mexico		Sievert, Matthew
		ODU		Li, Yaohang
		Tufts U		Goldstein, Gary
		V Pol I, Blacksburg, VA		Boer, Marie

NP AI/ML FY2023 DE-FOA-0002875Awards List-P3

10	Experiment ML	LBNL	Machine Learning Optimization: VENUS & GRETA	Crawford, Heather
11	Accelerator	TJNAF UVA subcon	Graph Learning for Efficient and Explainable Operation of Particle Accelerators	Tennant, Chris
12	Detector, FS	UNC, Chapel Hill	Interpretable Machine Learning for Germanium-Based Neutrinoless Double Beta Decay Searches	Gruszko, Julieta
13	**Accelerator Pol.**	**BNL** Cornell RPI, NY SLAC TJNAF	**Beam polarization increase in the BNL hadron injectors through physics-informed Bayesian Learning**	**Hoffstaetter, Georg** Hoffstaetter, Georg Wang, Yinan Edelen, Auralee Schram, Malachi
14	**Detector**	**W&M** BNL Cath U Duke U. TJNAF	**A Scalable and Distributed AI-assisted detector design for the EIC**	**Fanelli, Cristiano** Wenaus, Torre Horn, Tanja Vossen, Anselm G. Diefentahler, Markus
15	Experiment ME	TJNAF	AI/ML Optimized Polarization	Lawrence, David, Subcon with CMU and W&M

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NP AI/ML NOFO DE-FOA-0003458

FY2025

- FOA: DE-FOA-0003458
- Issue Date: Oct 15, 2024
- LOI due: Nov 14, 2024
- LOI Response due: Dec 5, 2024
- Proposals due: Jan 14, 2025

- This announcement builds on NP's efforts to address technical challenges in theory, simulations, control, data acquisition, and data analysis. AI methods and techniques promise to address these challenges and shorten the timeline for experimental and computational discovery.

Artificial Intelligence and Machine Learning Applied to Nuclear Science and Technology

Notice of Funding Opportunity (NOFO) Number:
DE-FOA-0003458

NOFO Type: INITIAL
CFDA Number: 81.049

NOFO Issue Date:	Date: October 15, 2024
Submission Deadline for Letters of Intent:	Date:November 14, 2024 at 5:00 PM ET A Letter of Intent is required. Letters of Intent must be submitted by an authorized institutional representative.
Letter of Intent Response Date	Date: December 5, 2024 at 11:59 PM ET
Submission Deadline for Applications:	Date: January 14, 2025 at 11:59 PM ET

FY 2025 NP AI/ML NOFO- P1

General approach: Application of AI/ML tools and methods for **experiments, simulation, theory and accelerator operation to expand scientific outreach**

Technical areas and scope for FY2025 FOA

- Efficiently extract critical and strategic information from large complex data sets,
- Development and implementation of digital twins for future colliders
- Address the challenges of autonomous control and experimentation,
- Efficiency of operation of accelerators and scientific instruments,
- AI for data reduction of large experimental data.

New this year

Application context and NP Major Projects

- AI/ML for EIC application can be carefully drafted to ensure they would not overlap with approved EIC project scope. However, they can be related to enhancing scientific output of the EIC project.
- The above is also true about other major NP projects in Fundamental Symmetry or any other programmatic research areas of NP (Medium Energy, Heavy Ion, Nuclear Structure and nuclear astrophysics, etc.).

FY 2025 NP AI/ML NOFO – P2

- **Solicitation S&T Scope:**
  - Research focused on data for autonomous optimization and control of accelerators and detectors relevant to current- or next-generation NP accelerator facilities.
  - Research on technical developments at the intersections between real-time machine learning and the control and optimization of accelerator systems operation and detector design using AI models
- **Program Planning/Context:**
  - Impart an acceleration of experimental and computational discovery by applying AI methods and techniques to address technical challenges in simulations, theory, control, data acquisition and analysis for NP accelerators and scientific instruments.
  - Provides support consistent with FY 2025 budget language for targeted investments to develop cutting-edge techniques based on AI of relevance to nuclear science research and accelerator facility operations.
- **Application Requirements:**
  - **Eligibility:** Universities/colleges, non-profit/ small business as collaborators, DOE/NNSA laboratories only;
  - **Award size/duration**: National Labs: Up to $1.75 M/Y; Universities: up to $1M/Y: **2-year awards**
  - **Funding by Fiscal Year**: FY 2025-26 ~ up to $22M, - subject to budget appropriations.
  - **Preproposals:** Letters of Intent are required
  - **Proposal Types:** Single and multiple institutions: Multi-institutional teams **must** submit one application from a designated lead institution with all other team members proposed as subrecipients.

