

# Graph Neural Networks

Muchang Bahng

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# 1 Graph Neural Networks

Now we want to process data in a graph, which has no direct grid structure. The adjacency matrix may not be enough. For example, the molecular structure. Applications in recommender systems.

The absolute value of the determinant of the cofactor expansion of a Laplacian matrix tells you the number of minimum spanning trees of the graph.

Let  $\mathcal{L} = \Delta$  with  $\mathcal{L}u = \Delta u$ .

$$\Delta u = \lambda u = \sum_{i=1}^n \frac{\partial u}{\partial x_i} \quad (1)$$

for some  $\lambda < 0$ . The eigenvectors of  $L$  are the fourier basis. This turns convolution into multiplication.

$$\frac{d^2 x}{dt^2} = -\lambda x \quad (2)$$

## References