

# Future Computing Frontiers at SLAC

SLAC MASS Computing Working Group  
Cartaro, Kagan, Terao

- What is the goal of the SNOWMASS [Computational Frontier \(CF\)](#)
  - **Goal:** The CF will assess the software and computing needs of the High Energy Physics community emphasizing common needs and common solutions across the frontiers
  - Working groups in the CF:
    - [Experimental Algorithm Parallelization](#)
    - [Theoretical Calculations and Simulation](#)
    - [Machine Learning](#)
    - [Storage and processing resource access \(Facility and Infrastructure R&D\)](#)
    - [End user analysis](#)
    - [Quantum computing](#)
    - [Reinterpretation and long-term preservation of data and code](#)
- Snowmass Letters of Intent (LOI) and White Papers
  - LOI and the white paper is the default method to make (community) input into the Snowmass Process. We will compile the key questions we ask at SLACmass and answers into these format working with other SLACmass frontier conveners.
  - LOI due date: end of August, white paper next Summer.

- What is the goal of the SLACMASS computing
  - What does future of computing in HEP look like
  - What do computational workflows look like in the future?
  - What role will ML play in the future of HEP data analysis
    - What computing needs are there for ML
  - What is the role of R&D for cutting edge computing vs. HPCs and large facilities?
  - What does future of computing at SLAC look like
    - How does that interact with the non-HEP computing needs at SLAC
  - How to train the staff and students in new computing tools and ML methods?
  
- Eventual goal - (Chapter of) White paper from SLAC for SNOWMASS

- We would very much like to hear from you
  - We have prepared a few question to be discuss, plus anything you would be interested in bringing up with us [Google doc](#)
  - These discussions will help structure the computing chapter of the white paper
- Already had a few discussions with individual, thank you!
  - We will summarize some of the feedback
- Based on recent discussions with Yee, Wei, and Yemi, we invited them to speak about their views on the future on computing at SLAC here today
- Let us know if you would potentially like to present in a future SLACMASS computing meeting
  - We plan to hold semi-regular meetings going forward

- Topics for Computational Frontier
  - Computational Physics and Algorithms
  - Machine and Deep Learning
  - Statistical Techniques
  - Distributed / Grid computing
  - Large Scale High Performance Computing
  - Networking
  - Computing/software infrastructure
    - Storage systems
  - Quantum Computing

# Some Feedback

- SLAC HEP groups share a strong culture of collaboration
  - Shared computing (cores, storage, ...) resources
    - Easier to manage for computing division, possibility to better leverage existing resources
    - Huge advantage for smaller groups and individuals with limited resources
- Continued need for local computing resources which offer more flexibility
  - NERSC or other large facilities are not always the answer
    - Changes usually too aggressive for experiments lifetimes
    - Not ideal for certain tasks (online monitoring/processing)
  - Cloud is still expensive and science is not a priority in business models
  - Outsourcing from Centers of excellence only for small scale, limited scope projects (with uncertain results)
- How to support both large and small experiments and interact w/ computing division
- Need for training in software engineering for physicists/staff
  - Face current challenges with new trends and new technologies
    - Optimize code, develop ready-to-use workflows (event processing or infrastructure for experimental setups), take full advantage of ML, GPUs, support/promote R&D activities, ....