



O. STEZOWSKI

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# AGATA & GRETINA

Développements 2017 ➡ 2018



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# AGATA & GRETINA

Origins and common goals

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Following the work by Amel & Torben for  $\gamma$ -ray tracking, 2 workshops have been organized

## **First workshop in Argonne in December 2016**

What about a full processing of the GRETINA data through the AGATA processing chain ?

## **Second workshop in Orsay in April 2018**

Machine learning should be investigated as solution for new developments (PSA / Tracking)

Opportunity for us to add more bricks in the AGAPRO package !



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# AGATA & GRETINA

Mixing of the current data processing chains

How to process GRETINA Data through AGATA processing chain ?

↪ In our world, it means write ACTORS to read GRETINA Data (and play with)

A producer to read GRETINA Traces (out of crystal) and Hits (out of PSA)

Difficulties :

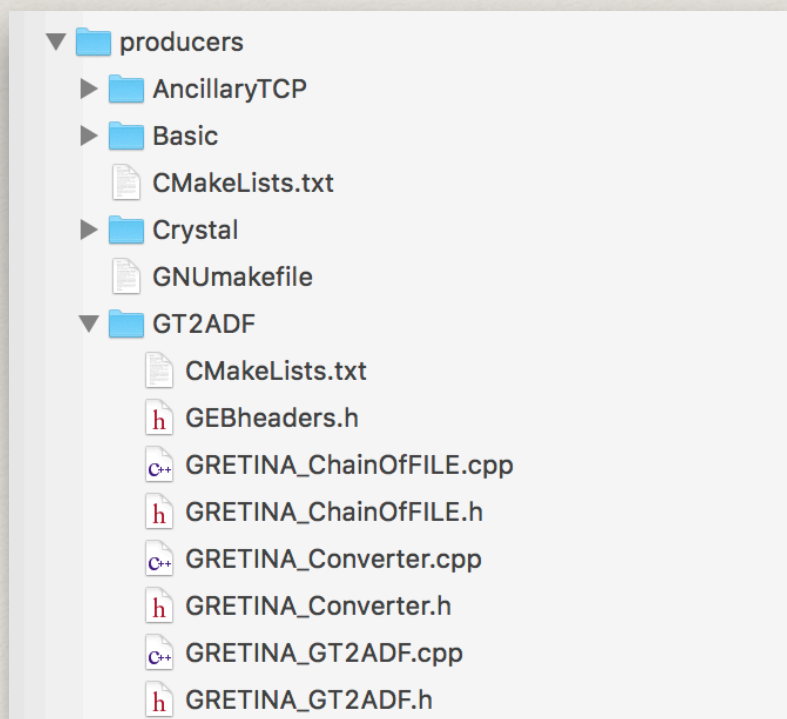
The data are compressed (gz)

Traces come combined (kind of events): global data processing scheme is quite different

The data contents have differences ...

