Heterogeneous Graph Representation Learning

Yuxiao Dong, Ziniu Hu, Kuansan Wang, Yizhou Sun, Jie Tang

Heterogeneous Graph Transformer (HGT)
- it uses attention to model each type of nodes and edges, so **NO meta paths**
- it can automatically output the **importance** of implicit meta paths
- it is straightforward for heterogeneous graph pre-training & fine-tuning
- it can also support dynamic heter. graphs

**Open & Reproducible Graph Research**
- Open Graph Benchmark **OGB**
- Open Academic Graph (OAG)
- **Open Academic Graph (OAG)**
  - [https://ogb.stanford.edu/docs/leader_nodeprop/#ogbn-mag](https://ogb.stanford.edu/docs/leader_nodeprop/#ogbn-mag)
  - [https://www.aminer.cn/oag-2-1](https://www.aminer.cn/oag-2-1)
  - [https://github.com/HeterogeneousGraph](https://github.com/HeterogeneousGraph)

**Contrastive Pre-Training across Heter. Graphs**

**Generative Pre-Training of One (Heter.) Graph**

**Open Academic Graph (OAG)**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Method</th>
<th>Test Accuracy</th>
<th>Validation Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HGT (LADIES Sample)</td>
<td>0.5007 ± 0.0043</td>
<td>0.5124 ± 0.0039</td>
</tr>
<tr>
<td>2</td>
<td>Graph/Saint (R-GCN app)</td>
<td>0.4751 ± 0.0022</td>
<td>0.4837 ± 0.0026</td>
</tr>
</tbody>
</table>

**Contact:**
- ericdongyx@gmail.com, (bull, yzsun)@cs.ucla.edu
- kuansanw@microsoft.com, jietang@tsinghua.edu.cn

**Open Academic Graph (OAG)**

**Generative Pre-Training of One (Heter.) Graph**

- `Attention_{HGT}(s, e, t) = \text{Softmax}_{\forall s \in N(t)} \left( \left\| ATT\text{-head}^i(s, e, t) \right\|_2 \right)`
  
  - `ATT\text{-head}^i(s, e, t) = \left( K^i(s) W^{ATT}_\phi(t) Q^i(t)^T \right)`
  
  - `K^i(s) = \text{K-Linear}_\tau^i(s) (H^{[i-1]}_s)`
  
  - `Q^i(t) = \text{Q-Linear}_\tau^i(t) (H^{[i-1]}_t)`

- it can avoid manually designing meta paths for each dataset?

- `can we avoid manually designing meta paths for each dataset?`