

NP is a highly distributed scientific field, utilizing various data types across different scales, making it **ideal for AI/ML applications**.

Tremendous interest and activity in AI/ML in NP:

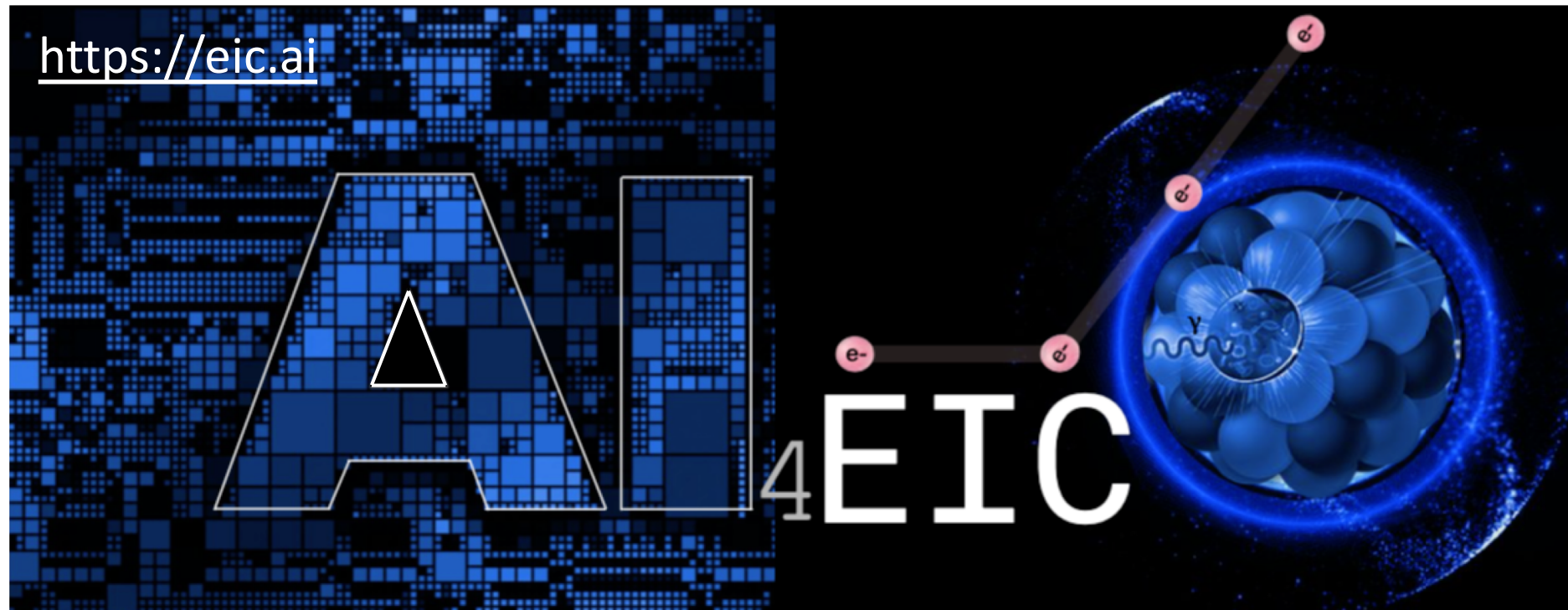
- NP researchers already have the talent and many of the tools required for the AI/ML revolution.
- NP addresses challenges that are not addressed in current technologies.
- NP presents data sets that expose limitations of cutting edge methods.
- **Cross collaboration:** To solve the many complex programs in the field and facilitate discoveries strong collaborations between NP and data science would be beneficial for all parties.
- **Education** is key to increase the level of AI-literacy – research programs and curricula in data science can help to attract students.

AI4EIC

AI/ML already has an **important presence in EIC** with many prototypes, e.g., for detector optimization or reconstruction methods using ML.

