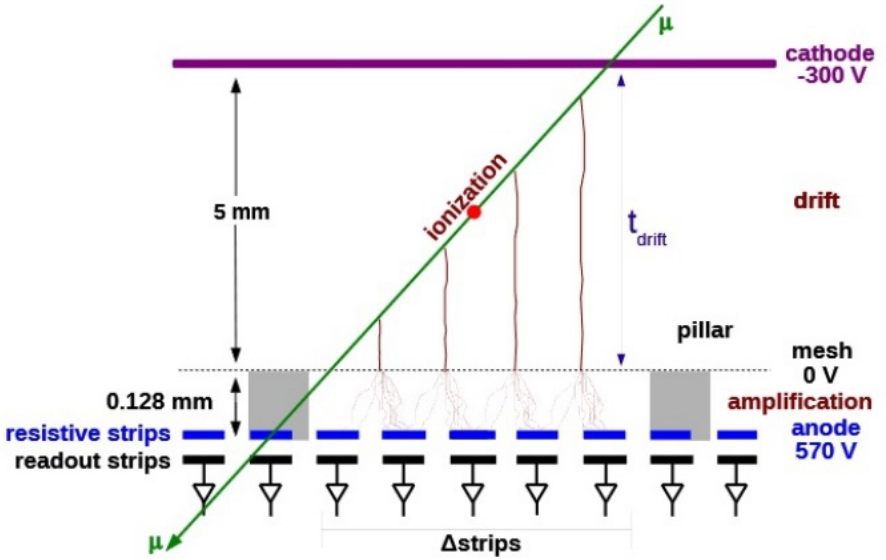
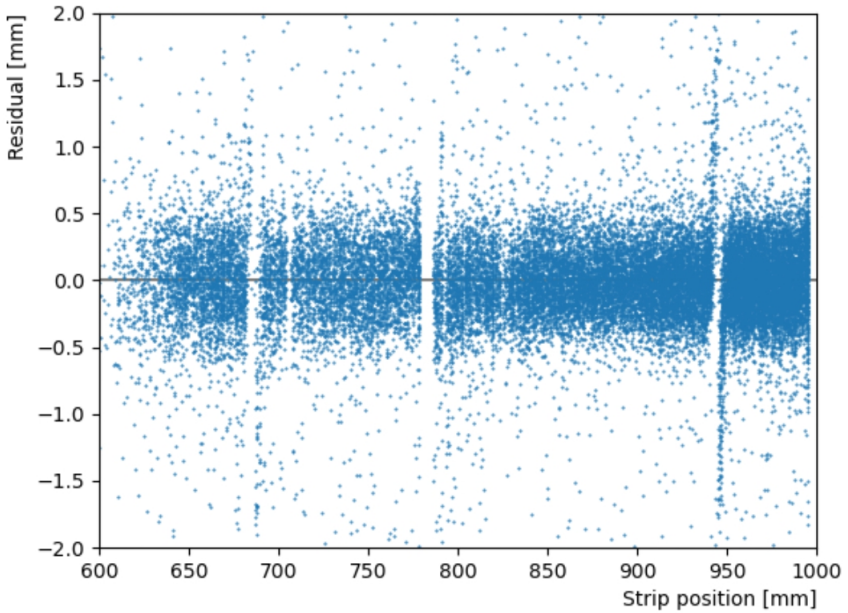
Particle track analysis with ML

