Connecting the Dots

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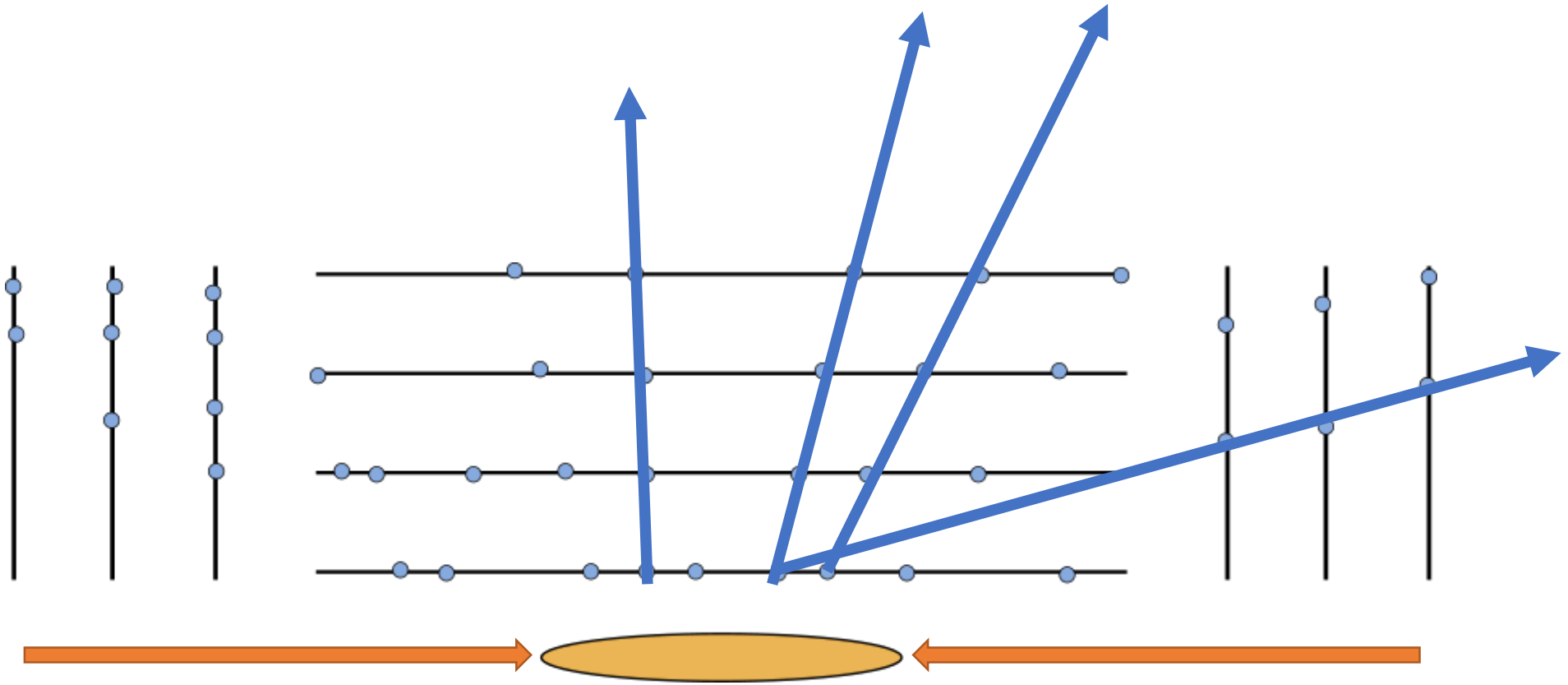
