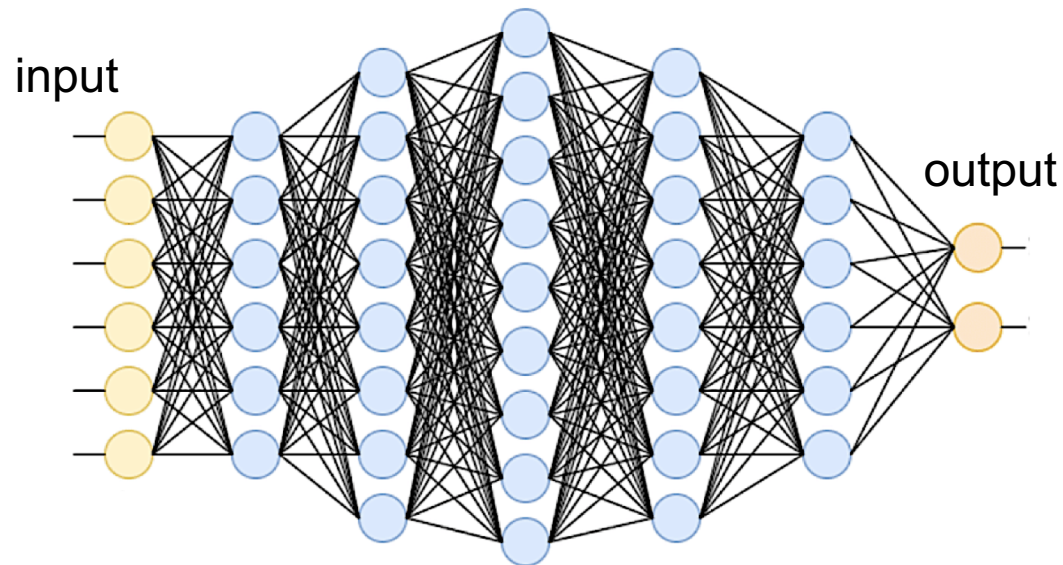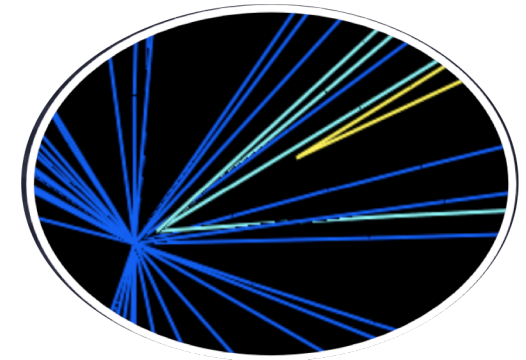# Status Report
Development of Flavor Tagging algorithm with Deep Learning at the ILC

Tomoki ONOE

Flavor Tagging by Deep Learning

- Now jet flavor identification is based on boosted decision trees (BDTs) as the multivariate classifier on LCFIPlus.

- I am trying to apply DeepLearning to flavor tagging for accuracy improvement.

input

output

DeepLearning

- "Deep" refers to the use of multiple layers.

- DNN (Deep Neural Net) is the architecture of DeepLearning.

