1154-42-1677 **Michael Perlmutter*** (perlmut6@msu.edu), **Feng Gao**, **Guy Wolf** and **Matthew Hirn**. *The Scattering Transform for Geometric Deep Learning.*

The scattering transform is a mathematical model of convolutional neural networks (CNNs) introduced for functions defined on Euclidean space by Stephané Mallat. It differs from traditional CNNs by using predesigned, wavelet filters rather than filters which are learned from training data. This leads to a network which provably has desirable mathematical properties such as translation invariance and diffeomorphism stability. Moreover, in situations where the wavelets can be designed in correspondence to underlying physics, it can produce numerical results which rival state of the art CNNs. However, many data sets of interest have an intrinsically non-Euclidean structure and are better modeled as graphs or manifolds. This motivates us to construct geometric versions of the scattering transform using the spectral decompositions of Laplace-Beltrami operator and Graph Laplacian. We will discuss applications of these networks to a variety of geometric deep learning tasks and show that analogously to its Euclidean predecessor, the manifold scattering transform possesses desirable invariance and stability properties with respect to the actions of the isometry and diffeomorphism groups. (Received September 16, 2019)