BUT there is a new producer in AGAPRO : GT2ADF

The implementation is done ✓

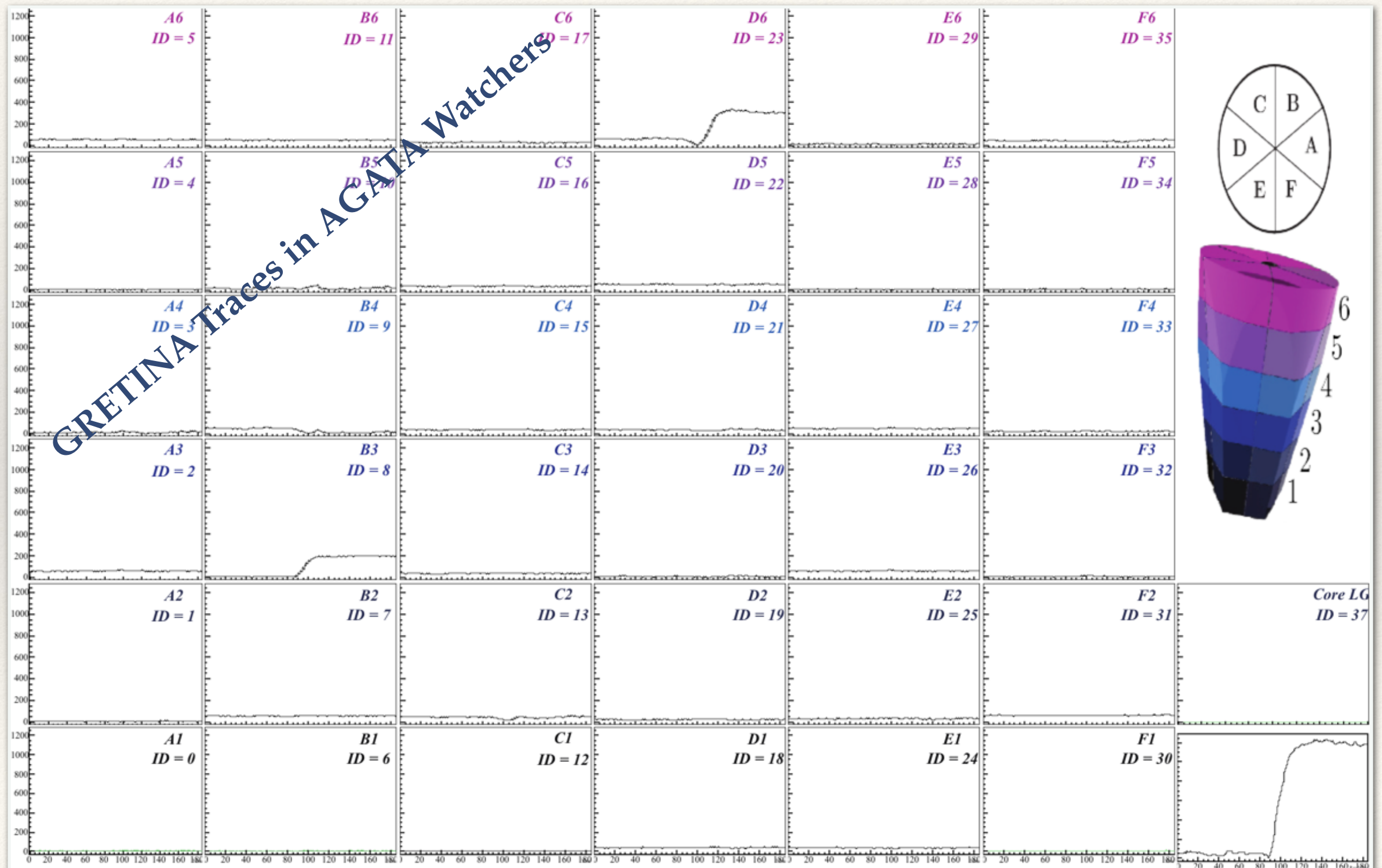


Note : Multitask based to avoid slowing down the system



# AGATA & GRETINA

Mixing of the current data processing chains



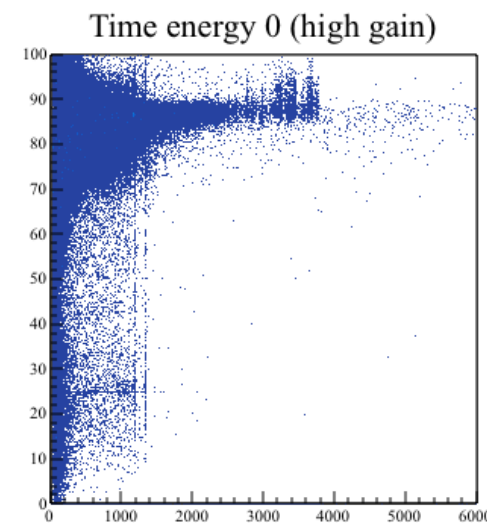
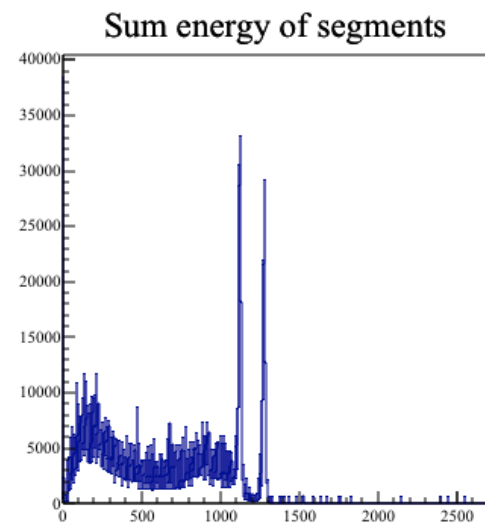
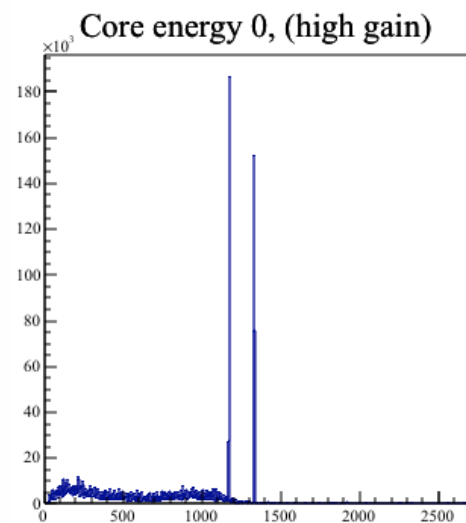
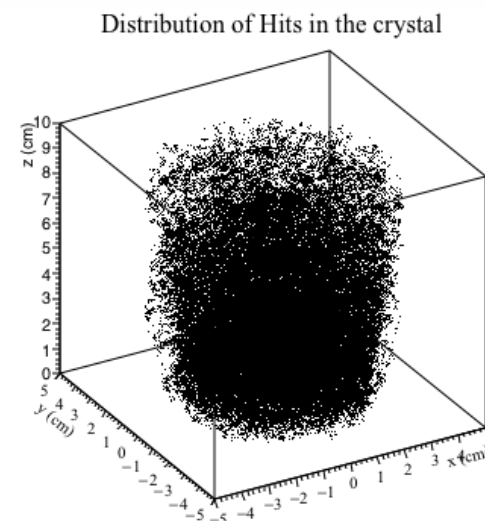
