Deep learning for imaging calorimeters

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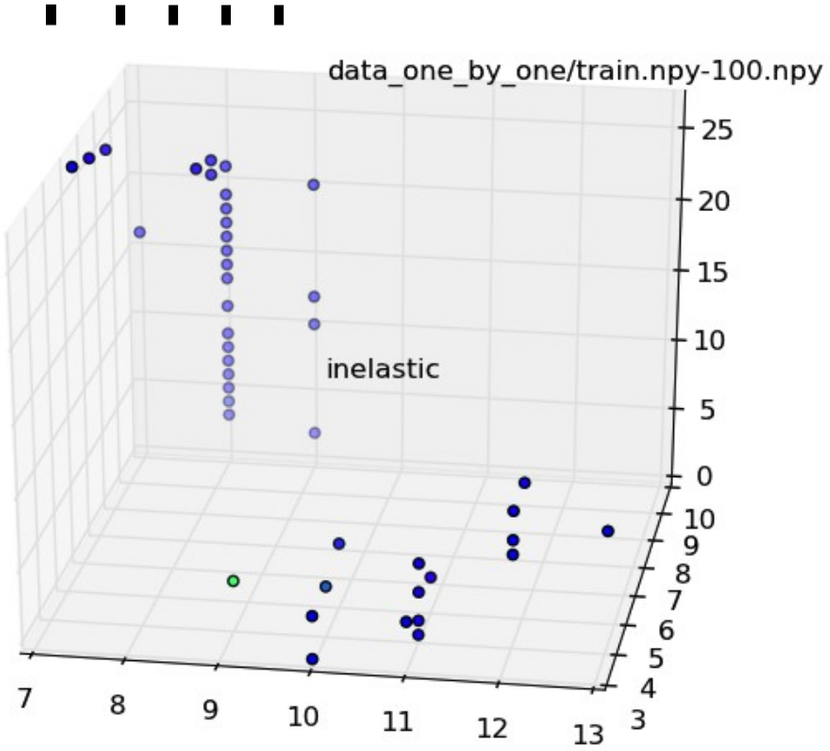
Outline

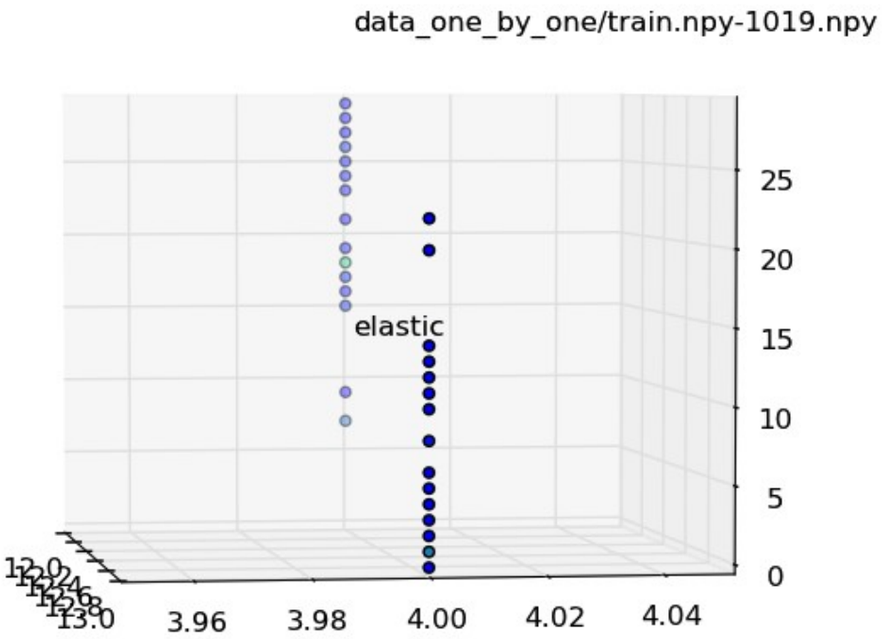
- Purpose of this work
- What have been done
- Next steps

Purpose of this work

- Apply deep learning techniques to calorimeter data
  - For what ? classification (elastic/inelastic), regression (energy of the incoming particle, direction)
  - Why deep learning ?

Purpose of this work





- 18x18x30 energy points

What have been done

- Frank's work : Implemented several deep learning techniques (AutoEncoders, DBN, RBM) and used multiboost to train the classification model
- Comparisons with baseline («manual features» : Front image, Lateral Image, Covariance matrix, Correlation matrix,...)

What have been done

- Several hyperparameters to deal with : Hyper parameter optimization (using hyperopt)
- Best results found so far : error rate is about 10% with «manual features», and 8.5% with Denoising AutoEncoders and Adaboost.

Next steps

- Adapt convolutional neural networks (state of the art deep learning technique for image classification) to a 3D problem
- Use random forests for regression (to do energy prediction for instance)