AI WG
“2nd” meeting

EICUG

eicug-software-ai@eicug.org

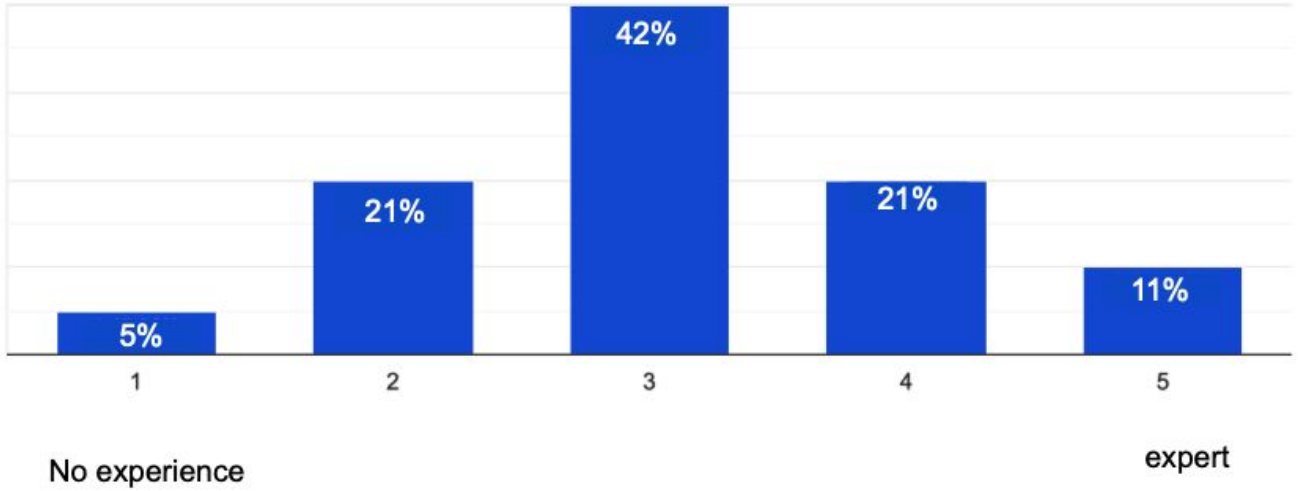
eic.ai

AI4EIC Community

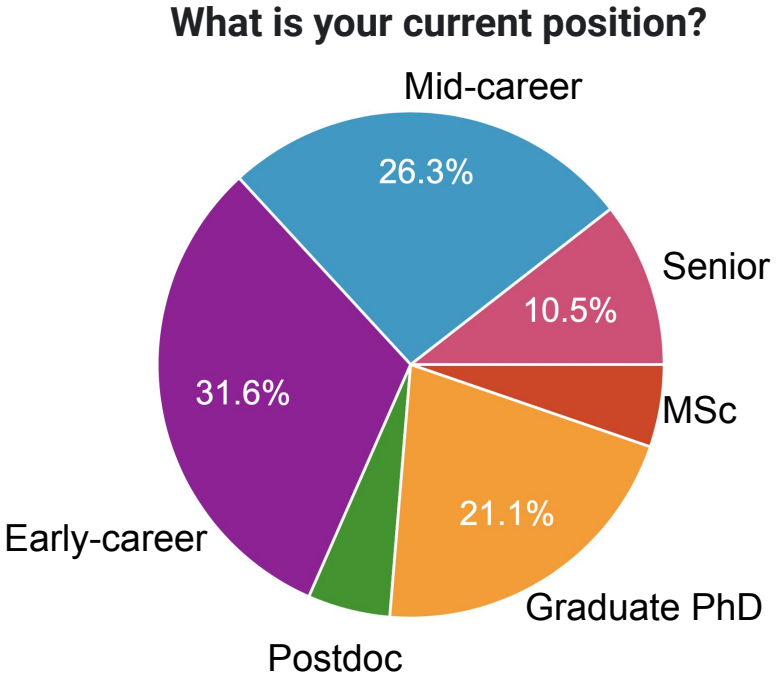
- The website where you can find everything is **eic.ai**
  - All relevant links are/will be listed there!
- A detailed survey was recently sent; **https://forms.gle/6LADKTGaX7DeTVE46**
- We want to learn more about our community, and we asked for feedback on what the needs and interests are, and what potential opportunities
- Snapshot taken at 20 responses; survey still ongoing
- Slides will be posted

Demographics

What is your level of experience with AI/ML?



