Transductive Learning: (转导推理) 直推式

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

"只能处理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"

（从特征样本到一般性等的学习）

"只需样本特征属于同样的已拟空间，即可进行预测"

Sample / Aggregate

Graph SAGE （相对的异构建邻域）

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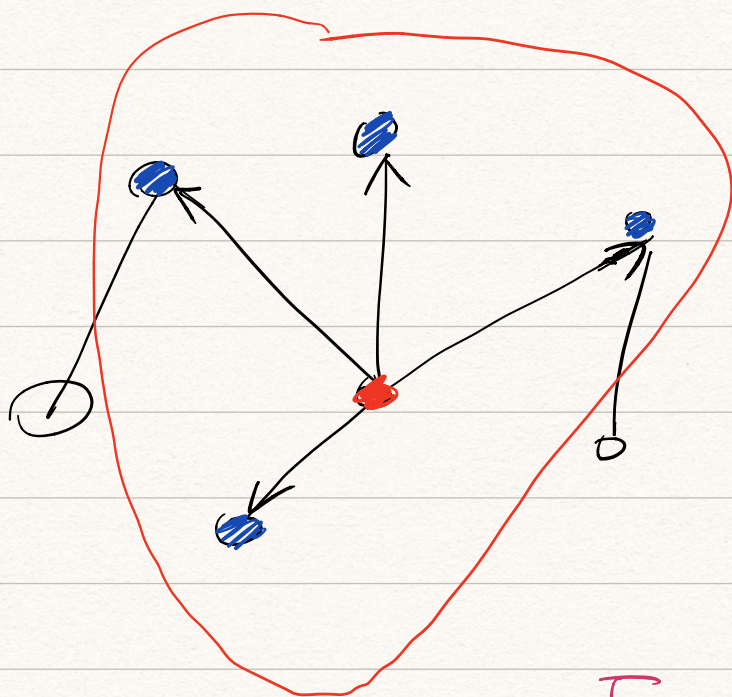
Node Embedding Approaches

aggregator functions

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

K aggregator functions

$$\begin{cases} \text{AGGREGATE}_k, \quad \forall k \in \{1, \cdots, k\} \\ W^k, \quad \forall k \in \{1, \cdots, k\} \\ X_v, \quad \forall v \in V \end{cases}$$

$$h^k_{N(v)} \leftarrow \text{AGGREGATE}_k(\{h^{k-1}_u, \forall u \in N(v)\})$$

$$h^k_v \leftarrow \sigma(W^k \cdot \text{CONCAT}(h^{k-1}_v, h^k_{N(v)}))$$

Function

$$h^{k-1}_{N(v)} = \boxed{\{h^{k-1}_u, \forall u \in N(v)\}} \quad \text{Single Vector}$$

$$h^k_v \quad \boxed{\{h^{k-1}_v, h^{k-1}_{N(v)}\}} \quad \text{Concatenate}$$

Concat

k: current step in the outer loop

    (depth of the search)

$N(v)$: fixed-size

    uniform draw from

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

Aggregator : <u>symmetric</u>

Mean Operator:

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

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

Pooling aggregator :

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

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

Loss Function

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

$$J_G(z_u) = -\log\left(\sigma\left(z_u^\top z_v\right)\right) - $$

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

number of negative samples   negative sampling distribution

"nearby nodes have similar representations,

representations of disparate nodes are

highly distinct"
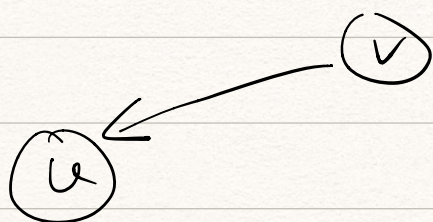
V : a node that co-occurs near u

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)

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