

Introduction to Compf01, Experimental Algorithm Parallelization

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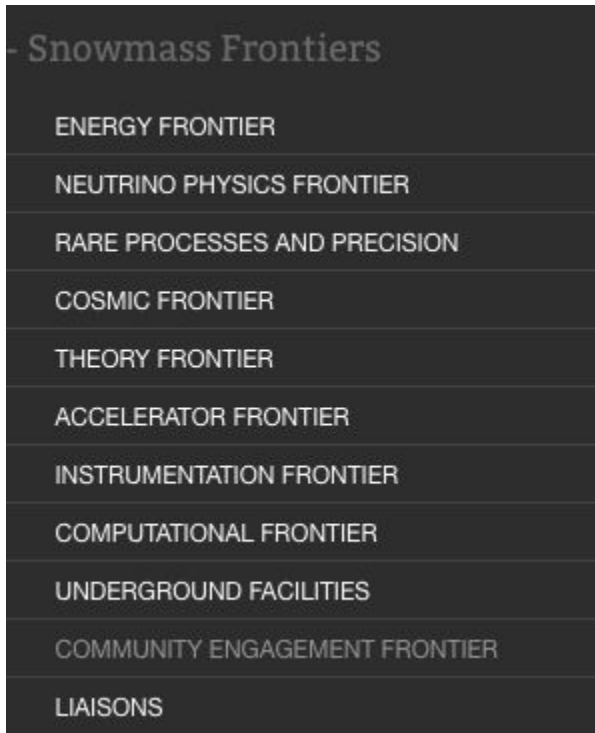
August 10, 2020

Snowmass

The Particle Physics Community Planning Exercise (a.k.a. “Snowmass”) is organized by the Division of Particles and Fields (DPF) of the American Physical Society. Snowmass is a scientific study. It provides an opportunity for the entire particle physics community to come together to identify and document a scientific vision for the future of particle physics in the U.S. and its international partners.

The P5 (Particle Physics Project Prioritization Panel) will take the scientific input from Snowmass and develop a strategic plan for U.S. particle physics that can be executed over a 10 year timescale, in the context of a 20-year global vision for the field.

From: <https://snowmass21.org/start>

A vertical menu titled "Snowmass Frontiers" with a dark background and light text. The menu items are listed from top to bottom: ENERGY FRONTIER, NEUTRINO PHYSICS FRONTIER, RARE PROCESSES AND PRECISION, COSMIC FRONTIER, THEORY FRONTIER, ACCELERATOR FRONTIER, INSTRUMENTATION FRONTIER, COMPUTATIONAL FRONTIER, UNDERGROUND FACILITIES, COMMUNITY ENGAGEMENT FRONTIER, and LIAISONS.

Snowmass Frontiers
ENERGY FRONTIER
NEUTRINO PHYSICS FRONTIER
RARE PROCESSES AND PRECISION
COSMIC FRONTIER
THEORY FRONTIER
ACCELERATOR FRONTIER
INSTRUMENTATION FRONTIER
COMPUTATIONAL FRONTIER
UNDERGROUND FACILITIES
COMMUNITY ENGAGEMENT FRONTIER
LIAISONS

Computational Frontier

The Computational Frontier will assess the software and computing needs of the High Energy Physics community emphasizing common needs and common solutions across the frontiers.

We want to gain an overall understanding of the community's needs and discuss common solutions to them in the context of current and future solutions from the HEP community, other science disciplines and industry solutions

