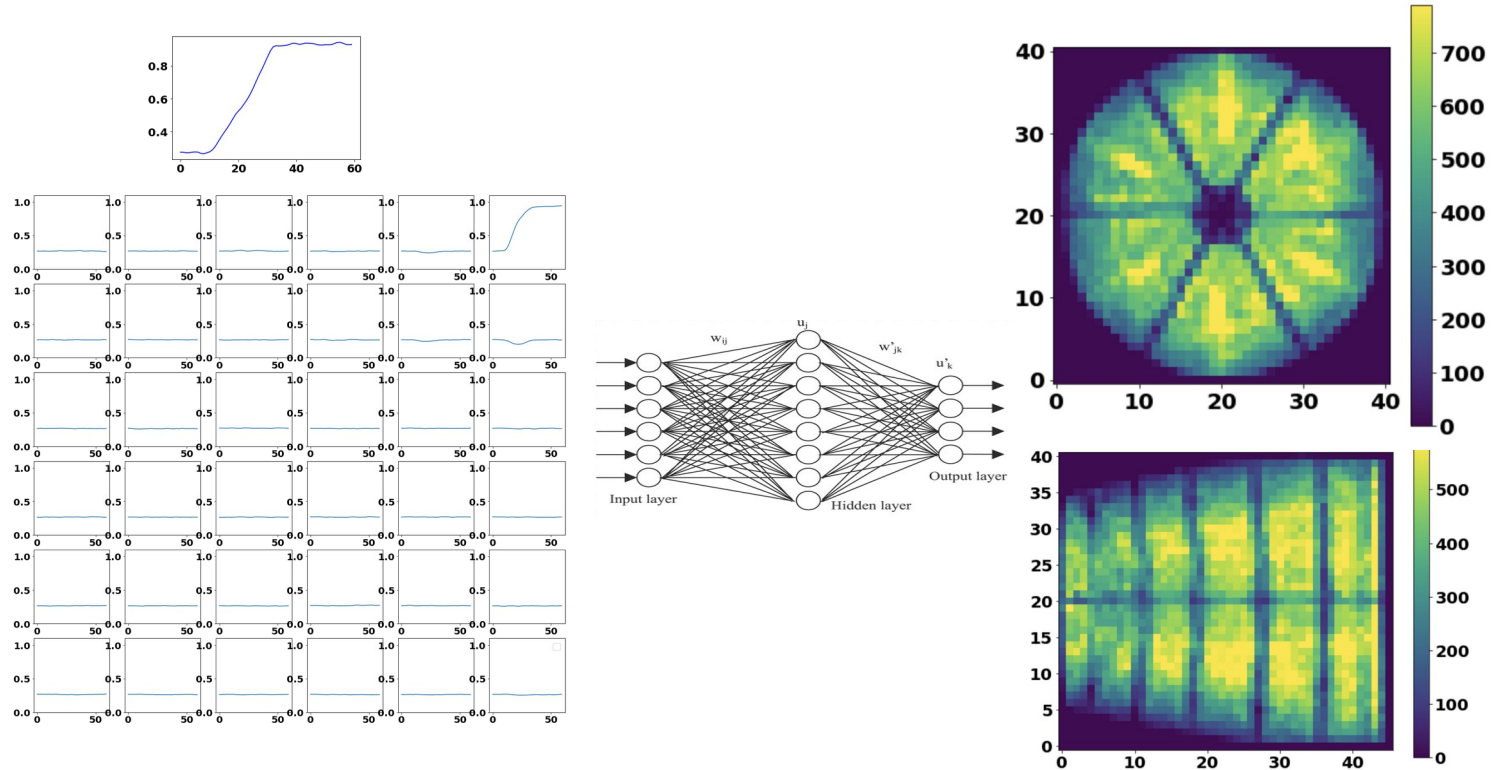


# Machine Learning at IP2I : from NEDA to AGATA

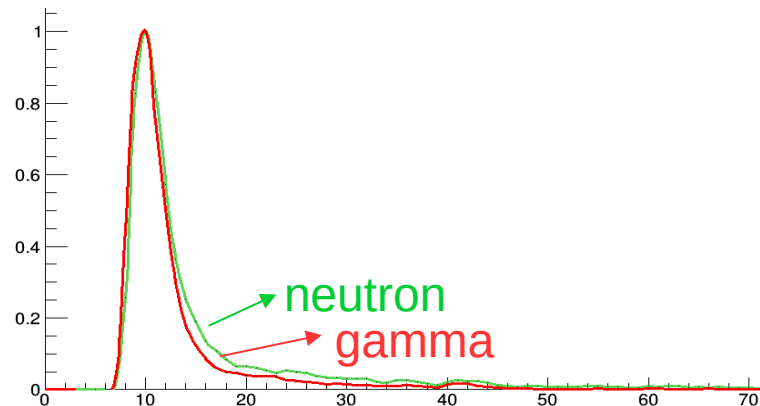


Previous work on NEDA  
Moving to AGATA  
Tools and environment

M. Abushawish - G. Baulieu – L. Ducroux – J. Dudouet – O. Stezowski

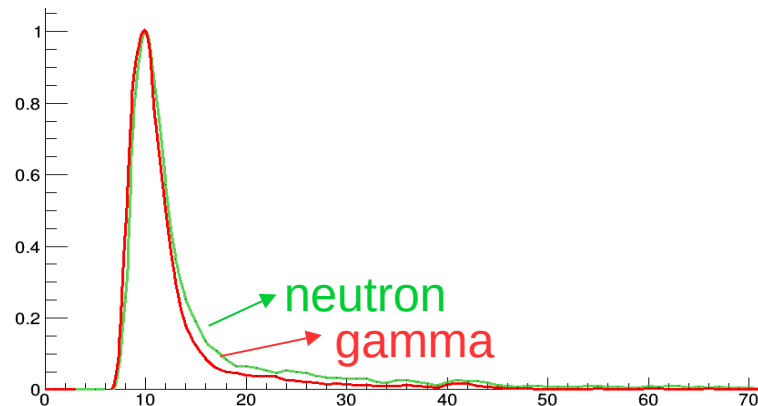
## Signals classification using neural networks (n/ $\gamma$ discrimination) :

- Different network architectures : MLP, CNN, LSTM
- Online implementation at GANIL using TensorFlow C++ API (MLP on CPU)
- NIM Paper :  
<http://dx.doi.org/10.1016/j.nima.2020.164750>



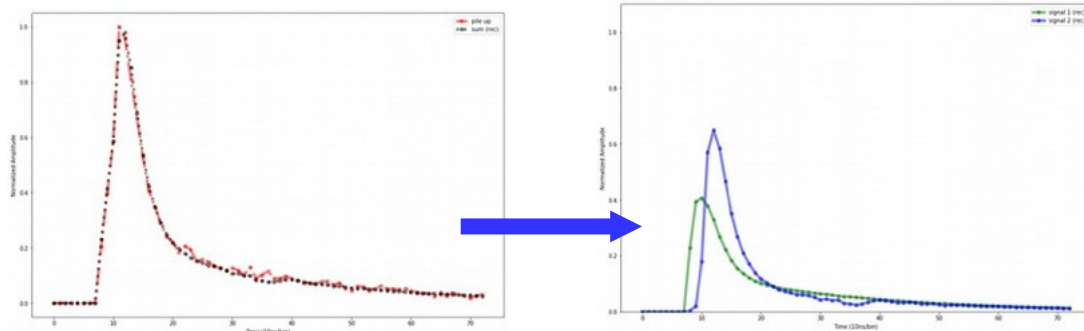
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## Additional studies on **auto-encoders** :

