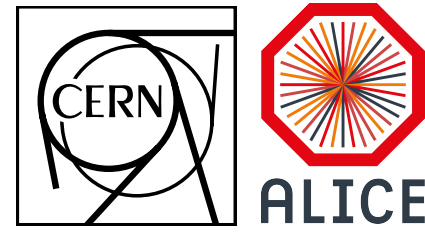


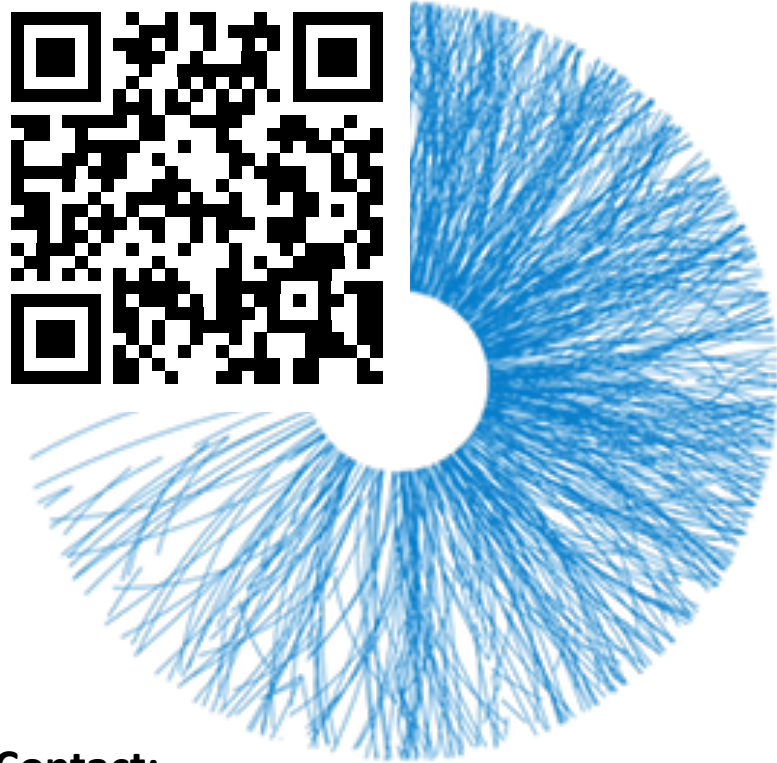


# ALICE

## (A Large Ion Collider Experiment)



<http://alice-collaboration.web.cern.ch>

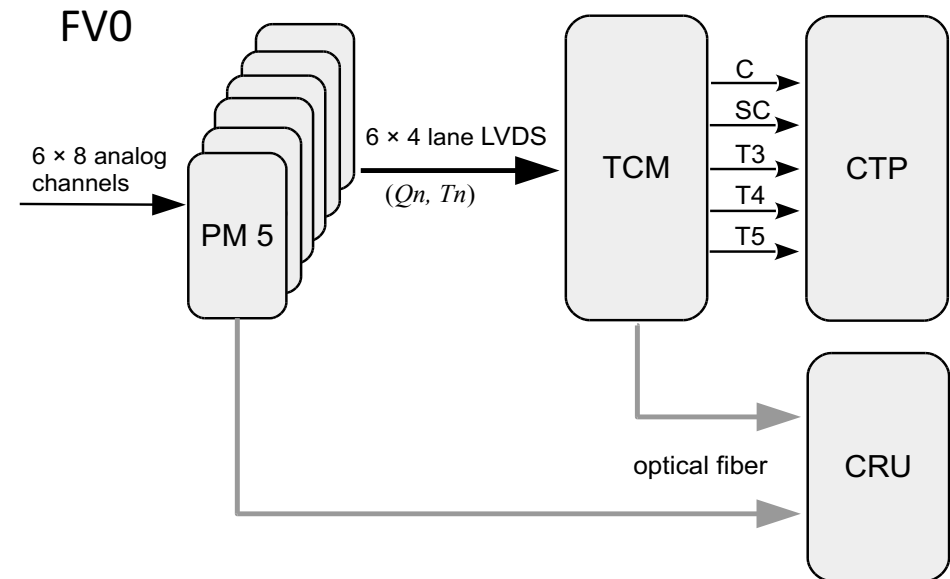
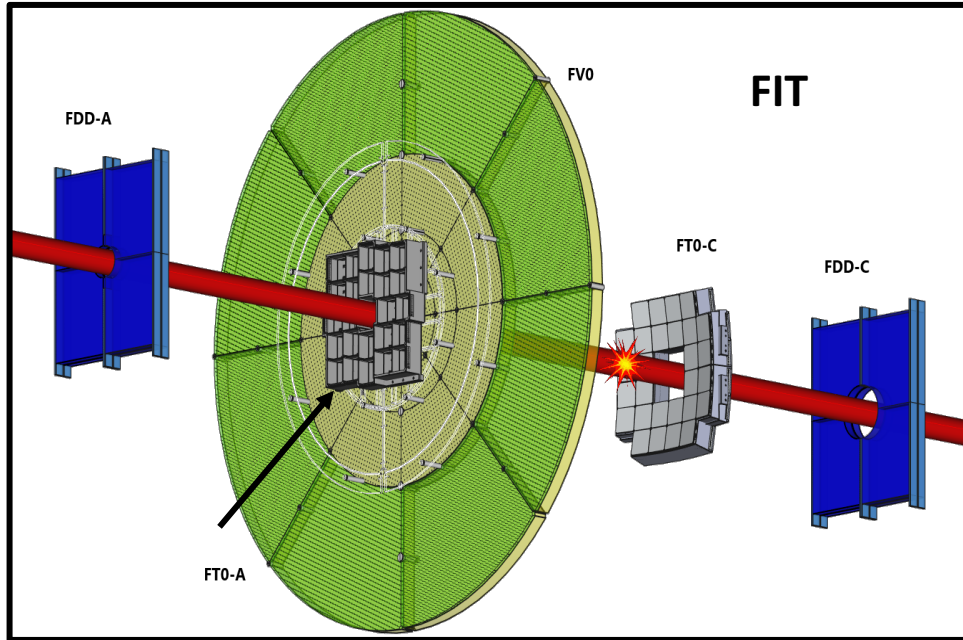