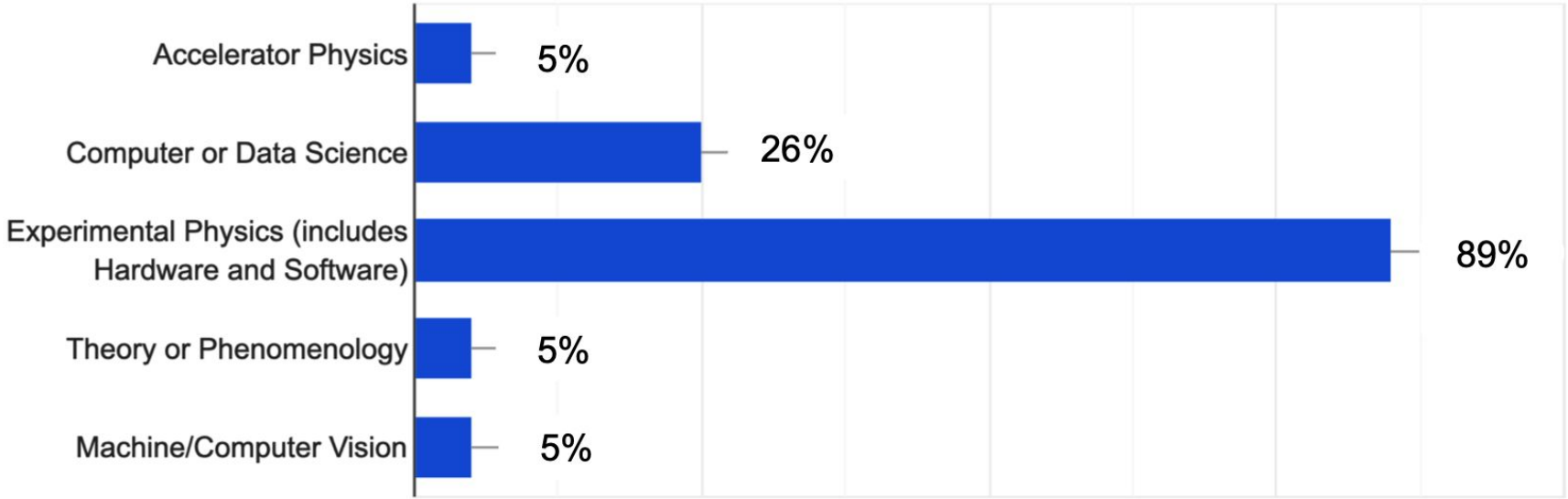
Demographics



- Undergraduate student
- Graduate student (M.Sc.)
- Graduate student (Ph.D.)
- Postdoctoral researcher
- Early-career scientist (pre-tenure, assistant professor, staff scientist < 5…
- Mid-career scientist (tenure, associate professor, staff scientist 5-10 years)
- Senior scientist (full professor, staff scientist > 10 years)

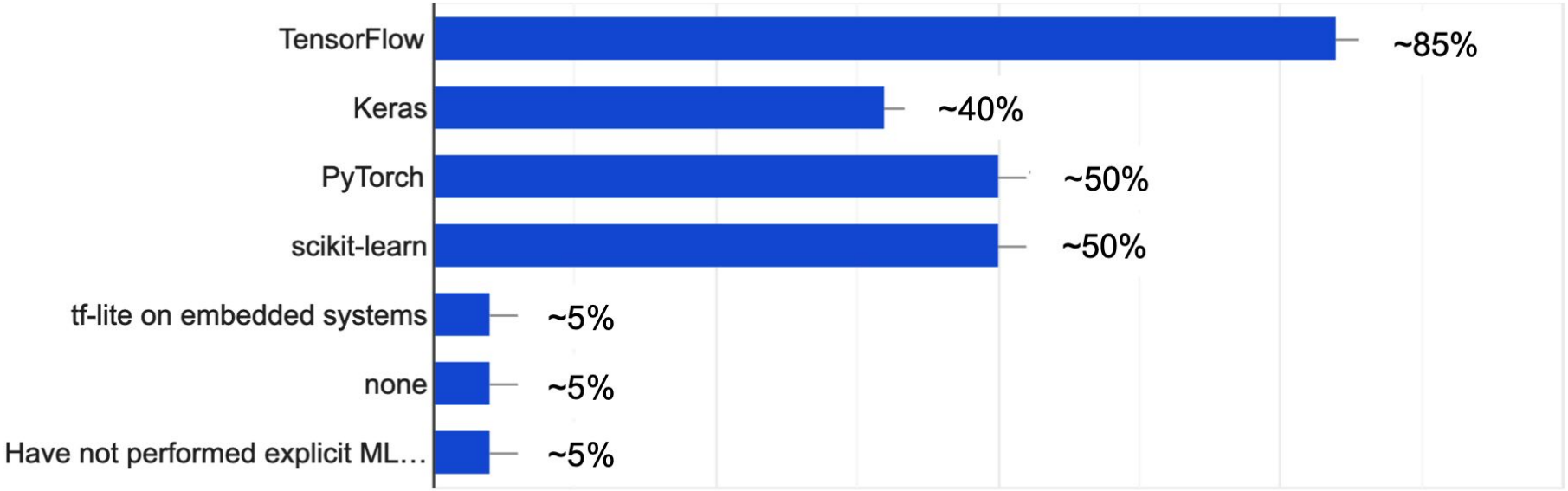
Demographics

Which field represents you best? (Check all that applies)

