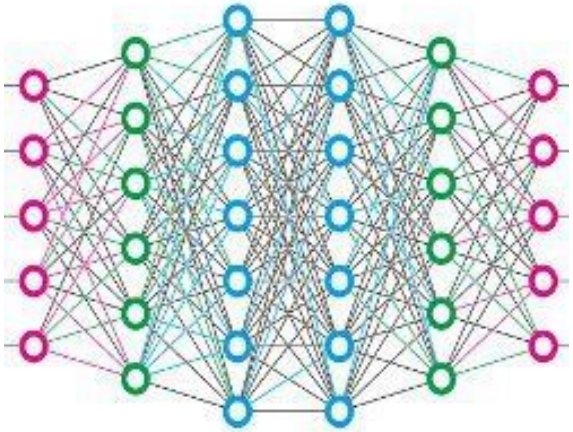
Snowmass CPM:
AI and Data handling



Oct 6 2020

SnowMass2021

APS DIVISION OF PARTICLES & FIELDS

DPF Core Principles and Community Guidelines (CP&CG)

- By participating in this meeting, you agree to adhere to the CP&CG
  - **Respect and support community members**
  - **Commit to constructive dialogue and take initiative**
  - Details of what this means, expectations for behavior, and accountability procedures are provided in the CP&CG document linked at: https://snowmass21.org/cpcg/start

- Everyone is invited to invoke the CP&CG as needed to encourage constructive and supportive collaboration

- The conveners of this meeting are your recommended first point of contact for reports of CP&CG violations occurring here
  - The conveners have received training in the CP&CG and how to handle reports
  - The CP&CG accountability procedure is designed to encourage early intervention and is flexible enough to appropriately address issues ranging from the discourteous to the egregious
  - Please do not hesitate to contact us!

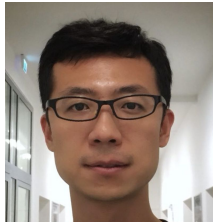
- Snowmass is most successful when everyone's voice can be heard!

Plan for session

- Overview of role in AI/ML in HEP and data handling
  - Jean-Roch Vlimant (CalTech)
  - Where has AI/ML infiltrated HEP and where do opportunities remain?

- Panel discussion of the future!
  - Topics:
    - What is the future of AI/ML in HEP and data handling?
    - How can we foresee and prepare for future needs?
  - Panelists:
    - David Miller (University of Chicago)
    - Katrin Heitmann (Argonne National Laboratory)
    - Nhan Tran (FNAL), Rui Zhang (Michigan State University)
    - Savannah Thais (Princeton University)
    - Xiangyang Ju (LBNL)
    - Rui Zhang (Wisconsin)



TDAQ AI/ML focused LOIs

- Inference applications
  - Fast inference, heterogenous acceleration, ML as a service (Acosta Flechas et al., 128)
  - FPGA-based edge AI (R.Herbst et al., 121)
  - High speed instrumentation for front-end DAQ (Mostafanezhad et al, 132)
- New techniques
  - Non Von-Neumann neuromorphic computing, non-volatile memory (Miryala et al., 180)
  - Self-driving trigger for automated/adaptive data selection (Miller et al, 72)
  - Real-time adaptive deep-learning with embedded systems (Miller et al, 132)
- Experiment focused needs:
  - DUNE, low energy events (Balantekin et al, 167)
  - Project 8, tracking (Oblath, 46)

AI/ML LOIs

- Physics-specific ML
  - Problems inspired by physics, heterogeneous data
- ML and Simulation
  - Fast simulation and differentiable simulation
- Interpretability
  - Systematic uncertainties, validation and interpretation, esp rare events
- Tools and Resources
  - Computing facilities, ML standards, industry interface
- Education and Community
  - ML for HEP courses, open data, career planning
- Application examples
  - Deep networks for jet flavor tagging

INSPIRE HEP

literature

find t machine learning