- Detector and readout electronics developments
- Big data analytics using machine learning methods
- Online data processing with hardware accelerators  
FPGAs and GPUs
- Data quality monitoring and visualization
- Bookkeeping and databases developments
- Physics analyses

**Contact:**

Jacek Otwinowski: [jotwinow@ifj.edu.pl](mailto:jotwinow@ifj.edu.pl), Jacek Kitowski: [kito@agh.edu.pl](mailto:kito@agh.edu.pl), Marek Gorgoń: [mago@agh.edu.pl](mailto:mago@agh.edu.pl),  
Adrian Horzyk: [horzyk@agh.edu.pl](mailto:horzyk@agh.edu.pl)

# Fast Interaction Trigger (FIT)



**Project:** Development of software and firmware (FPGA) for the FIT FV0 and FDD detectors

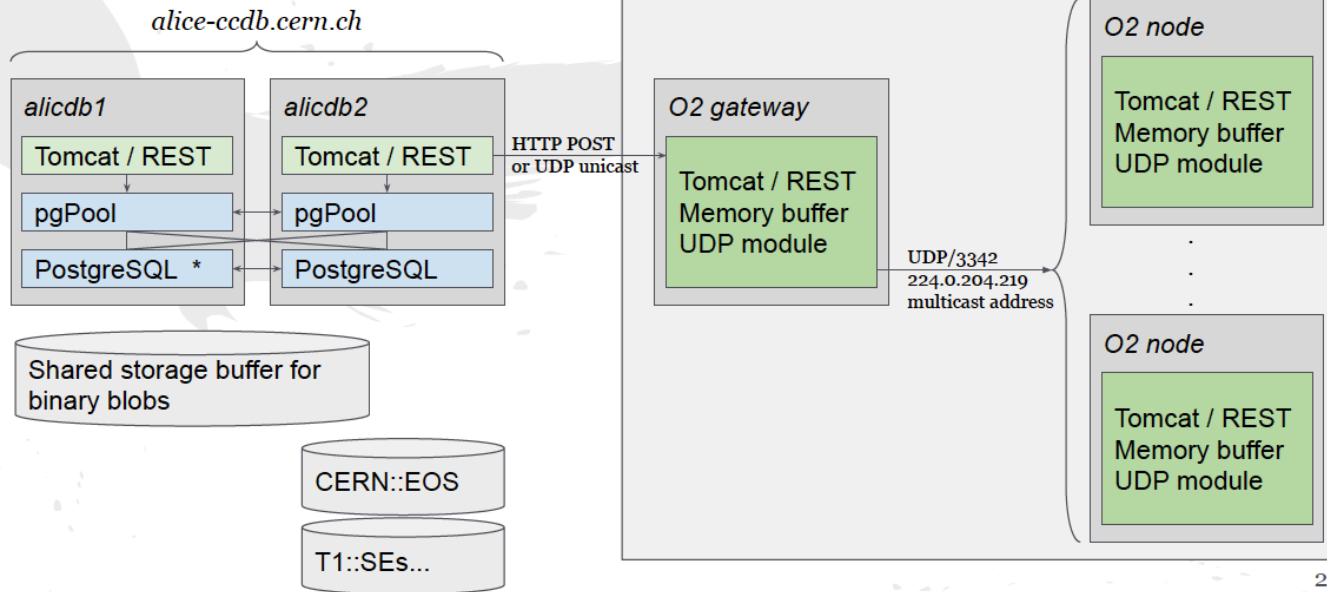
- Work under supervision of experts from AGH and IFJ PAN
- Possibility of master or engineering theses