Result of DNN

Data: 4 million events data from ILD simulation

$\quad$ ($e^+e^- \rightarrow Z \rightarrow q\bar{q}$ two jet samples for $\sqrt{s} = 250\text{GeV}$)
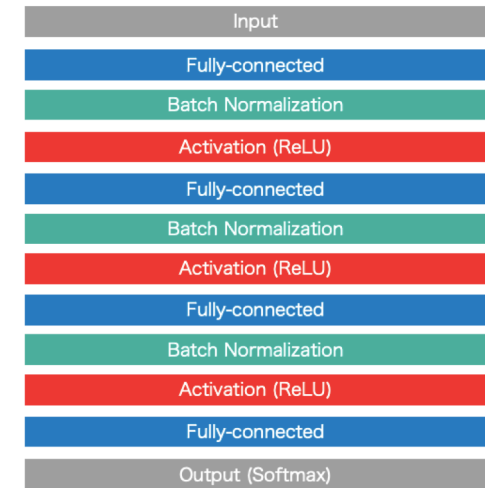
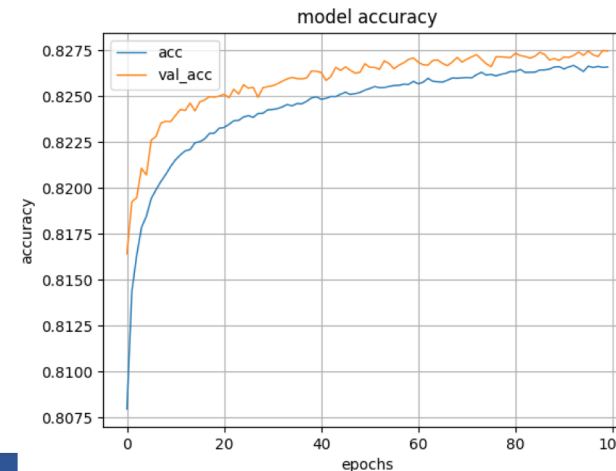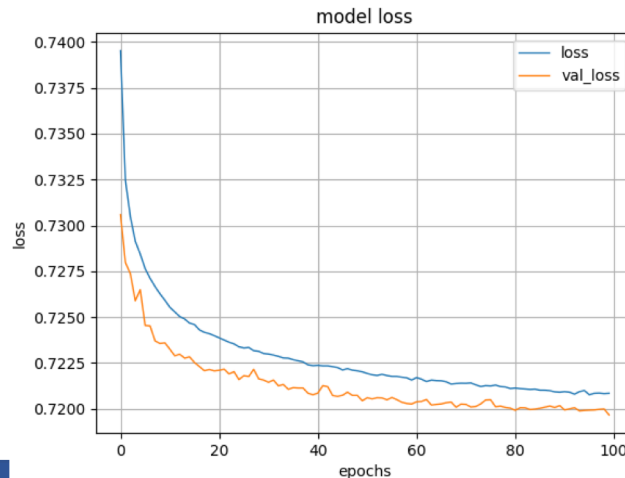$\quad$ 124 variables from vertex finder (e.g. number of vertices, positions)

Training:

$\quad$ Network consisting of 4 fully-connected layer with batch normalization and ReLU activation
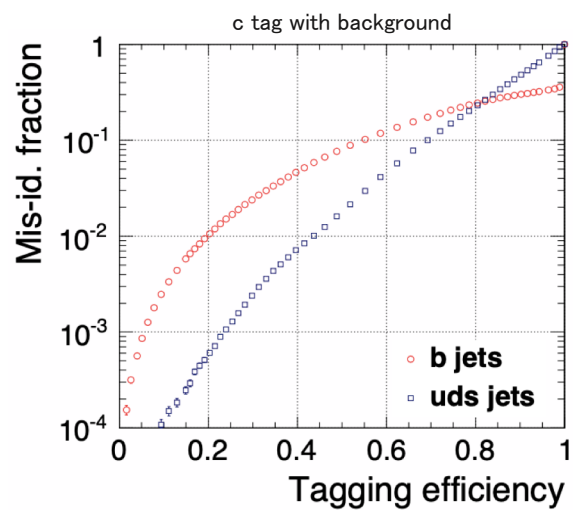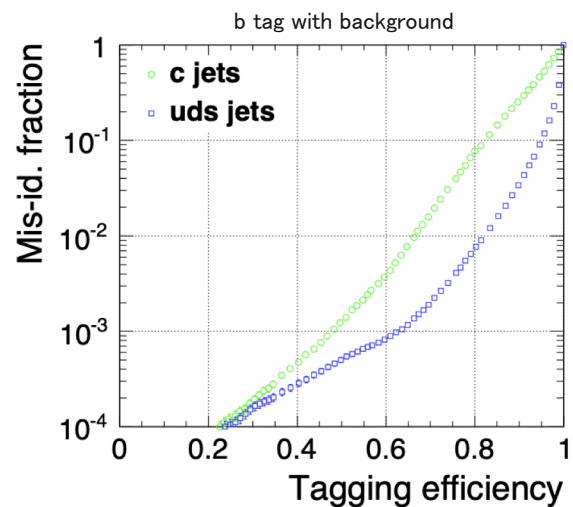
Output:

