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ICSC

Advanced Machine Learning. Flash Simulation and bleeding edge applications

FlashSim: *October status report*

Lucio Anderlini
Istituto Nazionale di Fisica Nucleare, Sezione di Firenze

External Partner

Who we are

Staff members:

- Alessandro Bombini [j], INFN
- Giuseppe Piparo[l], INFN
- Maurizio Martinelli [a], Università Milano Bicocca
- Simone Capelli [a], Università Milano Bicocca
- Federica Maria Simone [i], Politecnico di Bari
- Nicola De Filippis [i], Politecnico di Bari
- Vieri Candelise [h], Università di Trieste
- Giuseppe Della Ricca [h], Università di Trieste
- Valentina Zaccolo [k], Università di Trieste
- Mattia Faggin [k], Università di Trieste
- Lorenzo Rinaldi [e], Università di Bologna
- Piergiulio Lenzi [g], Università di Firenze
- Vitaliano Ciulli [g], Università di Firenze
- Sharam Rahatlou[h], Università Roma 1
- Daniele del Re [h], Università Roma 1
- Lorenzo Capriotti [f], Università di Ferrara
- Francesco Conventi [e], Università di Napoli
- Francesco Cirotto [e], Università di Napoli

PhD students:

- Francesco Vaselli [c], Scuola Normale Superiore di Pisa
- Matteo Barbetti [b], Università di Firenze
- Muhammad Numan Anwar [j], Politecnico di Bari
- Benedetta Camaiani [g], Università di Firenze
- Alkis Papanastassiou [g], Università di Firenze
- Antonio D'Avanzo [e], Università di Napoli

External collaborators:

- Andrea Rizzi [c], Università di Pisa

Ongoing activities

- ALICE - Timing-based vertex-reconstruction validation for the triggerless DAQ
- ATLAS - Fast simulation
- ATLAS - 4D reconstruction algorithms
- ATLAS - Anomaly detection for full-hadronic final states
- CMS - Flashsim
- CMS - Theory-independent classifiers for CMS using domain adaptation
- CMS - Data anomaly detection for data validation and certification
- LHCb - Lamarr (Flashsim) - PID and Calorimetry
- LHCb - Lamarr (Flashsim) - Tracking
- LHCb - Parametrization of Cherenkov detector path inRICH detectors
- LHCb - Flash simulation of resistive solid-state detectors
- LHCf - Reconstruction of multiple calorimetric clusters

Simulation
Reconstruction
Monitoring
Data analysis

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Products since last update

- New papers (submitted)
  - The LHCb ultra-fast simulation option, Lamarr: design and validation, 2309.13213 submitted to EPJ WoC

KPIs

KPI ID	Description	Acceptance threshold	2023-09-26
KPI2.2.1.1	N_{MC} billion events obtained from ML-based simulation, as demonstrated by official links in experiments' simulation databases	N_{MC} >= 1	0 events (completed: 0%)
KPI2.2.1.2	N_{EXP} experiments have tested a machine-learning based simulation	N_{EXP} >= 2	0 experiment (completed: 0%)
KPI2.2.1.3	Machine-learning use-cases tested in the context of the CN were presented at N_{CONF} international and national events	N_{CONF} >= 3	0 use-cases (since Sept. '23) (completed: 0%)
KPI2.2.1.4	N_{UC} different machine-learning use-cases were tested in the context of the CN and made available in git repositories	N_{UC} >= 5	3 use-cases (completed: 60%)