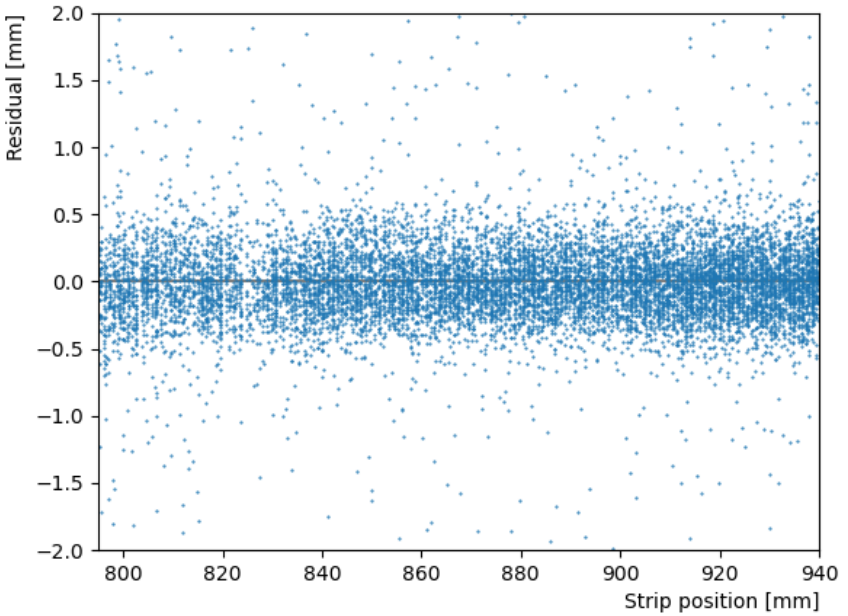


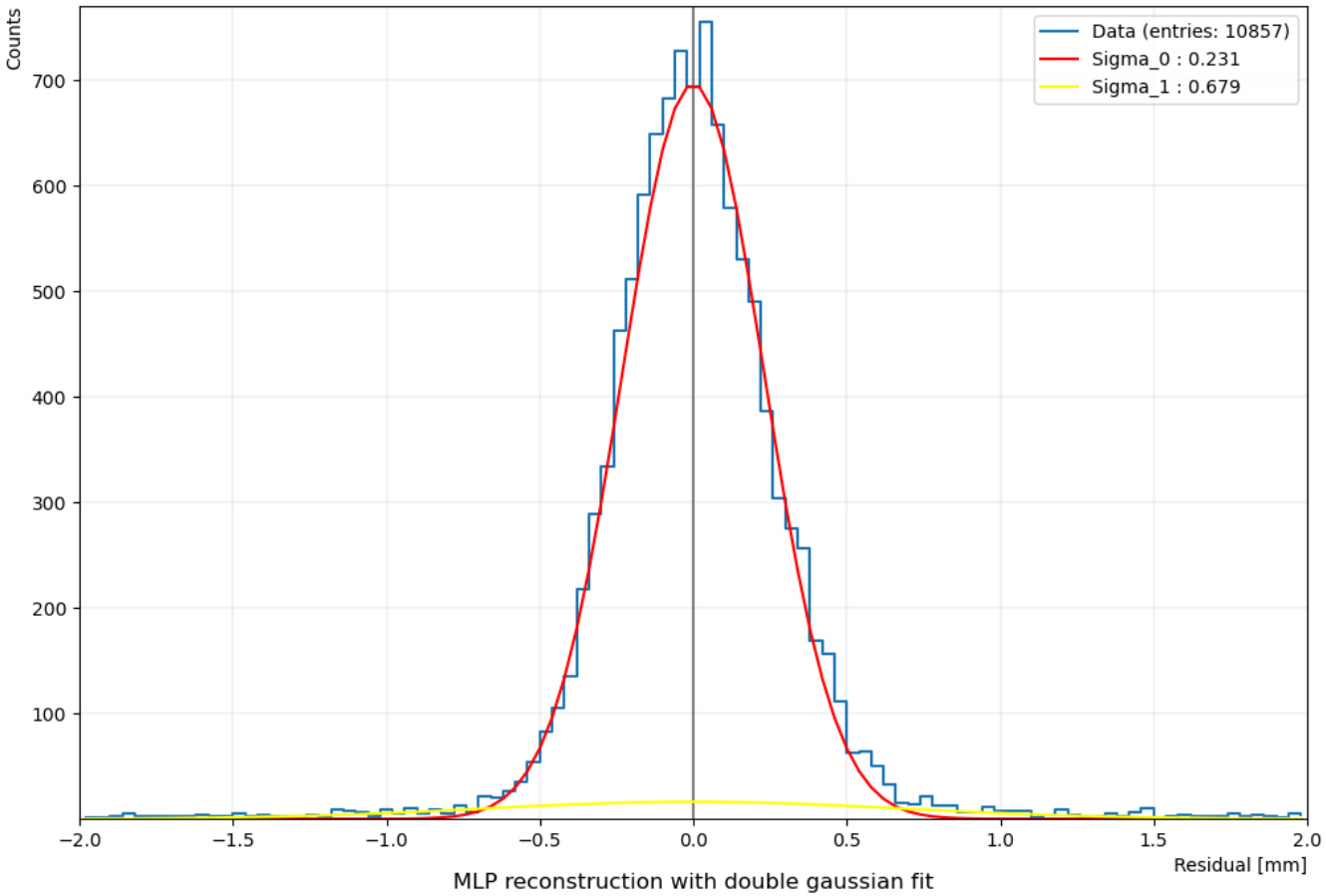
Schematic of a resistive strip micromegas detector (taken from [Lösel, 2017]).