From: <https://snowmass21.org/computational/start>

Topical groups

Name	Email List	Slack Channel
CompF1: Experimental Algorithm Parallelization	snowmass-compf01-expalgos[at]fnal.gov	#compf01-expalgos
CompF2: Theoretical Calculations and Simulation	snowmass-compf02-theorycalcsim[at]fnal.gov	#compf02-theorycalcsim
CompF3: Machine Learning	snowmass-compf03-ml[at]fnal.gov	#compf03-ml
CompF4: Storage and processing resource access (Facility and Infrastructure R&D)	snowmass-compf04-storeandprocess[at]fnal.gov	#compf04-storeandprocess
CompF5: End user analysis	snowmass-compf05-useranalysis[at]fnal.gov	#compf05-useranalysis
CompF6: Quantum computing	snowmass-compf06-quantum[at]fnal.gov	#compf06-quantum
CompF7: Reinterpretation and long-term preservation of data and code	snowmass-compf07-preservation[at]fnal.gov	#compf07-preservation

Experimental Algorithm Kick-off meeting

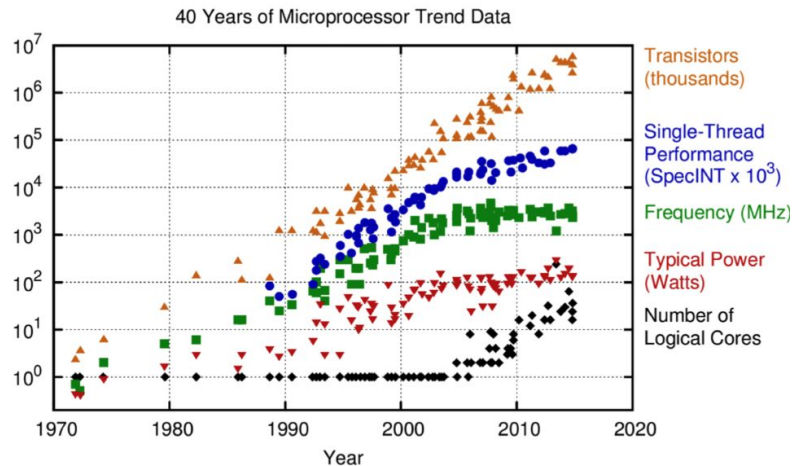
- First meeting held on July 13: <https://indico.fnal.gov/event/44250/>
- Introduced the group
- Gauged the interests of group members.
- Started discussing concerns and plans of frontiers.

This meeting will expand and continue the discussion of the kick-off meeting

Computing landscape

The computing landscape has been transforming in the last few years: end of Dennard scaling, emerging of GPUs, building of exascale machines.

This means that adiabatic improvements from past solutions may not work or may be suboptimal. This is an opportunity to re-think how we process our data, and define new solutions for a higher science throughput.



Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten
New plot and data collected for 2010-2015 by K. Rupp



Functional areas of our working group

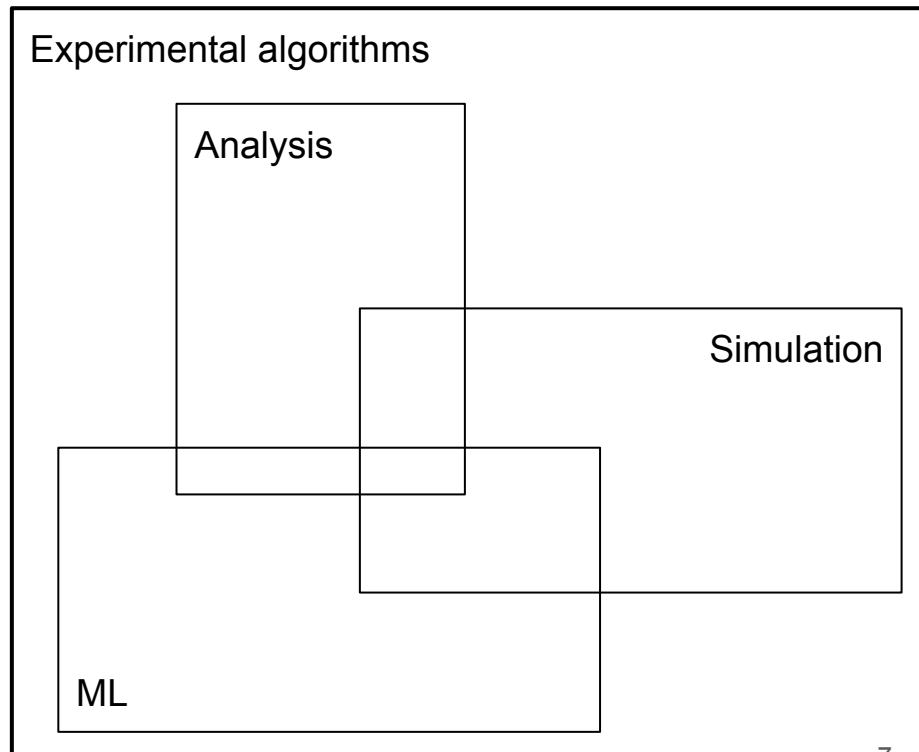
- Parallelization of detector reconstruction algorithms, physics object reconstruction/calibration algorithms
- Utilization of CPU, accelerator hardware and what comes next in 5-10 years
- Developing better algorithms in addition to parallelization
- Portability solutions that support the same algorithm implementation on multiple hardware architectures

