Metapath2vec

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DONG, Yuxiao; CHAWLA, Nitesh V.; SWAMI, Ananthram. metapath2vec: Scalable representation learning for heterogeneous networks. In: *Proceedings of the 23rd ACM SIGKDD international conference on knowledge discovery and data mining*. 2017. p. 135-144.

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(my laptop not powerful enough😊)

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06

01 Metapath

So far we sow some **homogeneous** type of graphs:

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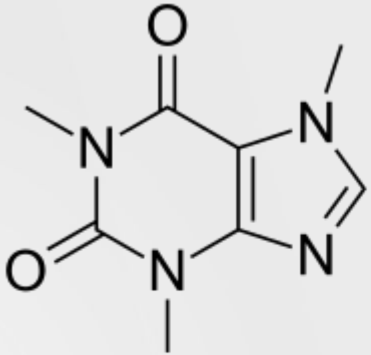
- CiteSeer
- Cora



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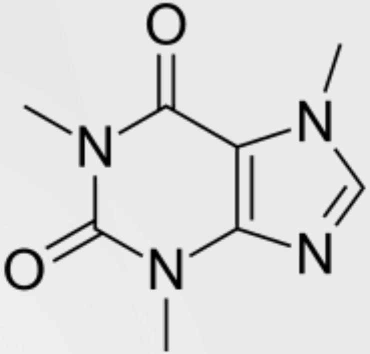

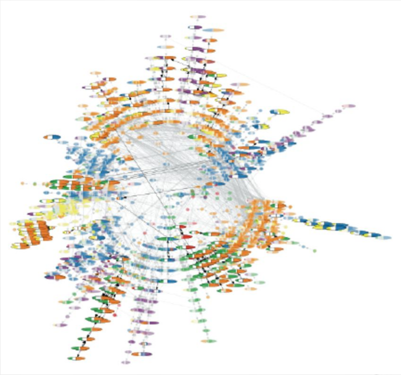

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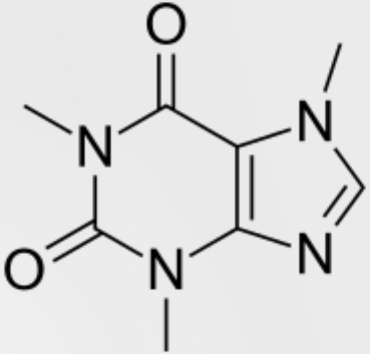

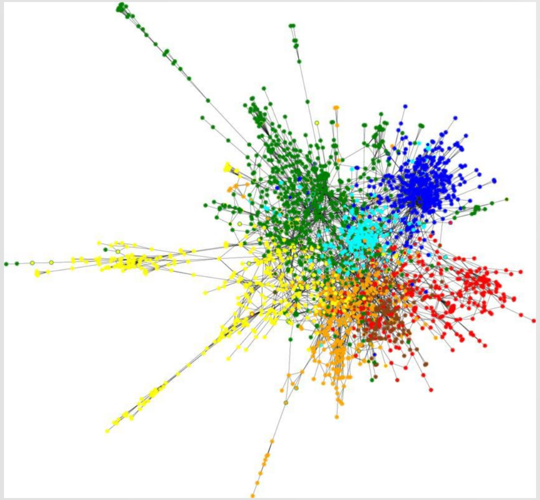

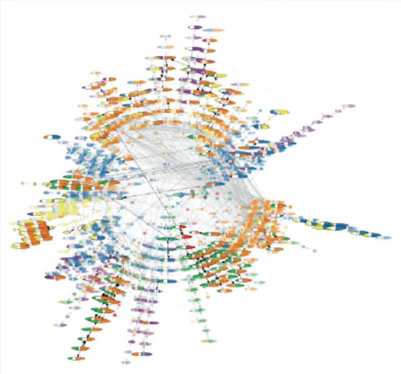

01 Metapath

What are **heterogeneous** graph?

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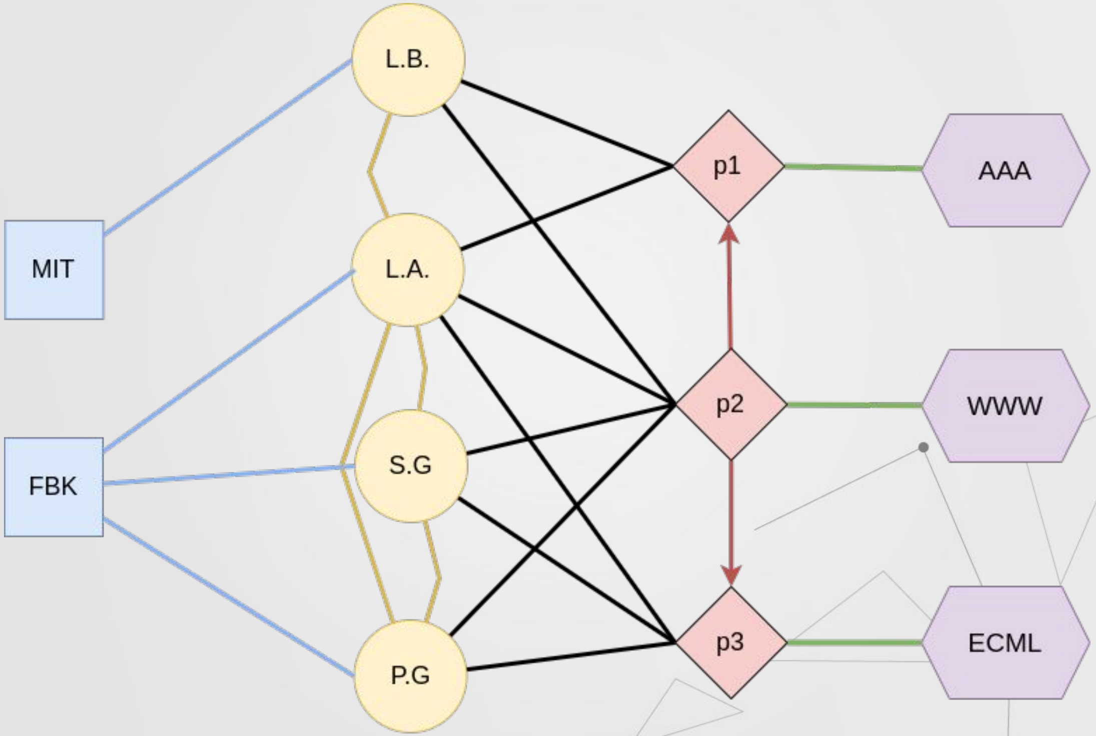
An heterogeneous graph is a graph in witch nodes and edges have differents types.

01 Metapath

For instance:



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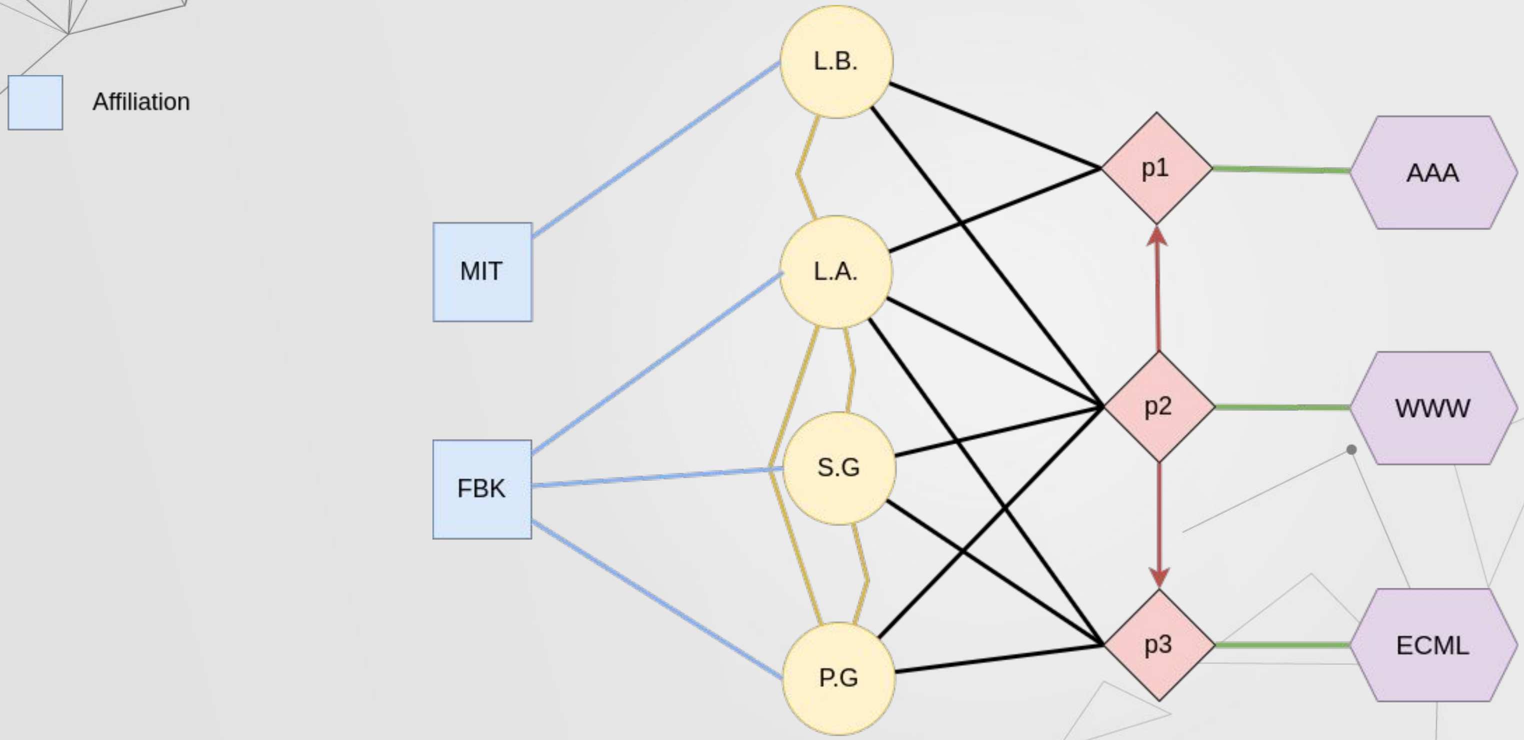