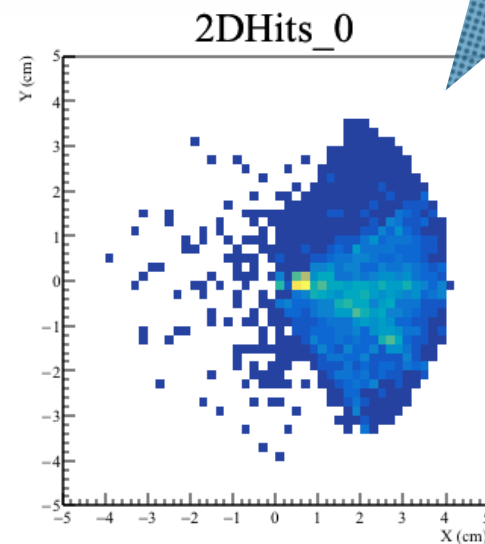
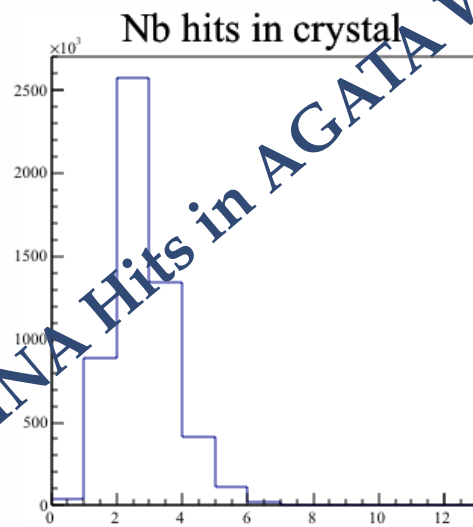


# AGATA & GRETINA

Mixing of the current data processing chains

Should be slice not sector !

GRETINA Hits in AGATA Watchers



GT2ADF Consumer running, data quality check **required** now !



# AGATA & GRETINA

Mixing of the current data processing chains

How to process GRETINA Data through AGATA processing chain **and check the quality?**