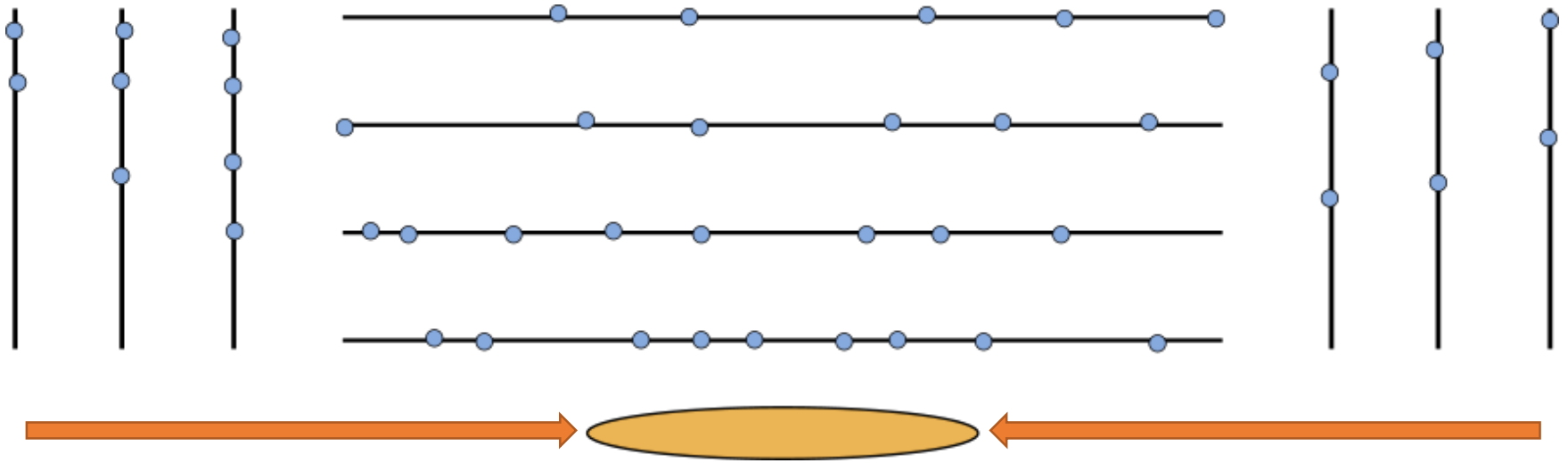
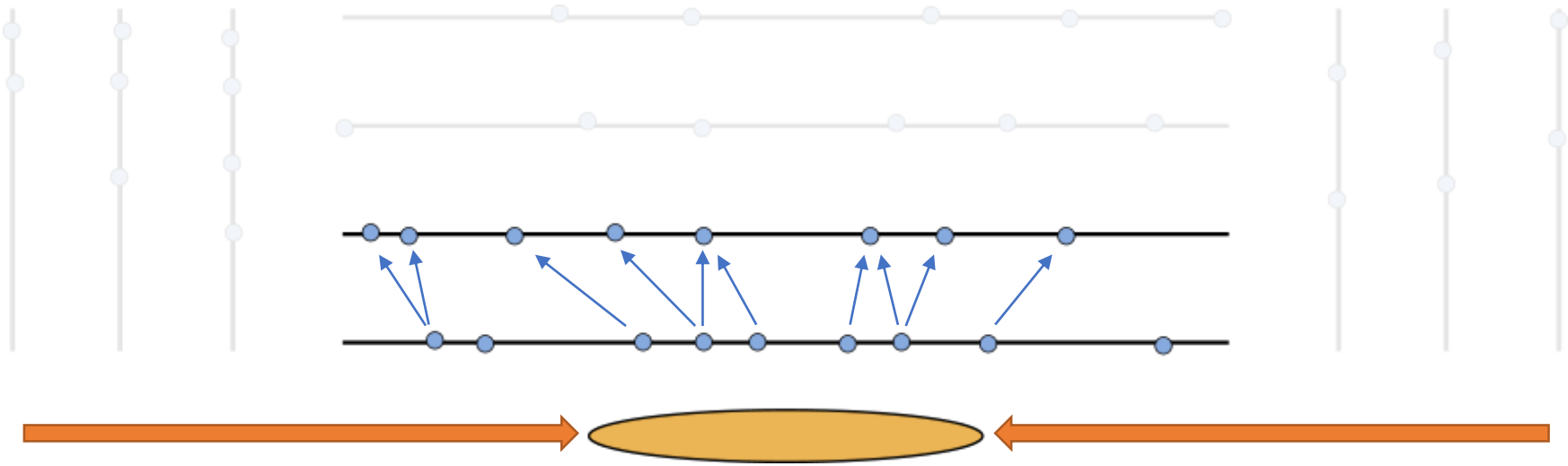
Track Reconstruction



