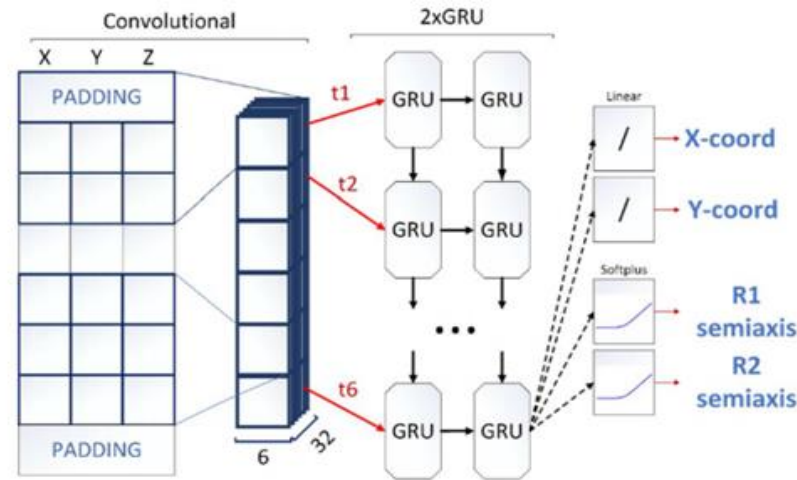# SPD track reconstruction using TrackNet neural network
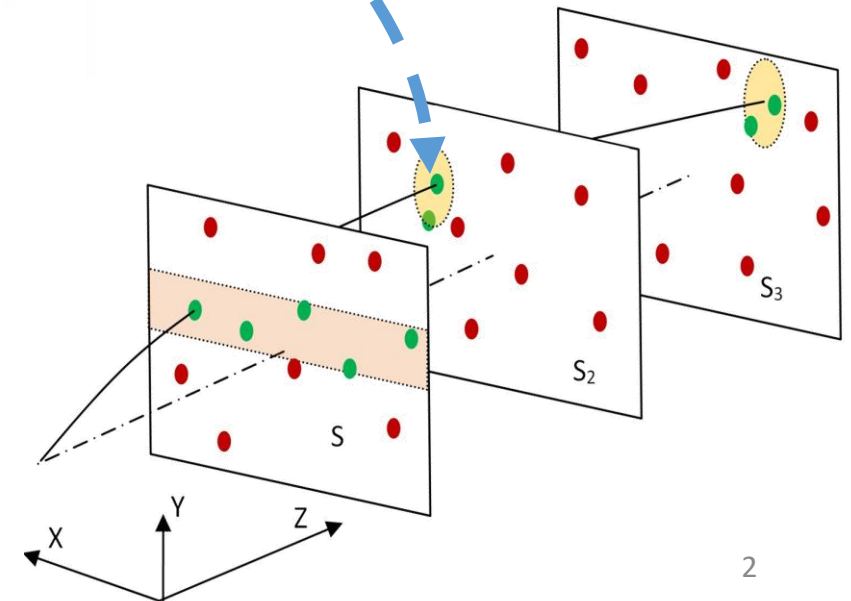
TrackNet

TrackNET is an algorithm for local tracking that allows us to restore each track station by station.
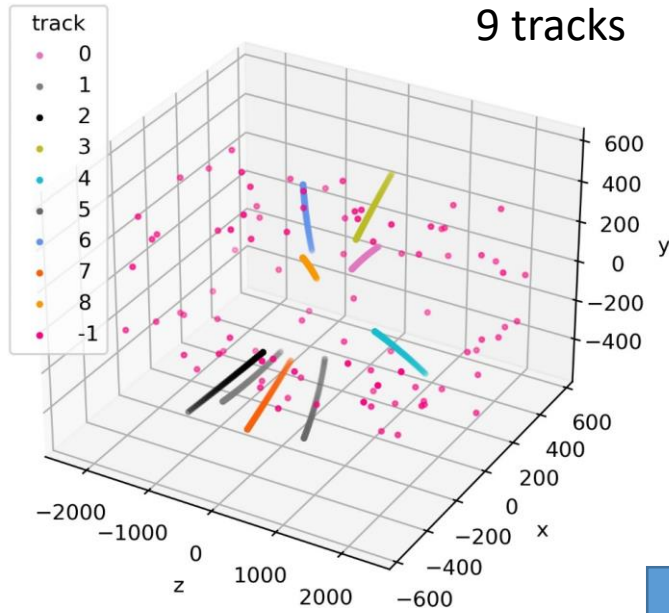

Tracknet uses recurrent architecture to extract temporal features from data and convolutional to get additional features from coordinates of hit.