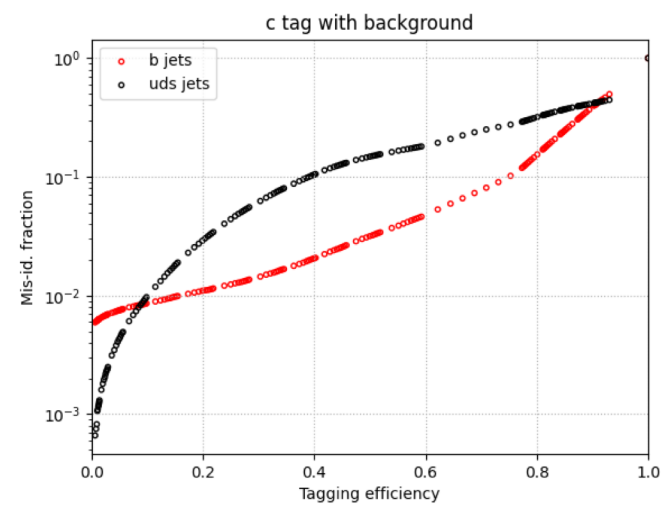$\quad$ Classify jets to 3 classes (b, c, uds)
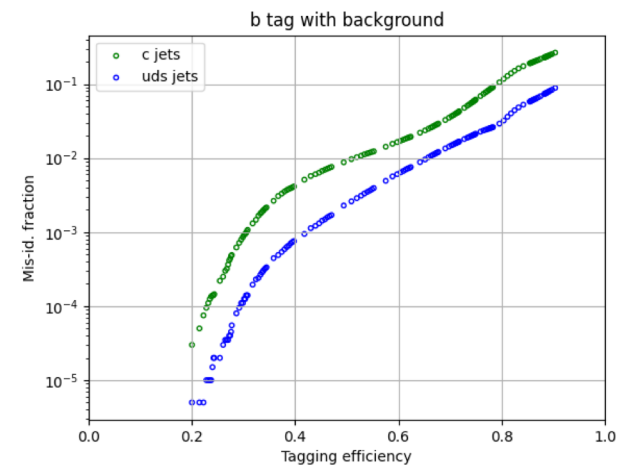
Result:

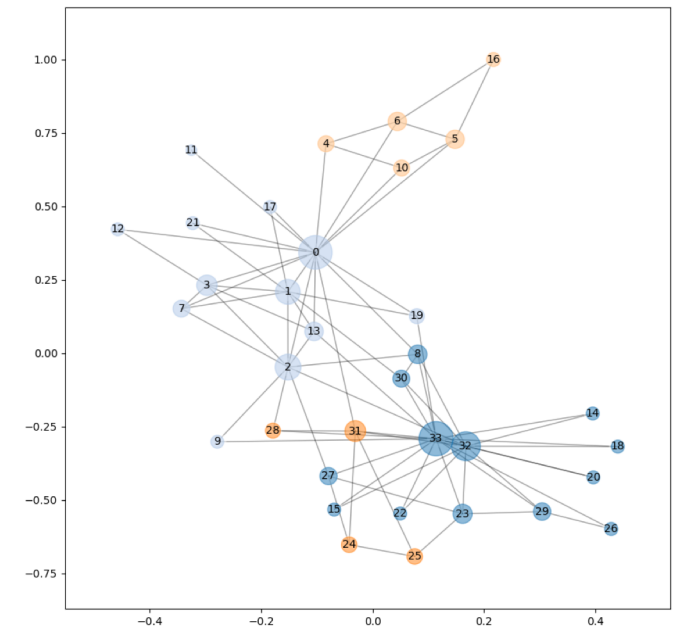
Accuracy: 82.7%

Result of DNN

LCFIPlus

DNN

Next step (Graph Neural Networks)

- To archive higher accuracy, Graph Neural Network (GNN) may be one solution.

- Graph can be represented with less information loss.

- I preparing the graph dataset from simulation data about tracks and vertices.

The image of Graph