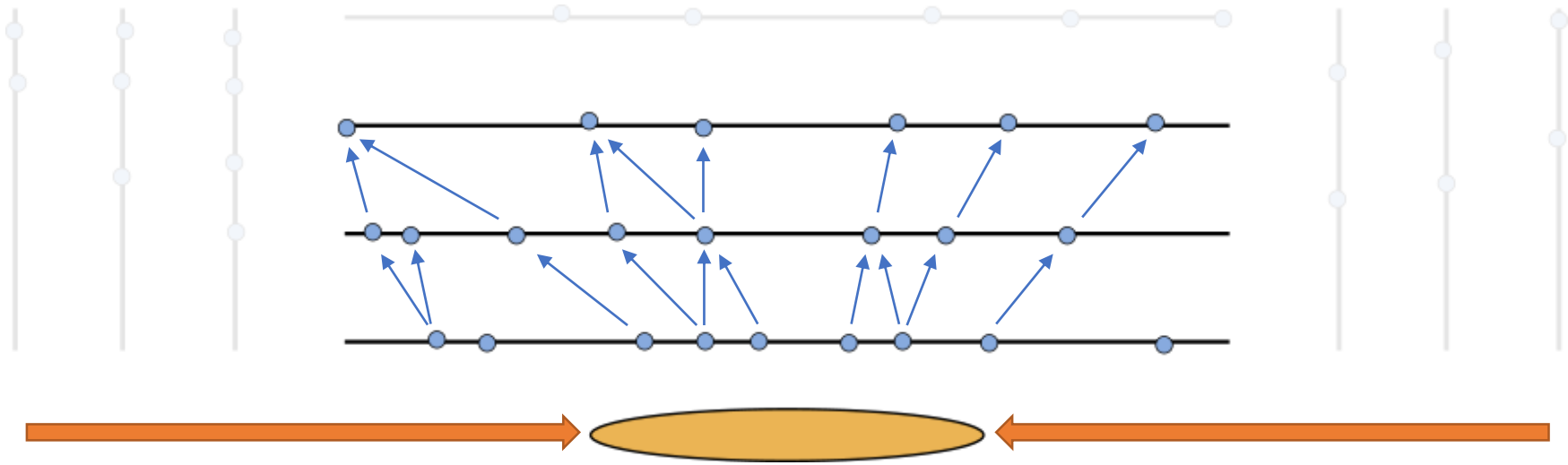
Track Reconstruction



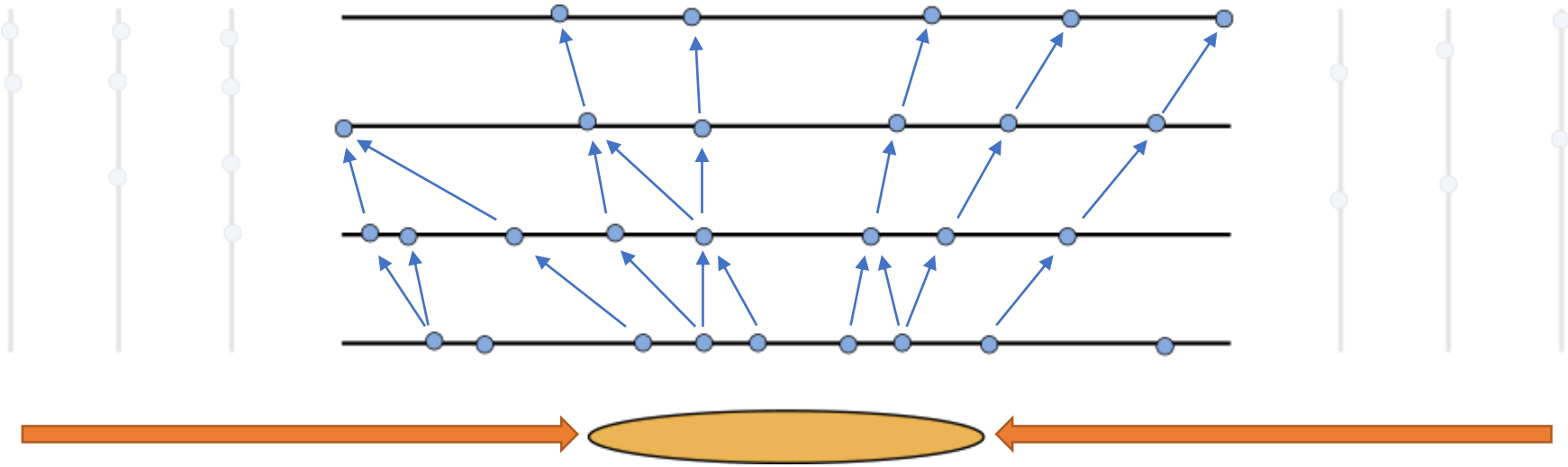
Track Reconstruction



Track Reconstruction



Track Reconstruction

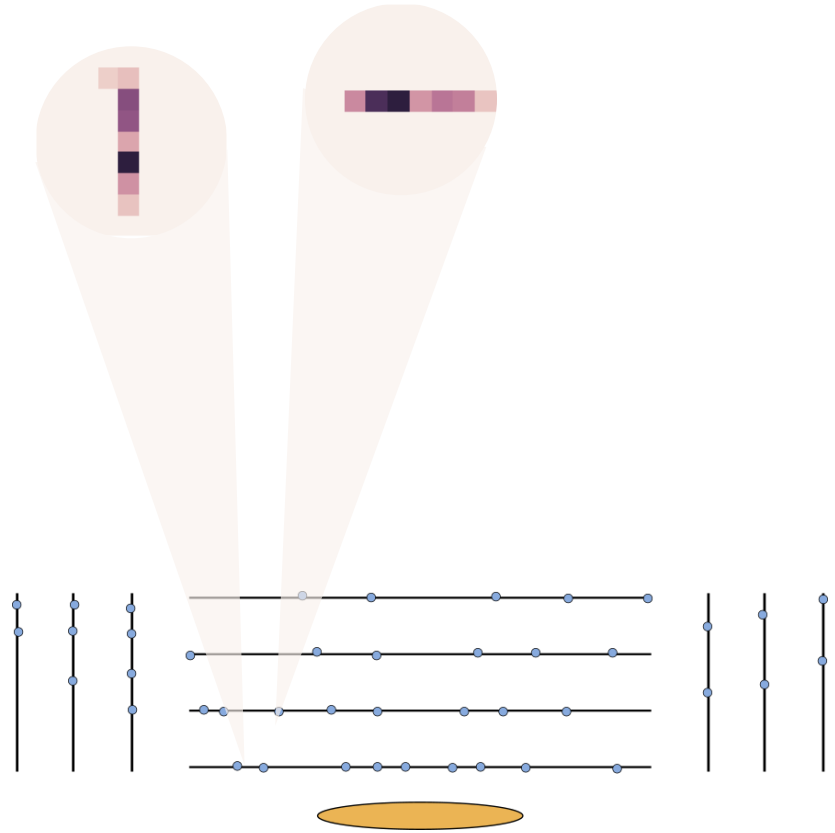