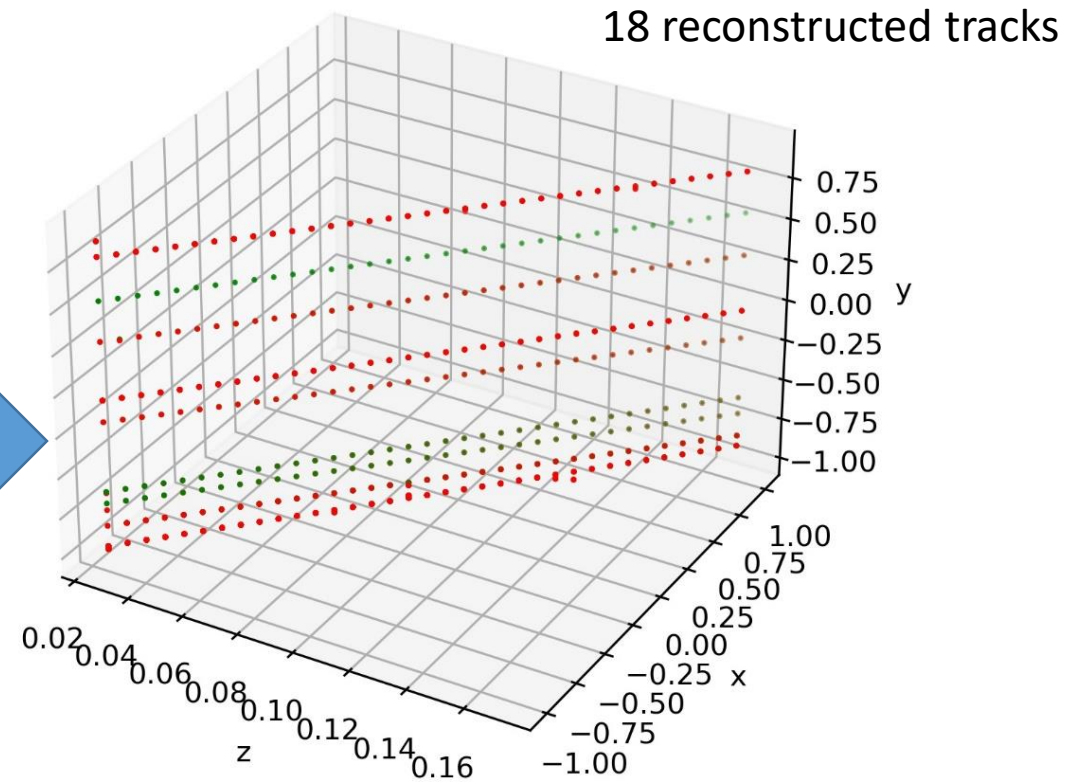# Tracking process

9 tracks

`Pretraind TrackNet`

131kB

Preprocessing each event:
  - Convert to cylindrical coordinates
  - Normalized coordinates

Model was trained using Ariadne library algorithms

18 reconstructed tracks

We decide that the track is restored only if 100% of the hits were determined correctly.

Results

The quality of track recovery is assessed using two metrics: recall and precision.
Recall is the percentage of true tracks that have been restored completely.
Precision reflects the proportion of true tracks among all tracks found by the model.

Recall	0,93
Precision	0,16

Inference speed on a **single Nvidia Tesla V100**

Mean gpu time per event 0.1952 sec
5.12 events per second

Increasing Precision

1. To fit a helical line to each track using the maximum likelihood method.
2. Calculate for each received line χ^2.
3. Using the <u>average value + 3 sigma</u> as a criterion for dropping out, discard the extra tracks.

Dependence of metrics on the value of the chi-square criterion