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3.a

[**?**]

Kipf and Welling approximate a filter of a graph signal x in the spectral domain by

$$g_\theta \star x = U g_\theta U^\top x \approx \sum_{k=0}^{K} \theta'_k T_k(\tilde{L}) x.$$

Here g_θ is a diagonal matrix acting as a filter, T_k is the Chebyshev polynomials of the $k-th$ order, and $\tilde{L}$ being a scaled and translated version of the graph Laplacian L. Since $T_k(\tilde{L})$ is a Kth-order polynomial in the Laplacian L, the expression only depends on nodes that are at maximum K steps away from the central nodes. Hence, the expression is K-localized. This is analogous to the convolutional layers of CNNs.

Limitations of this approach include that memory requirement grows linearly in the number of edges.