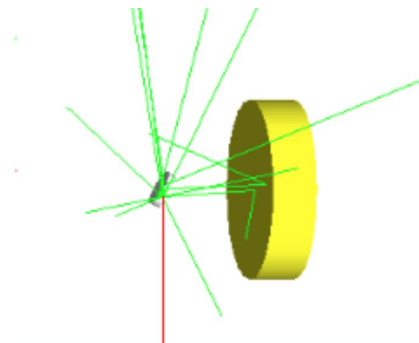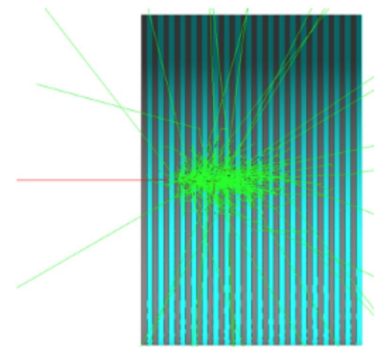# Competence Centre on Simulation and Big Data
Highlights - simulation

- Support and maintenance for an Advanced Example of the Geant4 simulation toolkit, for which LIP has been holding responsibility for several years.

- Teaching of advanced detector simulation techniques, integrated into the curricula of undergraduate courses and doctoral programs.

- Extensive use of the Virtual Radiation Laboratory by postgraduate students, in projects simulating radiation-matter interactions.
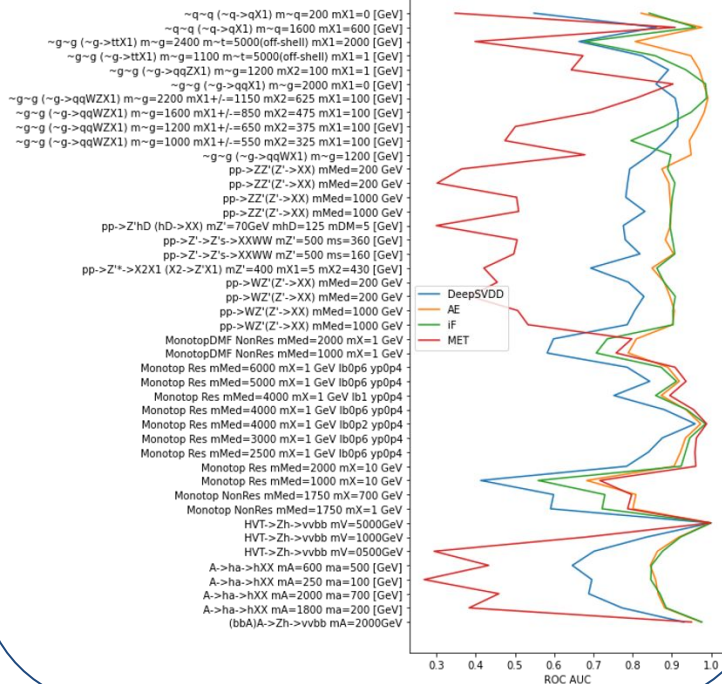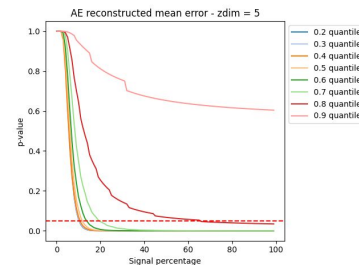
Competence Centre on Simulation and Big Data

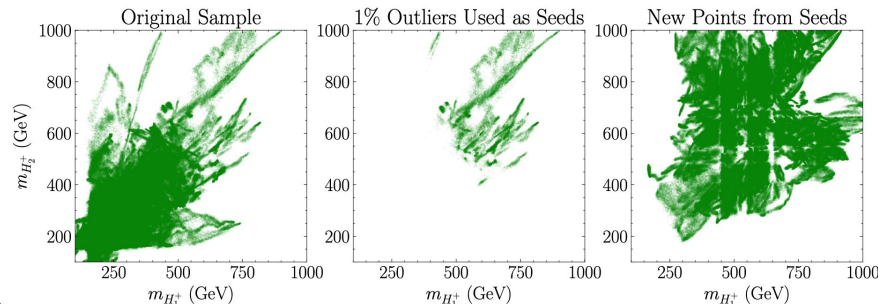## Highlights - machine learning

Anomaly detection in fully hadronic topologies (ATLAS)

