

Graph Neural Networks – Overview

- GNNs are neural networks that can be directly applied to graphs
- provide an easy way to do **node-level, edge-level, and graph-level** prediction tasks
 - Node Classification: labeling of samples, semi-supervised usually
 - Graph Classification: classify the whole graph into different categories
 - Link prediction: predict whether there's a connection between two entities
- CNNs fail on graphs
 - Convolution and pooling layers to identify spatially localized features
 - center node of center pixel aggregates information from its neighbors, as well as from itself, to produce a new value.
 - very difficult to perform CNN on graphs because of the arbitrary size of the graph, and the complex topology, which means there is no spatial locality
- GNNs goal is to map nodes so that similarity in the mapped embedding space approximates similarity in the network
 - Encoding functions to convert from input to d-dimensional embedding space. It performs:
 - Locality (local network neighborhoods)
 - Aggregate information
 - Done using NNs
 - Stacking multiple layers (computation)
- Training
 - Unsupervised: use only the graph structure
 - Supervised: node classification, normal or anomalous node
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