ML Collaboration with LHCb, FBK & Microsoft









Goals of the Collaboration

- Apply ML methods to event reconstruction.
- Leverage LHCb domain knowledge and FBK CS expertise.
- Learn from industry partners and don't reinvent the wheel.
- Explore new computing paradigms for HEP applications.



Bringing industry and HEP researchers together is a challenge.

The Hackathon Idea



Let's bring everyone together in a nice place.

Rare Decay LHCb Data for the Hackathon

- We used the ntuples from the LHCb $B^0_s \rightarrow \mu^+ \mu^-$ analysis.
- Real LHC data is exciting.
- Microsoft engineers were enthusiastic to acquire domain specific knowledge.
- Students liked it.

Different domains have different languages and visual habits.



Hackathon Challenge Structure

- Explore & visualise the data.
- Build a classification model.
- Collaborate with your team.
- Use MS Azure Ml resources.
- Automated hyper-parameter tuning with MS Azure.



We aimed to show how cloud ML resources can be applied in HEP.

The Day Before



Everyone is excited.

Preparations



The facilities provided by FBK were exceptionally good.

Teams at Work



Something is done right when people concentrate.

Team Reports



There was some constructive criticism.

Team Reports



But everyone agreed they had learned something useful.

The Road Ahead

- Apply ML methods to event reconstruction.
- Deploy models for real-time analysis on FPGAs.
- Detector simulation and optimisation.
- Explore cloud computing options.

There is a lot of work ahead.