High Luminosity LHC

- The HL-LHC events will have PU 200
- number of fake tracks increase

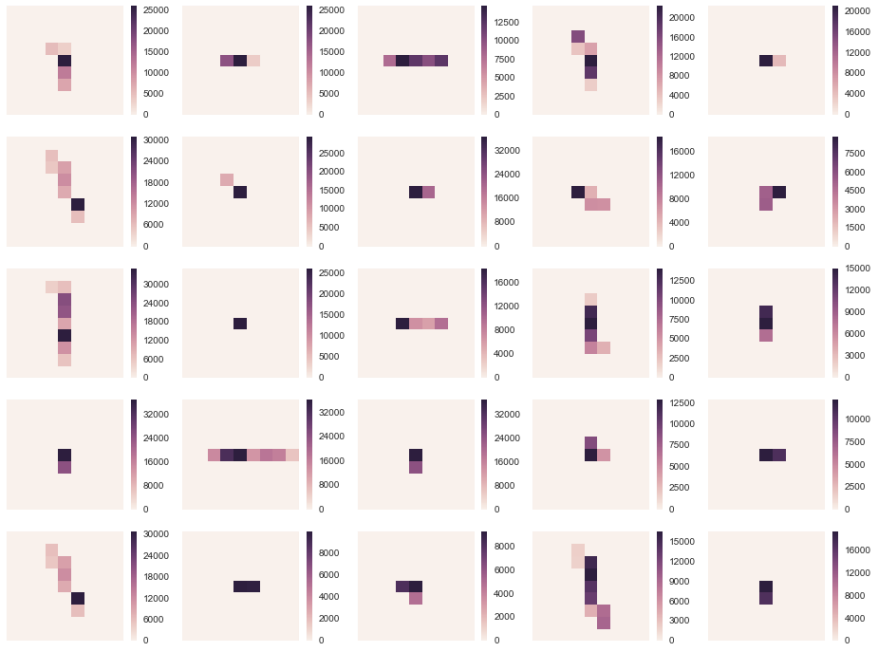
Doublet Filtering

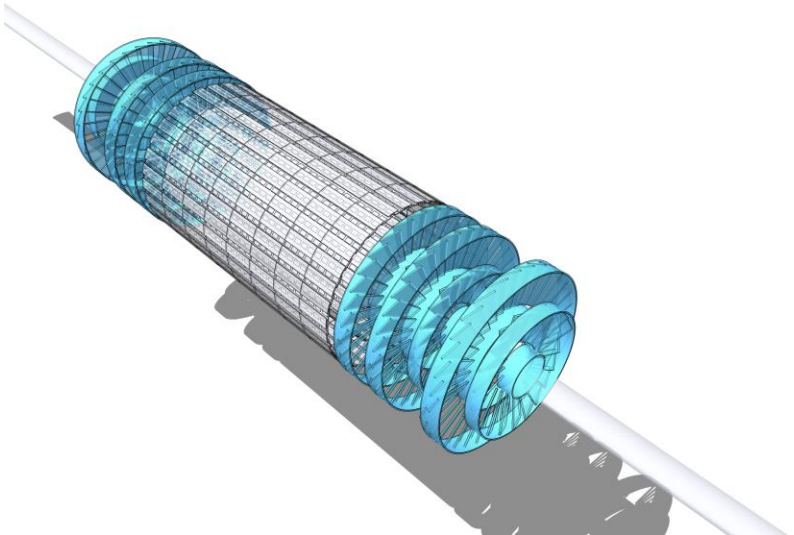
- eliminate fake tracks as soon as possible
- exploit cluster shape during seed generation
- cluster shape depends on
  - energy released in the layer
  - crossing angle
  - type of the particle



