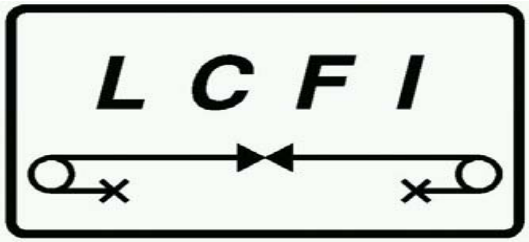

LCFIVertex tutorial – Neural Net Tagging

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Neural Net Tagging

- The flavour tag is performed by 3 separately trained neural networks, depending on the number of vertices found (1 vertex, 2 vertices or greater than 2 vertices), so there are 9 networks.

b Tagging	**c Tagging**	**c Tagging (only b background)**
1 Vertex	1 Vertex	1 Vertex
2 Vertices	2 Vertices	2 Vertices
3 or more Vertices	3 or more Vertices	3 or more Vertices

- Uses the neural network package written by David Bailey (Manchester)
- See Erik Devetaks talk for details of the inputs.
- Networks can be trained using the example processor “NeuralNetTrainer”, but trained networks are provided.
- The tag is performed by the example processor “FlavourTag”

Example training processor

- The processor is located at: **LCFIVertex/src/NeuralNetTrainer.cc**
- It should be of type **“NeuralNetTrainer”** in the steering file.
- There is an example steering file located at **LCFIVertex/steering/trainNeuralNets.xml**

Example training processor

Input Collections

- **"JetCollectionName"** - the ReconstructedParticle collection found by your jet finder. This is only used to get the jet energy to scale the inputs (so that trained networks can be used at different energies).

- **"FlavourTagInputsCollection"** – the LCFloatVec collection created by FlavourTagInputsProcessor

- **"TrueJetFlavourCollection"** – the LCIntVec collection created by TrueAngularJetFlavourProcessor

Example training processor

Other Parameters

- Output filenames for each of the created networks. If a filename is not provided for a network or is left blank, then that network is not trained. This enables networks to be trained individually or all at once.
- **“SaveAsXML”** – Set to non zero to save the networks as XML (recommended), or zero to save them as plain text (either type can be loaded by the flavour tag processor).

Output Collections

The LCIO file is not modified.

Example tagging processor

- The processor is located at **LCFIVertex/src/FlavourTag.cc**
- It should be of type **“FlavourTag”** in the steering file.
- There is an example steering file at **LCFIVertex/steering/ft.xml**

Example tagging processor

Input Collections

- **"JetCollectionName"** - the ReconstructedParticle collection found by your jet finder. Only used to get the energy.

- **"FlavourTagInputsCollection"** – the LCFloatVec collection created by FlavourTagInputsProcessor

Example tagging processor

Other Parameters

- Filenames for each of the previously trained networks (plain text or XML). Currently 9 networks (see earlier) have to be supplied. The processor will fail if it is not given all 9.

Note that improperly formed XML files can cause problems at the moment.

Output Collections

- **“FlavourTagCollection”** – The name to store the LCFloatVec collection of the calculated tag values under. This vector will have three entries: the b tag, c tag and c tag only b background (in that order).

Modifying the networks

Changing the network variables

- The inputs are read from the file and normalised in **processEvent()** (for both the trainer and the tagger).

- A STL vector called “inputs” is created and passed to the networks or added to the training data sets. This vector can be modified in both training and tagging processors to change the network inputs, whether read from the output of a separate processor (like FlavourTagInputsProcessor) or calculated in the trainer/tagger itself.

Summary

- The Vertex Package is now available.
  - LCFIVertex on http://www-flc.desy.de/ilcsoft/
- Well tested procedure, but very flexible. The default setup should be adequate for most unless studying tagging.
- There is a lot of documentation and examples.
- Questions to the ILC Forum.