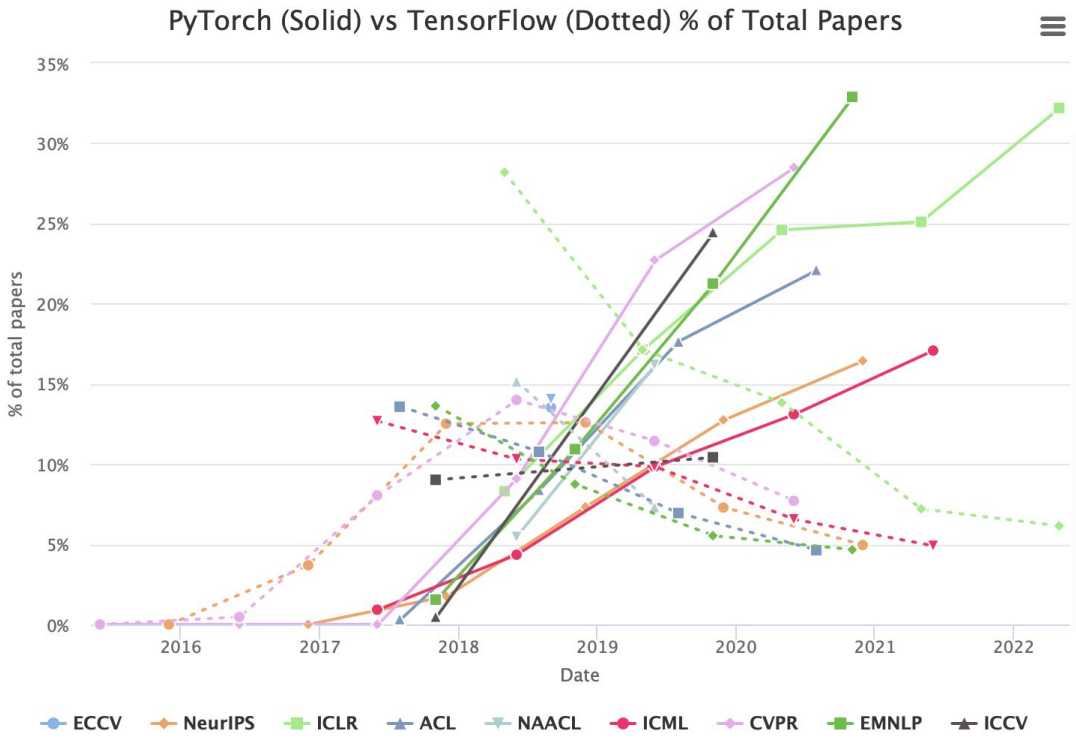


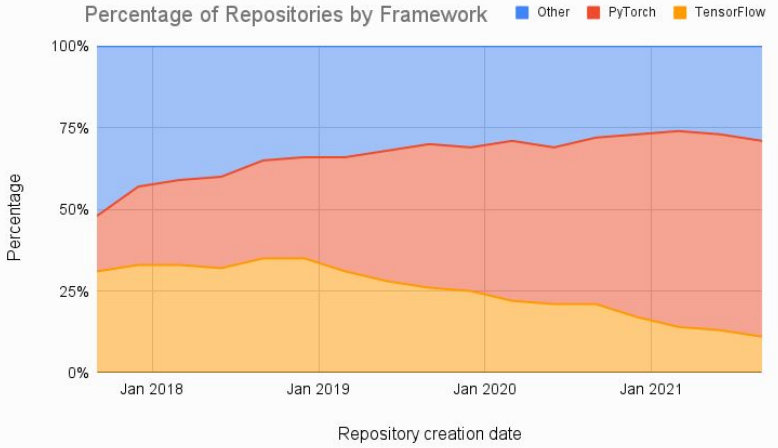
Demographics

What SW libraries for AI/ML/DL do you use? Check all that applies



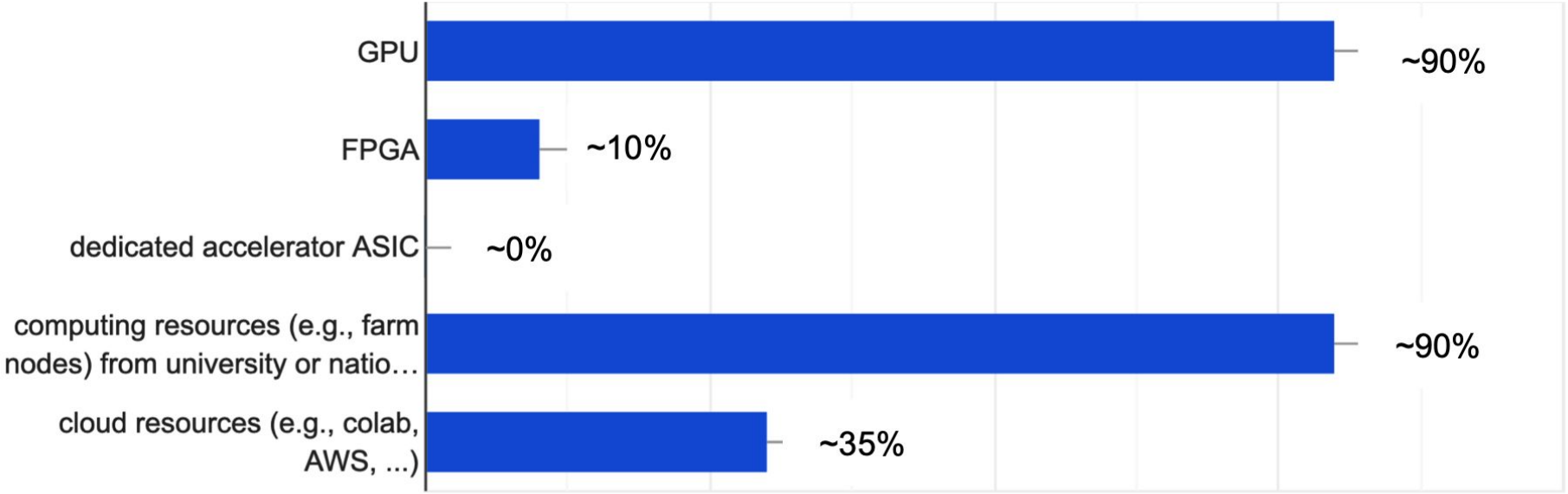
PyTorch VS TensorFlow (digression)





