Tracking efficiency studies in dense environments

Poster Introduction - Connecting the Dots 2022

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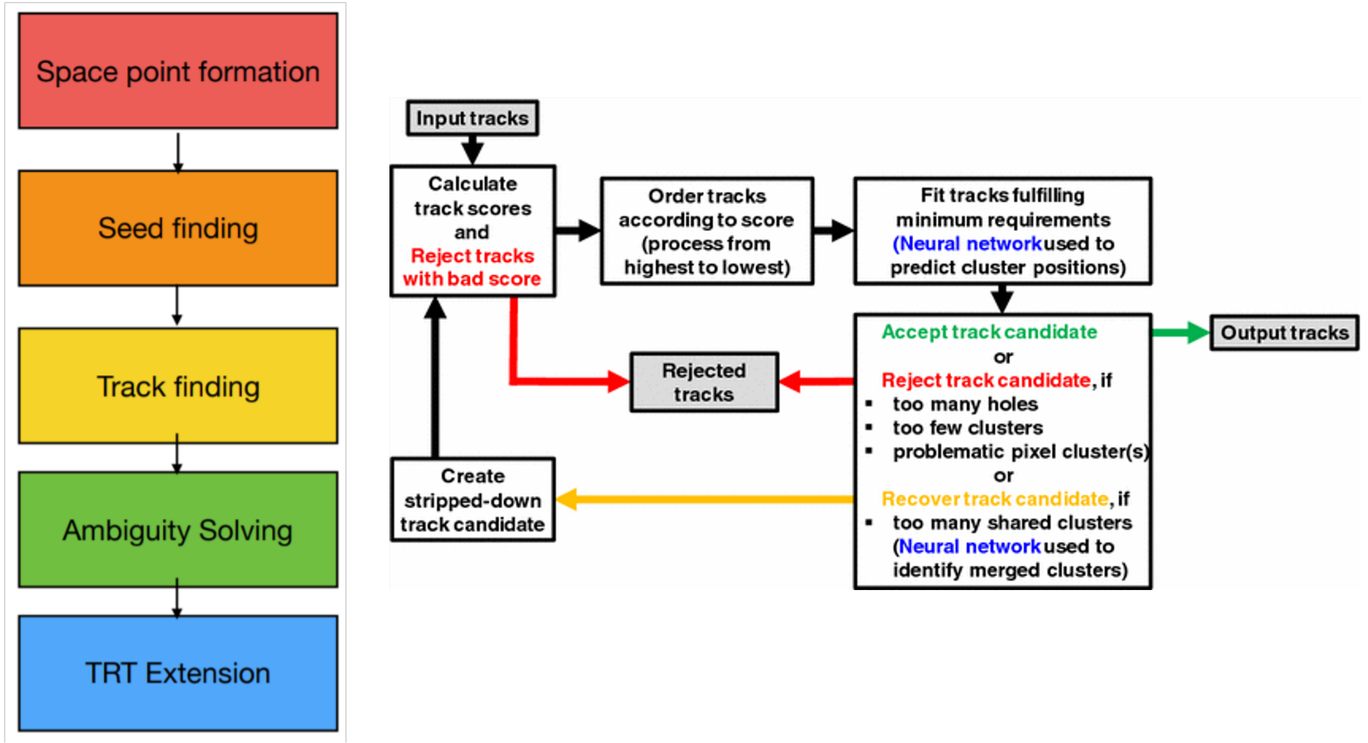
ATLAS EXPERIMENT

UCL

Introduction to the Ambiguity Solver and Motivation

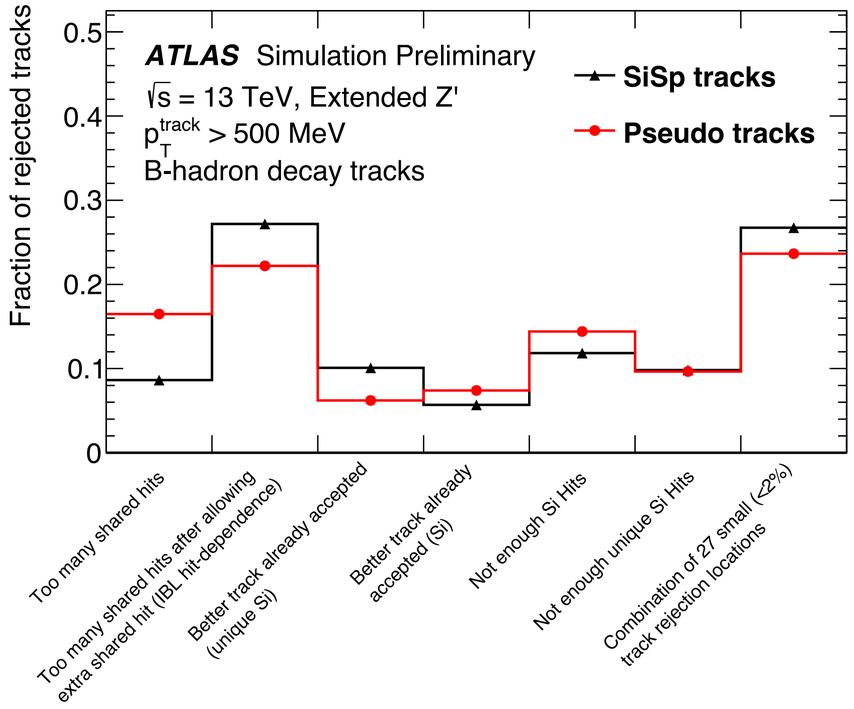
- During pattern recognition stage, multiple track candidates can be created for one charged particle
- Ambiguity solving stage is required to remove excessive track candidates
- Due to their overlapping nature, there is consequentially a large drop in reconstruction efficiency for high p_T B-hadron decay tracks when using the ambiguity solver to remove excessive track candidates
- Any improvement to the B-hadron decay track reconstruction efficiency will have a significant impact in the **downstream b-tagging algorithms** and analyses
- **Studies were conducted to investigate *why* the ambiguity solving process is removing so many B-hadron decay tracks and starting to probe possible ways this could be improved.**
- **Further studies underway to investigate best way to enhance efficiency in this region**



