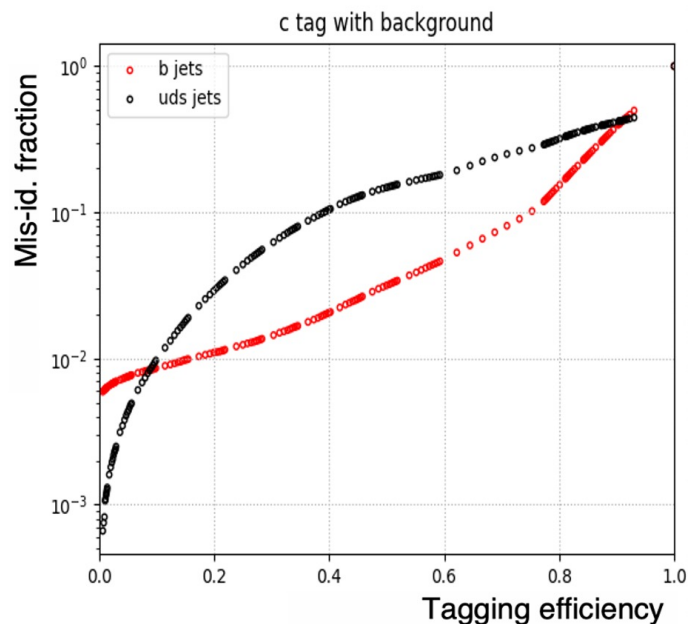
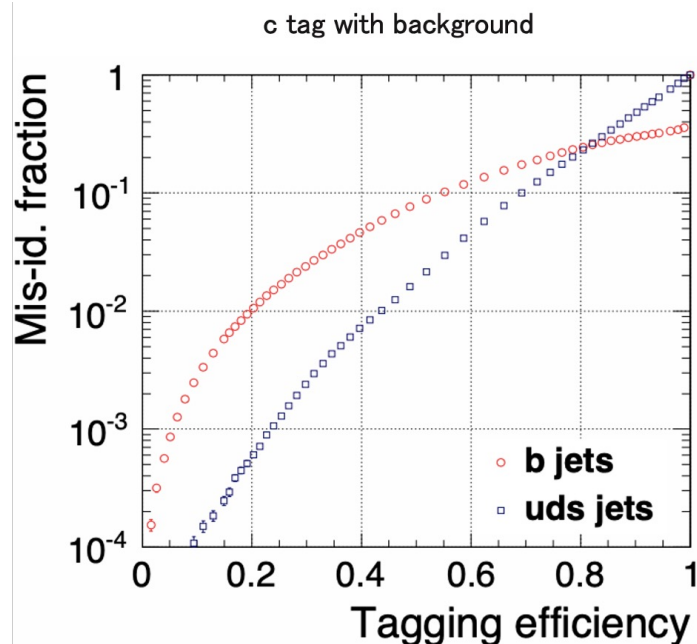
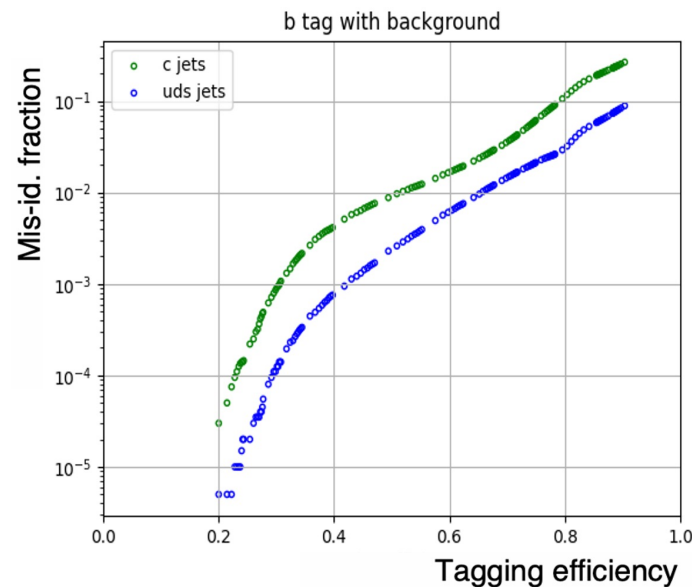
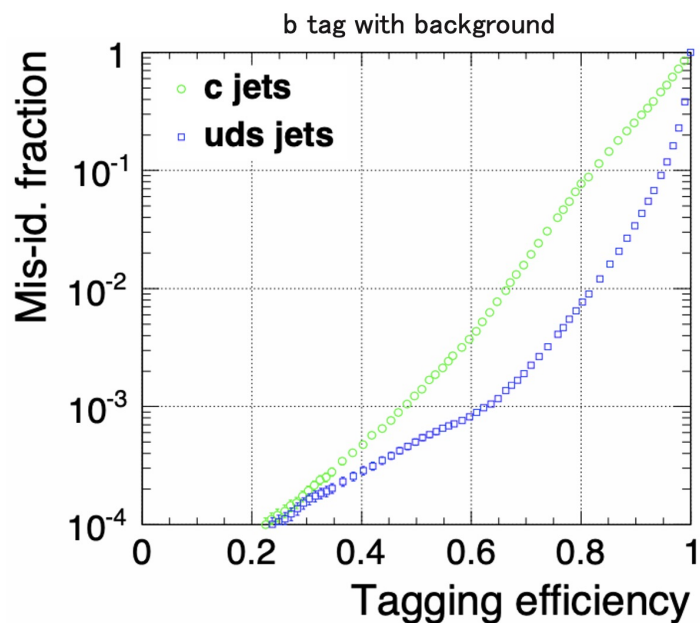


