Shower Classification in the GlueX Experiment[1] REBECCA BAR-
SOTTI, Univ of Texas, Dallas, MATTHEW SHEPHERD, Indiana University —
The GlueX forward calorimeter is an array of 2800 lead glass modules that was con-
structed 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 pho-
tons 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 se-
lected 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 pos-
itives, 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%.

Rebecca Barsotti
Univ of Texas, Dallas

Date submitted: 12 Jan 2018   Electronic form version 1.4