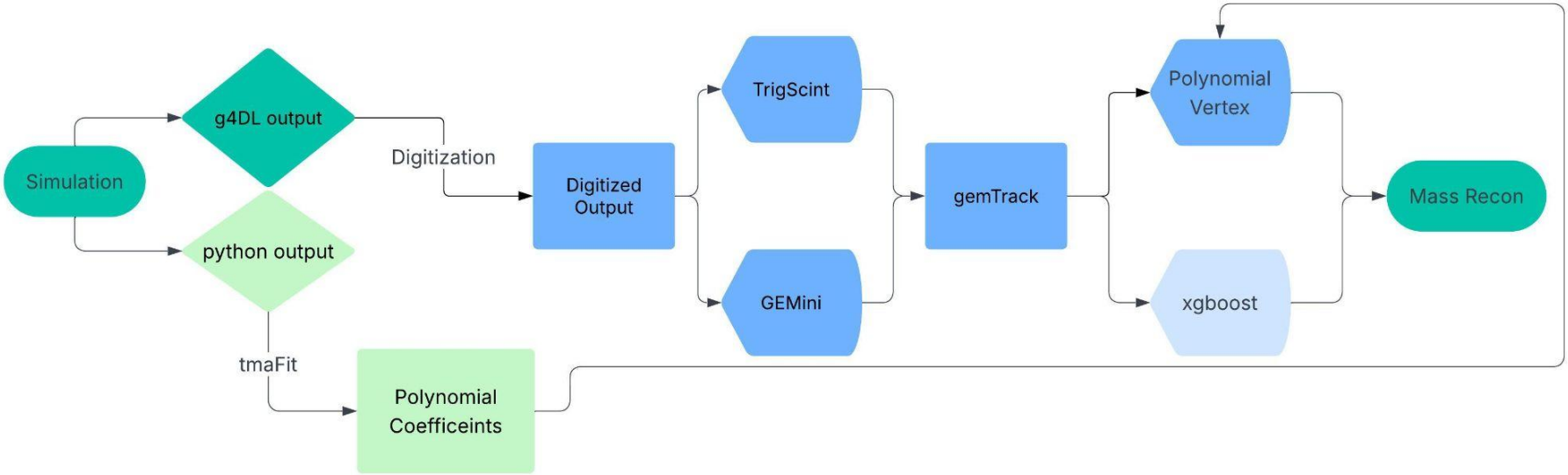
Research Updates

Week of 6/9

Xavier Braun

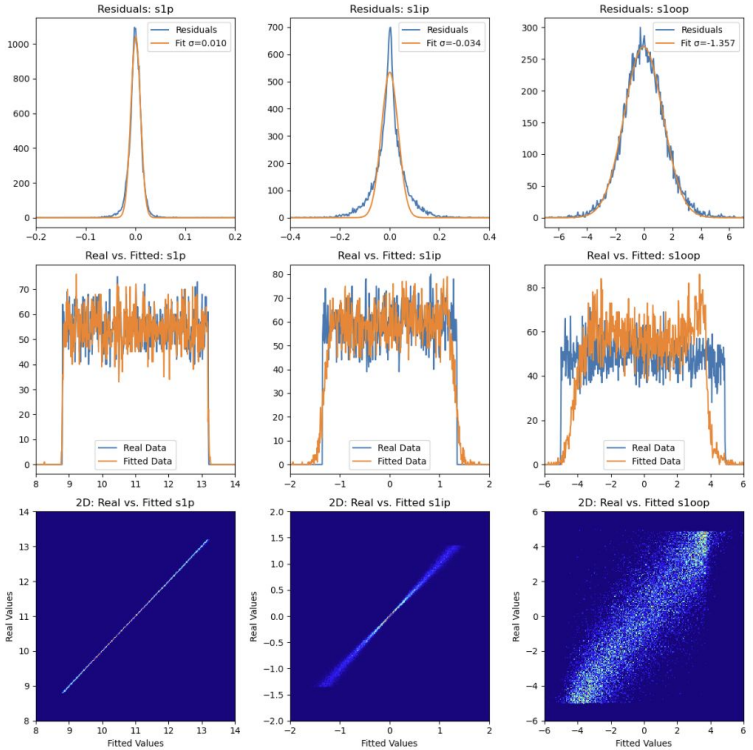
Existing Data Pipeline



Polynomial Coefficient Calculation

- We obtain both detector data (X, Y, dX, dY) and truth data (P, ϕ, Θ) from each of the events
- e.g. $P_{calc} = \sum(a_{ijkl} X^i Y^j dX^k dY^l)$ ->