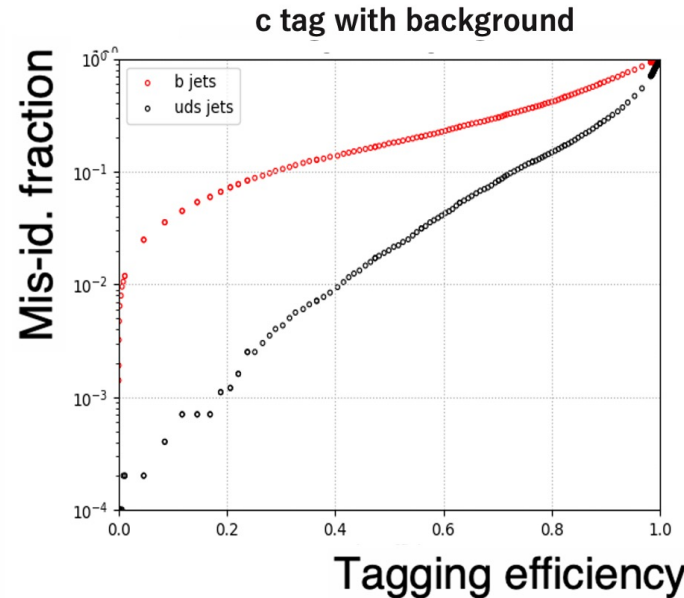
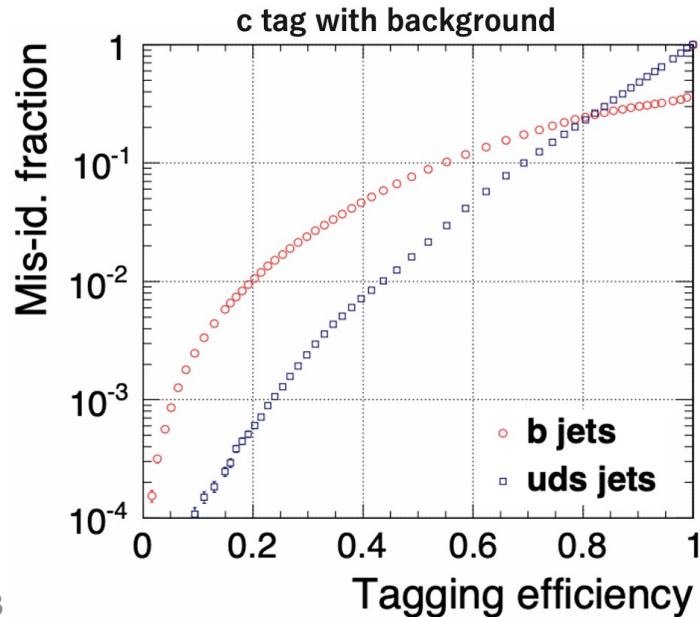
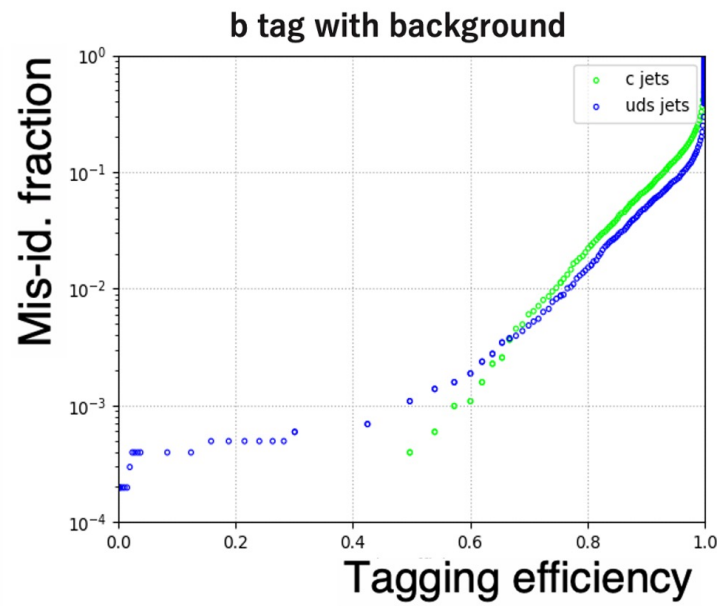
