Fermilab CPAD RDC5 activities/interests

Nhan Tran for a lot of different groups
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Activities

Sampling of platforms and technologies

- **OTSDAQ** (code) for intensity frontier experiments and test beam readout
- LTA: low threshold architecture for low-noise cosmic experiments
- **QICK** (w/RFSoC): for QIS and cosmology applications, full stack (Pynq)
- **hls4ml**: codesign workflow for ML on FPGA, ASIC, etc.
- SONIC: framework abstraction for coprocessors and heterogenous compute
- **DUNE DAQ**
- Photonic link R&D
- Accelerator controls (e.g. **ACORN**) - autonomous, low-latency (**READS**) continuous learning

Activities extend across all HEP science:
Energy, intensity, cosmic frontiers; QIS; accelerator controls, etc.
Strong synergy with RDC4 and microelectronics effort at FNAL

R&D interests

Aligned with interests of RDC5 (PRD 21,22,23)

- PRD 21: Wide range of activities in Fast ML ([conference](),[workshop]())
    - End-to-end co-design from AI algorithms to transpilation (representation lowering) to microarchitectures to new hardware (AIEs, neuromorphic, etc.)
    - Collaborations on application across and beyond HEP
- PRD 22:
    - More recent projects in continuous, adaptive, robust learning
    - Full stacks for control (QICK, ACORN, DUNE DAQ, etc.) including embedded SoC architectures and heterogeneous computing
- PRD 23:
    - timing distribution R&D connected to CMS MTD development, [Quantum networks](), and other areas

Common platforms and training
- A lot of effort put into training materials and documentation for big projects, e.g. AWS integration of QICK, many tutorials (hosted on Google cloud) for hls4ml (e.g. [IEEE NSS]())
- Interested in developing a distributed TDAQ hardware network for training and R&D (accessing hardware across the US HEP community wherever it may be)