Demographics

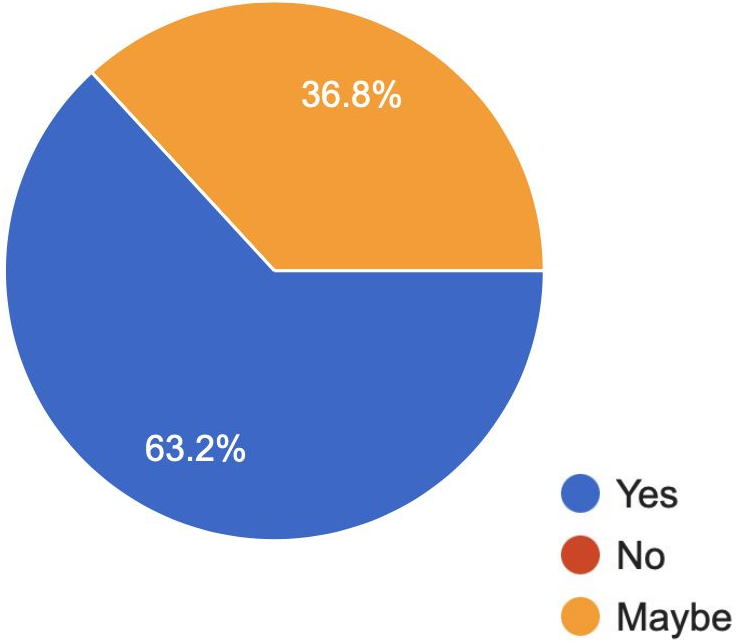
Which resources for AI acceleration do you use? Check all that applies



AI4EIC Events

https://eic.ai/events

The second annual workshop on AI4EIC will be held on October 10-14, 2022.
Would this be a good option for you?

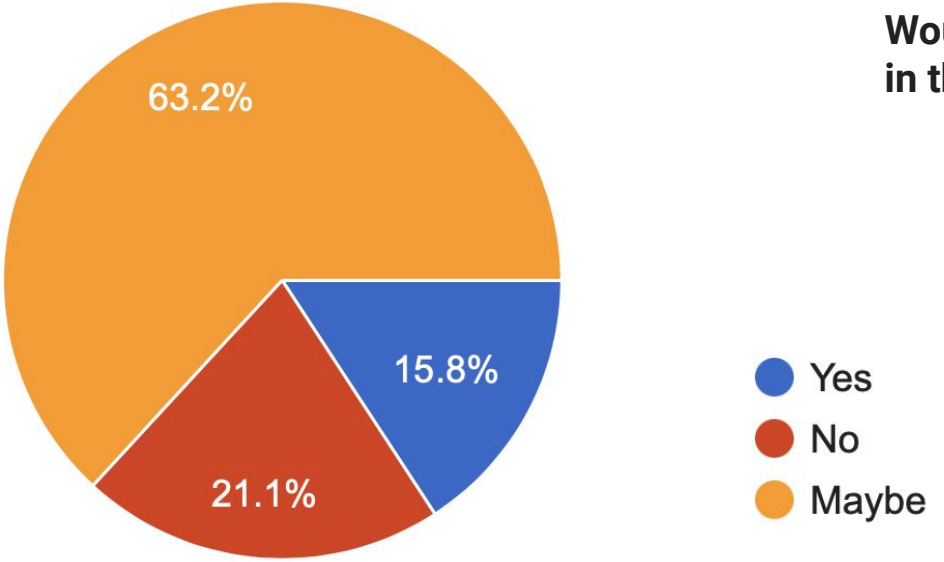


Announcement:

