GNN Script

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1 Message Passing Graph Neural Networks

1.1 Introduction

The idea behind message passing GNNs is **k - hop neighborhood aggregation**. One single GNN layer can be looked at as one single hop.

A GNN layer mainly consists of two parts: **Message Computation** and **Aggregation**.

1.1.1 Message Computation

Each node computes a message based on it's embedding in the previous layer.

$$m_u^{(l)} = \phi^{(l)} \left(h_u^{(l-1)} \right)$$

$m_u^{(l)}$	...	message of node u in layer l
$\phi^{(l)}$	...	message computation function of layer l
$h_u^{(l-1)}$	...	node u's embedding in layer l - 1

1.1.2 Aggregation

Node v's new embedding is computed by aggregating its own message as well as all of its neighbor node's messages.

$$h_v^{(l)} = \sigma \left(\square^{(l)} \left(\{ m_u^{(l)} \mid u \in N(v) \}, m_v^{(l)} \right) \right)$$

σ	...	nonlinear activation function
$h_v^{(l)}$	...	node v's new embedding in layer l - 1
$\square^{(l)}$	...	aggregation function of layer l
$m_u^{(l)}$	...	message of node u in layer l
$N(v)$	...	neighborhood of node v

$$3^x - (\sqrt{3})^{x+4} + 20 = 0$$

$$<=> (\sqrt{3^x} - 4.5)^2 - \frac{1}{4} = 0$$

$$<=> (\sqrt{3^x} - 4.5)^2 = \frac{1}{4}$$

$$<=> \sqrt{3^x} - 4.5 = +- \sqrt{\frac{1}{4}}$$

$$<=> \sqrt{3^x} = +- 0.5 + 4.5$$

$$=> \sqrt{3^{x_0}} = 5$$

$$<=> 3^{x_0} = 5^2$$

$$<=> x_0 = \log_3 5^2$$

$$<=> x_0 = 2 * \log_3 5$$

$$=> \sqrt{3^{x_1}} = 4$$

$$<=> 3^{x_1} = 4^2$$

$$<=> x_1 = \log_3 4^2$$

$$<=> x_1 = 2 * \log_3 4$$

$$=> s = 2 * \log_3 5 + 2 * \log_3 4$$

$$<=> s = 2 * (\log_3 5 + \log_3 4)$$

$$<=> s = 2 * \log_3 5 * 4$$

$$<=> s = 2 * \log_3(20)$$