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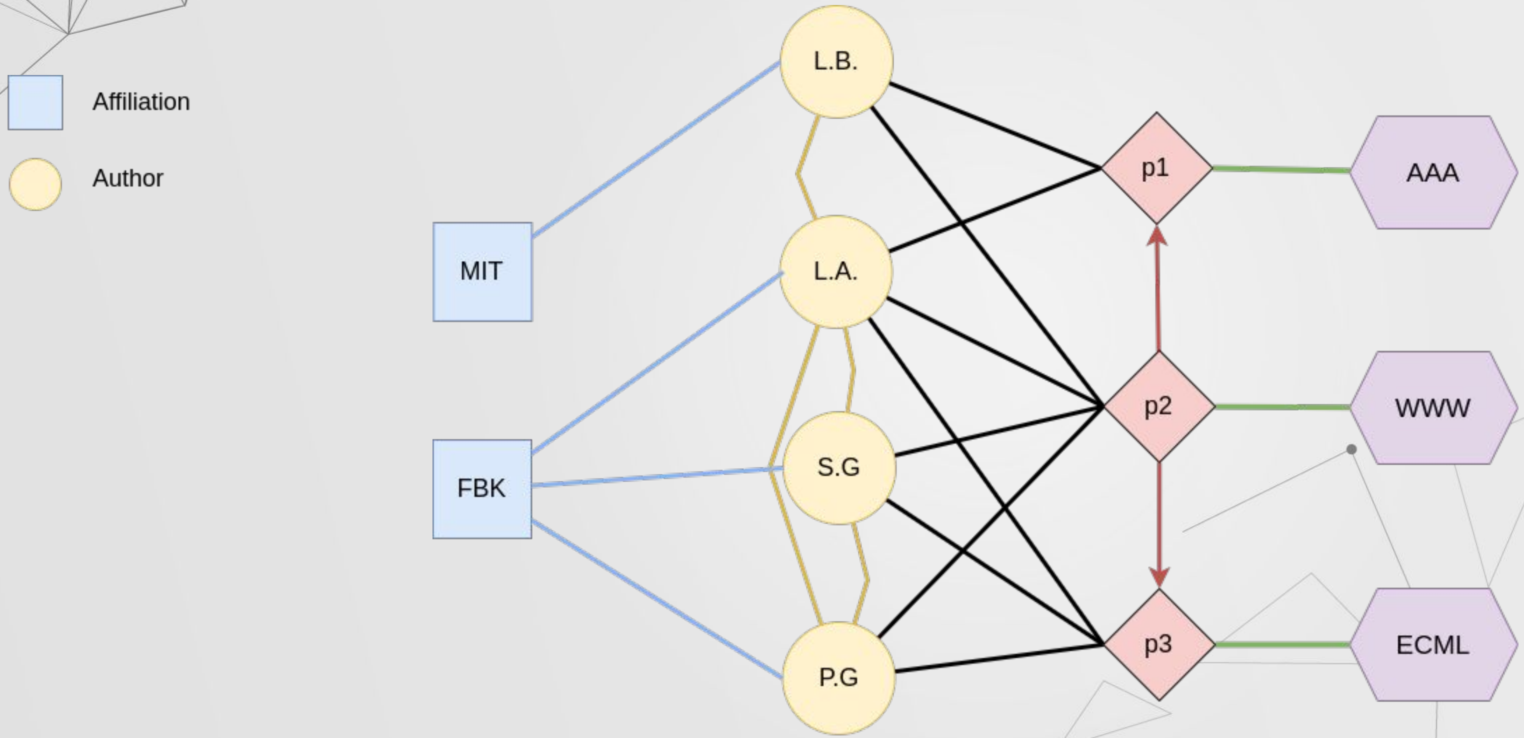

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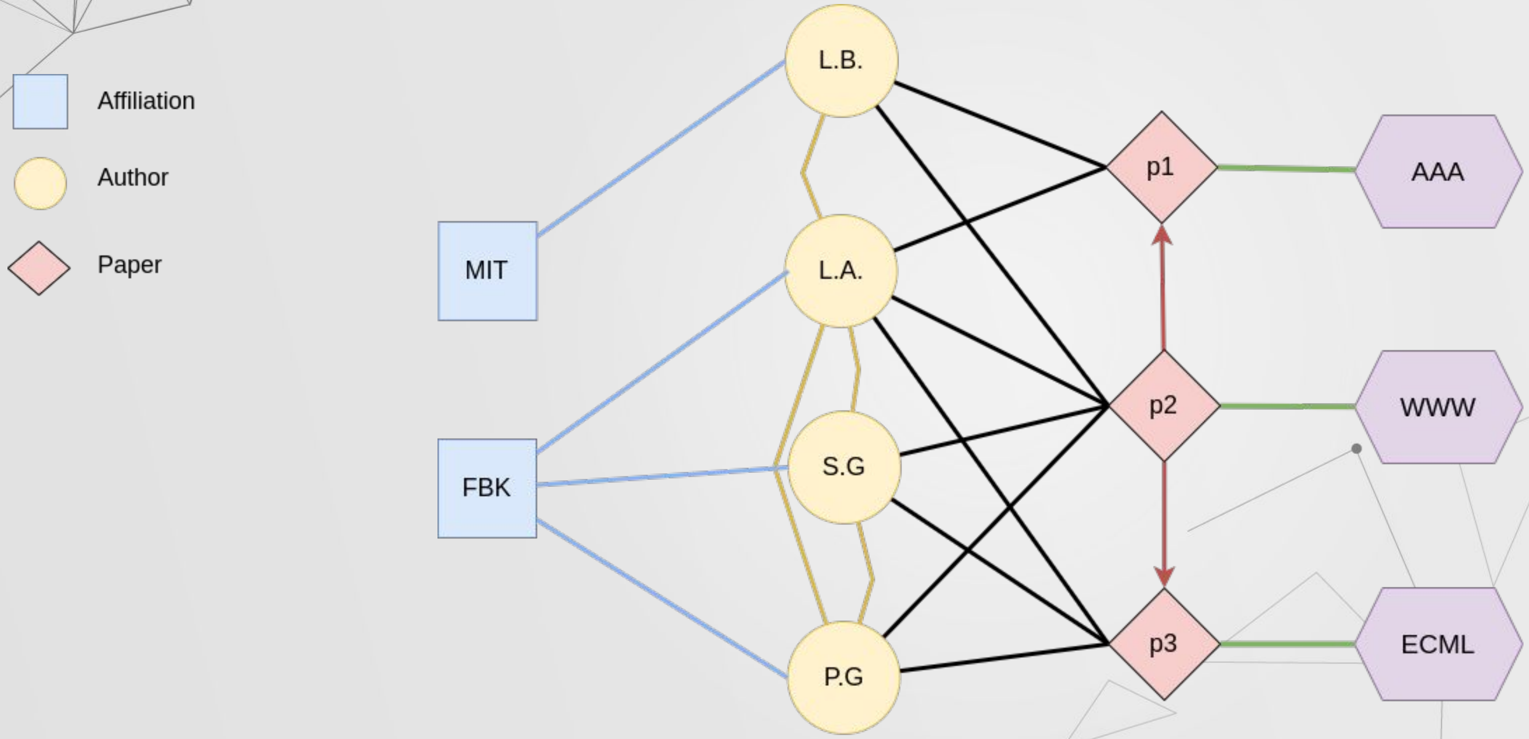

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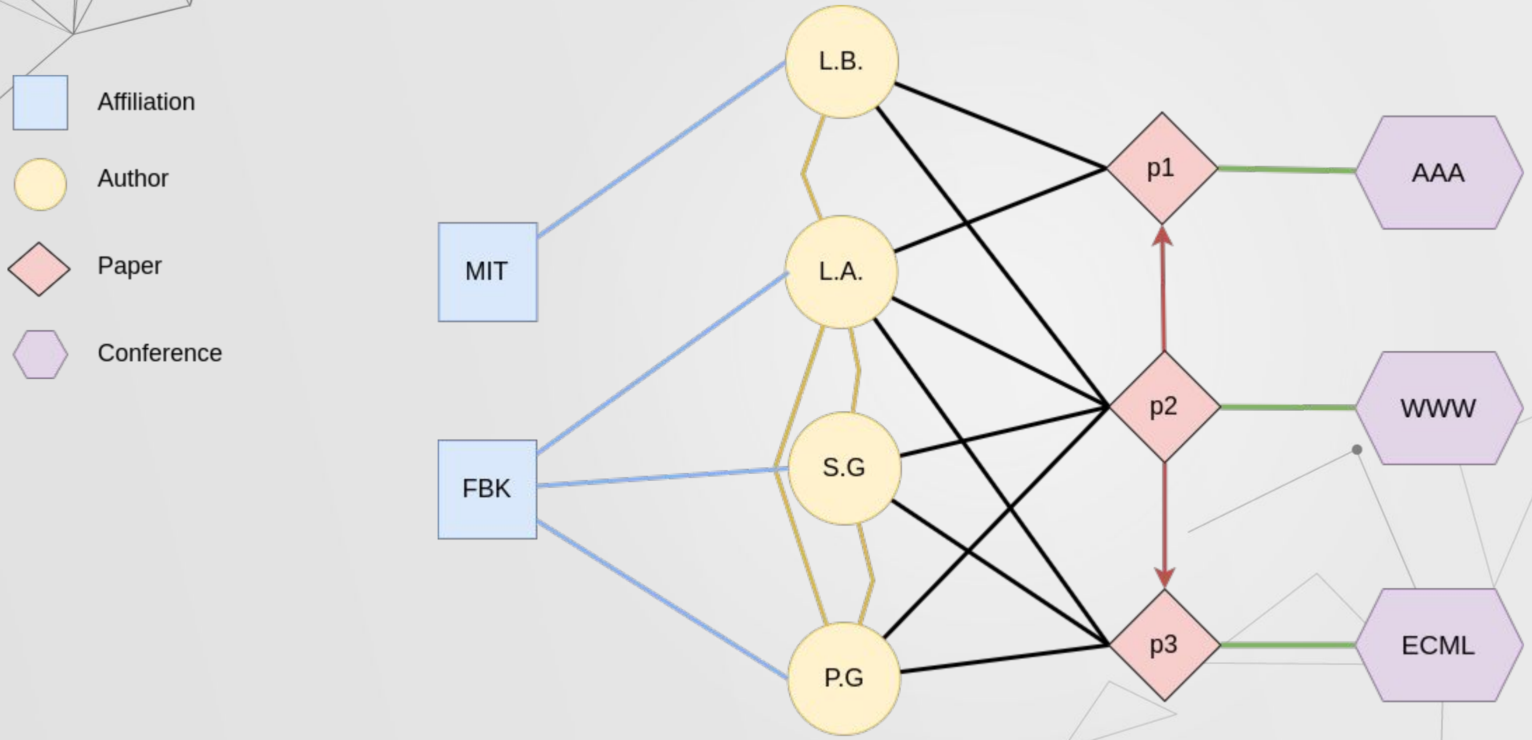

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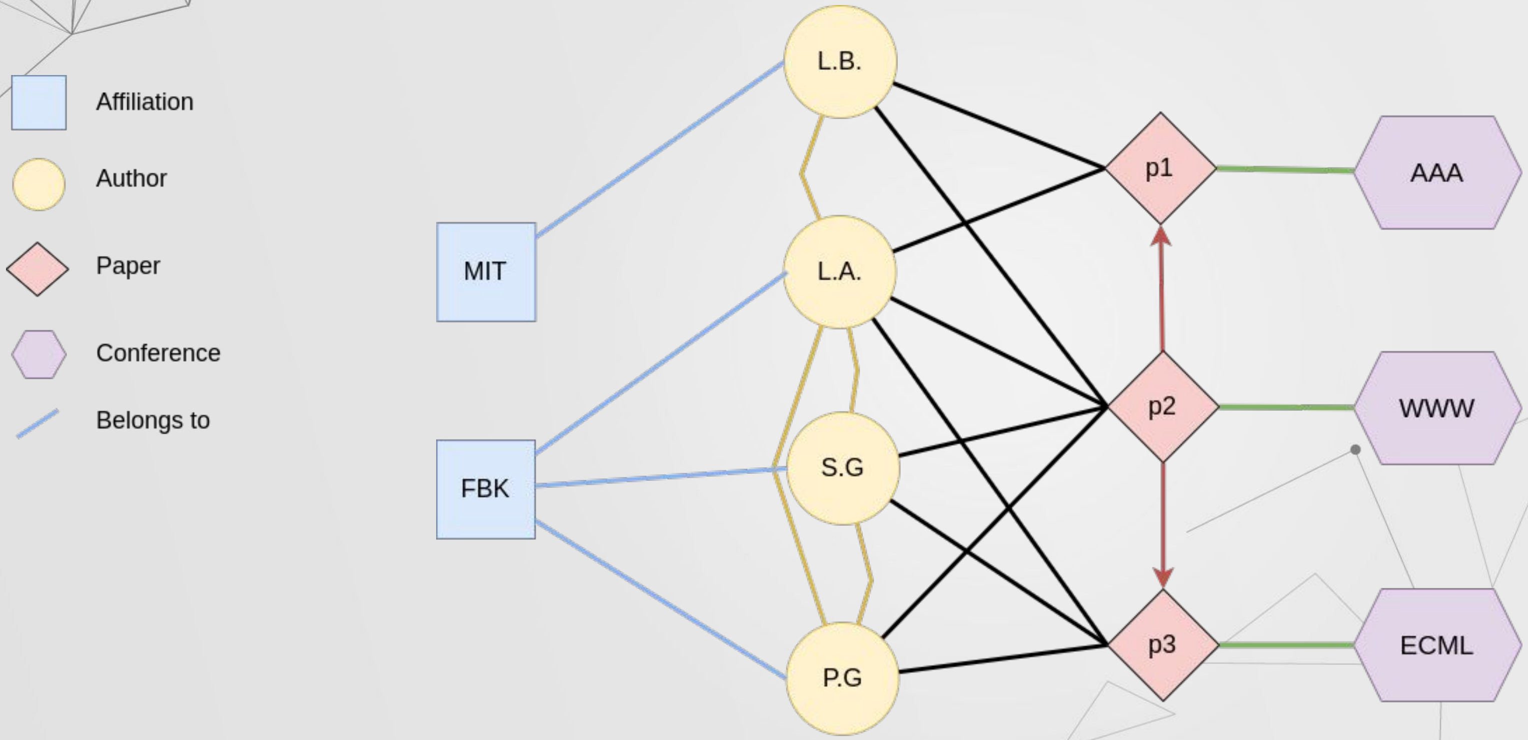