Relationships with other working groups

The definition of “experimental algorithms” is broad, covering the topics of other WGs.

We’ll focus on the area not covered by others. It means central (i.e. not analysis specific), non-ML algorithms whose inputs are experimental data (both offline and software trigger). This may have different meaning for different physics frontiers!

Frameworks are not specifically covered in other groups, and we’d be happy to discuss implications of parallel execution for frameworks in our WG.



Mandate of our working group

- Describe experimental algorithms that are or will be used by the stakeholders
- What are the processing resource needs to execute the experimental algorithms of the stakeholders
- What is the technology evolution of processing resources?
 - Coordinate with theoretical calculations and simulations working group
- How will stakeholders be able to design and write algorithms for these processing resources?
 - Coordinate with theoretical calculations and simulations working group
 - Coordinate with Machine Learning working group
- How can coding standards and performance standards be used?
 - Coordinate with theoretical calculations and simulations working group, and Collaboration and Ecosystem working group
- How are the solutions used by the community embedded/derived from solutions from industry/other science domains?

Communication channels

Mailing list: `snowmass-compf01-expalgos[at]fnal.gov`

Slack Channels: `#compf01-expalgos`, `#comp_frontier_topics`

Wiki page: <https://snowmass21.org/computational/algorithms>

Instructions to subscribe:

<https://listserv.fnal.gov/users.asp#subscribe%20to%20list>

<https://snowmass21.org/communicationtypes>

Next steps

LOI submission deadline: August 31, 2020 (<https://snowmass21.org/loi>)

Virtual Town Hall meeting early September 2020

Snowmass-wide workshop: November 4-6

Snowmass Summer Study: July 11 - 20, 2021

Contributed paper submission deadline: July 31, 2021 (<https://snowmass21.org/submissions/start>)

CompF01 workshop agenda

The compf01 workshop meetings are meant to spur discussion, and we welcome both formal and informal contributions.

		Mon 10/08	Tue 11/08	All days						
						Print	PDF	Full screen	Detailed view	Filter
14:00	Cosmic Frontier Report					<i>Brian Yanny</i>				
						14:00 - 14:15				
	Intensity Frontier Report					<i>Alex Himmel</i>				
						14:25 - 14:40				
15:00	Energy Frontier Report					<i>Vyacheslav Krutelyov</i>				
						14:50 - 15:05				
		Mon 10/08	Tue 11/08	All days						
						Print	PDF	Full screen	Detailed view	Filter
12:00	HEP-CCE Report					<i>Meifeng Lin</i>				
						12:00 - 12:15				
	IRIS-HEP Report					<i>Heather Gray</i>				
						12:25 - 12:40				
13:00	Challenges and opportunities: resources					12:50 - 13:05				
	Challenges and opportunities: parallelizing algorithms					13:15 - 13:30				