New this year

New this year

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PIER Plan Requirement for FY 2023 and beyond SC Funding opportunities

➢ ***For all FY2023 and beyond SC FOA applications:***

- *All new and renewal applications must provide a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to the research narrative.*

➢ As a result, a new criteria (PIER) is added to the four existing SC Merit Review criteria

- *Scientific and/or Technical Merit of the Project;*
- *Appropriateness of the Proposed Method or Approach;*
- *Competency of Applicant's Personnel and Adequacy of Proposed Resources;*
- *Reasonableness and Appropriateness of the Proposed Budget; and*
- *Quality and Efficacy of the Promoting Inclusive and Equitable Research (PIER) Plan.*

Link to SC website https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans

➢ *PIER Criterion Questions:*

- *Is the proposed Promoting Inclusive and Equitable Research (PIER) Plan suitable for the size and complexity of the proposed project and an integral component of the proposed project?*
- *To what extent is the PIER plan likely to lead to participation of individuals from diverse backgrounds, including individuals historically underrepresented in the research community?*
- *What aspects of the PIER plan are likely to contribute…*

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Communications between NP and PI for AI/ML work

Two modes of communications between PIs and NP office: Quarterly reports and an annual meeting with all PIs in one place.

- Quarterly Reports
  - PIs are asked to submit quarterly reports to NP in a “Small Project” format. Quarterly reports are reviewed by the Division (they are not just filed away). For FY2023 FOA awards Ms. Saryna Cameron has been requesting for these periodic reports.

- PI Exchange Meetings:
  - **AI/ML:** This is the 3rd standalone annual NP AI/ML PI Exchange meeting, and we plan to have one yearly.

NP Matrix for Quarterly Report Review and PM Assessment.

Include brief and clear responses to these NP Matrix questions in your quarterly reports.

- *NP matrix for Quarterly Report and progress assessment.*
- *Make sure your quarterly reports addresses elements of this matrix for our evaluation*
- *Continue to use the NP "small Project" template Ms. Saryna Camron sends you.*

These questions are for the NP PM and your response are only part of the information I use to arrive at my own assessments.

1-		**PI's performance during the quarter**
	a	Progress made
	b	Milestones met
	c	Any breakthrough
2-		**Assessment of risk mitigation**
	a	Issue comunicated?
	b	appropriate mitigation strategies
3-		**Likelihood of achieving project goals**
	a	Will they meet cost and schedule
	b	Will they deliver the promised scope
4-		**Recommendation on need for action**
	a	Are there any actions you need to take in response to points above

PI Exchange Meeting, Dec 4-5, 2024

- Presentations on status of work by all Principal Investigators (PIs) who received awards
  - All FY 2023 FOA DE-FOA-0002875 awards
  - Three FY 2021 FOA DE-FOA-0002490 awards still in progress
  - One FY 2020 Lab call Lab-20-2261 award still in progress.

- This is not a review, and no review panel is involved. Presentations will be made to NP Office Program Managers and Division Directors, and possibly a few PMs from HEP and BES Program Offices.

- To facilitate exchange of information between PIs and the NP Office and among PIs and institutions on all current NP AI/ML awards activities.

PI Meeting Presentation Guidelines:

Each presentation should include the following information:

- Description of the project and the current status;
- The main goal of the project for which you received the FY 2020- 23 AI/ML awards,
- A table showing annual budget and the total received to date (see below);
- A table showing major deliverables and schedule; and
- There will be no written report or follow up actions required for this meeting.
- Summary of expenditures by fiscal year (FY):
- All talks will be posted on PI Exchange meeting page on NP website.
- **35 min talks should allow 7 min for Q/A.**