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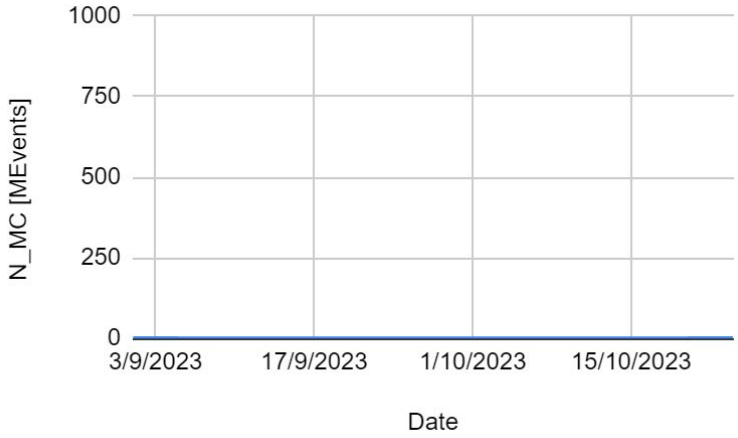
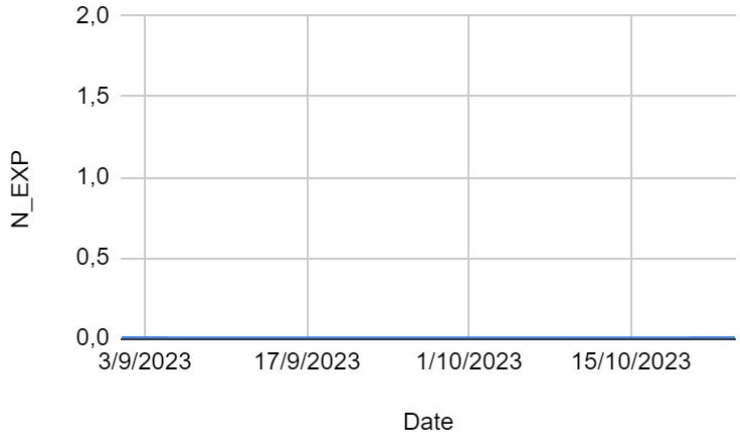
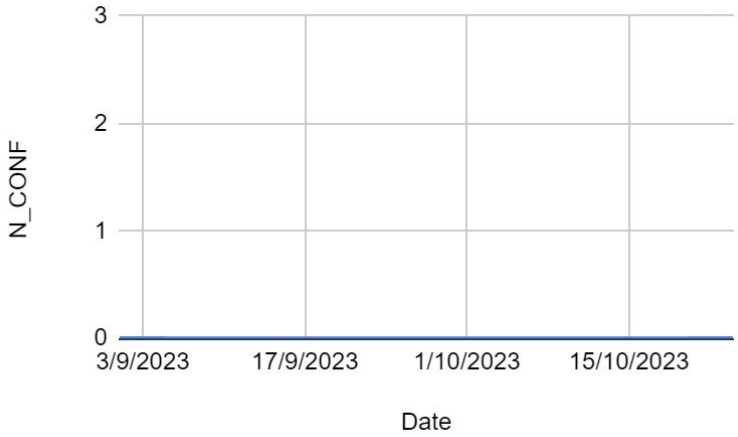
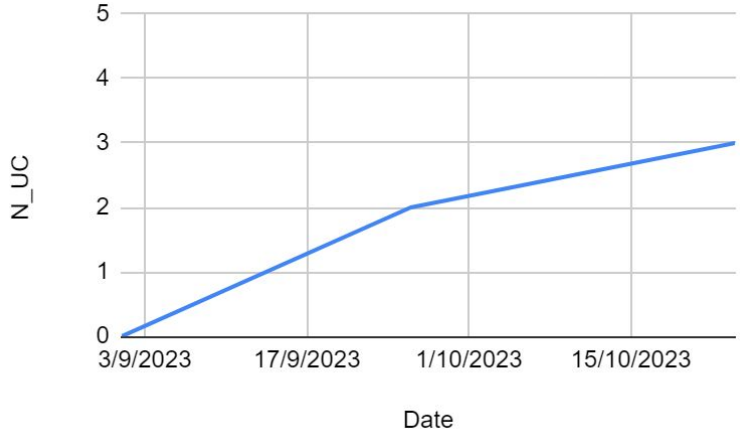
KPIs









On resources

The HPC bubbles requested by this flagship should be commissioned by summer 2024.

In the meanwhile:

- **Compute**:
  - ML_INFN is providing GPUs for **interactive development** (no batch)
  - some of us is starting playing with ***Leonardo Booster*** for practicing **ML with batch jobs** (spoke, please clarify rules and procedures)
  - ML_INFN plans for experimental support for batch jobs since early 2024, (but very tight schedule)
- **Storage:**
  - cache and ephemeral storage is available through INFN Cloud (few TB)
  - “permanent” storage for data relevant for audit under discussion, for the time being, we are encouraged using minio.cloud.infn.it

Get in touch! The machinering is slowly starting to spin, since getting accustomed to the environment may require time, if you plan to use ICSC resources at some point, we suggest you start practicing with the temporary, resource-limited environment we have now.