1145-65-1029 **Wei Zhu***, zhu@math.duke.edu, and **Qiang Qiu**, **Jiaji Huang**, **Robert Calderbank**, **Guillermo Sapiro** and **Ingrid Daubechies**. *LDMNet: Low Dimensional Manifold Regularized Neural Networks.*

Deep neural networks have proved successful when large training sets are available, but when the training data are scarce, their performance suffers from overfitting. Many existing methods of reducing overfitting are data-independent. Data-dependent regularizations are mostly motivated by the observation that data of interest lie close to a manifold, which is typically hard to parametrize explicitly. To resolve this, we propose the Low-Dimensional-Manifold-regularized neural Network (*LDMNet*), which incorporates a feature regularization method that focuses on the geometry of both the input data and the output features. In *LDMNet*, we regularize the network by encouraging the combination of the input data and the output features to sample a collection of low dimensional manifolds, which are searched efficiently without explicit parametrization. To achieve this, we directly use the manifold dimension as a regularization term in a variational functional. In the experiments, we show that *LDMNet* significantly outperforms widely-used regularizers. Moreover, *LDMNet* can extract common features of an object imaged via different modalities, which is very useful in real-world applications such as cross-spectral face recognition. (Received September 18, 2018)