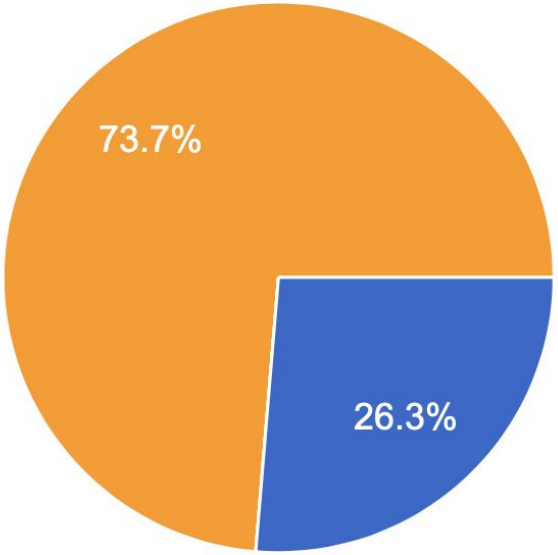
After the successful 1st workshop at CFNS/BNL, the 2nd workshop of AI4EIC will be hosted by William and Mary on October 10-14

AI4EIC Events

Are you interested in participating to an hackathon event organized by AI4EIC?



Would you like the hackathon event to be organized in the same week of the second AI4EIC workshop?



AI4EIC Events

Do you have suggestions on topics to discuss during the next AI4EIC workshop?

I'm interested in how I can get involved. I am often asked to speak at AI/EIC events but am not actively working on any projects there.

Data management and reproducibility in the context of AI/ML studies; lifecycle management from prototyping to production

Follow up on priorities from first AI4EIC, i.e.g., topics we think AI/ML can make a difference. Lessons learned from AI/ML work for detector collaboration proposals, discussion what is unique about our field.

event-level RICH reconstruction

No specific suggestion

Transformers, OCC/AD

Section that discuss new modern methods and advances of AI that industry uses and that might be relevant for us but not yet being widely used in NP communities. Discussion of possible applications of new methods.

Domain Adversarial Neural Networks and Graph Neural Networks

Having some sessions/tutorials for already used AI/ML techniques which have shown promising results/indications in experimental high energy physics will be useful.

continual learning; autonomous optimization workflows; anomaly detection; jet reconstruction and classification; imaging Cherenkov reconstruction; xAI;

Particle ID, background rejection in tracking, signal recognition in tracking.

Connections of the AI4EIC developments with other fields of (applied) science

AI for streaming readout and how we can integrate complex computational workflows into edge computing

AI4EIC Events

Do you have suggestions on the challenge for a future hackathon?

Learning and inference in streaming-only mode

No specific suggestion

I have some ready for ML data on negative ecal which could be used for hackathon. There might be different tasks, starting with E,x,y, e/p, ending with trying to identify scattered electron. While I'm not sure it is a good for an entry level hackathon.

particle reconstruction, classification with calorimeter information; lepton identification with deep learning; classification with deep learning using patterns from imaging Cherenkov detectors;

Identify the criteria to choose the optimal software framework for EIC (driven, maybe, by AI models)

AI4EIC Events

Do you have suggestions on problems for a kaggle-like competition for our community?

Do NOT try to replicate the trackML or upcoming caloML challenges, or try to do something else that others are already doing (fast calo simulations). Do something that is specific to EIC, e.g. event decay topology extraction for hadronic decay chains, jet reconstruction, extracting actual ep DIS kinematics or observables,...

PID, accelerating detector simulations.

No specific suggestion

Perhaps something like LHC olympics, but scaled appropriately.

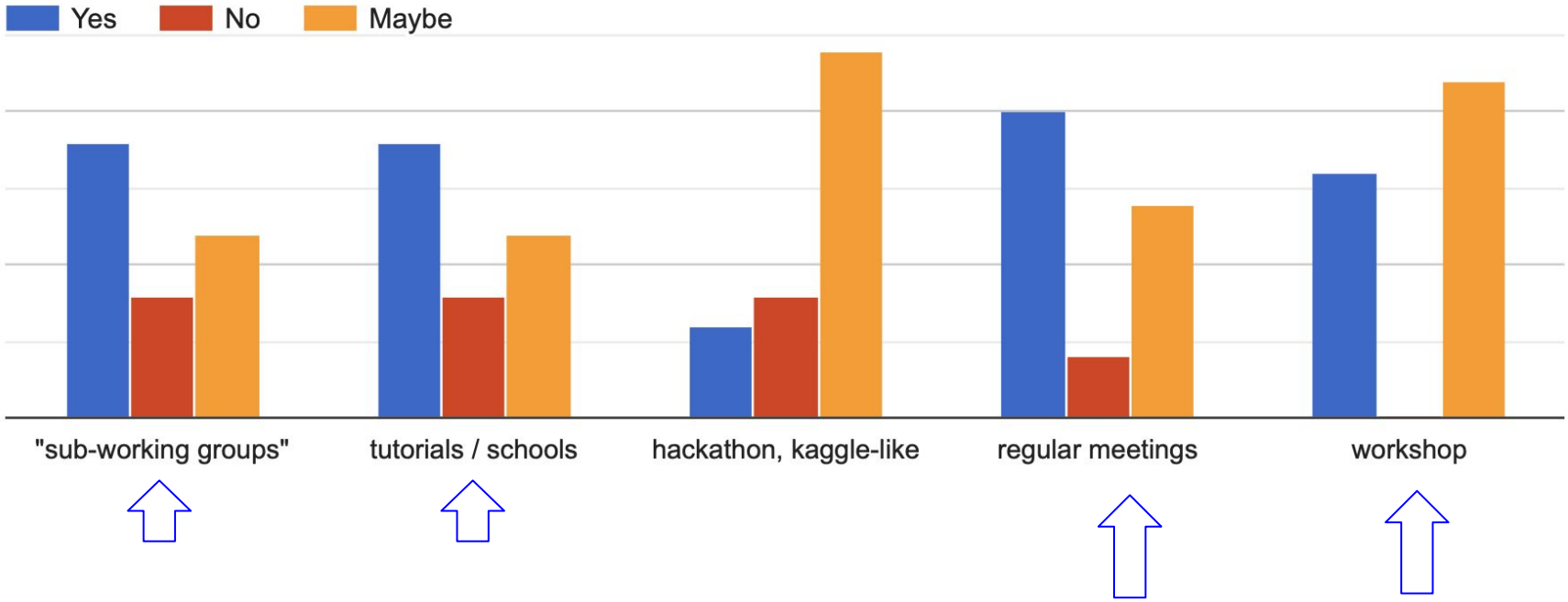
Need to think!