- Signal compression
- Anomaly detection
- Pile-Up de-correlation



Start working on AGATA data : **from 1x75 bins to 37x60 bins**

First tests with different **auto-encoders** (MLP, LSTM, U-Net) :

- Compression
- De-noising
- Re-building a missing segment signal

Some tests on **simple PSA** (one interaction)

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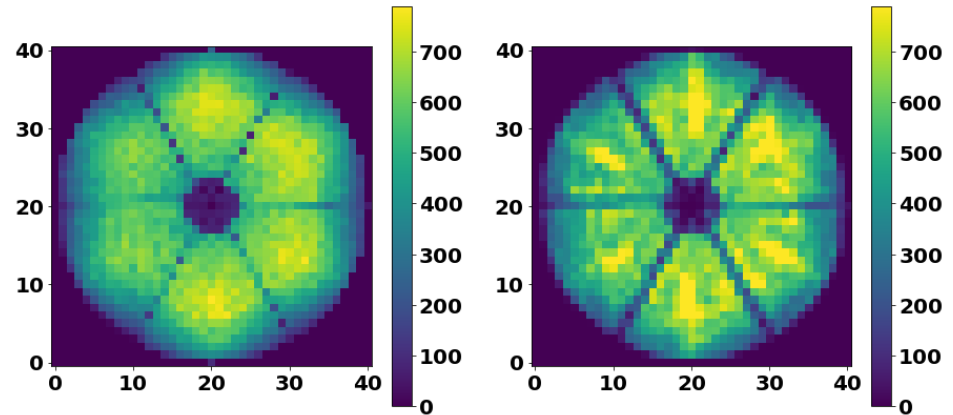
**Data limitation :**

- On *acquisition data* : 3D positions are coming from existing PSA algorithm  
→ impossible to achieve better results. Additionally, we do not know the true position.
- *Simulated data* : network will not be directly usable on real data

... what about *scanned data*?

