



Contribution ID: 13

Type: **not specified**

## Event Categorization using Deep Neural Networks for $t\bar{t}H$ ( $H \rightarrow b\bar{b}$ ) with the CMS Experiment

*Wednesday, 11 April 2018 09:55 (20 minutes)*

The analysis of top-quark pair associated Higgs boson production enables a direct measurement of the top-Higgs Yukawa coupling. In  $t\bar{t}H$  ( $H \rightarrow b\bar{b}$ ) analyses, multiple event categories are commonly used in order to simultaneously constrain signal and background contributions during a fit to data. A typical approach is to categorize events according to both their jet and b-tag multiplicities. The performance of this procedure is limited by the b-tagging efficiency and diminishes for events with high b-tag multiplicity such as in  $t\bar{t}H$  ( $H \rightarrow b\bar{b}$ ).

Machine learning algorithms provide an alternative method of event categorization. A promising choice for this kind of multi-class classification applications are deep neural networks (DNNs). In this talk, we present a categorization scheme using DNNs that is based on the underlying physics processes of events in the semi-leptonic  $t\bar{t}H$  ( $H \rightarrow b\bar{b}$ ) decay channel. Furthermore, we discuss different methods employed for improving the network's categorization performance.

### Intended contribution length

20 minutes

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**Session Classification:** Session 5