↪ Implement Torben's tracking code as an actor

A Filter to track Hits (GRETINA / AGATA) is thus being developed

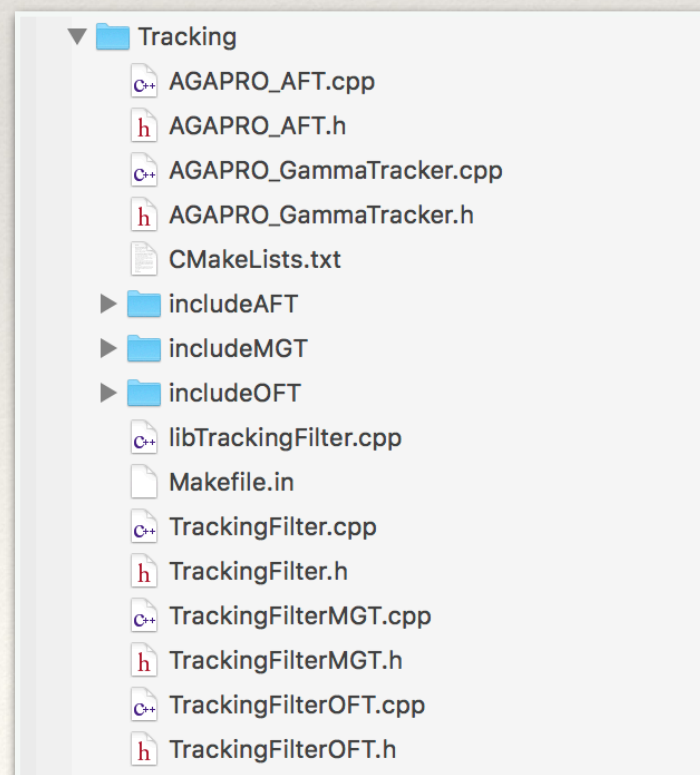
Difficulties :

Our actors (TrackingOFT / TrackingMGT) are AGATA linked (parameters / conf files)

↪ It requires a better virtualization of the code (in Object Oriented sens)

↪ It is an opportunity for us to prepare the implementation of new algorithms

THUS there is a new filter in AGAPRO : AFT  
It links Torben's code  
The implementation is about 80%



Note : AFT for Argonne Forward Tracking



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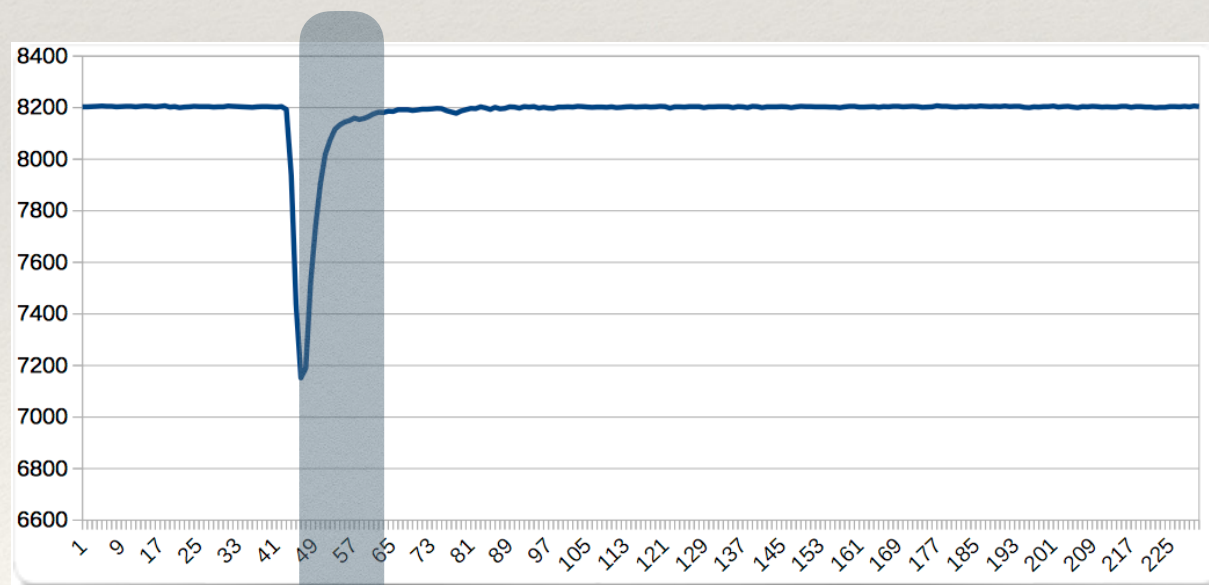
Exploring the / one future

At the second workshop, it has been agreed that machine learning technics have to be investigated as tools for new algorithms