extraction of ep DIS kinematics or observables; classification with deep learning using patterns from imaging Cherenkov detectors in realistic environment that includes background; jet reconstruction and classification

Propose tracking or PID algorithms, given simulated data

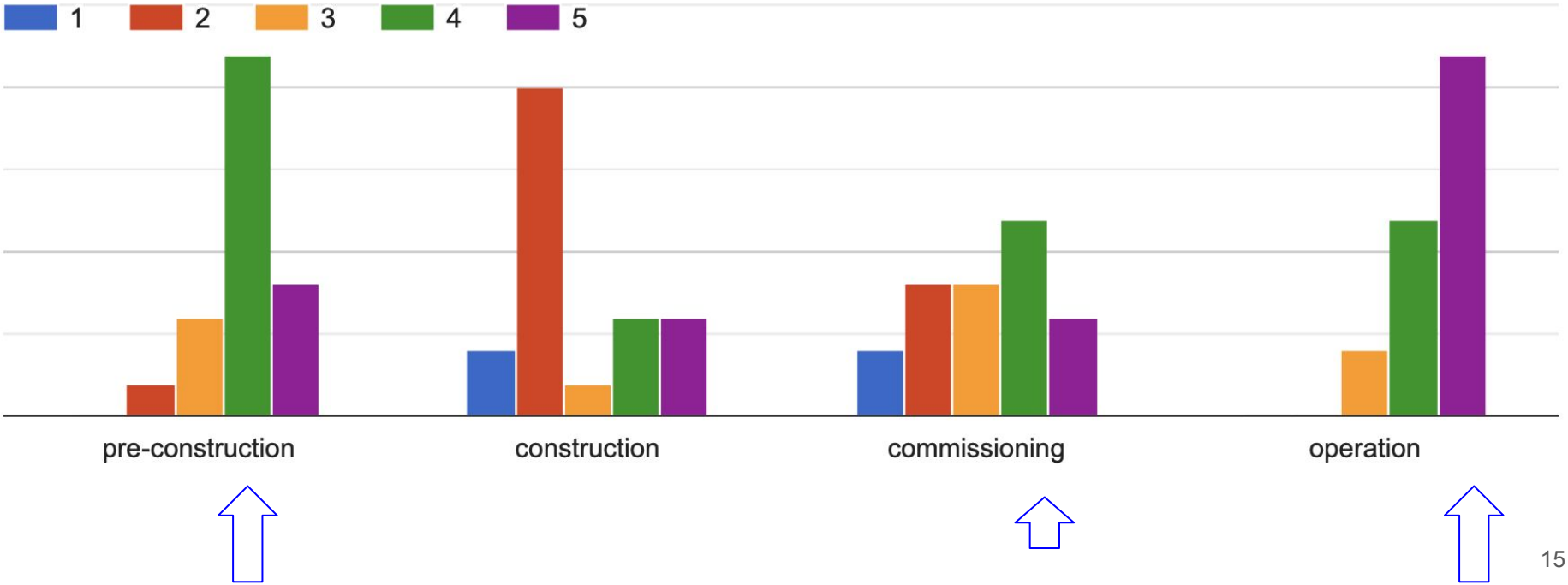
Activities

How would you like to get involved?



