Preliminaries

Graph Convolutional Networks

- GCN is one of the most effective convolution models
  - Considered as a general "message-passing" architecture
  - $\mathbf{H}_k = M\left(\mathbf{A}, \mathbf{H}_{k-1}; \boldsymbol{W}_{k-1}\right)$: hidden feature matrix computed by k-th GCL
    - $\mathbf{A}$: adjacency matrix
    - $\mathbf{H}_{k-1}$: hidden feature matrix
    - $\boldsymbol{W}_{k-1}$: trainable parameters
    - M: message propagation function for GCN

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- M defined in 1stChebNet (Kipf and Welling 2017) as follow:
- $\mathbf{H}_k = M\left(\mathbf{A}, \mathbf{H}_{k-1}; \boldsymbol{W}_{k-1}\right) = \sigma\left(\hat{\mathbf{A}}\mathbf{H}_{k-1}\boldsymbol{W}_{k-1}\right)$
  - $\hat{\mathbf{A}} = \tilde{\mathbf{D}}^{-\frac{1}{2}}\tilde{\mathbf{A}}\tilde{\mathbf{D}}^{-\frac{1}{2}}$: normalized adjacency matrix
  - $\tilde{\mathbf{A}} = \mathbf{A} + \mathbf{I}_N$: adding self-connection
  - $\tilde{\mathbf{D}}_{ii} = \Sigma_j \tilde{\mathbf{A}}_{ij}$: degree of the i-th node