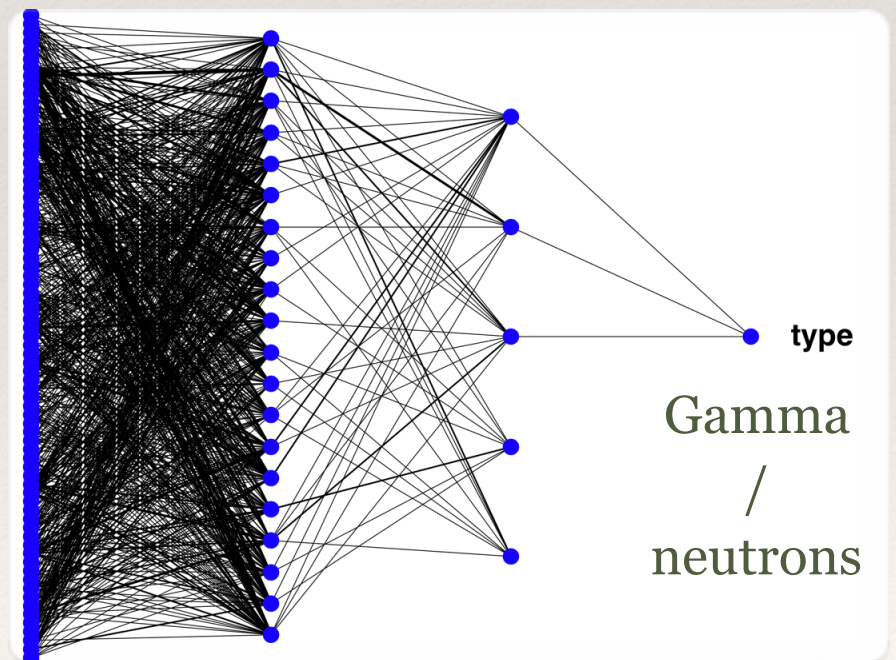
In Lyon, we are learning machine learning using NEDA data :

- Pulse Shape Analysis based
- Digital electronics and traces are recorded

PSA is used to identify neutrons / gammas in NEDA



75 samples





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# AGATA & GRETINA

Exploring the / one future

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First implementation of the NN by NEDA collaboration using ROOT API

- ➡ Problem of performances / kind of network limited
- ➡ Multi layer based Neural Network

First benchmarks we done :

ROOT Neural Network ~ 50 slower that Charge Comparison  
(on single core)

We decided to move to Tensor Flow (google)

- ➡ Typical neural network calculations highly optimized
- ➡ It allows running on CPU or GPU without any changes of the code !



# AGATA & GRETINA

Exploring the / one future

What we have learned so far:

On the training phase (Neural Networks have to be teached)

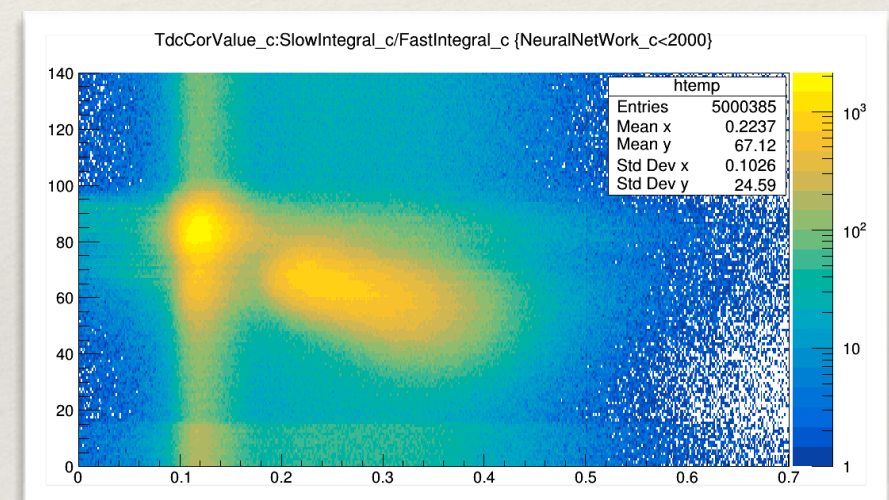
**Crucial part** ... it fixes the performances of the system

For the moment it is done using the data (cuts on Slow / Fast versus TDC or amplitude )

Better to have an uniform distribution of event to not bias the training

Other bias ?

↪ Might be better to have a dedicated experiment ?