Contact: Marek Gorgoń [mago@agh.edu.pl](mailto:mago@agh.edu.pl)

# ALICE Data Base

## Overview

from Costin Grigoras / CERN



- **General purpose data base for calibration and quality control objects**
  - Combination of PostgreSQL (for metadata) and CERN EOS distributed storage (for actual data)
  - HTTP REST API hides the actual backend from the clients

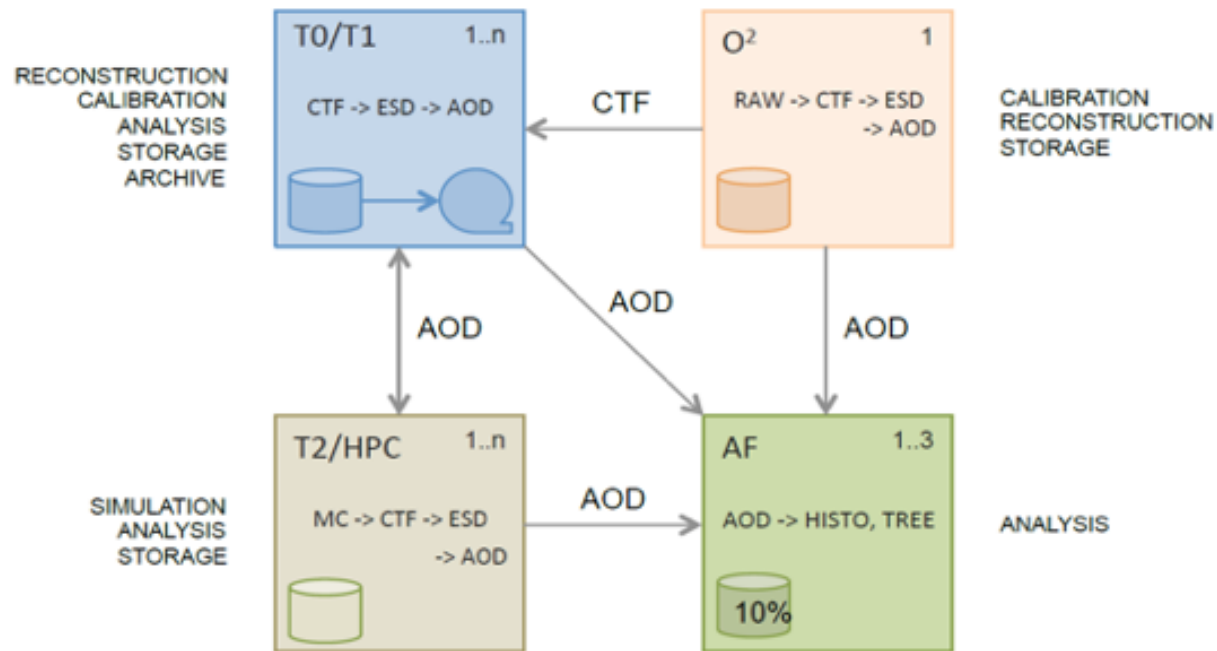
**Project:** Network multicast-based calibration data propagation in the online environment

- Work under supervision of experts from CERN and AGH performed on the test cluster (AGH Cyfronet)
- Testbed for the various technologies involved (Ethernet, Infiniband)
- Requires basic knowledge of SQL and REST APIs and C++

Contact: Jacek Kitowski: [kito@agh.edu.pl](mailto:kito@agh.edu.pl)