Thanks to Strasbourg team, we now have scanned data from symmetric crystal.

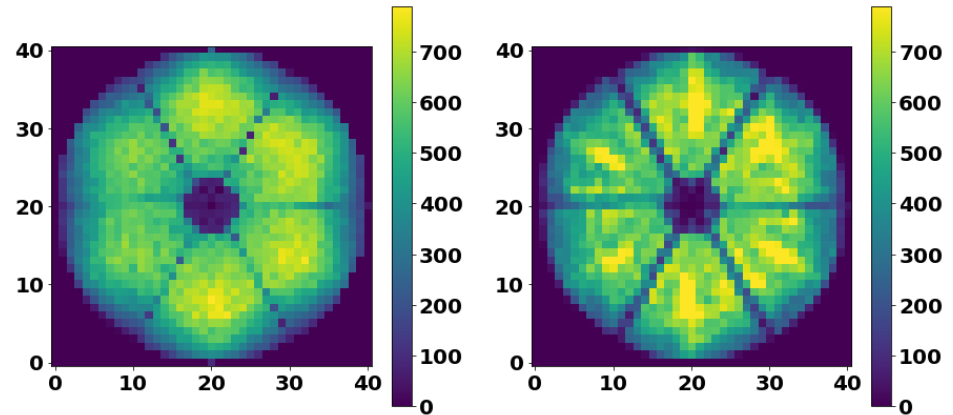
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Some errors in the database :  
building the 3D position from 2D  
information is a long and error prone  
process... (exponential complexity  
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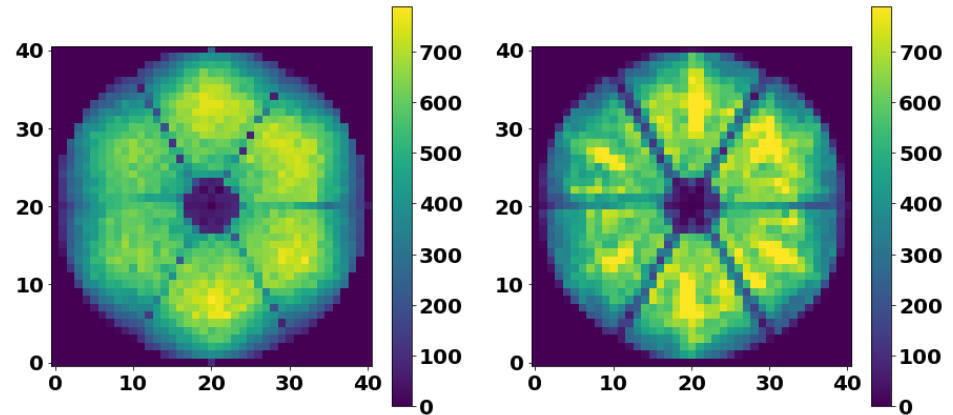


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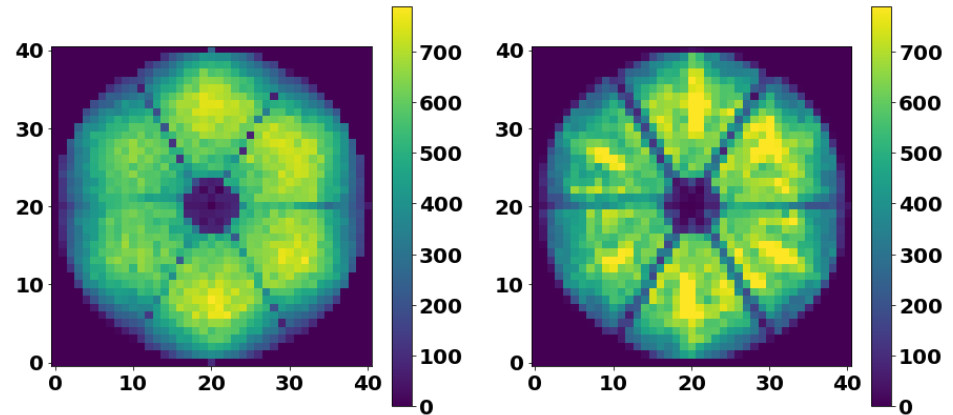


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**Next Study** : training a network to compute a 3D position from Agata signals, using a 2D training set.

## **Hardware available :**

- 1 Nvidia P4 GPU (IP2I Agata group)
- 3 Nvidia RTX6000 GPU (IP2I)
- CCIN2P3 GPU cluster (Nvidia K80 and V100 GPUs)

## **Software used :**

- TensorFlow + Keras (Python)
- Docker / Singularity containers
- Jupyter Notebooks