Dataset

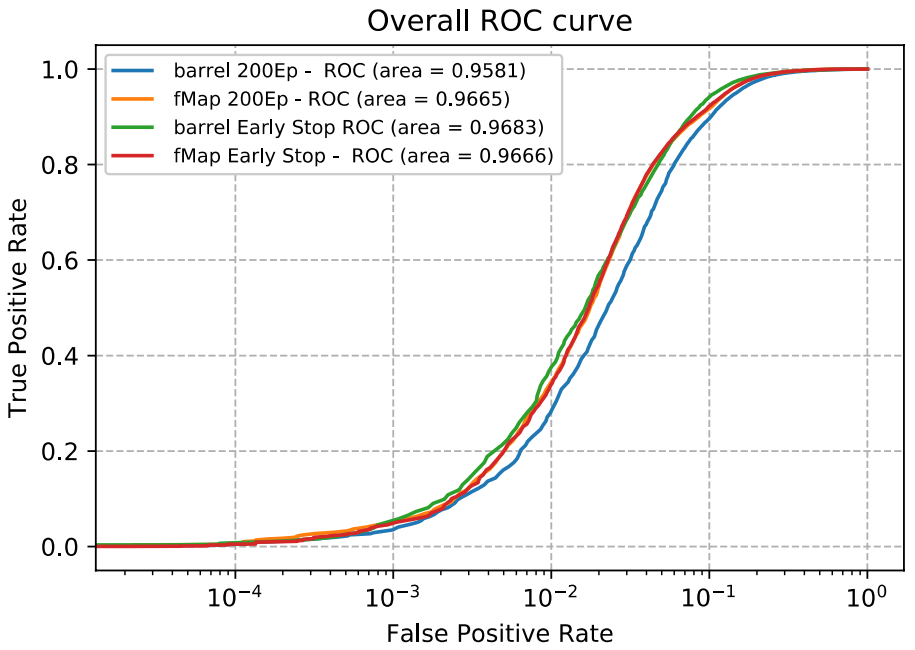
- data simulated with CMSSW
- TTbar events @ PU35
- hit shape 15x15
- global coordinates
- geometry information

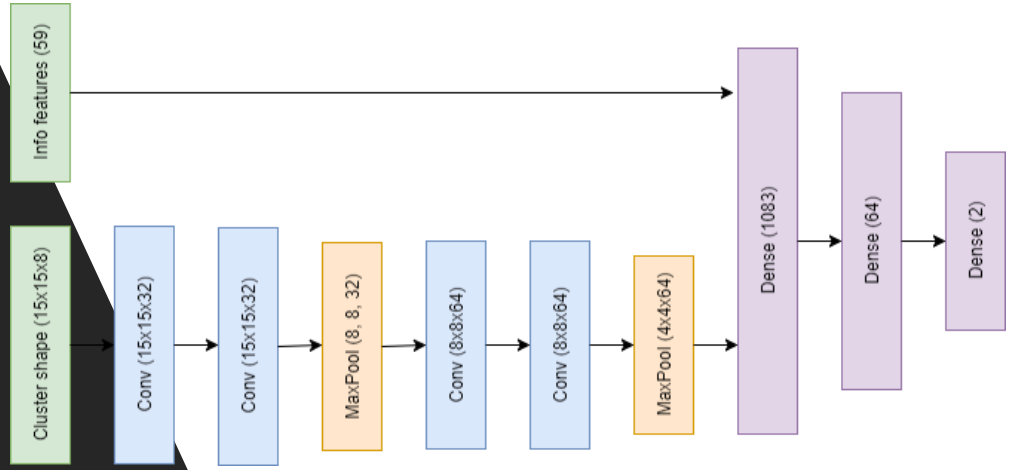




Model

- convolutional neural network
- separate feature maps to exploit
  - crossing angle
  - module orientation
  - layer
- ReLU activations
- ROC ~ 0.96
- it is possible to filter 90% of the doublets with efficiency >90





Implementation

- should run in real-time
- benchmark on FPGAs and GPUs
- architectures optimized for inference
  - shallower network
  - smaller input
  - lower precision (binarized neural network)

Thank you!