# Data Analysis Framework

Data processing happens in separate processes (ZeroMQ devices)



- **Analysis Framework to be used for the online and offline data processing**

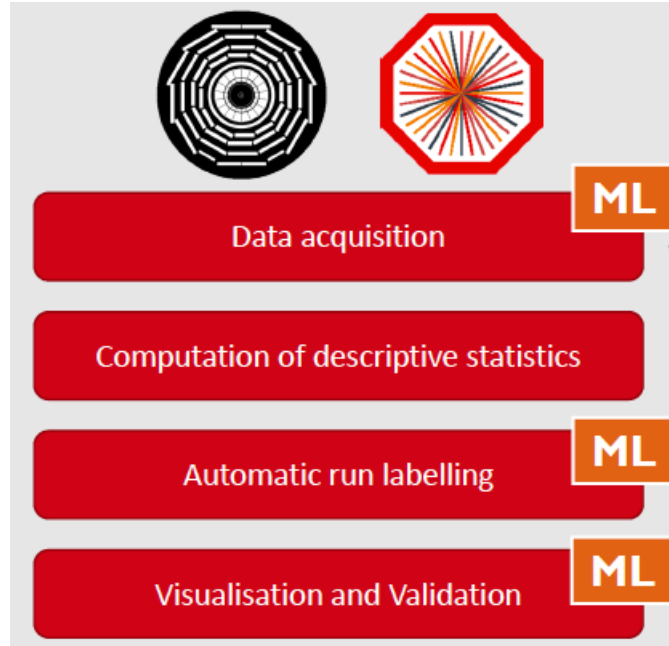
- **Fast:** simplify analysis data model to achieve better performance
- **Familiar:** hide as much as possible internal details
- **Modern:** follow developments of CERN/ROOT to use its new features
- **Open to the rest of the world:** possible integration with external analysis frameworks (e.g. Python Pandas) and ML toolkits (e.g. TensorFlow)

**Project:** Development of the ALICE Data Analysis Framework

- Work under supervision of experts from CERN and IFJ PAN
- Requires good programming skills (C++17)

Contact: Jacek Otwinowski: [jotwinow@ifj.edu.pl](mailto:jotwinow@ifj.edu.pl)

# Data Analysis with Machine Learning



- ALICE is heavy-ion detector (few million channels) will produce huge amount of data up to 3 TB/s
- Ideal environment for studies and development of new Big Data analysis methods, especially those involving machine learning (ML)
  - Data quality monitoring and classification
  - Searching and reconstruction of physical signals
  - Fast Monte-Carlo simulations