	Year 1	Year 2	Year 3	Totals
a) Funds allocated				
b) Actual costs to date				

FY2024 PI Meeting Agenda- Day 1

	AGENDA : Day 1: 2024 NP AI-ML PI Exchange Meeting, Wednesday, December 4, In-Person								
#	Time (E.S.T)	Dur. (min)	Principal Investigator	Institution	Collaboration	FOA Year	R&D Area	Presentation Title	Speaker(s)
	9:00 AM	10	-	DOE NP			-	Introductory Remarks	Mantica
	9:10 AM	35	-	DOE NP			-	NP supported AI/ML	Farkhondeh
1	9:45 AM	35	Liu, Ming Xiong	LANL	Yes	FY2021	Detectors	Intelligent Experiments Through Real-time AI: Fast Data Processing and Autonomous Detector Control for sPHENIX	Liu
2	10:20 AM	35	Wrede, Christopher	MSU	No	FY2023	Detectors	Machine Learning for Time Projection Chambers at FRIB	Wrede
	10:55 AM	20	Break						
3	11:15 AM	35	Jacobs, Peter	LBNL	Yes	FY2023	Experiment AI	New approaches to Bayesian uncertainty quantification for Nuclear Science	Jacobs
4	11:50 AM	35	Carpenter, Michael	ANL	No	FY21-23	Experiment, LE	Modern Data Analytics for the Large Gamma-Ray Spectrometers: GRETINA/GRETA and Gammasphere via Machine Learning and Optimization	Carpenter
5	12:25 PM	35	Redpath, Thomas	VSU	No	FY2023	Experiment, LE	Neural network classifier for analyzing measurements of fast neutrons for invariant mass spectroscopy	Redpath
	1:00 PM	100	Lunch	On your own					
6	2:40 PM	35	Liuti, Simonetta	UVA	Yes	FY2023	Theory, LQCD	EXCLAIM - EXCLusives via Artificial Intelligence and Machine learning	Liuti
7	3:15 PM	35	Lee, Dean	MSU	Yes	FY2023	Theory ML	STREAMLINE Collaboration: Machine Learning for Nuclear Many-Body Systems	Lee
	3:50 PM	20	Break						
8	4:10 PM	35	Ostroumov, Peter	MSU	Yes	FY2023	Accelerator	Online Autonomous Tuning of the FRIB Accelerator Using Machine Learning	Ostroumov
9	4:45 PM	35	Mustapha, Brahim	ANL	Yes	FY2023	Accelerator	Use of artificial intelligence to optimize accelerator operations and improve machine performance	Mustapha/Santiago
	5:20 PM		Adjourn	End of Day 1					

FY2024 PI Meeting Agenda- Day 2

	AGENDA : Day 2: 2024 NP AI-ML PI Exchange Meeting, Thursday, December 5, In-Person								
#	Time (E.S.T)	Dur. (min)	Principal Investigator	Institution	Collaboration		R&D Area	Presentation Title	Speaker(s)
10	9:00 AM	35	Crawford, Heather	LBNL	No	FY21-23	Accelerator	Machine Learning Optimization: VENUS & GRETA	Crawford
11	9:35 AM	35	Hoffman, Calem	ANL- ATLAS	No	FY2021	Accelerator	Autonomous Optimization of the Secondary Beam Production and Delivery at the ATLAS In-Flight Facility	Mustapha(?)
12	10:10 AM	35	Tennant, Christopher	TJNAF	Yes	FY20 Lab call	Accelerators	AI for Improved SRF Operation at CEBAF	Tennnant
	10:45 AM	20	Break						
13	11:05 AM	35	Gruszko, Julieta	UNC	No	FY21-23	Detector, FS	Interpretable Machine Learning for Germanium-Based Neutrinoless Double Beta Decay Searches	Gruszko
14	11:40 AM	35	Fanelli, Cristiano	W&M	Yes	FY2023	Detectors	A Scalable and Distributed AI-assisted detector design for the EIC	Fanelli
15	12:15 PM	35	Lawrence, David	TJNAF	No	FY20 Lab call	Detectors	A.I. Assisted Experiment Control and Calibration	Britton /Lawrence
	12:50 PM	100	Lunch	On your own					
16	2:30 PM	35	Arratia, Miguel	UC, Riverside	Yes	FY2021	Detectors	AI-driven detector design for the EIC	Arratia
17	3:05 PM	35	Hoffstaetter, Georg	BNL/Cornell	Yes	FY2023	Accelerator	Beam polarization increase in the BNL hadron injectors through physics-informed Bayesian Learning	Hoffstaetter
	3:40 PM	20	Break						
18	4:00 PM	35	Lawrence, David	TJNAF	No	FY2023	Polarization	AI/ML Optimized Polarization	Lawrence
19	4:35 PM	35	Tennant, Christopher	TJNAF	No	FY2023	Accelerator	Graph Learning for Efficient and Explainable Operation of Particle Accelerators	Tennant
	5:10 PM	5	Closing Remarks					Closing Remarks	
	5:15 PM		Adjourn						