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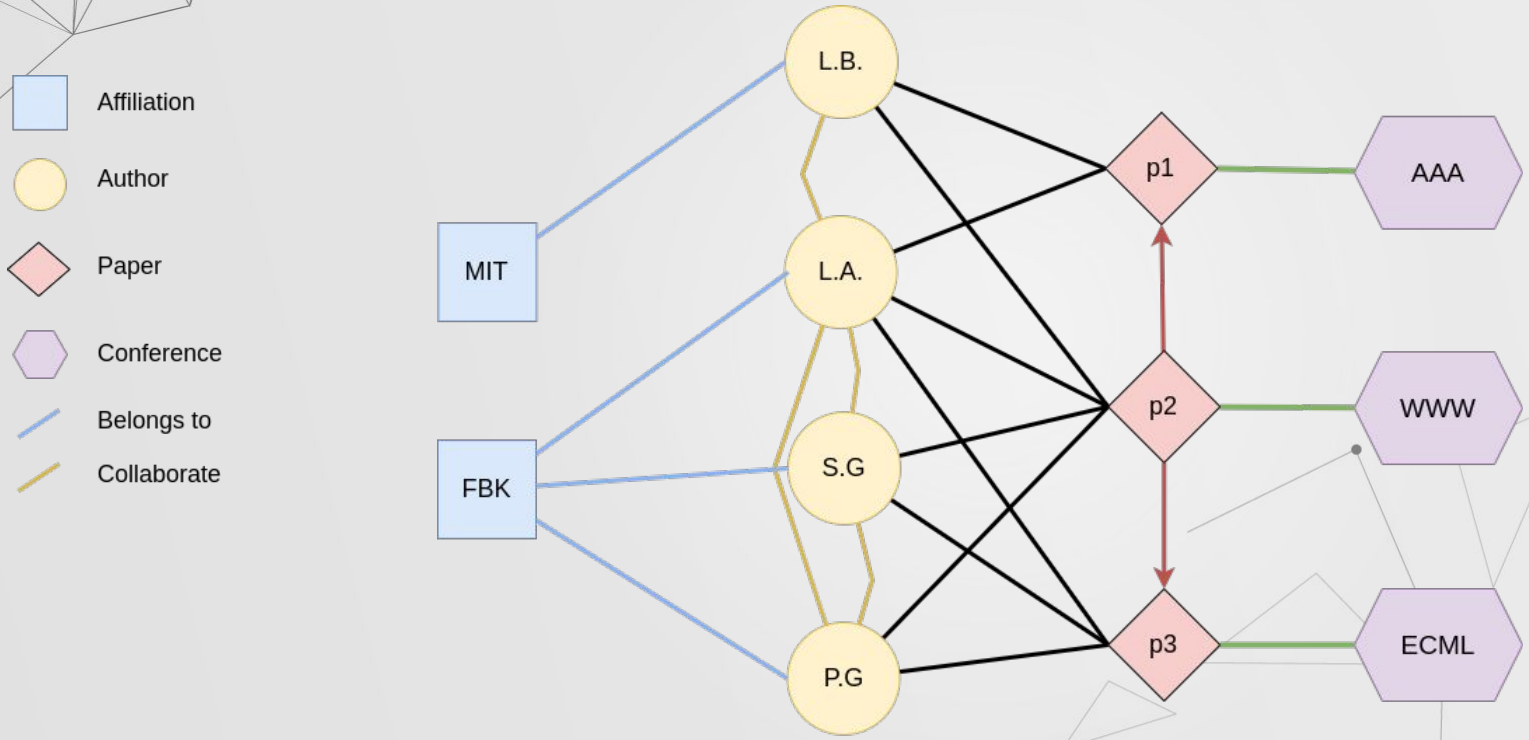

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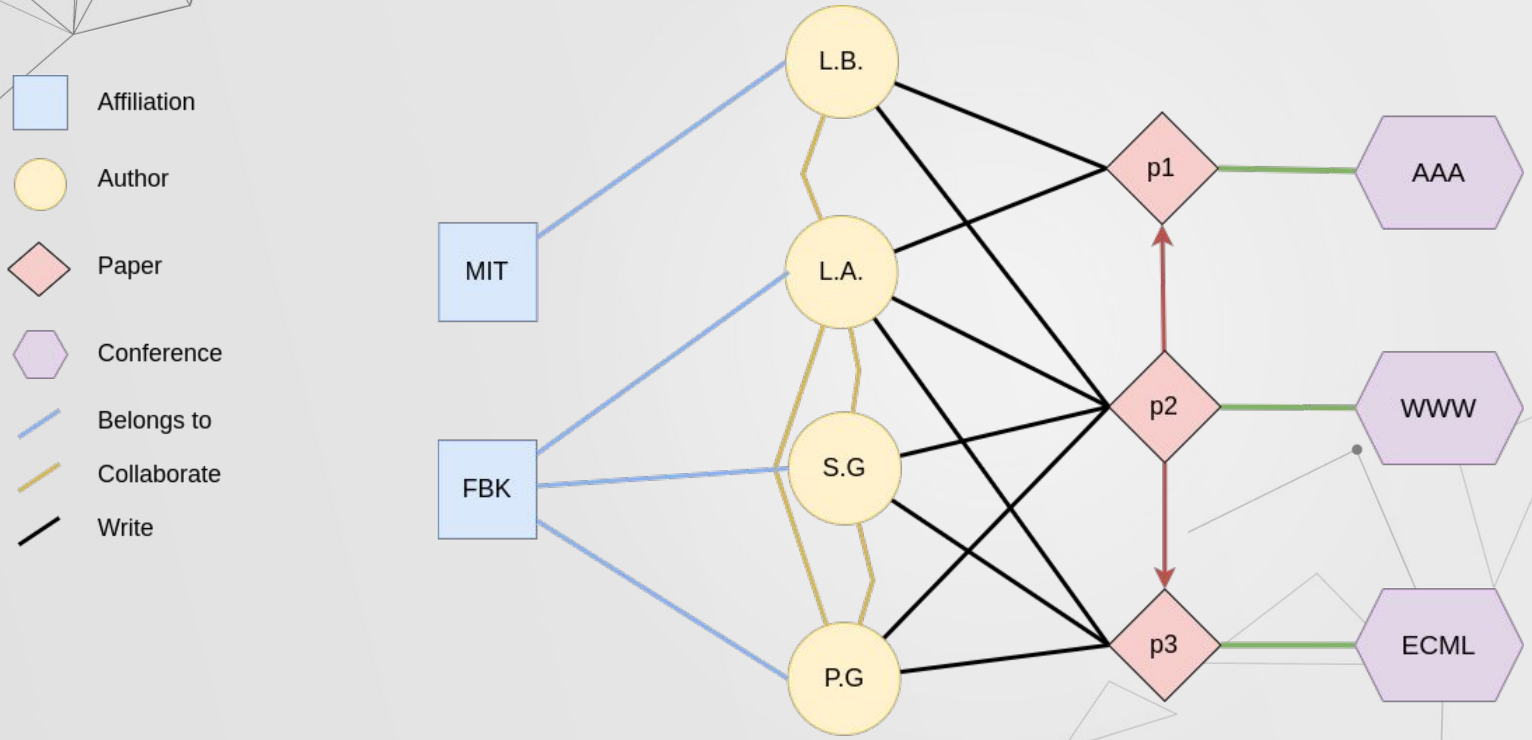

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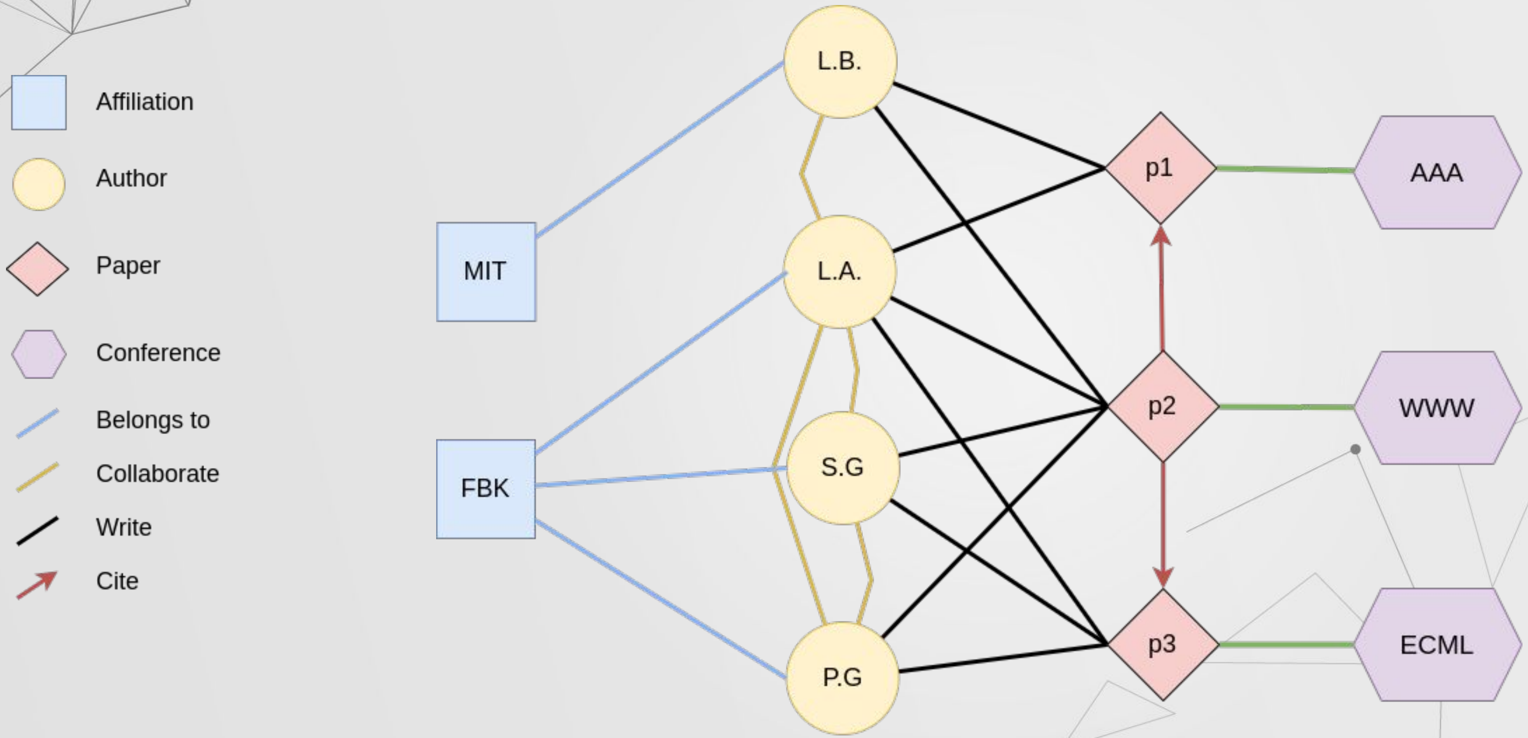