- [AI4EIC 2021 and 2022 workshops](#) with 200+ participants each
- Summary: [Artificial Intelligence for the Electron-Ion Collider \(AI4EIC\)](#)

To explore and develop the full potential of **AI/ML for ePIC**, we need to **move from prototyping to production** and add promising AI/ML approaches into our workflows.



AI Town Hall Meeting

Calibrations

- Derek Anderson (Iowa State) - **AI/ML Workflow for BHCAL Calibration**

Detector Surrogates

- Derek Glazier (University of Glasgow) - **ML Simulations**

Reconstruction and Analysis (ordered by last name)

- Simon Gardner (University of Glasgow) - **Scattered Electron Reconstruction in the Low-Q2 Tagger**
- Omar Hassan (University of Victoria) - **ePIC dRICH Detector Using Deep Learning**
- Connor Pecar (Duke University) - **SIDIS Event Reconstruction at ePIC**
- Chao Peng (ANL) - **ML Particle Identification With 3d Shower Profiles From Calorimetry**
- David Ruth (University of New Hampshire) - **AI/ML for Roman Pot Measurements**

Event Classification

- Matthew McEneaney (Duke University) - **Domain Adaptation In Lambda Tagging With Domain Adversarial GNNs And Normalizing Flows**

Experimental Control (ordered by last name)

- Thomas Britton (JLAB) - **Hydra**
- Torri Jeske (Jefferson Lab) – **AIEC**

Data Reduction

- Dmitry Romanov (Jefferson Lab) - **ML4FPGA for Data Reduction**

Experimental Design

- Cristiano Fanelli (William & Mary) - **AIDE**

Objectives:

- Showcase the AI/ML projects. 12 projects were presented.
- Gain insight into the AI/ML activities within ePIC.
- **Indico:** <https://indico.bnl.gov/event/20374/>

Next: Start integrating projects in production.

ePIC Streaming Computing Model WG

- **Meetings on Tuesdays at 9:00 a.m. (EDT)**, announced on the collaboration mailing list:

Next discussions:

- **Interface Definition:** Define the interface between the streaming DAQ system and the streaming computing infrastructure.
 - **Algorithmic Workflow:** Design the algorithmic workflow required for a holistic reconstruction of physics events.
 - **Autonomous Calibration:** Determine the requirements for autonomous calibration of ePIC detectors, including latency considerations.
 - **Echelon 1 Specifics:** Discuss specific requirements for Echelon 1, including failback modes.
 - **Raw Data Retention:** Determine which raw data we intend to retain.
 - **Physics Analysis Use Cases:** Identify and explore specific use cases for in-depth discussions regarding their impact on our computing model.
- These discussions are **relevant for the collaboration at large**, not only for computing experts.

Why is this a priority?

- ePIC has been asked to present an **update on the computing model at the EIC RRB** in December, describing how international partners can contribute to computing for the EIC.
- Prior to the EIC RRB in December, the host labs will organize a review of the ePIC Computing model. The review is scheduled for October 19–20. The scope of this review also includes the organization of the the newly formed EIC Computing and Software Joint Institute (ECSJI).



- September 20–22
- **Indico:** <https://indico.bnl.gov/event/20159/>
- **Purpose:** Collectively drive forward priority targets and provide an avenue for new collaboration members to actively engage:
- **Priority targets:**
 - **Reconstruction Workflow:** What is the algorithmic workflow for a holistic reconstruction of physics events?
 - **Software Development:** How can we foster a development community for ePIC?
 - **Streaming Computing Model:** Open questions prior to the review?
User Learning: How can we expedite the process of creating instructional material for onboarding new users and developers.
 - **Validation:** How can a collaboration member access the accuracy and quality of our simulations?
 - **Broad scope:** Focus on working with the collaboration at large and needs for (CD)-3A and (CD)-2.
 - **High priority** on UI to explore and select detector performance plots from the October campaign and infrastructure. Regular meetings, e.g., just today. Ongoing work on collecting plots.