Low Power on-Detector Computing

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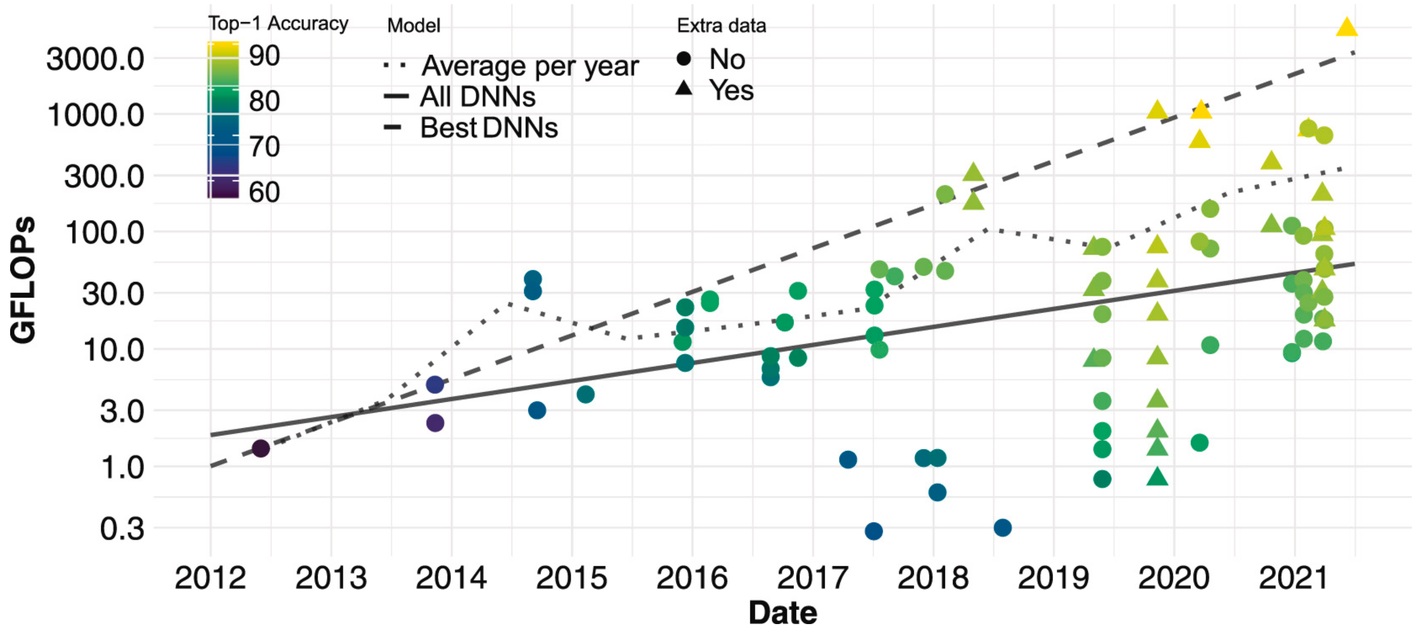
Introduction