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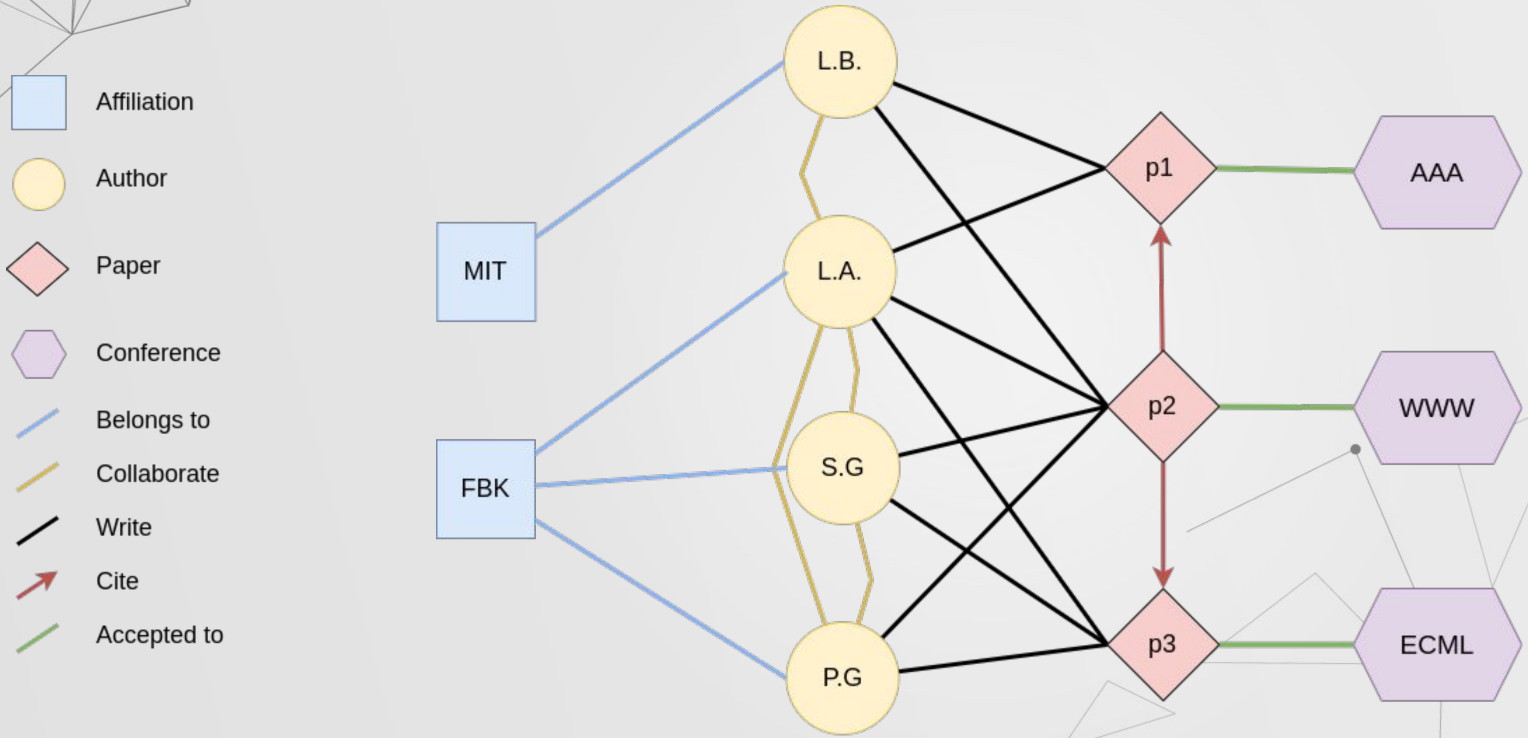

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Def:
A **meta path** in a heterogeneous graphs, is a path following a specific meta path scheme P.

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A **meta path scheme** P is defined as a path that is denoted in the form of :

$$V_1 \to^{r_1} V_2 \to^{r_2} V_3 \to^{r_3} V_4 \to^{r_4} \dots V_{l-1} \to^{r_{l-1}} V_l$$

Wherein

$$R = R_1 \cdot R_2 \cdot R_3 \cdot \dots R_{l-1}$$

Defines the composite relations between nodes types V_1 and V_l

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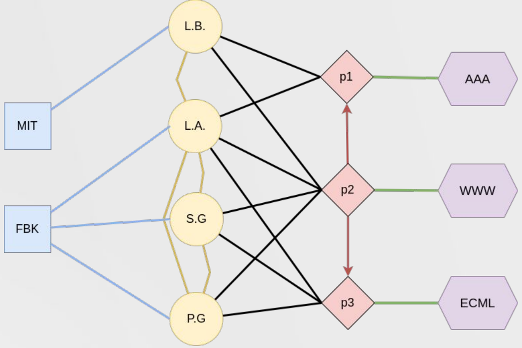

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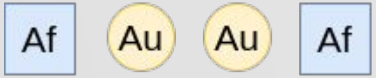

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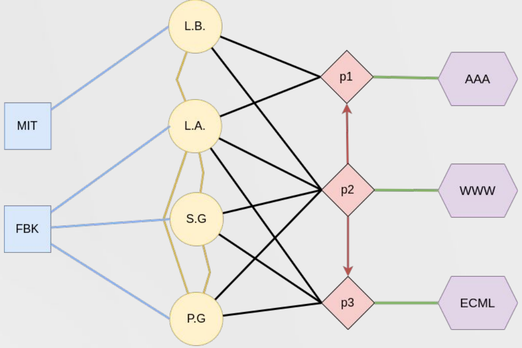

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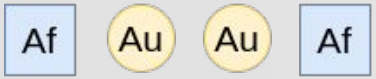

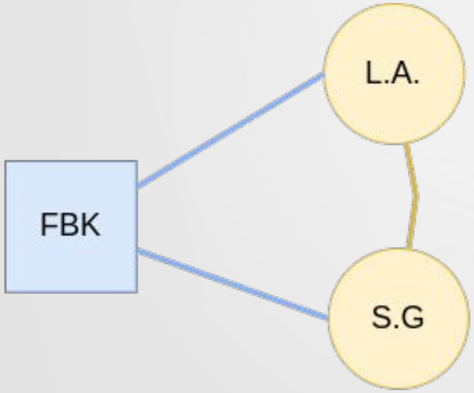

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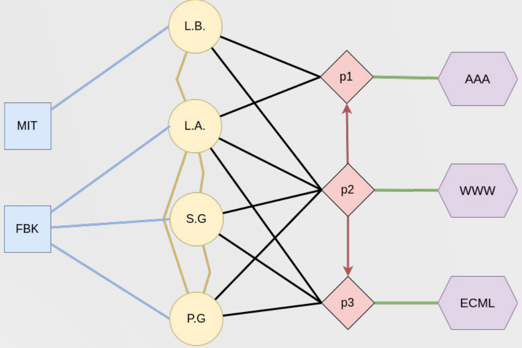

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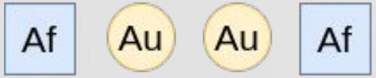

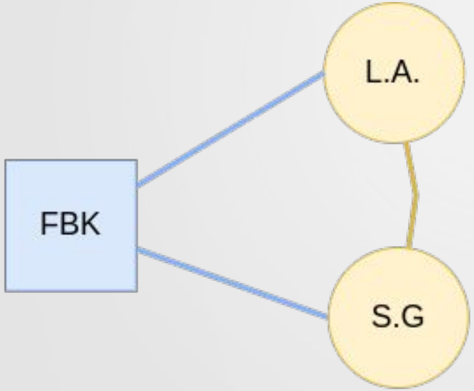

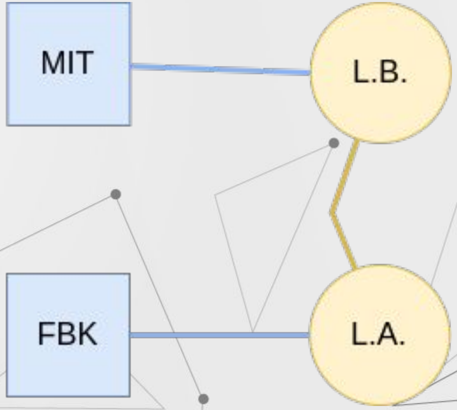

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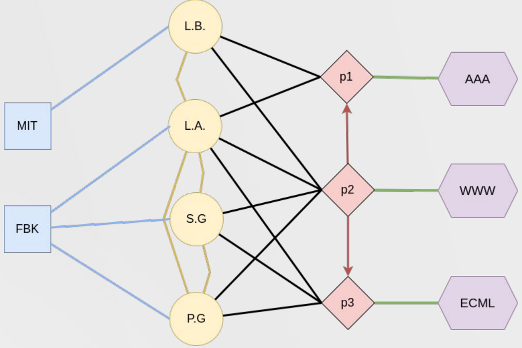

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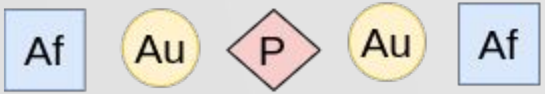

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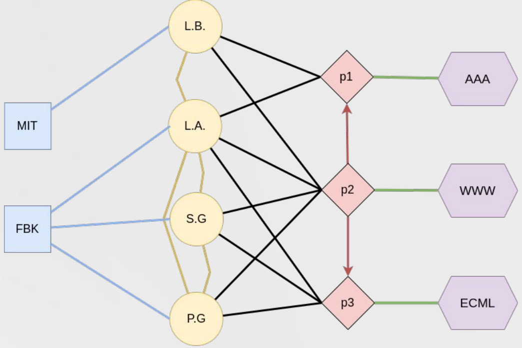

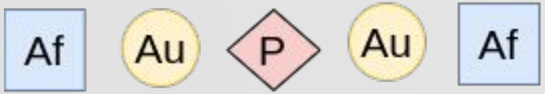

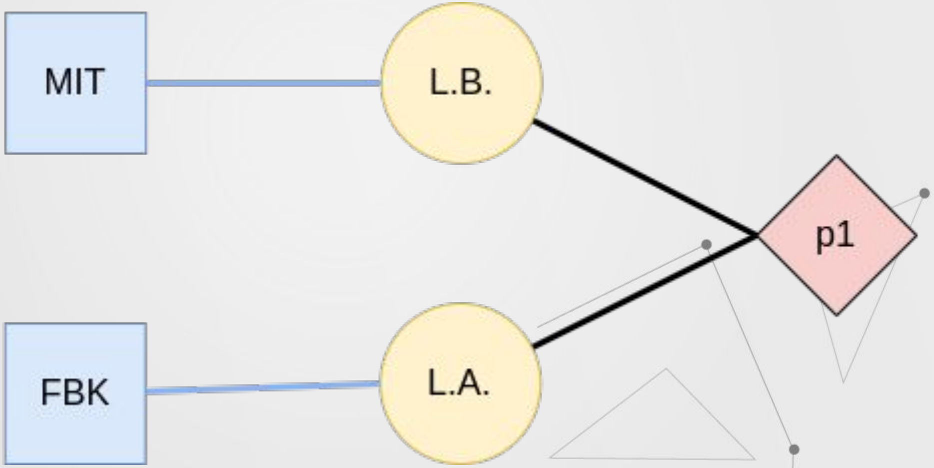

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Node at time i +1

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Function that compute the type of a node

