



Advanced Machine Learning. Flash Simulation and bleeding edge applications

FlashSim: September status report

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External Partner





Who we are

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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 in RICH detectors



LHCb - Flash simulation of resistive solid-state detectors



LHCf - Reconstruction of multiple calorimetric clusters

Simulation
Reconstruction
Monitoring
Data analysis

Thanks to everyone for replying to the heart-beat survey.
To me, it counts as the first successful cornerstone of the flagship!

Products so far

- Recent conference contributions
 - Lamarr @ CHEP, indico.jlab.org/event/459/contributions/11454/
 - CMS anomaly detection for DAQ @ LHCP, indico.cern.ch/event/1198609/contributions/5340126/
- (New) papers
 - CMS Anomaly detection, cds.cern.ch/record/2854697?ln=en
 - Domain adaptation for CMS, doi.org/10.1140/epjc/s10052-022-10871-3
- (New) repositories
 - github.com/landerlini/lb-trksim-train
 - github.com/LamarrSim
 - github.com/mfaggin/monitorPvML_hpc
 - github.com/fsimone91/ML4DQMDC-PixelAE
 - github.com/mbarbetti/pidgan
 - github.com/mbarbetti/calotron



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	$N_{MC} \geq 1$	0 events (completed: 0%)
KPI2.2.1.2	N_{EXP} experiments have tested a machine-learning based simulation	$N_{EXP} \geq 2$	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	$N_{CONF} \geq 3$	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	$N_{UC} \geq 5$	2 use-cases (completed: 40%)



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.