On the Transferability of Spectral Graph Filters and CNNs

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The rise of graph-structured data such as social networks, regulatory networks, citation graphs, and functional brain networks, in combination with resounding success of deep learning in various applications, has brought the interest in generalizing deep learning models to signals defined over graphs. This talk focuses on spectral graph convolutional neural networks (CNNs), where filters are defined as elementwise multiplication in the frequency domain of a graph. In machine learning settings where the dataset consists of signals defined on many different graphs, the trained filters should generalize to signals on graphs unseen in the training set. It is thus important to transfer filters from one graph to the other. Transferability, which is a certain type of generalization capability, can be loosely defined as follows: if two graphs describe the same phenomenon, then a single filter should have similar repercussions on both graphs. In this talk we show that spectral filters and CNNs are transferable under a reasonable definition of “two graphs describe the same phenomenon”.