

# Haar Graph Pooling

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## Abstract

Deep Graph Neural Networks (GNNs) are useful models for graph classification and graph-based regression tasks. In these tasks, graph pooling is a critical ingredient by which GNNs adapt to input graphs of varying size and structure. We propose a new graph pooling operation based on compressive Haar transforms — *HaarPooling*. HaarPooling implements a cascade of pooling operations; it is computed by following a sequence of clusterings of the input graph. A HaarPooling layer transforms a given input graph to an output graph with a smaller node number and the same feature dimension; the compressive Haar transform filters out fine detail information in the Haar wavelet domain. In this way, all the HaarPooling layers together synthesize the features of any given input graph into a feature vector of uniform size. Such transforms provide a sparse characterization of the data and preserve the structure information of the input graph. GNNs implemented with standard graph convolution layers and HaarPooling layers achieve state of the art performance on diverse graph classification and regression problems.