Transductive Learning: (转导推理) 直推式

"reasoning from observed, specific (training) cases to specific (test) cases"

"只能经测在其训练过程中用过的样本"

Inductive Learning (归纳式)

"reasoning from observed training cases to general rules, which are then applied to the test cases"

(从特定任务到一般任务的学习)

"只要样本特征属于同样的既有类别，即可进行预测"

Sample / Aggregate

GraphSAGE (把节点的表示构建好)

"Generate nodes' embeddings by sampling and aggregating features from a node's local neighborhood"

Node Embedding Approaches

aggregator functions

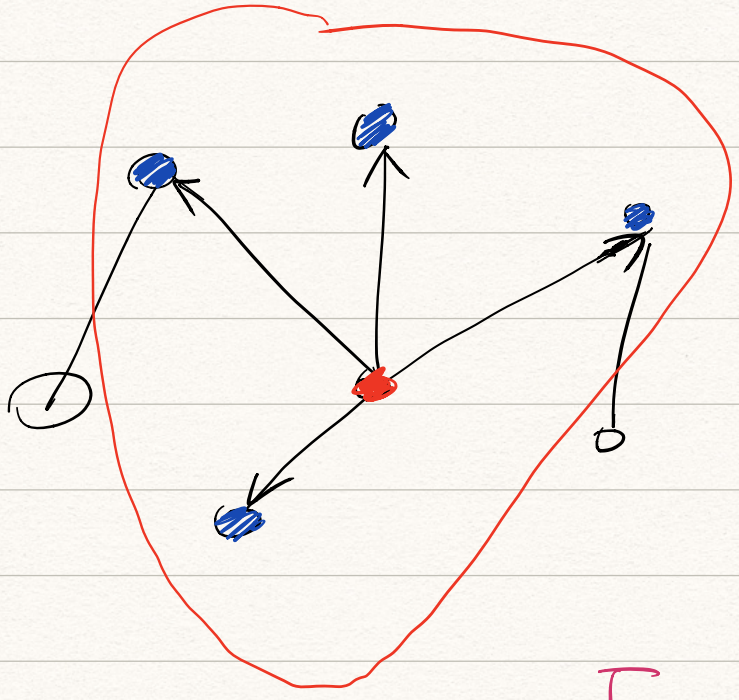
"Learn to aggregate feature information from a node's local neighborhood"

K aggregator functions

$$\begin{cases} AGGREGATE_k, & \forall k \in \{1, \dots, k\} \\ W^k, & \forall k \in \{1, \dots, k\} \\ X_v, & \forall v \in V \end{cases}$$

$$h_{N(v)}^{k} \leftarrow \text{AGGREGATE}_k\left(\{h_u^{k-1}, \forall u \in N(v)\}\right)$$

$$h_v^k \leftarrow \sigma\left(W^k \cdot \text{CONCAT}\left(h_v^{k-1}, h_{N(v)}^{k}\right)\right)$$



Function

$$h_{N(v)}^{k-1} = \left\{h_u^{k-1}, \forall u \in N(v)\right\}$$

Single Vector

$$h_v^k \qquad \left\{h_v^{k-1}, h_{N(v)}^{k-1}\right\}$$

Concatenate

Concat

k: current step in the outer loop

(depth of the search)

$N(v)$: fixed-size

uniform draw from

$$\{u \in V : (u, v) \in E\}$$

Aggregator: symmetric

Mean Operator:

$$h_v^k \leftarrow \sigma\left(W \cdot \text{Mean}\left(\{h_v^{k-1}\} \cup \{h_u^{k-1}, \forall u \in N(v)\}\right)\right)$$

$$h_v^k \leftarrow \sigma\left(W \{h_v^{k-1}\} \sqcup \text{MEAN}\left(\{h_u^{k-1}, \forall u \in N(v)\}\right)\right)$$

Pooling aggregator:

$$\text{AGGREGATE}_k^{\text{pool}} =$$

$$\max\left(\left\{\sigma\left(W_{\text{pool}} h_{u_i}^k + b\right), \forall u_i \in \mathcal{N}(v)\right\}\right)$$

Loss Function

update $W^k \quad \forall k \in \{1, \ldots, k\}$

$$J_G(z_u) = -\log\left(\sigma\left(z_u^T z_v\right)\right) - Q \cdot \mathbb{E}_{v_n \sim P_n(v)} \log\left(\sigma\left(-z_u^T z_{v_n}\right)\right)$$

Q: number of negative samples

$P_n(v)$: negative sampling distribution

"nearby nodes have similar representations,

representations of disparate nodes are highly distinct"

V : a node that co-occurs near u

on fixed-length random walk

$$z_v \leftarrow h_v^k$$

z_u : generated from the features

contained within a node's local neighborhood

(embedding lookup)

$$z_u, \quad \forall u \in V$$