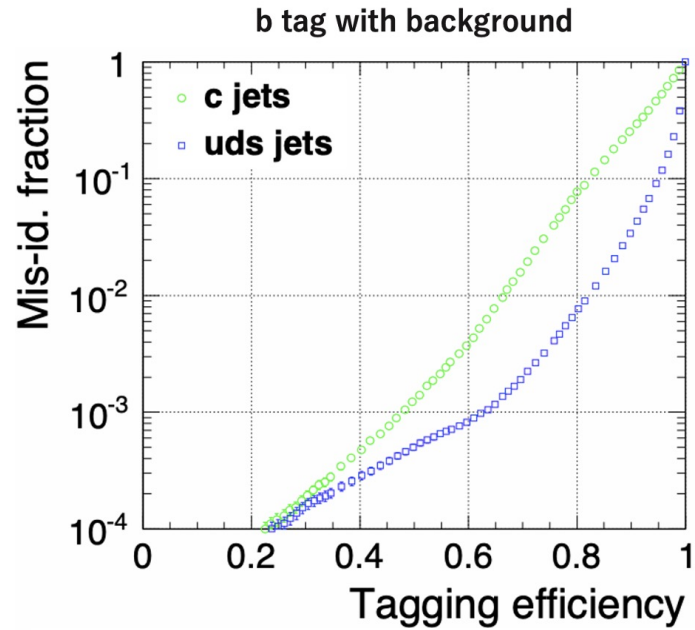
# **Status report (result of optimization)**

