

# Poster Awards

# Monday Winner: Aleksandra Poreba

## Performance of the ATLAS GNN4ITk Particle Track Reconstruction GPU pipeline



MON 25

21 Oct 2024, 15:18

57m

Exhibition Hall

Poster

Track 2 - Online and ...

Poster session

### Speaker

Aleksandra Poreba (CERN / Ruprecht Karls Universität Heidelberg (DE))

### Description

With the upcoming upgrade of High Luminosity LHC, the need for computation power will increase in the ATLAS trigger system by more than an order of magnitude. Therefore, new particle track reconstruction techniques are explored by the ATLAS collaboration, including the usage of Graph Neural Networks (GNN). The project focusing on that research, GNN4ITk, considers several heterogeneous computing options, including the usage of Graphics Processing Units (GPU). The framework can reconstruct tracks with high efficiency, however, the computing requirements of the pipeline are high. We will report on the efforts to reduce the memory consumption and inference time enough to enable the usage of commercially available and affordable GPUs for the future ATLAS trigger system while maintaining high tracking performance.

### Primary authors

ATLAS TDAQ

Aleksandra Poreba (CERN / Ruprecht Karls Universität Heidelberg (DE))

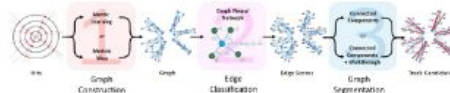
## Performance of the ATLAS GNN4ITk Particle Track Reconstruction GPU pipeline

Aleksandra Poreba (CERN/Heidelberg University) on behalf of the ATLAS Collaboration  
CHEP 2024, aleksandra.poreba@cern.ch

**Particle track reconstruction** is one of the most crucial and the time consuming steps of the event reconstruction in particle detectors.

For High Luminosity LHC, the pileup will increase and the track reconstruction in the ATLAS experiment will be more computationally expensive. At the same time, it needs to fit in the online trigger restrictions of 1 s for processing an event.

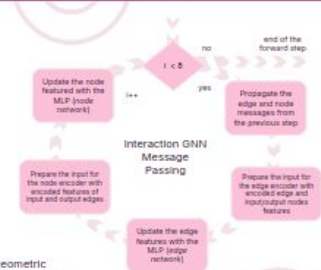
One of the considered approaches to accelerate particle track reconstruction in ATLAS is the usage of machine learning, i. e. the GNN4ITk project [1] proposing **Interaction Graph Neural Network**.



After the graph construction and initial filtering, the IGNN is used to score the edges based on their geometric properties (features) populated via **message passing**. Labelled edges are used to classify nodes as part of the track.

To even further improve the performance of the framework for a future use at the software trigger (Event Filter), different accelerators are proposed: **GPU** (focus of this poster) and FPGA.

The work presented in this poster focuses on the optimizations done to the GPU accelerated IGNN considering the **memory consumption** and the **inference time**.



### MEMORY CONSUMPTION

The input to the IGNN is an event represented as a **graph**, with node and edge features describing the geometric properties of hits (nodes), for example  $(x, y, z)$  position and track candidates (edges).



# Wednesday Winner: Marco Donadoni

User sharing of computational workflows in the REANA  
reproducible analysis platform



📍 WED 40  
📅 23 Oct 2024, 15:18  
🕒 57m  
📍 Exhibition Hall

Poster Track 5 - Simulation ... Poster session

## Speaker

👤 Marco Donadoni (CERN)

## Description

We present the new user-sharing feature of the REANA reproducible analysis platform. The researchers are allowed to share their selected workflow runs, job logs, and output files with colleagues. The analyst retains the full read-write access to the workflow and may opt for granting individual read-only access to colleagues for a possibly-limited period of time. The workflow sharing feature was developed to answer the needs of physics teams using REANA computational workflow platform and is available for all supported CWL, Serial, Snakemake, and Yadage workflow systems. The feature is available in the REANA command-line client and on the REANA web interface. The contribution describes the main use cases, presents the architecture and the implementation details, as well as comments on the challenges of supporting a variety of external Identity and Access Management systems holding user information for customising REANA deployments.