On Neural Networks

There are different kind of Neural Networks

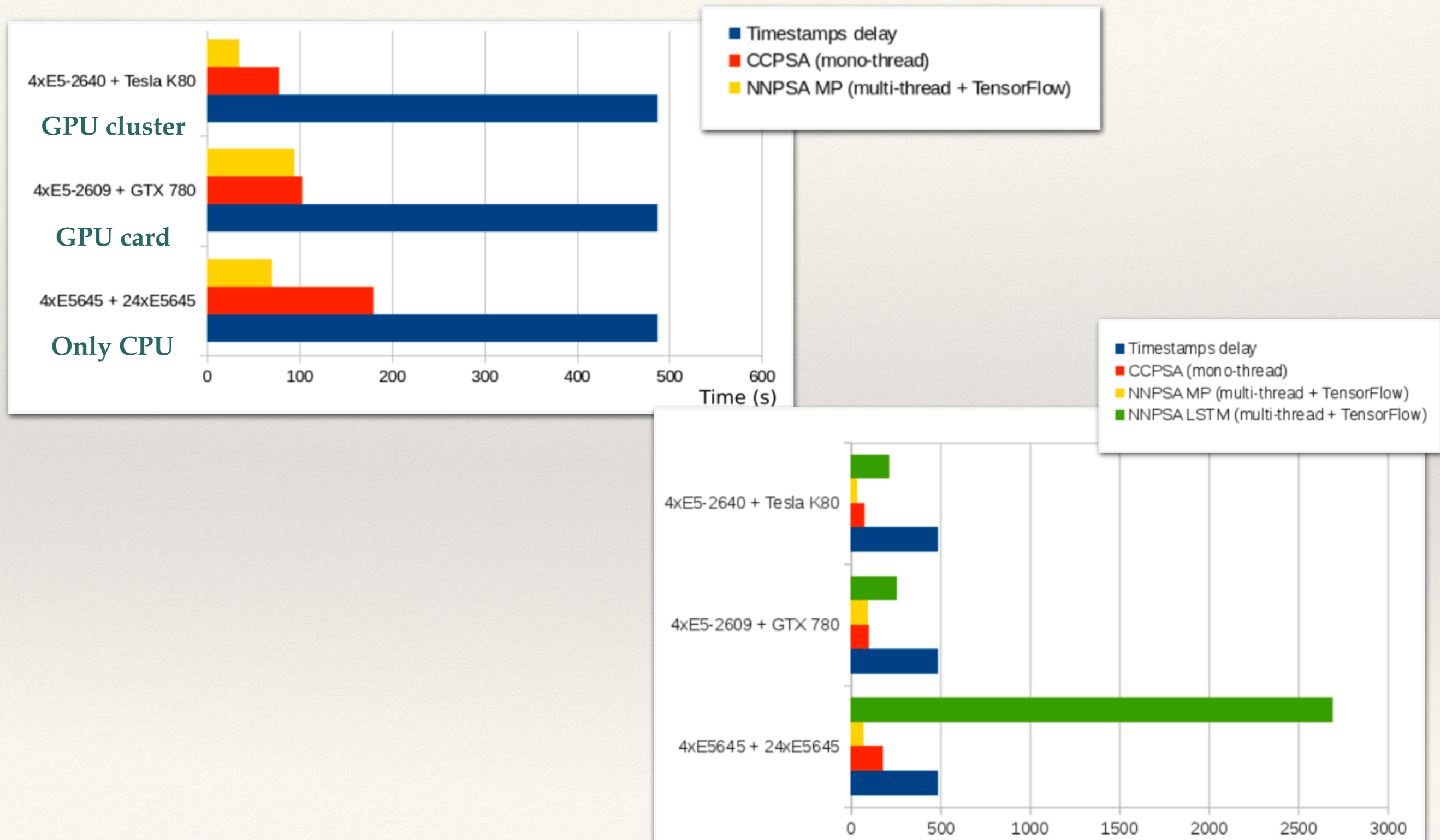
↪ We have implemented Multilayer perceptron BUT also recurrent neural network

Time processing does matter !



# AGATA & GRETINA

Exploring the / one future





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# Conclusions

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GRETINA data into AGATA Processing chain, on going work:

- Tracking almost completed
- PSA : traces are almost there

The most complex work is going to start i.e. traces calibration + PSA

↪ signal basis for GRETINA capsules is mandatory ! Who ?

Machine learning technics:

- first steps using NEDA data ...
  - ↪ still many things to learn
  - ↪ ongoing work : gamma-ray spectra produced by different neural networks
- ... then we will try and apply the technics to AGATA / GRETINA Data