# Summary of the current situation : DNN implementation



Tag efficiency=0.8	back ground jet	Mis-id ratio	
		LCFIPlus	DNN
<i>bjet</i>	<i>cjet</i>	0.073	0.088
	<i>udsjet</i>	0.0074	0.0234
<i>cjet</i>	<i>bjet</i>	0.22	0.13
	<i>udsjet</i>	0.24	0.28

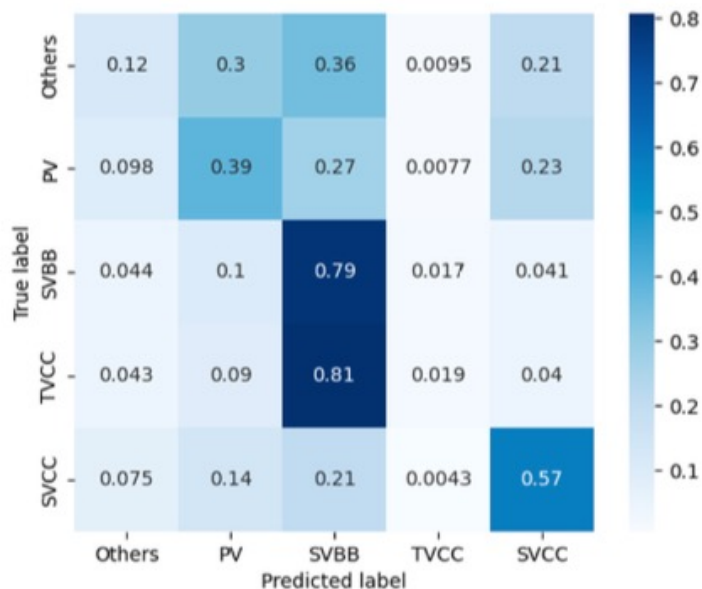
# Summary of the current situation : GNN implementation



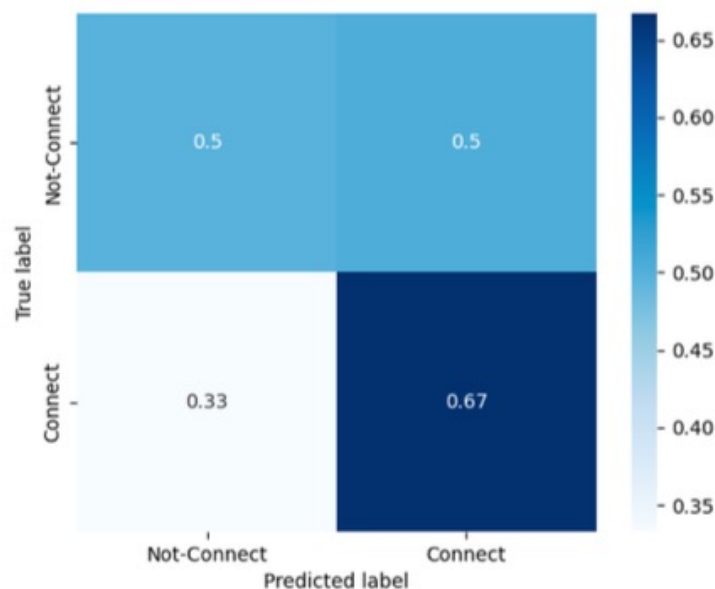
Tag efficiency=0.8	background jet	Mis-id ratio	
		LCFIPlus	GNN
bjet	cjet	0.073	0.021
	udsjet	0.0074	0.0149
cjet	bjet	0.22	0.40
	udsjet	0.24	0.14