## Primary authors

👤 Marco Donadoni (CERN)  
👤 Daan Eduard Rosendal (Christelijke Hogeschool Windesheim (NL))  
👤 Giuseppe Steduto (Politecnico di Milano (IT))  
👤 Tibor Šimko (CERN)

## User sharing of computational workflows in the REANA reproducible analysis platform

M. Donadoni, D. Rosendal, G. Steduto, T. Šimko  
(CERN, Geneva, Switzerland)

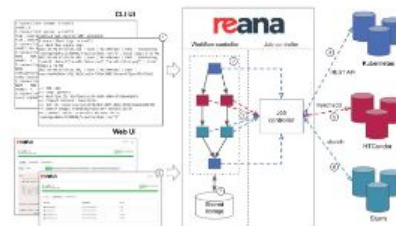
## What is REANA?

REANA is a reproducible analysis platform allowing scientists to run declarative computational data analysis pipelines on containerised compute clouds. REANA was built with the goal of fostering computational reproducibility.

Four ingredients are needed to run a workflow:

- input data and parameters;
- analysis code;
- computing environment (Docker, Singularity);
- computational workflow steps to arrive at results (CWL, Yadage, Snakemake).

These declarative workflows are then executed on remote containerised cloud (Kubernetes) or other supported compute backends (HTCondor, Slurm).



The architecture of REANA. Researchers can interact with the platform via the web interface and the command-line client, to run workflows on supported compute backends.

## Sharing workflow runs

### Share execution logs

Ease inspection of unexpected failures and issues of the workflow execution



### Share workflow results

Share workflow inputs and outputs and visualise results and plots, including images, PDF and ROOT files



### Promote traceability and reproducibility

Provide a clear trace of the origin of final analysis outputs by sharing not only the results, but the whole workflow execution

# Thursday Winner: Gordon Watts

## Evolution of Regional, Age and Gender Demographics in the ATLAS Collaboration



THU 01

24 Oct 2024, 15:18

57m

Exhibition Hall

Poster

Track 8 - Collaborati...

Poster session

### Speaker

Gordon Watts (University of Washington (US))

### Description

The ATLAS Collaboration consists of around 6000 members from over 100 different countries. Regional, age and gender demographics of the collaboration are presented, including the time evolution over the lifetime of the experiment. In particular, the relative fraction of women is discussed, including their share of contributions, recognition and positions of responsibility, including showing how these depend on other demographic measures.

### Primary authors

- Flavia De Almeida Dias (Nikhef National institute for subatomic physics (NL))
- Gordon Watts (University of Washington (US))
- Maria Teresa Dova (National University of La Plata (AR))
- Prof. Simon Connell (University of Johannesburg (ZA))
- Steven Goldfarb (University of Melbourne (AU))

<https://indico.cern.ch/event/1338689/contributions/6011134/>

## Evolution of Regional, Age and Gender Demographics in the ATLAS Collaboration



### Gordon Watts, for the ATLAS Collaboration

Thanks for Petya Vasileva (UMic) for layout and graphics help.

#### Why is this work important?

"UNITE PEOPLE FROM ALL OVER THE WORLD TO PUSH THE FRONTIERS OF SCIENCE AND TECHNOLOGY, FOR THE BENEFIT OF ALL"  
– CERN Mission Statement

ATLAS is at its best when everyone is fully participating

This work is one component tracking how well the policies & procedures in place are working.

It is impossible to trace a single policy to a single effect.

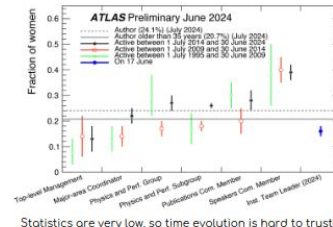


In many cases control over policy is indirect – institutional hiring policies and procedures, etc.

But those are evolving over time.

Some effects can be seen in the data...

#### Evolution of Gender in Leadership Roles



Statistics are very low, so time evolution is hard to trust!