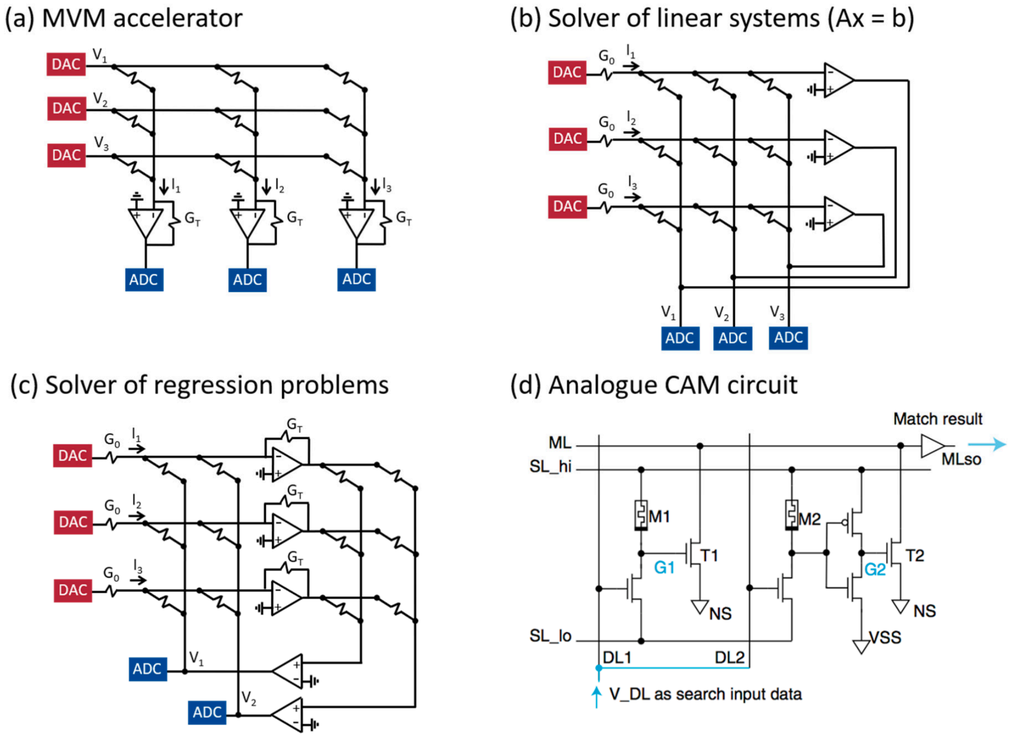
- Modern algorithms, especially AI/ML ones, are requiring ever increasing computation power
- Makes it prohibitive to include algorithms on the detector to make complex decisions
  - More computing -> more heat -> more cooling required-> more material -> lower performance



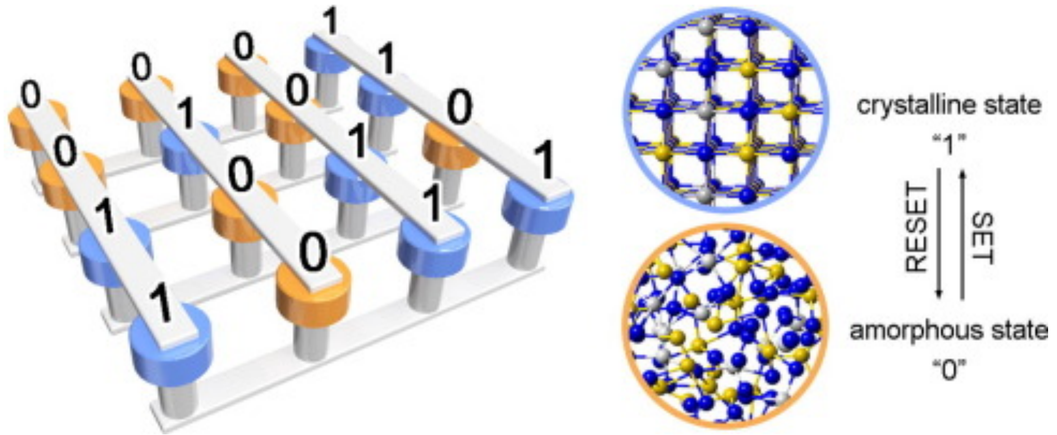
Trend of increasing computing needs for alogrithms Link

Analog computing

- Analog computing can provide 10-100x higher computational power per watt
  - In-memory implementation are radiation hard
- Opens a way to include a computational platform on the detector, even close the interaction point to run complex algorithms to perform tasks
  - Matrix multiplication for AI/ML algorithms are trivial current adders



Different types of computation can be implemented with analog techniques link



In memory circuits are inherently radiation hard as they use amorphous states to store info

Next Steps

- Continue collaborating with industrial partners to leverage their commercial technologies for our detector R&D
  - Develop benchmarks to test implementation and performance in realistic detector conditions

- Similar expression of interests from US & European institutes
  - Wide range of ideas on how to incorporate low-power computation techniques on detectors
  - Planning meeting early January to figure out synergies and collaborations!