# Confusion matrix : GNN implementation

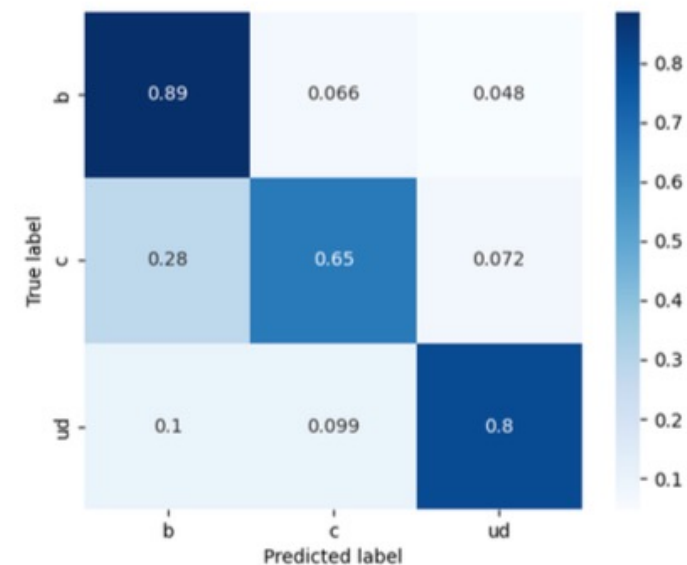
## Node classification



## Edge classification



## Graph classification



## Tracks (Nodes)

Label	Description
PV	From primary vertex
SVBB	From secondary vertex of b
SVCC	From secondary vertex of c
TVCC	From tertiary vertex of b
Others	From another particle

## Vertex (Edge)

Label	Description
Connected	tracks are connected
Not-connected	tracks are not connected

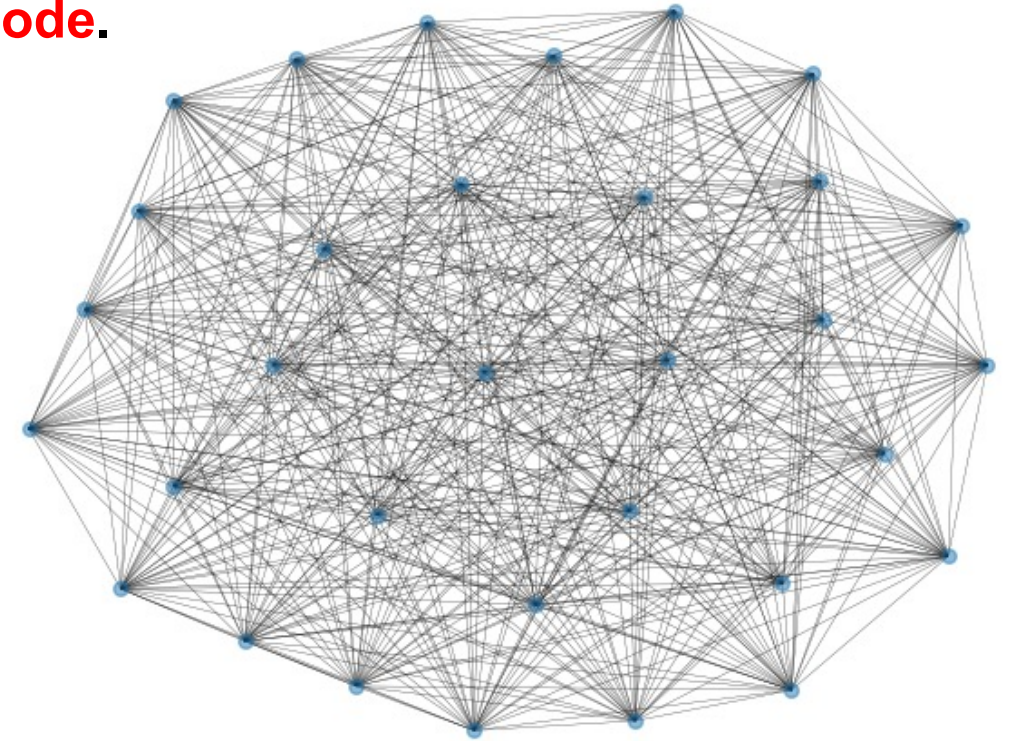
## Jets (Graphs)

Label	Description
$b\bar{b}$	the final state of $b\bar{b}$
$c\bar{c}$	the final state of $c\bar{c}$
$q\bar{q}$	the final state of $q\bar{q}$ ( $q = u, d, s$ )

# Reminder: Training information

- Create a graph where **one track** corresponds to **one node**.
- **One graph** corresponds to **one jet**.
- Each node has the features shown below.
- The nodes are all connected to each other.
- Aggregation operation is performed between the connected nodes.