Train a neural network to reconstruct from a signal

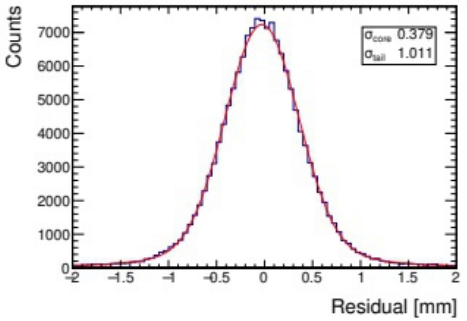
Reconstruction for 29 degrees muons



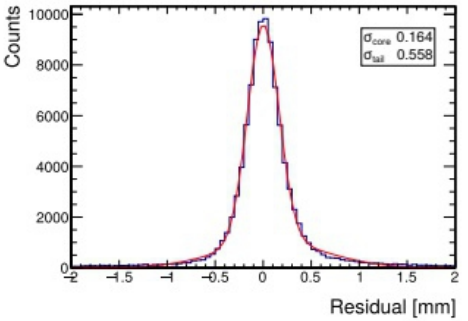




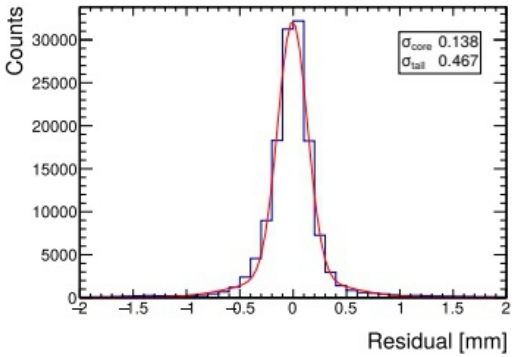
Residuals for hits with strip position between 790mm and 940mm



(a) Centroid.



(b) µTPC-like.



(c) Time-corrected centroid.

Figure 5.15: Comparison of the residuals determined using different position reconstruction methods for 120 GeV muons at an angle of inclination of $(29 \pm 1)°$ (see chapter 7).
For particles passing the detector the charge-weighted method suffers from the inhomogeneous ionization (see figure 5.10) resulting in a bad $\sigma_{\text{core}} = 0.379\,\text{mm}$. The µTPC-like method shows improvement with a $\sigma_{\text{core}} = 0.164\,\text{mm}$. Correcting the centroid position by the charge weighted cluster time using equation 5.40 surpasses the µTPC-like method showing a $\sigma_{\text{core}} = 0.138\,\text{mm}$.
For all the residuals shown here, the track extrapolation error has not been subtracted yet.