1157-68-99 **Michael Perlmutter*** (perlmut6@msu.edu), **Feng Gao**, **Guy Wolf** and **Matthew Hirn**.
Scattering Neural Networks for Graph Structured Data.

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. This motivates us to construct geometric versions of the scattering transform using the spectral decomposition of the Graph Laplacian. We will discuss applications of these networks to a variety of geometric deep learning tasks such as graph classification and show that, analogously to its Euclidean predecessor, the graph scattering transforms possess desirable invariance and stability properties. (Received January 20, 2020)