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Using Convolutional Neural Networks for Particle ID in Spherical Detectors THOMAS KLOSTERMAN, Univ of Chicago — Particle ID in high-energy particle detectors involves complicated heuristics redesigned for every new experiment. Neural networks are suited to this problem, because they can be passed arrays of PMT hit information from simulated events. Convolutional models for image categorization can be trained to distinguish between event types. An unexplored avenue is how to apply these techniques to experiments not using flat images, such as data in a spherical detector. I present a custom network that performs convolutions on data in their native spherical geometry, taking inspiration from a previously proposed geodesic convolution model, by Masci, et al. in 2015. An initial test distinguishes electrons of two different energies, a situation involved in separating high-energy neutrinos from background. When trained with 2000 sample events, the model could achieve 80% accuracy on a test set, which could be improved on by fine-tuning hyper-parameters. This is not significantly better than can be achieved with current energy fitting heuristics. But, this custom model still offers a new way of taking advantage of modern, high-powered image recognition tools and could be generalized to any non-flat detector shape.

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