Activities

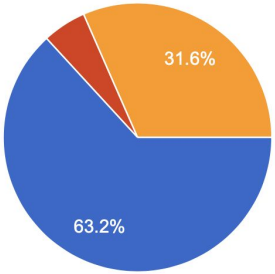
How would you rate the potential impact of AI/ML during the following phases of the EIC?
(1: no impact, 5: largest impact)



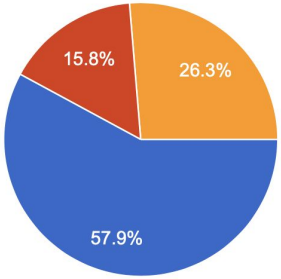
Activities

Yes
No
Maybe

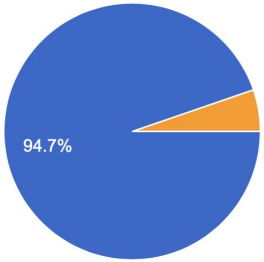
Would you participate in discussions on AI/ML for design (accelerator/detector)?



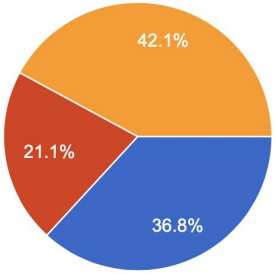
Would you participate in discussions on AI/ML to "speed-up" simulations?



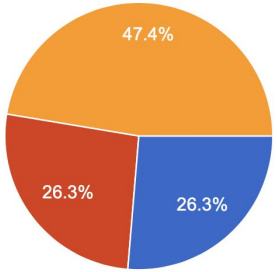
Would you participate in discussions on AI/ML for offline reconstruction and analysis?



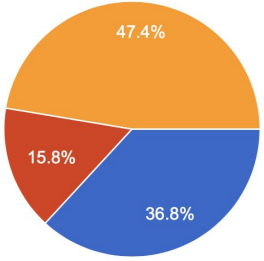
Would you participate in discussions on AI/ML for streaming readout?



Would you participate in discussions on AI/ML for accelerator and detector control?



Would you participate in discussions on AI/ML for computing frontiers



Activities

Do you want to suggest an additional experimental area not listed above?

no specific suggestion

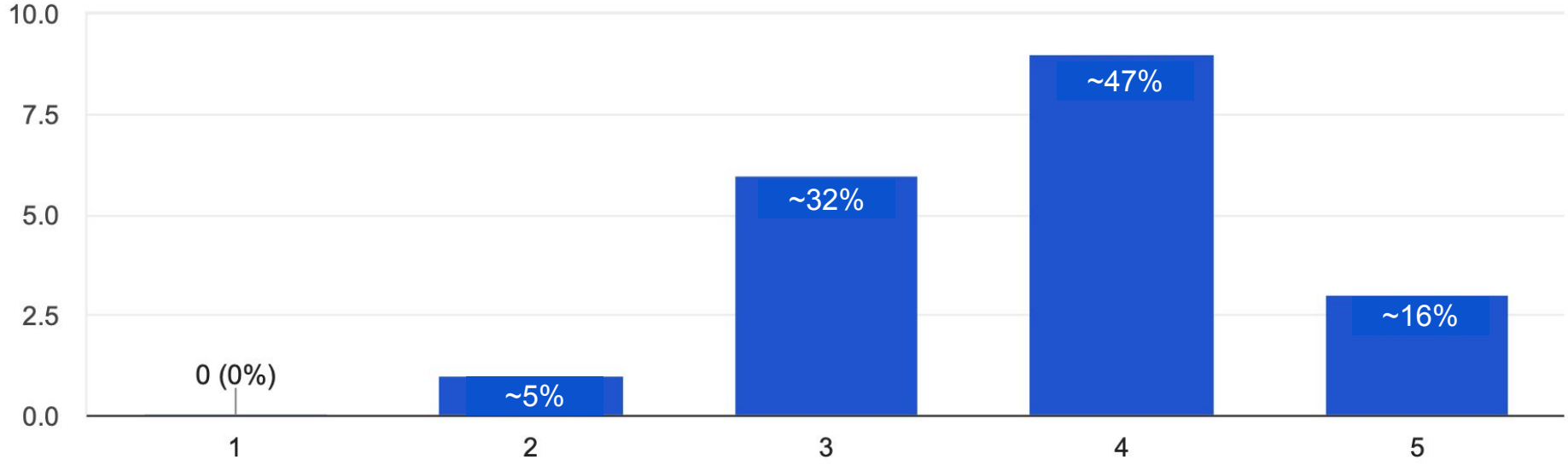
Common software + AI working together. It goes through all above fields. We don't have a ready software where AI is the first class citizen as conventional algorithms. How to move from jupyter notebooks to production piece in a pipeline. It not yet there but it must be built so we have to speak about it. Show cases, etc.

AI/ML for managing compute resources

Characterization of AI tools is an essential aspect, expected to be more critical that in "traditional" software; it could be possibly important to define a sort of "acceptance" criteria for routine use of AI/ML based software.

Activities

How would you rate the potential impact of AI/ML in the EIC physics theory or phenomenology?



