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Neural Estimation of Energy Movers Distance

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We propose a novel neural architecture that enforces an exact upper bound on the Lipschitz constant of the model by constraining the norm of its weights. This architecture was useful in developing new algorithms for the LHCb trigger which have robustness guarantees as well as powerful inductive biases leveraging the neural network's ability to be monotonic in any subset of features. A new and interesting direction for this architecture is that it can also be used in the estimation of the Wasserstein metric (or the Earth Mover's Distance) in optimal transport using the Kantorovich-Rubinstein duality. We describe how such architectures can be leveraged for developing new clustering algorithms using the Energy Mover's Distance. Clustering using optimal transport generalizes all previous well-known clustering algorithms in HEP (anti-kt, Cambridge-Aachen, *etc.*) to arbitrary geometries and offers new flexibility in dealing with effects such as pile-up and unconventional topologies.

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