ROOT_FAME: Analysis Scripts for the Investigation of Fission Events

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Introduction and Motivation

ROOT_FAME provides the user with the ability to:

- Process CoMPASS and MIDAS experimental fission data
- Form coincidences of fission observables
- Discriminate and determine the correlation of emitted particles
- Analyze PSD, kinematic, and TOF figures
- Define unique system characterization

ROOT_FAME Artificial Neural Network extension:

- Determine the significance of cross-talk/room return events
- Provide a reliable and repeatable method of accurately discriminating against these events

Mission Relevance

NNSA Mission: Preventing nuclear weapons proliferation and reducing the threat of nuclear and radiological terrorism around the world.

Analyzing the relationship between fission observables will further our understanding of fission in SNM and contribute to NNSA's non-prolifieration objectives.

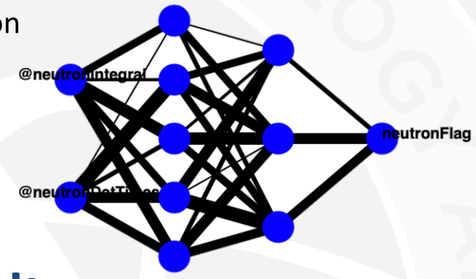
Technical Approach

Our goal was to provide a script that would continuously analyze the relationship between known experimental variables to isolate cross-talk events.

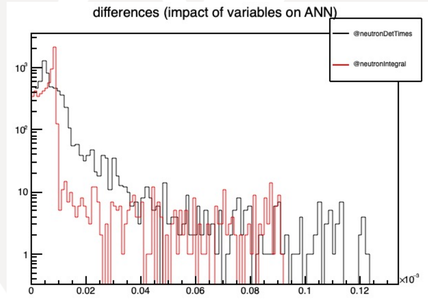
MCNPX-PoliMi simulated 1e7 nps on the FS-3 system.

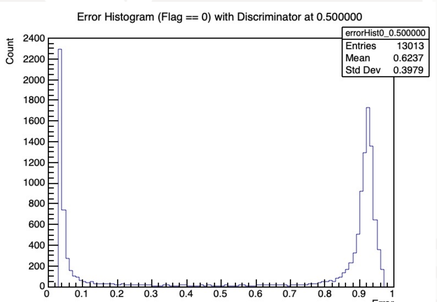
ROOT TMultiLayerPerceptron

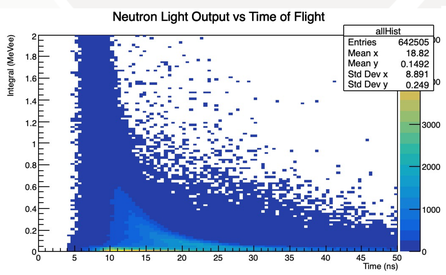
- Normalized input
- Restricted output
- Epoch: 100
- kBFGS method

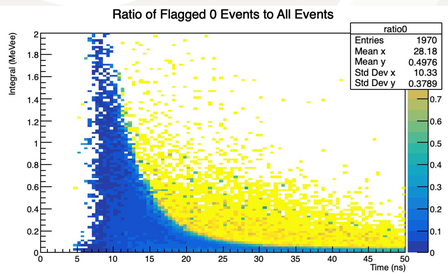


Results

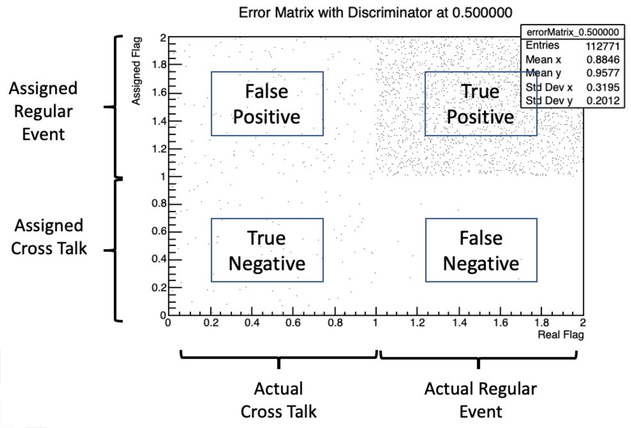








- User defined graphical cut had an accuracy of identifying cross-talk events of ~11%
- ANN had an accuracy of approximately 33%



MTV Impact

National Laboratory Collaborations:

- Los Alamos National Laboratory
- Oak Ridge National Laboratory
- Lawrence Livermore National Laboratory

MTV MCNP/MCNPX-PoliMi Workshop

Conclusion

Provides a repeatable and relatively accurate method to isolate cross-talk and room return events in unique configurations

Future work includes:

- Optimizing model to minimize identification error
- Adding ANN reliance on PSD
- Considering the "severity" of independent cross-talk events

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