SORTING CATEGORY: Q

TITLE: Shower Classification in the GlueX Experiment

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ABSTRACT:

The GlueX forward calorimeter is an array of 2800 lead glass modules that was constructed to detect photons produced in the decays of hadrons. We applied machine learning techniques to the classification of particle interactions in this calorimeter. These signals can be classified as either true electromagnetic showers, produced by photons, or background originating from charged particles or noise. To train and test the algorithms, we used reconstructed ω meson events which contain both true photons and charged particles that interact with the calorimeter. Different attributes of particle showers in the calorimeter (energy distribution, shower width, etc.) were used as distinguishing variables in training the machine learning algorithms. The selected data were used to optimize nine different types of machine learning algorithms to determine which would give the most effective final classifications between true and false photon showers. Algorithms were evaluated on efficiency, rate of false positives, runtime, and implementation complexity. The optimal method utilized was a multilayer perceptron algorithm with a signal efficiency of 94% for a background rejection rate of 90%.