Node at time i +1

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Scheme

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Metapath2vec

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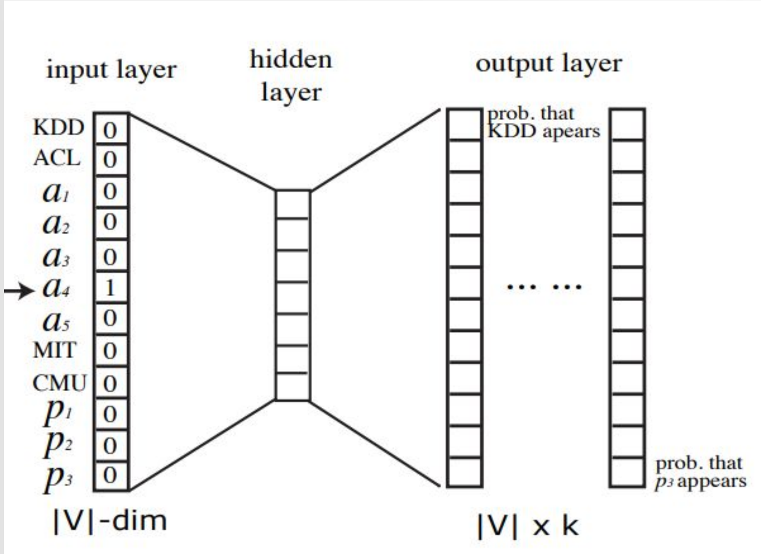

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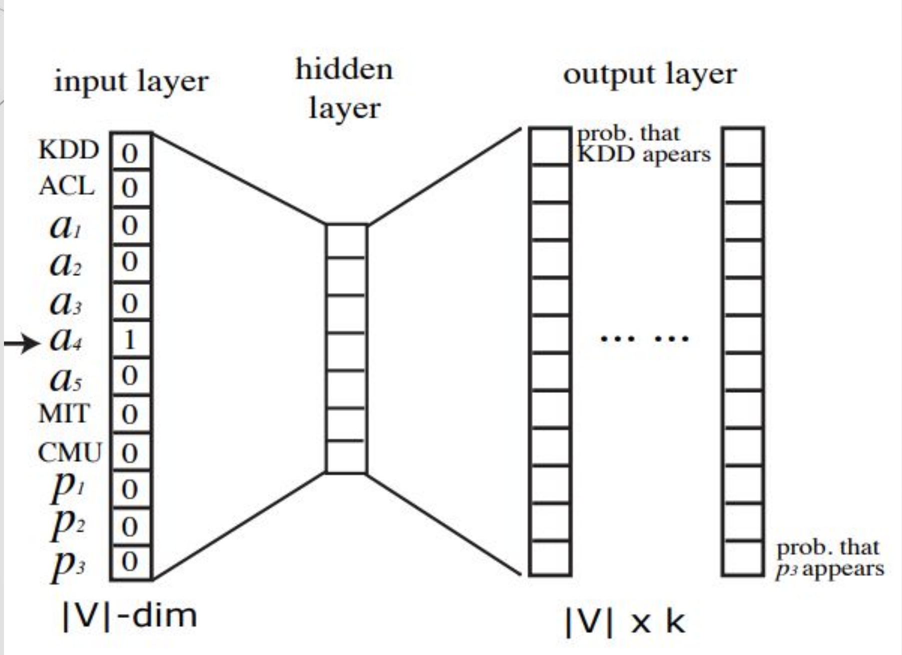

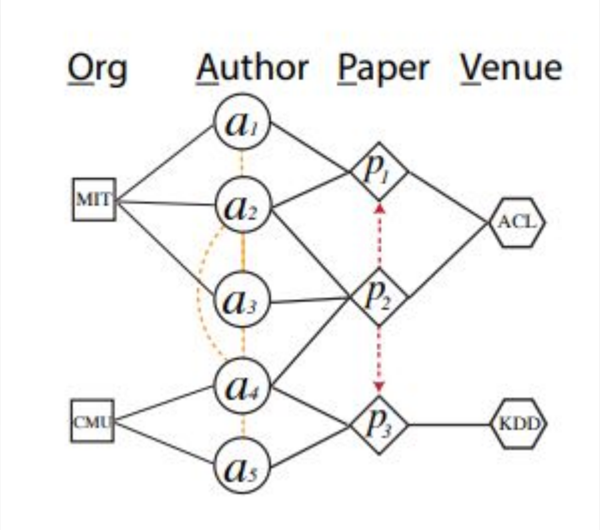

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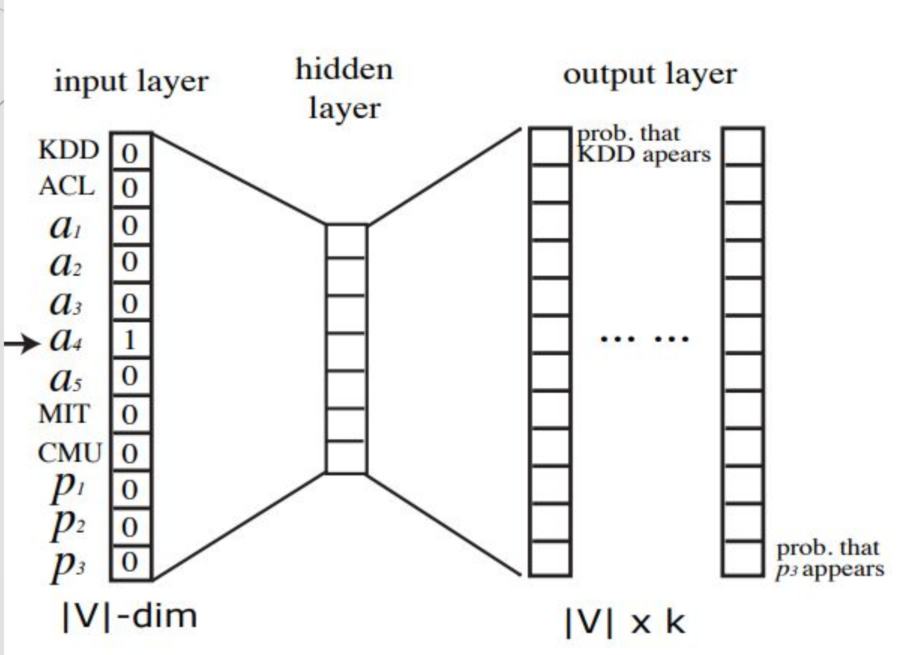

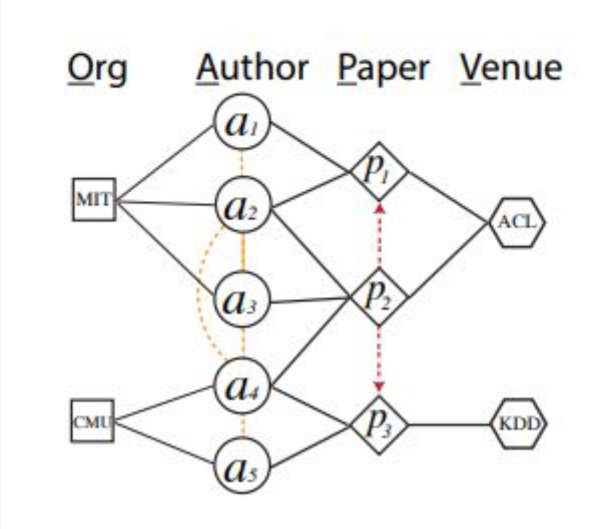

In the case of a4, the output layer is a **12x8,** because...

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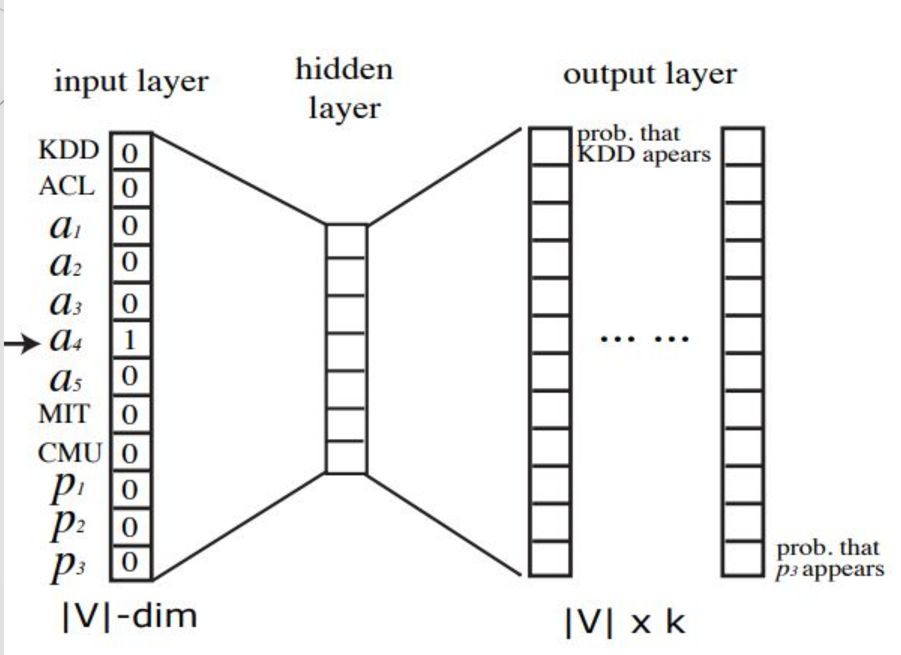

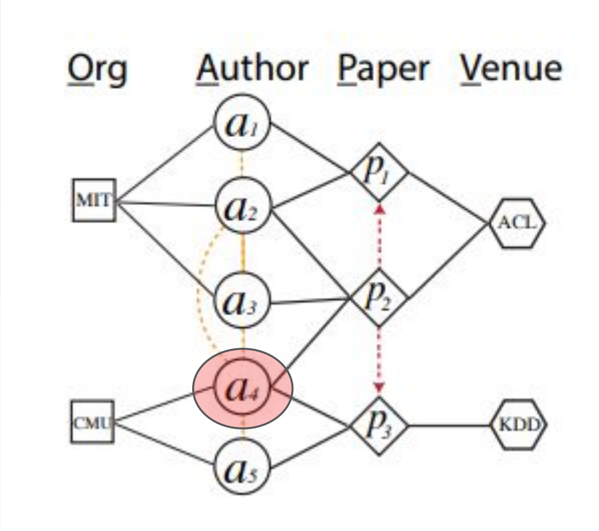

12x0

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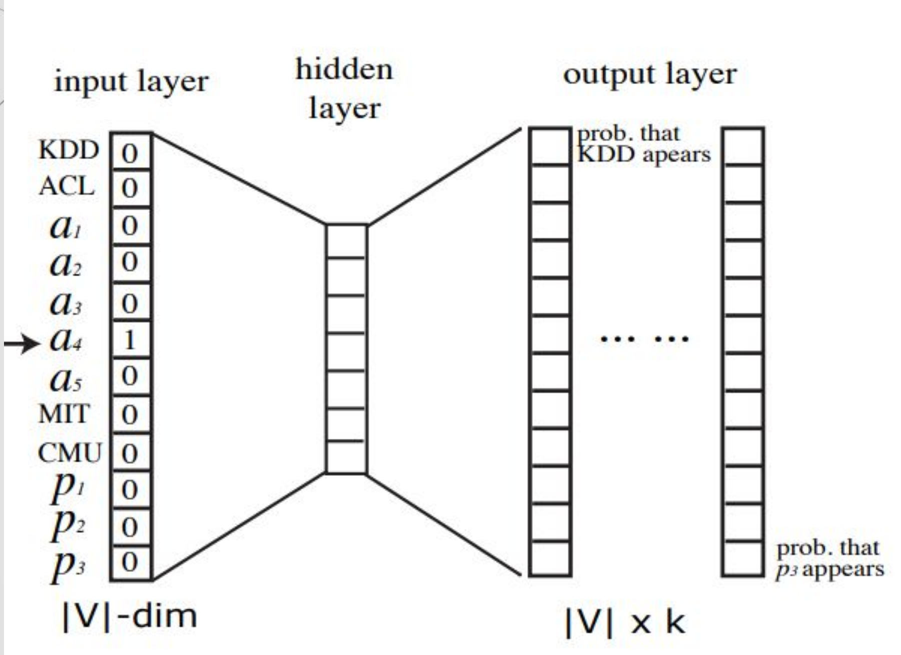
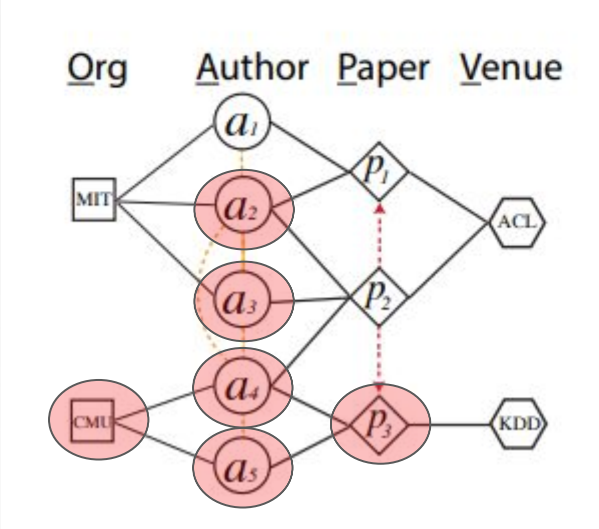


