Advanced Tracking and Pixel Clustering

The pattern recognition algorithms currently in use by the ATLAS experiment utilize only a fraction of the information produced by the inner detector that could be useful in reconstructing tracks with the highest purity and efficiency. In particular, the cell geometry and excellent charge calibration of the pixel detector provide extra constraints on the correct association of hits with track candidates that are completely ignored by current tracking algorithms.

The initial goal of this project is being motivated by an emergent problem with tracking in dense jets: when hits in the sensors are too close together, the clusters of hit pixels from the two hits become merged. Without knowledge that the hits have become compromised, these shared hits give ride to misestimated track parameters. Since the problem is most acute in the innermost layers and in dense jets, mis-tagging the heavy quark contents of jets results; a critical fault.

If these shared clusters can be identified and correctly split into individual sub-clusters, much of the lost resolution can be recovered and tracking in jets improves markedly. As part of a task force in ATLAS convened to address this problem, the ultimate goal of this project is to develop and implement strategies for cluster splitting that will be used in ATLAS production tracking.

Please contact Tim Nelson for more information regarding this project.