Acknowledgements of Federal Support for your award

For peer reviewed and technical papers, the following acknowledgment of support is **required:**

- **For Financial Assistance (Grants, etc.):**

  Acknowledgment: "This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of [insert the sponsoring SC Program Office, e.g., Nuclear Physics], [Add any additional acknowledgements or information requested by the sponsoring SC Program Office] under Award Number(s) [Enter the award number(s)]."

  Example: "This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of **Nuclear Physics** under Award Number DE-SC-000yyy."

- **For National Lab awards:**

  Example: "This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office Nuclear Physics program under Award Number DE-SC-000zzz.

Here is the link on Acknowledgment:
https://science.osti.gov/Funding-Opportunities/Acknowledgements

BACKUP SLIDES

FY2021 FOA: Data, Artificial Intelligence and Machine Learning

Solicitation S&T Scope: ***DE-FOA-0002490;*** ***issue date: March 16, 2021***

Scope: The AI/ML for autonomous optimization and control of nuclear physics accelerators and detectors described in this FOA support efforts essential to developing leading core competencies and transformative technologies that significantly advance the state-of-the art AI and data analytics capabilities in accelerator science and nuclear physics research:

- Efficiently extract critical and strategic information from large complex data sets,
- Address the challenges of autonomous control and experimentation,
- Efficiency of operation of accelerators and scientific instruments,
- AI for data reduction of large experimental data.

Eligible Institutions: Universities/colleges, non-profit and small business as collaborators, DOE/NNSA laboratories only; New single- or multi-PI proposals.

Outcome of the FOA:

- Received 32 individual applications : 22 collaborative and single PI proposals
- A review panel helped NP **to select 6 R&D projects** (11 proposals)
- Total funding of $5.68M over 2 years.

SC AI Lab Call Lab-20-2261
(Also, topic of this Exchange meeting)

DEPARTMENT OF ENERGY
OFFICE OF SCIENCE
BASIC ENERGY SCIENCES
HIGH ENERGY PHYSICS
NUCLEAR PHYSICS

DATA, ARTIFICIAL INTELLIGENCE, AND MACHINE LEARNING AT DOE SCIENTIFIC USER FACILITIES

DOE NATIONAL LABORATORY PROGRAM ANNOUNCEMENT NUMBER: LAB 20-2261

ANNOUNCEMENT TYPE: INITIAL

Announcement Issue Date:	**March 9, 2020**
Submission Deadline for Proposals:	**May 1, 2020, at 5 PM Eastern Time**

FY 2023 NP AI/ML FOA – P2

- ***Solicitation S&T Scope:***
  - *Research focused on data for autonomous optimization and control of accelerators and detectors relevant to current- or next-generation NP accelerator facilities.*
  - *Research on technical developments at the intersections between real-time machine learning and the control and optimization of accelerator systems operation and detector design using AI models*
- ***Program Planning/Context:***
  - *Impart an acceleration of experimental and computational discovery by applying AI methods and techniques to address technical challenges in simulations, theory, control, data acquisition and analysis for NP accelerators and scientific instruments.*
  - *Provides support consistent with FY 2023 budget language for targeted investments to develop cutting-edge techniques based on AI of relevance to nuclear science research and accelerator facility operations.*
- ***Application Requirements:***
  - **Eligibility:** Universities/colleges, non-profit/ small business as collaborators, DOE/NNSA laboratories only;
  - **Award size/duration**: Up to $1M/year; up to 2-year awards
  - **Funding by Fiscal Year**: FY 2023 ~$8M, FY 2024 up to $8M - subject to budget appropriation
  - **Preproposals:** No Preproposals or Letters of Intent are required