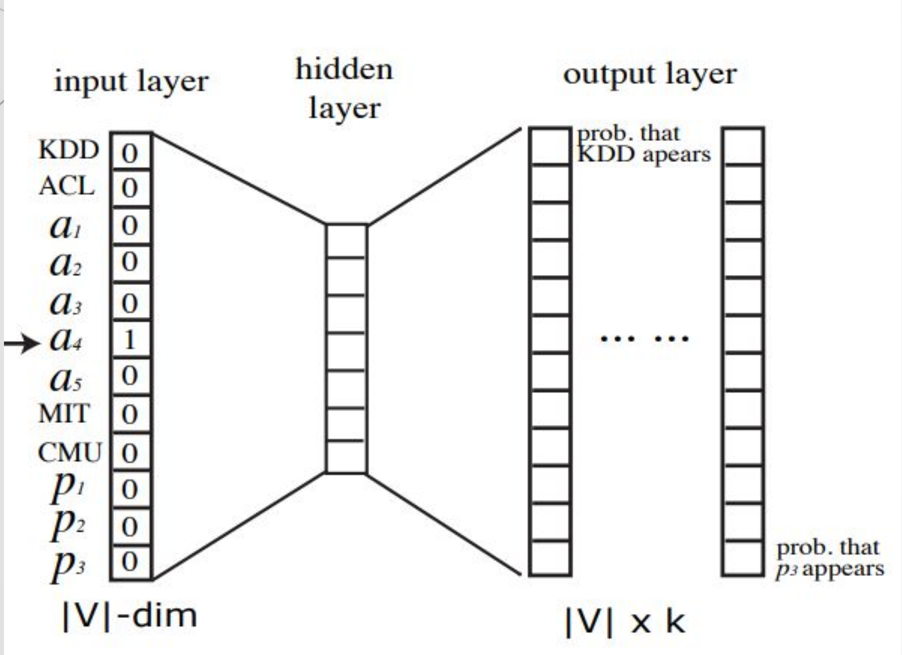


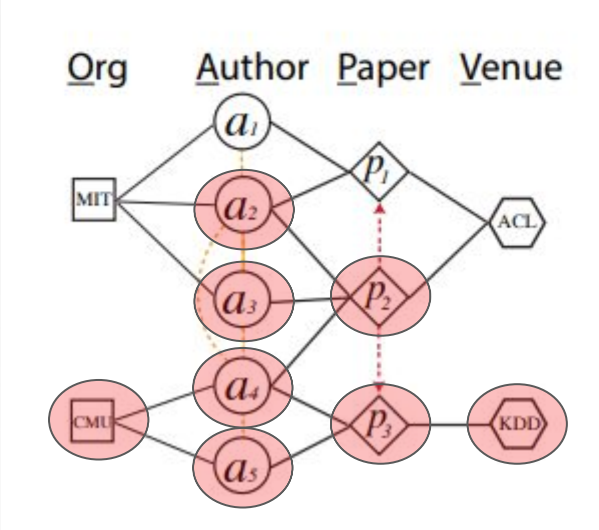
12x5

In the case of a4, the output layer is a **12x8,** because...

03 The model

Metapath2vec





12x7

In the case of a4, the output layer is a **12x8,** because...

03 The model

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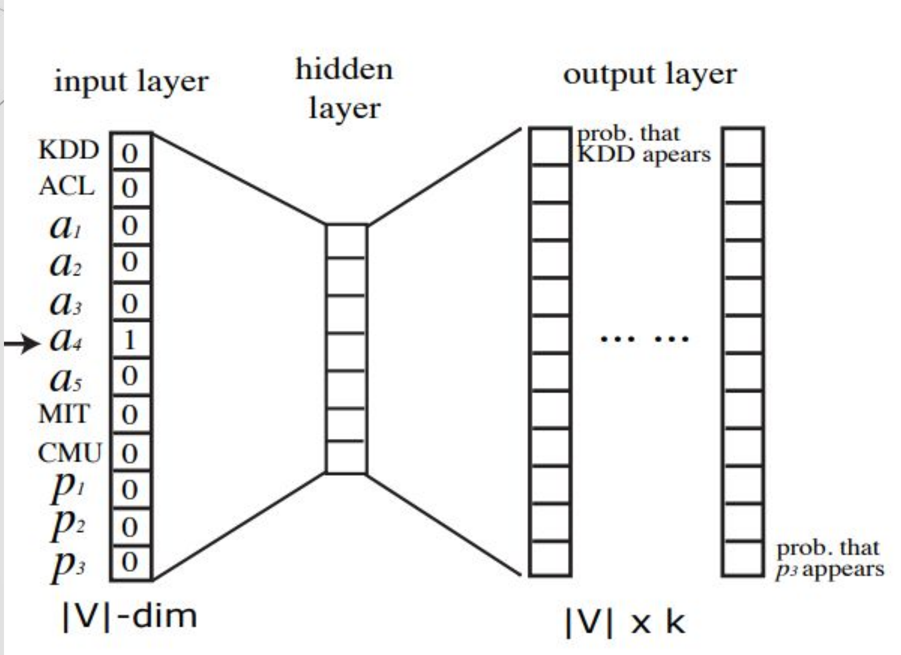

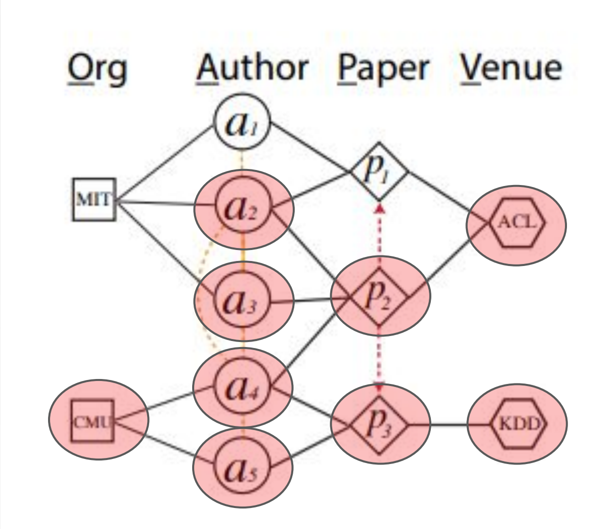

12x8

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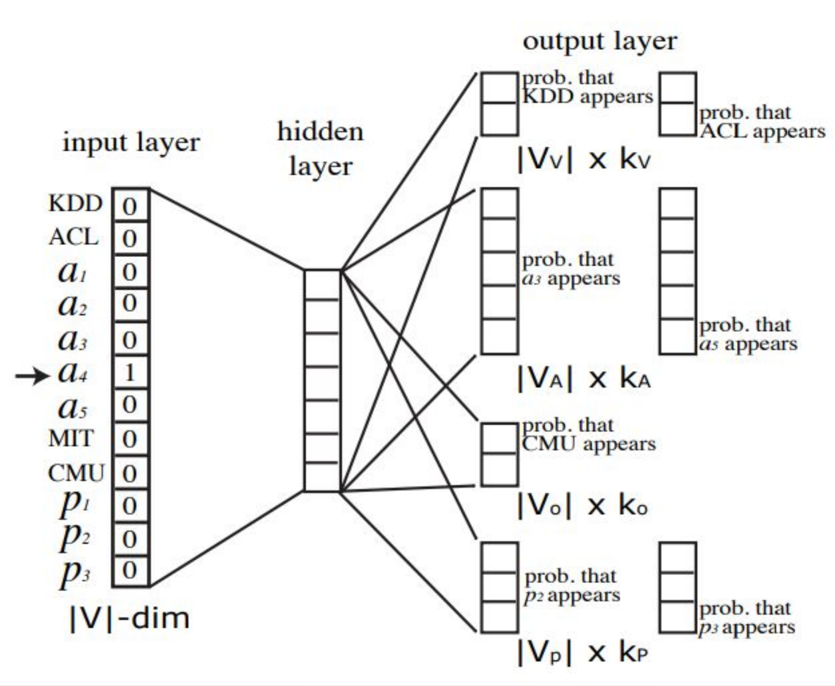

In the case of a4, there are 4 output layers, each of them with different size

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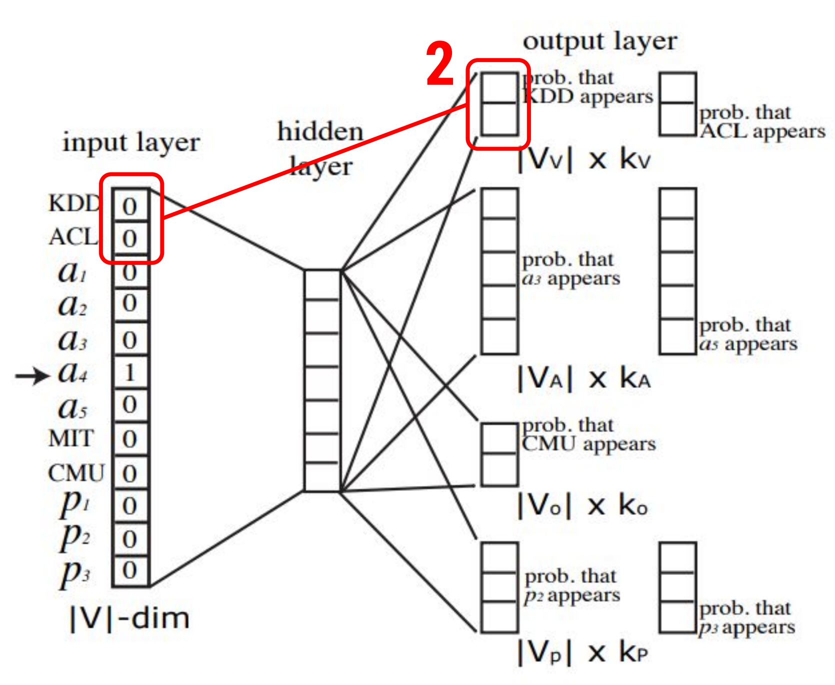

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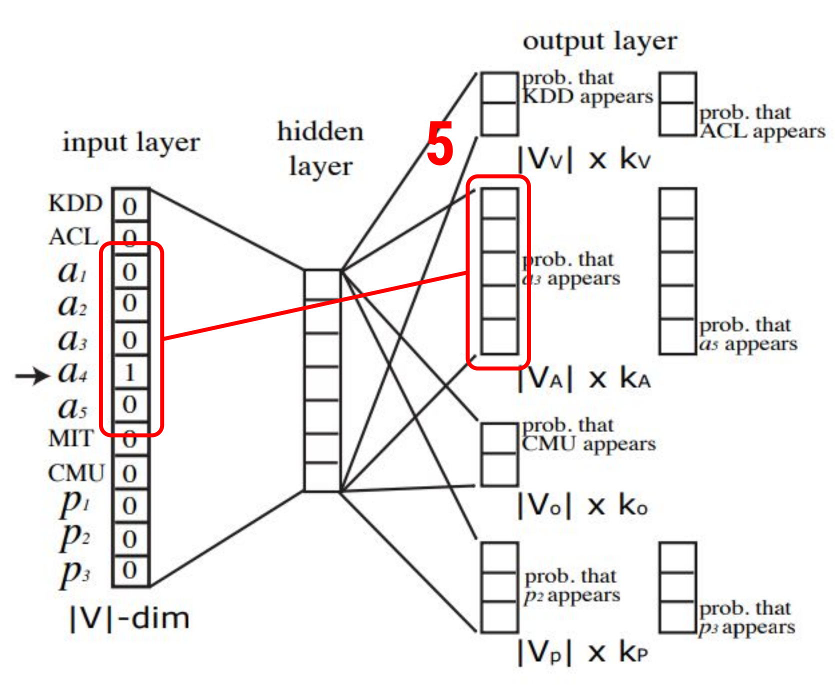