Track Input	
$d_0$	Longitudinal distance from track to IP
$\phi$	Azimuthal angle of track
$\omega$	the curvature of the track
$z_0$	Transverse distance from track to IP
$\tan \lambda$	$dz/ds$ in $sz$ plane
$\sigma(d_0)$	Uncertainty of $d_0$
$\sigma(z_0)$	Uncertainty of $z_0$



**one jet graph  
embedding representation**

# Training information with link prediction

- **Loss function**

$$L_{total} = L_{Flavor} + \alpha L_{Vertex} + \beta L_{Edge}$$

$(\alpha \cong 3, \beta \cong 1)$

- **Track** answer means which vertex came from
- **Edge** answers mean whether tracks form a vertex
- **Graph** answer means which flavor

## Tracks (Nodes)

Label	Description
PV	From primary vertex
SVBB	From secondary vertex of b
SVCC	From secondary vertex of c
TVCC	From tertiary vertex of b
Others	From another particle

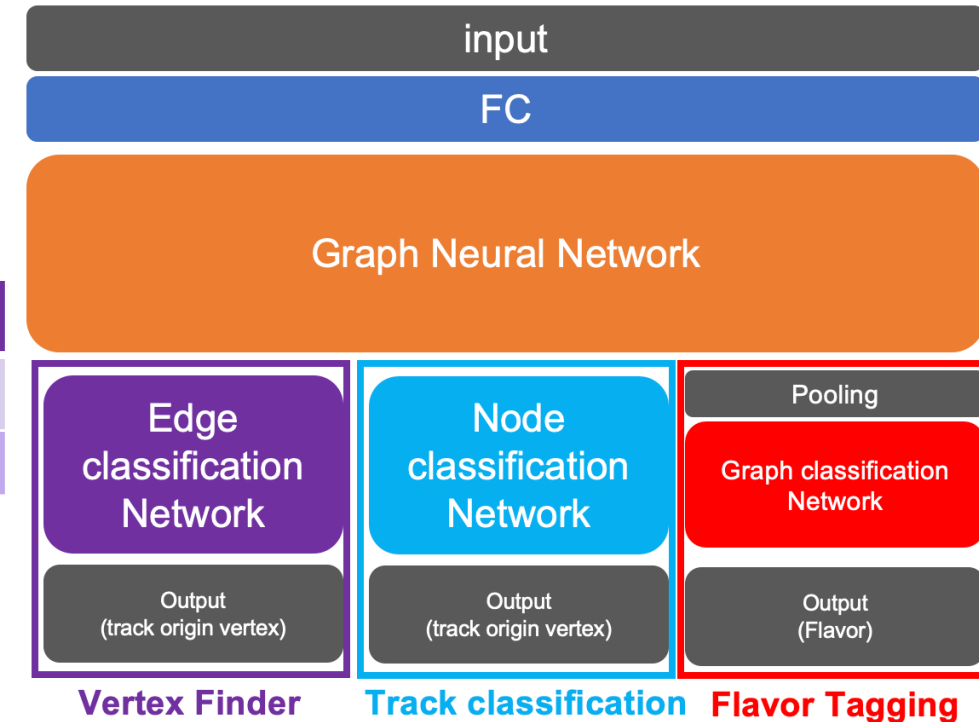
## Vertex (Edge)

Label	Description
Connected	tracks are connected
Not-connected	tracks are not connected

## Jets (Graphs)

Label	Description
$b\bar{b}$	the final state of $b\bar{b}$
$c\bar{c}$	the final state of $c\bar{c}$
$q\bar{q}$	the final state of $q\bar{q}$ ( $q = u, d, s$ )

## Over view of network



# Backup