Activities

What cross-cutting aspects in AI/ML would you like to discuss/tackle in our meetings? (e.g., uncertainty quantification, continual learning)

- UQ
- Differentiable reconstruction
- no specific suggestion
- Uncertainty Quantification, RL/CL, DataFusion
- Uncertainty quantification, systematics, data-simulation differences
- Data enhancement, attention/transformers application, Transparent/explainable AI, evaluation
- Uncertainty quantification
- UQ, continual learning, xAI
- Robustness and domain of application (e.g. when and where the AI/ML tool may fail in a given task)

UQ, xAI…

Activities

Do you have suggestions on the topics the AIWG should cover?

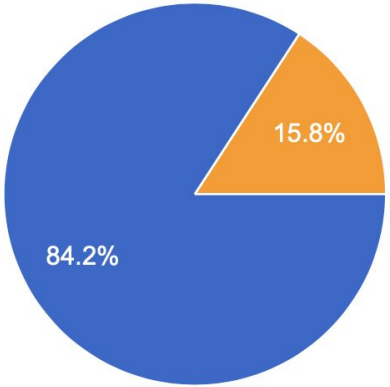
I think it would be interesting to start pulling SOTA algorithms from other fields, that seem directly applicable to problems in physics.

Commonality in tasks. Common data training sets (if one wants to invest time in it)

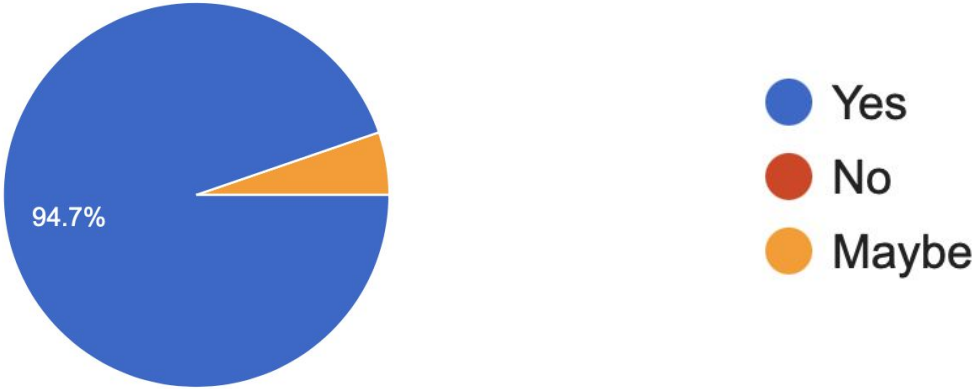
Related to previous answer: proper quality control of the operational AI/ML software

Open Data & SW, Information and Communication

Do you think it would be beneficial for the AI4EIC activities to have open datasets which can be accessed by the community?



Do you think it would be beneficial for the AI4EIC activities to share software that can be utilized by the community?



Open Data & SW, Information and Communication

What channels would you like to have in the ai4eic slack workspace?
Please include brief description (e.g., #what_i_learned_today, This channel is for sharing experience on ML)

a channel where people reach out for collaborators with certain expertise

no specific suggestion

Perhaps instead of having a random channel where people send SOTA algorithms, make this more specific. eg. semantic-segmentation, point-clouds, etc.

#question_answer - where one can ask "how I do this?" and get some answer. It unfortunately be dead if community is not active and no-one supports it

List of packages, tutorials, open problems and discussion (maybe repo)

#gripes on projects, for no-judgement posting of small inconveniences that don't rise to a level of a bug report, service request, or feature request; #today_I_learned: good for short snippets or one-liners that everyone may be interested in learning; #resources: links to comprehensive courses, tutorials, etc

Open Data & SW, Information and Communication

What tools you would like to use for storing/sharing information, data, software? (e.g., GitHub, doc-db, zenodo, etc)

GitHub
The same the EIC collaboration will work with.
GitHub for data and scripts, DocDB (documents, notes, training videos or Zoom recordings, etc)
Github, Zenodo
github
GitHub, Zenodo
Github
No clear idea
I could be useful to have a centralized AI-EIC github repo where everyone works/uploads code. This would have the benefit that new people would have dedicated examples when they get started.

General

Please add here any general comment or suggestion related to AI4EIC

Good luck with all this. Exciting but daunting work.

I think it would be awesome to start trying to use SOTA algorithms from other fields where applicable. This would give physics related AI much more visibility. Doing so also has the potential for the community to push these SOTA algorithms as the problems we deal with are unique.

Live and active community is the key

Promising

Summary

- Survey was conducted to poll the community about about AI/ML EIC priorities
- Results indicate that AI/ML is expected to have the largest impact at EIC operations - however, significant impact also anticipated in the periods leading up to it, e.g., pre-construction (specific areas: design, simulation, reconstruction)
- Topics to be addressed in the AI4EIC WG in the next <=5 months:
  - Communication and archiving (github, zenodo, etc)
  - Generating/getting data - work on data challenge
  - Information gathering on cross-cutting topics
  - …
- Practical aspects:
  - Regular meetings (invited talks on cross-cutting topics) - need to identify a day/time of the week
  - Formation of working groups? Discussion on slack in the related channels)...
- Announcement: 2nd Workshop on October 2022
- Mailing list: eicug-software-ai@eicug.org