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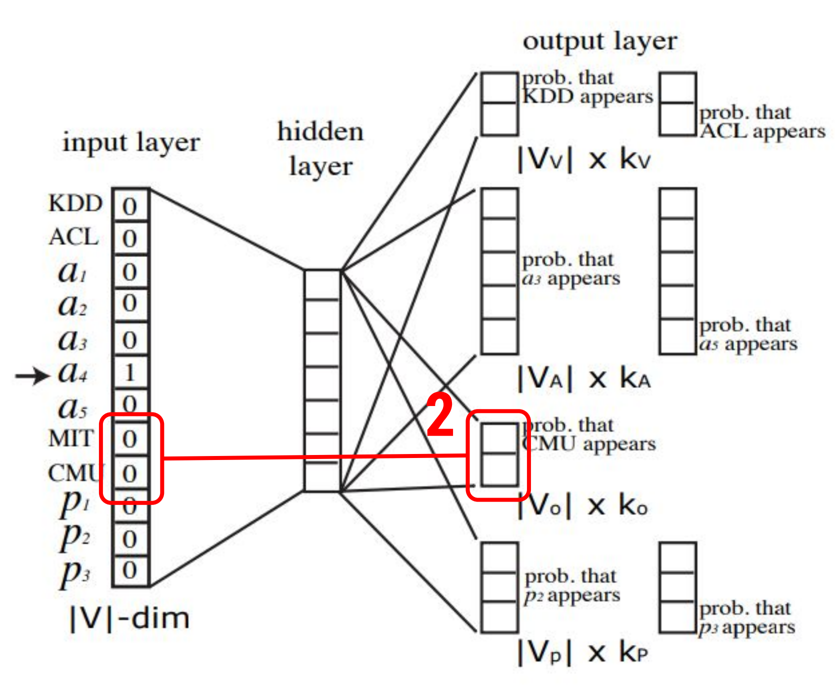

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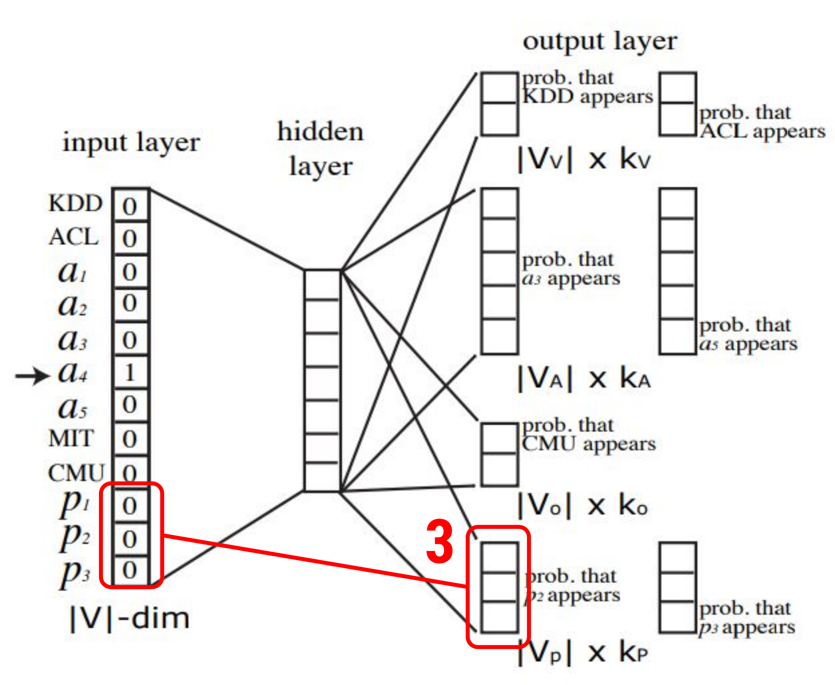

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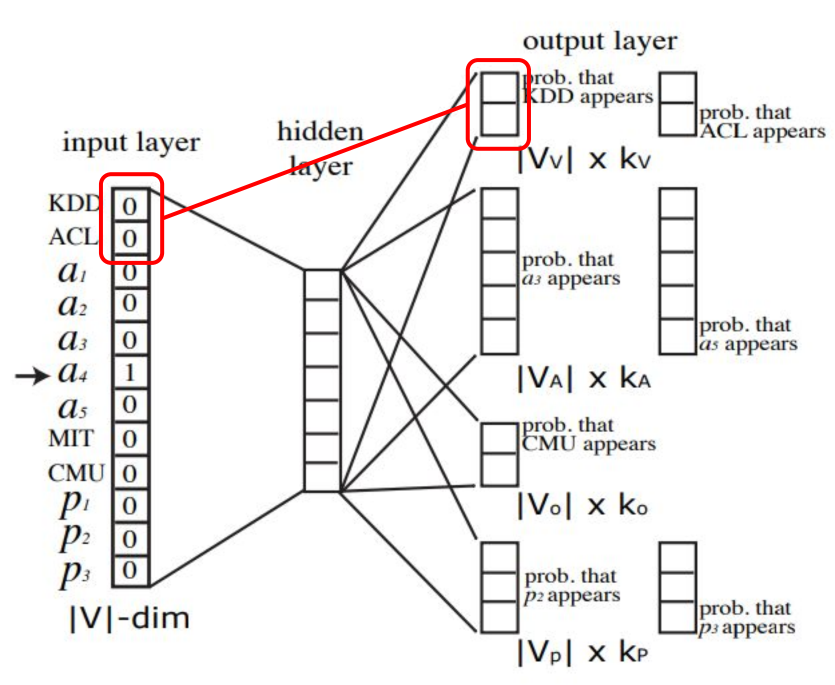
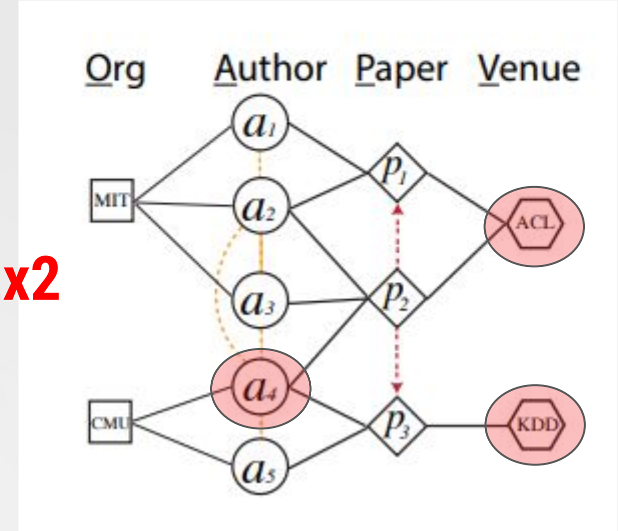


2x2



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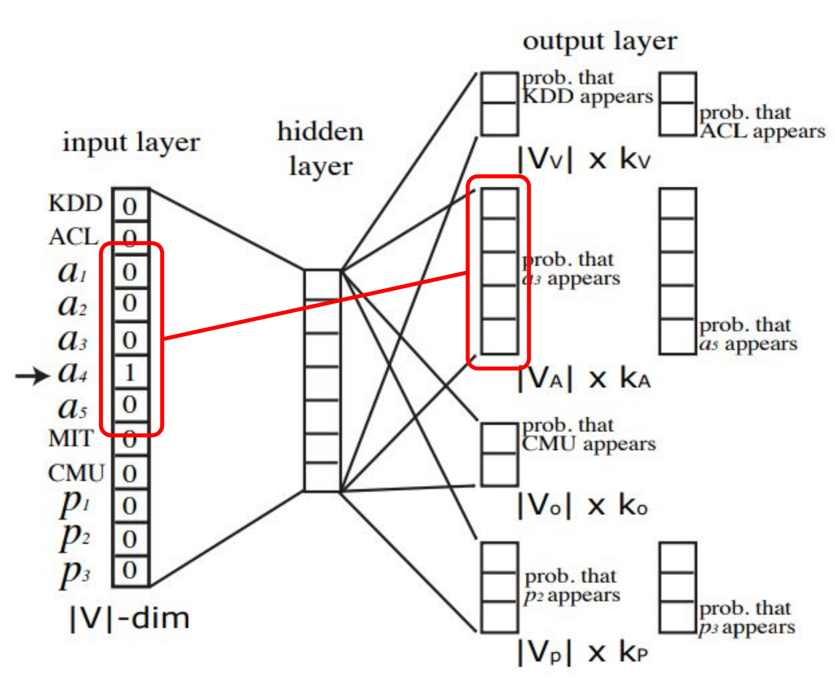
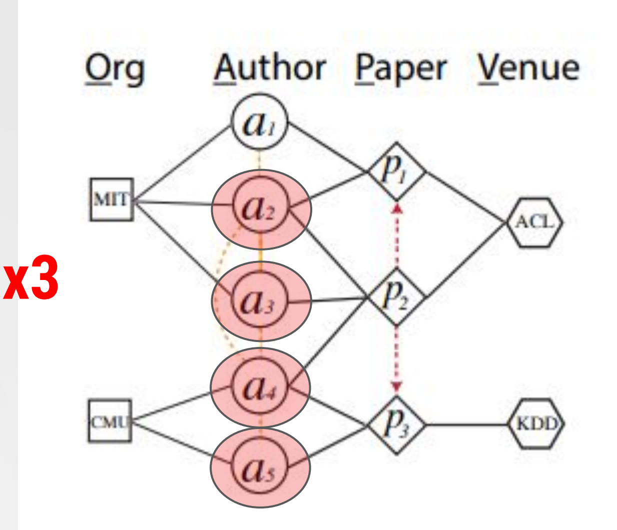


