

Methodology

Advance Deep Learning Approach

Cool, but How?

Advance Deep Learning Approach

Hybrid Model to Capture Local & Global Information:

- **Sparse Submanifold Convolutional Network (Local Info):**
 - A convolution that operates only on active voxels.
 - Efficiently learns local 3D features (shower shapes, track segments).
 - Efficiency SCNN: (16 times faster than a CNN on a GPU) [[Link](#)]
- **Hierarchical Transformer (Global Info):**
 - **Intra-Module Attention:** Summarizes patterns *within* each detector module.
 - **Inter-Module Attention:** given the created module summaries, combines them to learn the *entire event topology*.

