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## Discrimination of muons and hadrons inside calorimeter using the artificial neural network

### Content :

The India-based Neutrino Observatory (INO) [1] is a proposed atmospheric neutrino experiment where a large magnetized Iron Calorimeter (ICAL) will be used as main detector. When cosmic neutrinos interact with iron nuclei, they will produce corresponding charged lepton together with hadron shower i.e., muons and hadrons will be produced from muon neutrino interaction.

Hence in calorimetric measurements of neutrino interactions, hits generated by muons and hadrons together in an event poses a challenge in identifying muon hits for reconstruction of tracks. An algorithm based on the Artificial Neural Network (ANN) is developed to separate out the muon events and muon hits from the hadron events and hadron hits respectively in a calorimeter. The muon identification efficiency of about 98 % with 10 % hadron background fraction were obtained when muon and hadron events are mixed in event-level. However, for a case where hits from two types of particle are embedded in an event (i.e. generated due to charged current interaction), the efficiency obtained is 67 % with < 40 % hadron background fraction. It is seen that ANN provides a considerably better performance compared to other conventional likelihood methods.

### Reference :

1. INO Project Report INO/2006/01, June 2006, (<http://www.imsc.res.in/~ino/>)

### Collaboration :

India-based Neutrino Observatory (INO) Collaboration

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