Ambiguity Solver Flowchart [Eur. Phys. J. C 77 (2017) 673]

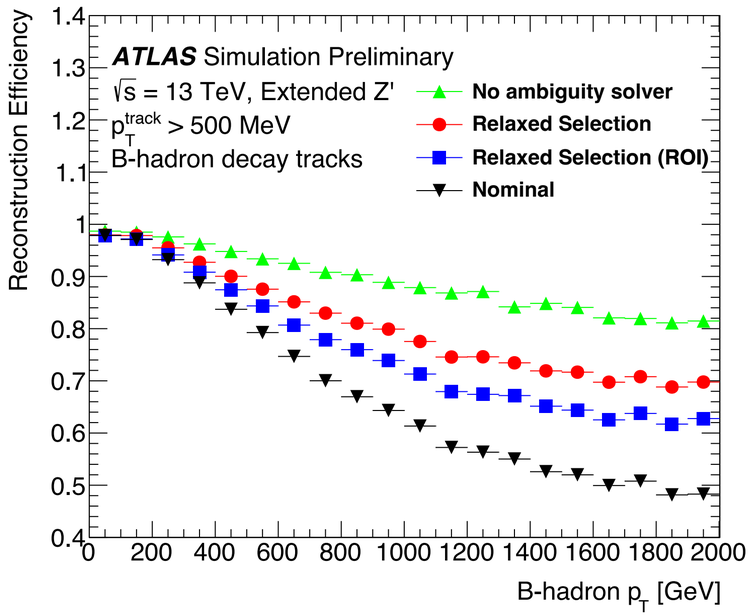
Identification of cause and attempts to recover excessive B-hadron decay track loss

Reasons for B-hadron decay track rejections



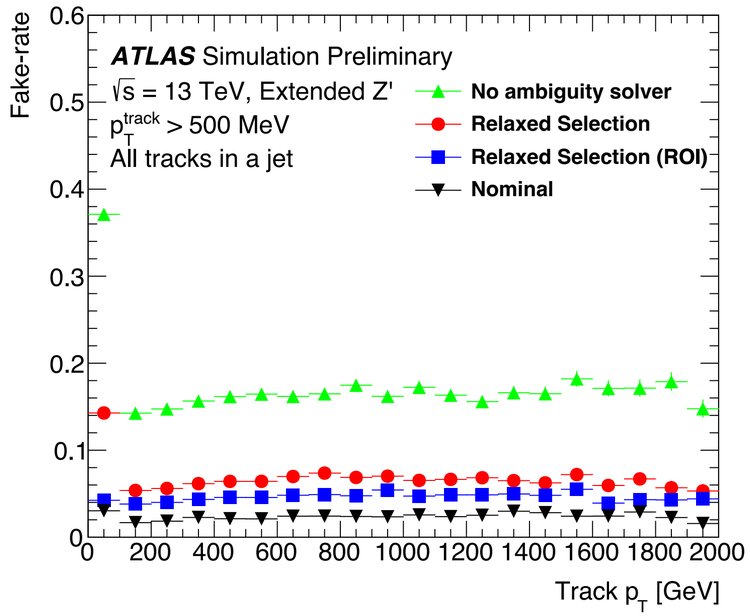
- Six main locations within the ambiguity solver contribute to ~ 75% of B-hadron decay track rejections. Pseudo tracks, use truth information to reconstruct the best possible set of reconstructable tracks.

Efficiency of B-hadron decay tracks



- The four selections that cause the majority of the B-hadron decay track rejections, are **fully relaxed** either inclusively (throughout the ambiguity solver) or only within a **hadronic ROI**.

Fake Rate



- Ambiguity Solver significantly reduces the fake-rate. Loosening the selection increases the fake rate, although this can be better controlled via the use of the **hadronic ROI**.