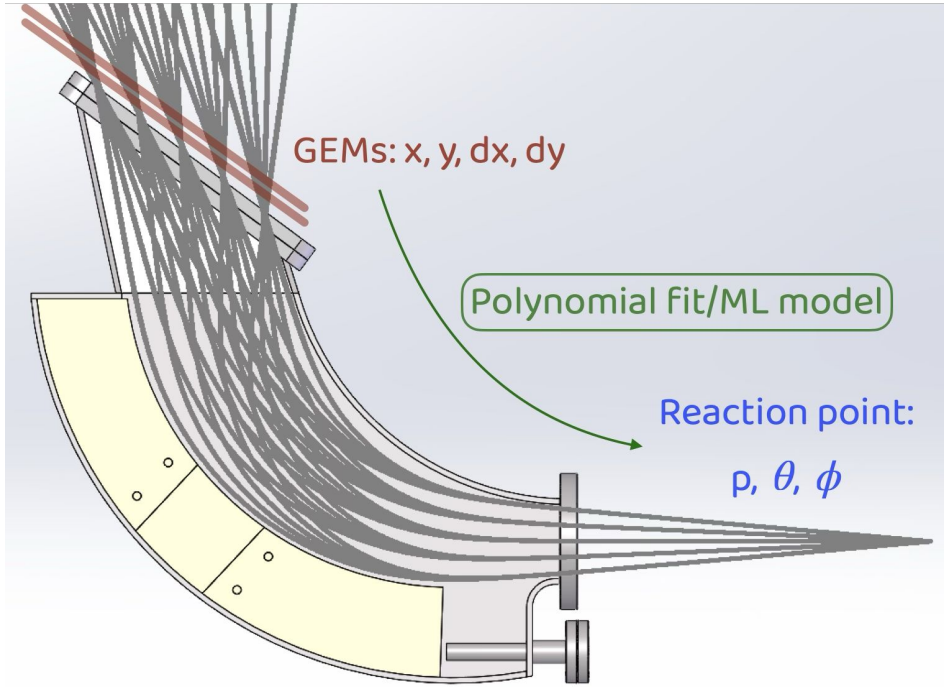
  Minimize $\sum(P_{truth} - P_{calc})$
- In the end we are left with a series of polynomial coefficients for each vertex value, which have been “trained”, to be used for new data



Polynomial Vertex

Purpose: Reconstruct the momentum, in plane, and out of plane angles from the trained polynomials

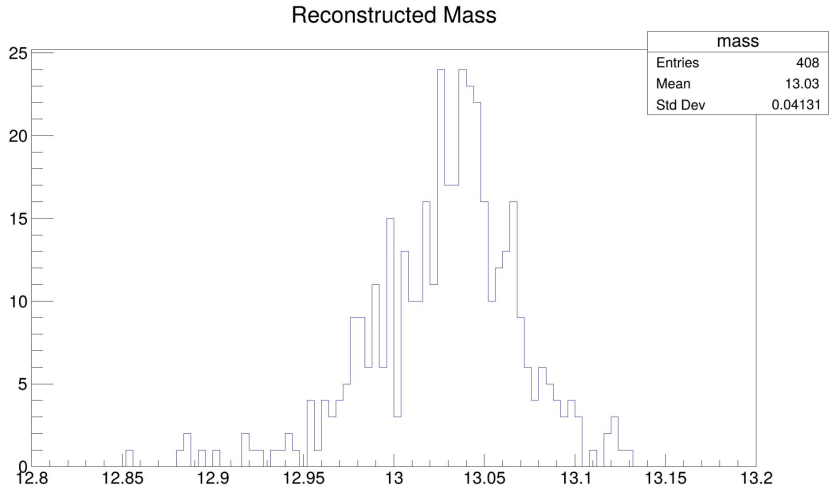
- Position data is carried from gemTrack plugin (our X, Y, dX and dY values)
- Pretrained coefficients (6th order) are retained within the plugin
- Resolve the momentum, in plane angles, and out of plane angles for each of the electron/positron pairs in each event



Mass Reconstruction Plugin

Purpose: Reconstruction of the invariant mass of each event pair e^+/e^-

- Use vertex values from polynomial vertex or xgboost plugins (they have the same tree structure)
- Convert the in plane and out of plane angles into a single direction vector (with additional rotation for each of the arms)



Some early stage results:
Expected mean of 13 Mev

Next Steps

- Create a more streamlined version of the coefficient python code for cleaner output and plugin compatibility
    - Should output the coefficients as a .txt file for easier interchange within the plugin
    - Also need to adjust the polynomial vertex code to accept a .txt file
- Figure out why we are getting multiple tracks from gemTrack plugin
    - Currently only use events with two clear tracks, most events do not