interpreting AD results

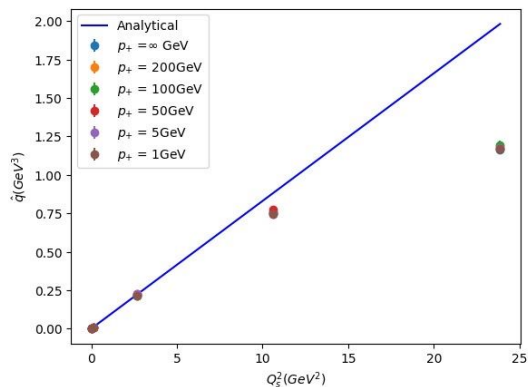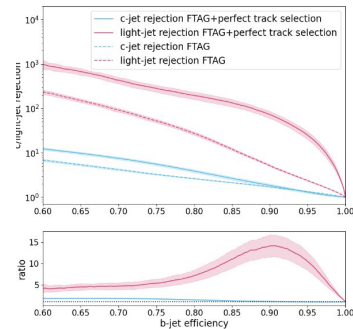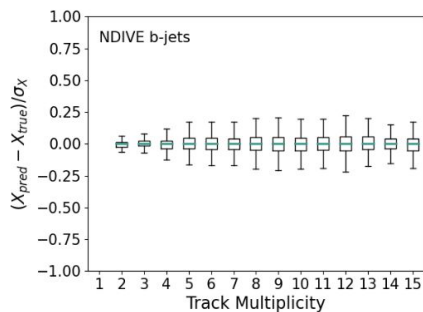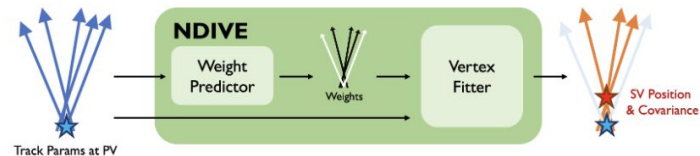Evolutionary Strategies and Novelty Detection: arXiv:2402.07661

Competence Centre on Simulation and Big Data
Highlights - machine learning

quantum computing for QCD simulation

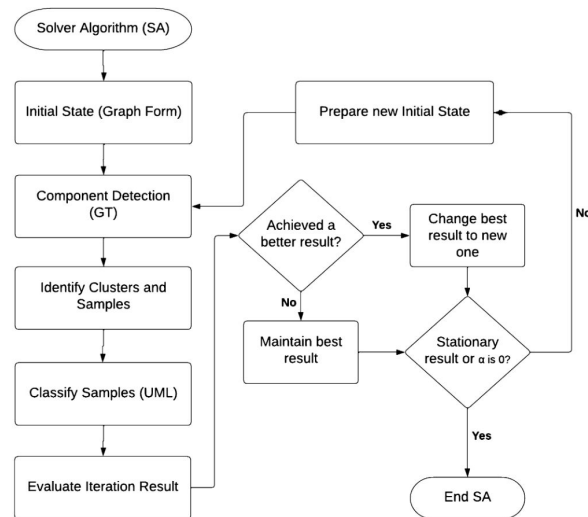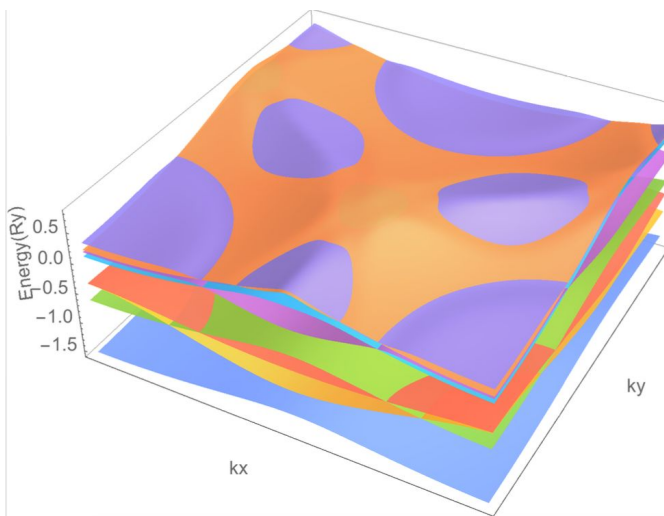Differentiable Vertex Fitting for Jet Flavour Tagging; arXiv:2310.1280

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Highlights - machine learning

ML for condensed matter physics, Comp. Phys. Comm. 295 (2024) 108972

Competence Centre on Simulation and Big Data
Highlights - machine learning

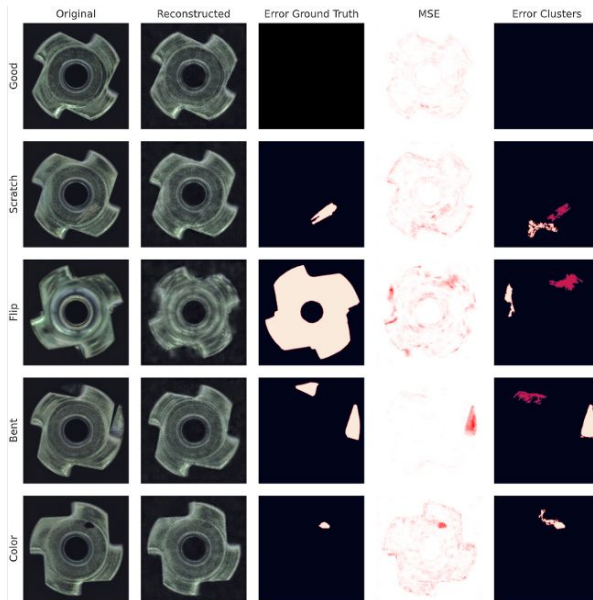Anomaly detection for industrial quality control

Competence Centre on Simulation and Big Data
SWOT

Strengths
 Integration in international collaborations (HEP experiments, Geant4 collaboration)
 Diverse team, consolidated by competitive fundings (some secured by the Competence Center)
 Good synergies with the computing team and INCD

Weaknesses
 Limited access to GPUs (we are not alone there…)
 We continue to improve the communication between groups, but there is still work to be done

Opportunities
 The Horizon Europe programme has a strong focus on Digital Transformation
 The plans for a National Centre for Advanced Computing

Threats
 External services in simulation and big data are highly competitive outside some niche areas