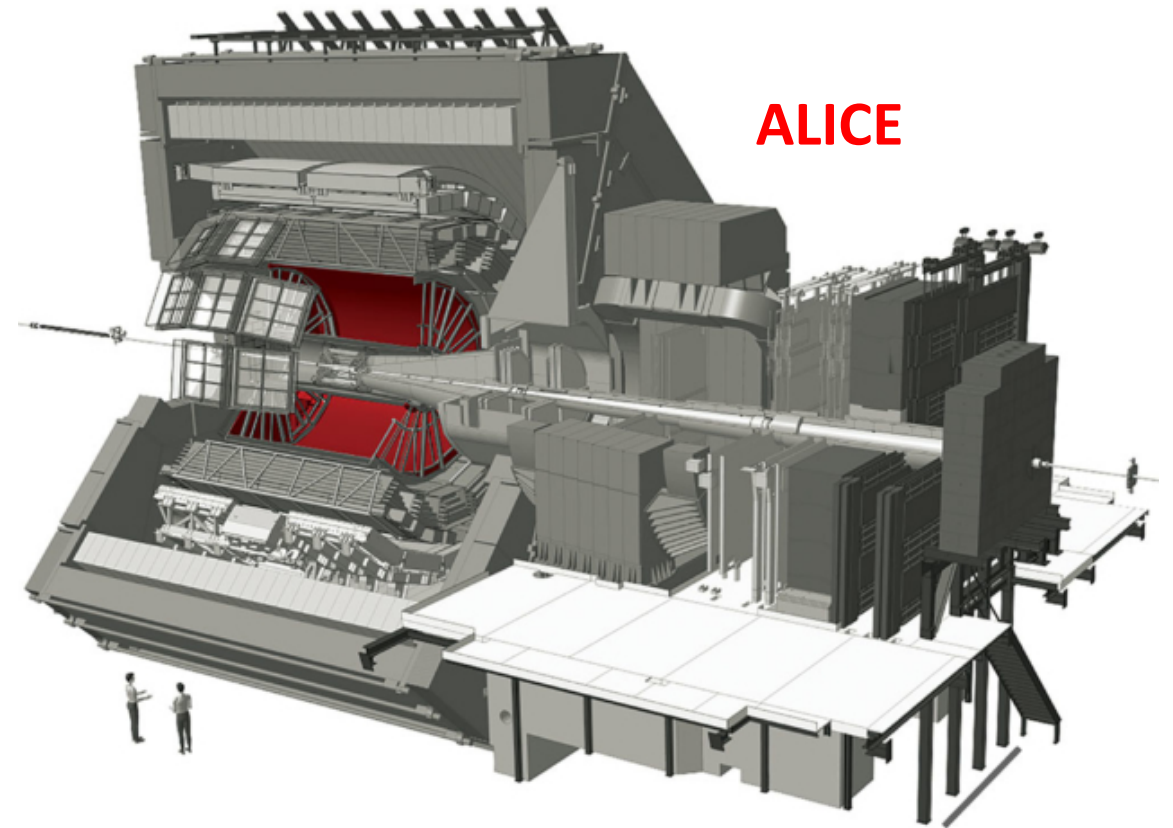
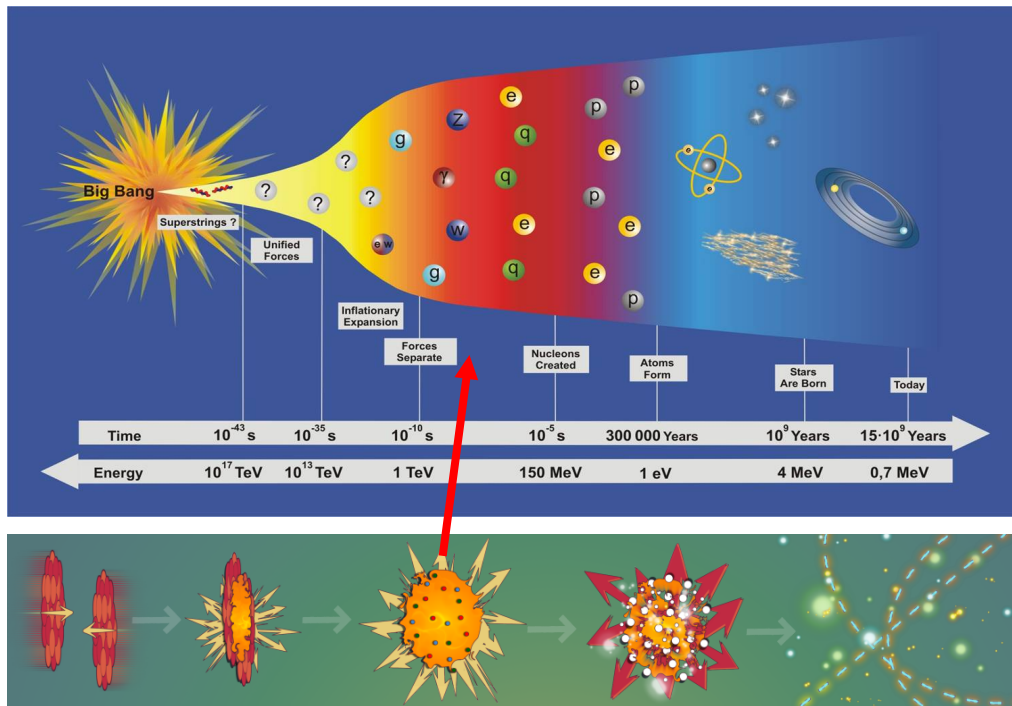
**Project:** Application of neural networks in data analysis for signal extraction in heavy-ion collisions

- Work under supervision of experts from IFJ PAN and AGH
- Requires good programming skills (Python)
- Basic knowledge of TensorFlow package for ML
- Possibility of master and engineering theses

Contact: Adrian Horzyk [horzyk@agh.edu.pl](mailto:horzyk@agh.edu.pl),



# Physics – Big Bang in the Laboratory



- We are studying properties of **Quark-Gluon Plasma (QGP)** - the hottest matter ever produced in the laboratory

**We look forward to collaborating with you!**

Contact: Jacek Otwinowski: [jotwinow@ifj.edu.pl](mailto:jotwinow@ifj.edu.pl)