Near Term | Done and To-Do

- **What's currently implemented in EICrecon?**
  - Calorimetry
  - Tracking
    - Primary vertexing
  - PID
    - Initial lepton-hadron separation (e-finder)
    - Initial Hadron ID (LUTs)
  - FF/FB (matrix RP reconstruction)
  - Holistic:
    - E-finder
    - Jets
    - ZDC neutron reconstruction
    - Kinematics (available for inclusive DIS with DIS lepton finder)
- **Identified near term to-dos:**
  - Implement secondary vertexing
  - Transition from LUTs to full reconstruction of hadron IDs
  - RP/OMD ML Reconstruction
  - Reclustering clusters with tracks
  - Initial particle flow implementation
- **Possible near-term tasks:**
  - Merging PID from different sources
    - E.g. combining RICH and clusters, or TOF and RICH detectors
  - Refitting tracks with PID info
  - Reclustering based on PID info
  - Realistic timeframe unfolder (see slide 3)

Output | What Goes into *.eicrecon.root?

- **Partially-complete information:** some implemented, but some missing
  - The set of kinematics
  - The set of reconstructed particles
    - E.g. improving separating out the neutrals from charged
- **Missing information:**
  - Interaction metadata NOT reliant on MCParticles like x-section
  - Propagation of simulation and reconstruction metadata
  - Uncertainties on all reconstructed quantities (see right)

- **Uncertainties:** need to propagate uncertainties for fitted quantities
  - E.g. tracking variables from ACTS (momentum, etc.)
  - Similarly, will be needed for other quantities that involve fits like PID
- **TBD:** will likely require broader discussion
  - Should kinematics be wrt the detector? Or Born kinematics? Both?
  - How will analysis metadata be handled?
- **Note:** HepMC lacks a good field to store polarization
  - (This is a known issue)

Streaming | How does it impact reconstruction?

- **Where does streaming make difference?**
  - I.e. where do we need frame-level algorithms vs. event-level algorithms?
  - Likely most will be event-level

- **Example of a frame-level algorithm:** The timeslice unfolder
  - IDs an interesting timeslice (something that could be a physics event) and passes it to event-level algorithms
  - Need to define milestones for realistic time-frame unfolder

- **Will need:** an algorithm to assess the event-level output
  - I.e. is it a physics event? Or background?
  - Should happen *before* beginning any iterations in reconstruction…

- **Long-term:** the classifying algorithm will need physics, accelerator knowledge to build realistic classifiers

Miscellaneous | Various Thoughts

- **Where can ML help?**
  - Combining PID, tracking, calo info to make reconstructed particles
  - Reclustering (e.g. combining tracking info to update calo clusters)
  - Event classification (e.g. DIS vs. DVCS)

- **What prerequisites are there for reconstruction?**
  - Calorimeter calibrations (e.g. PID-dependent calorimeter calibrations)

- **What validation tools do we need?**
  - For physics performance (benchmarking) of algorithms
  - For IDing where we can speed up our reconstruction

Planning | Possible Work Packages

- **In-progress tasks:**
  - Secondary Vertexing
  - ML RP/OMD Reconstruction
  - Tracking-based calo reclustering
  - Initial particle flow implementation

- **For discussion:** possible work packages for the remaining year based on slides
  - **Tracking package**
    - Propagating track uncertainties **[doable]**
    - Refitting tracks based on PID hypotheses **[hard]**

- **For discussion (cont.):** possible work packages
  - **PID package**
    - Implementing a PID merging algorithm **[doable]**
    - Propagation of PID uncertainties **[doable]**
    - Implementing a cross-detector type PID merging algorithm **[hard]**
    - Transitioning from LUTs to full reconstruction **[hard]**

Key: grade reflects my own feelings on (and ignorance of) tasks
- **[easy]** definitely doable by 2025
- **[doable]** reasonably doable by 2025 (with some effort)
- **[hard]** very challenging to get done by 2025

Planning | Possible Work Packages

- **For discussion :** possible work packages for the remaining year
  - **Meta package**
    - Propagating interaction metadata not via MCParticles **[hard]**
    - Propagating simulation and reconstruction metadata **[hard]**
  - **Streaming package**
    - Defining milestones for a realistic timeslice unfolder **[easy]**
    - Develop a prototype event assessor **[doable]**

- **For discussion (cont.):** possible work packages for the remaining year
  - **Calo package**
    - Reclustering based on PID hypotheses **[easy]**
  - **Event package**
    - Complete the set of kinematics **[doable]**

Key: grade reflects my own feelings on (and ignorance of) tasks

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