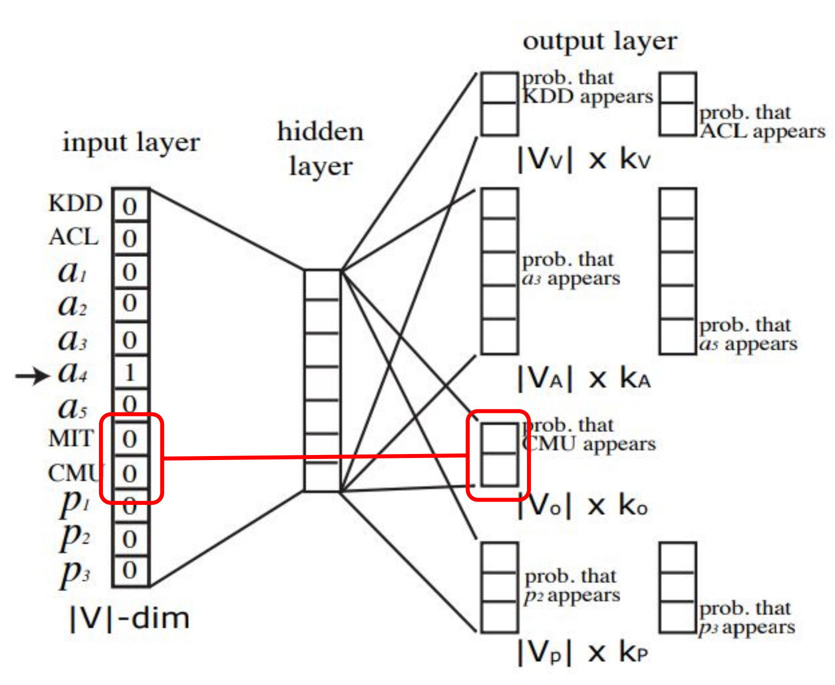
4x3



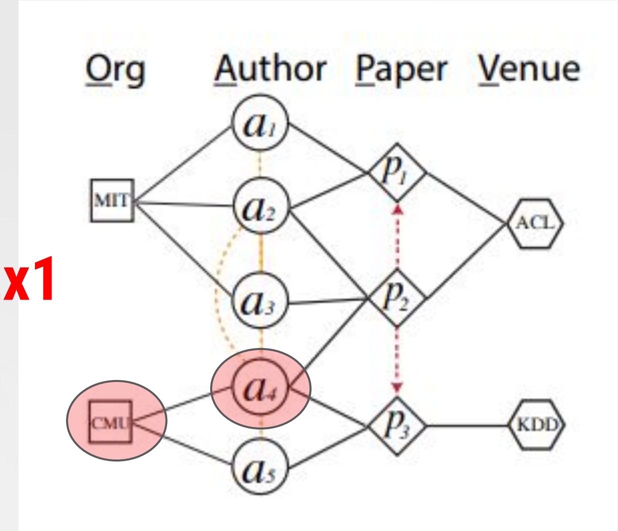
In the case of a4, there are 4 output layers, each of them with different size

03 The model

Metapath2vec++



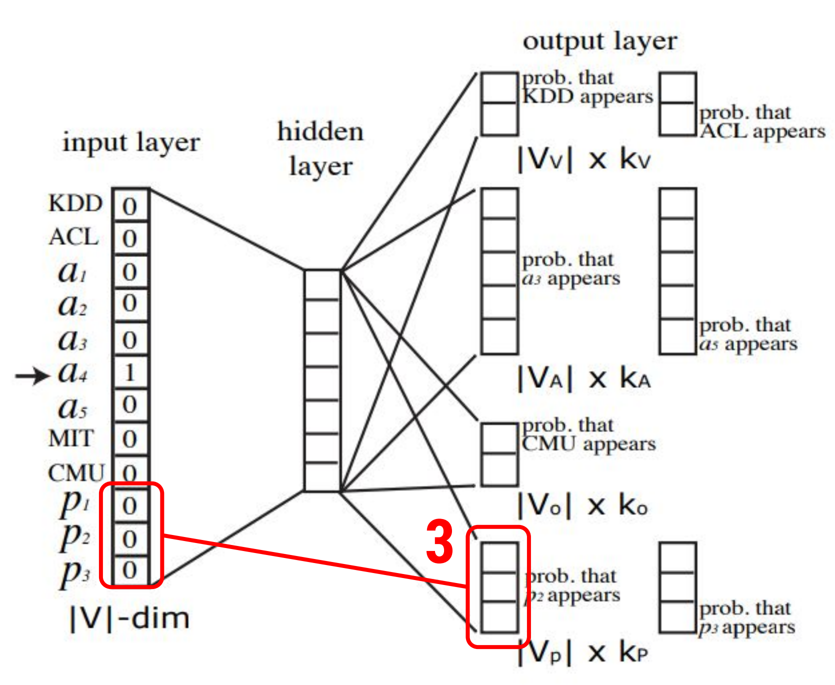
2x1

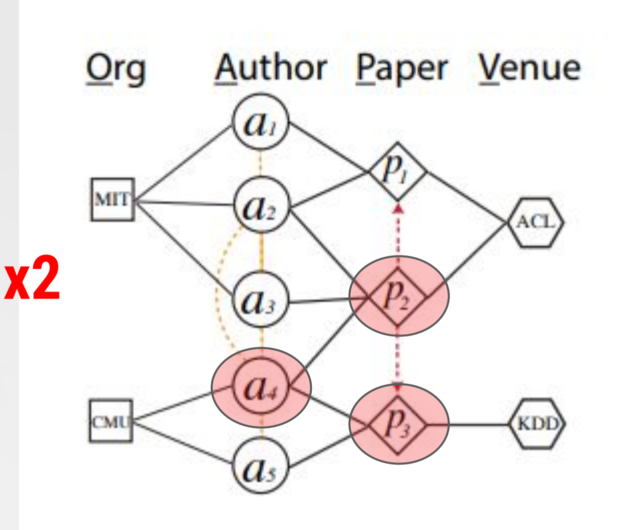


In the case of a4, there are 4 output layers, each of them with different size

03 The model

Metapath2vec++

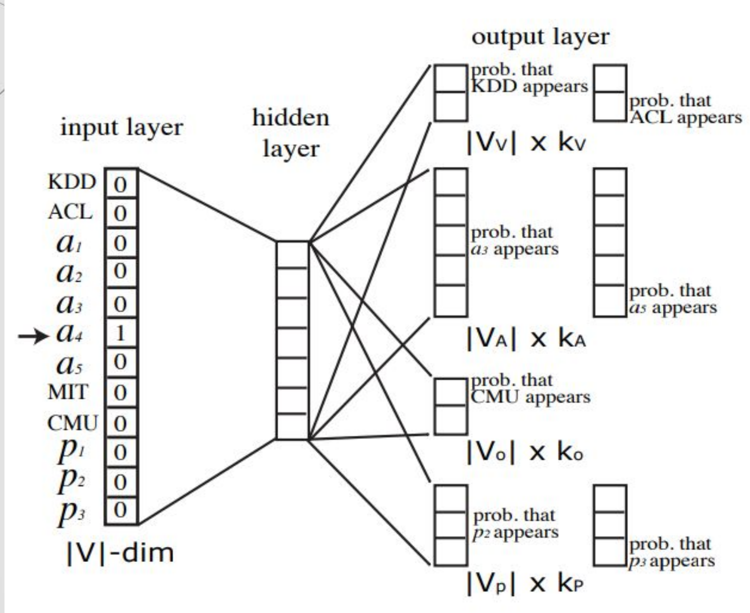


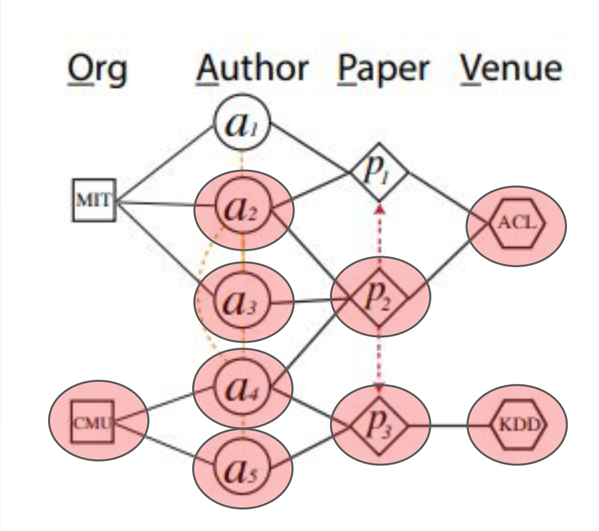


In the case of a4, there are 4 output layers, each of them with different size

03 The model

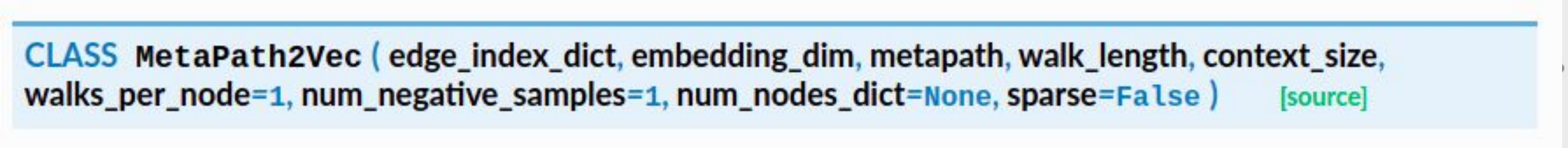
Metapath2vec++





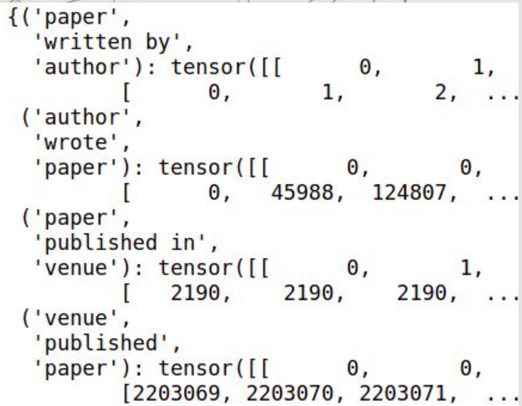
In the case of a4, there are 4 output layers, each of them with different size

04 Training



```
CLASS MetaPath2Vec ( edge_index_dict, embedding_dim, metapath, walk_length, context_size,
walks_per_node=1, num_negative_samples=1, num_nodes_dict=None, sparse=False )      [source]
```

04 Training



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  'paper'): tensor([[       0,        0,
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  'venue'): tensor([[       0,        1,
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  'paper'): tensor([[       0,        0,
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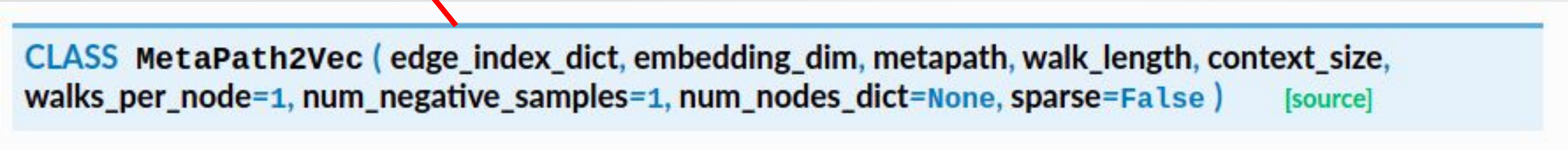
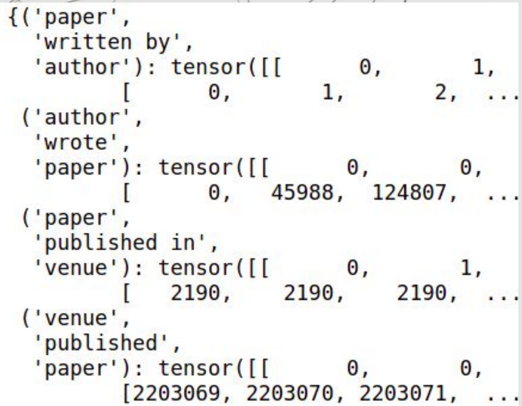
```



CLASS **MetaPath2Vec** (edge_index_dict, embedding_dim, metapath, walk_length, context_size, walks_per_node=1, num_negative_samples=1, num_nodes_dict=None, sparse=False) [source]

04 Training



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  'wrote',
  'paper'): tensor([[       0,        0,
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  'published in',
  'venue'): tensor([[       0,        1,
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  'paper'): tensor([[       0,        0,
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```
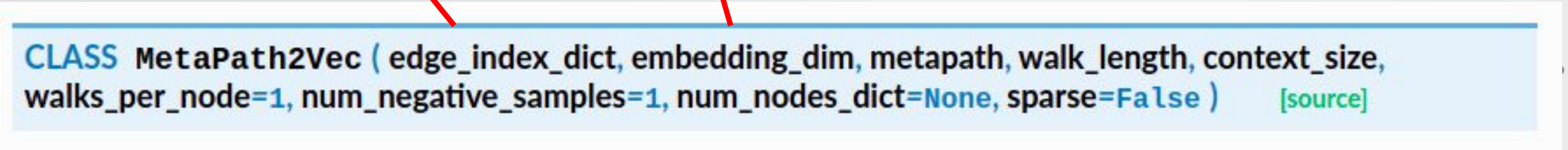
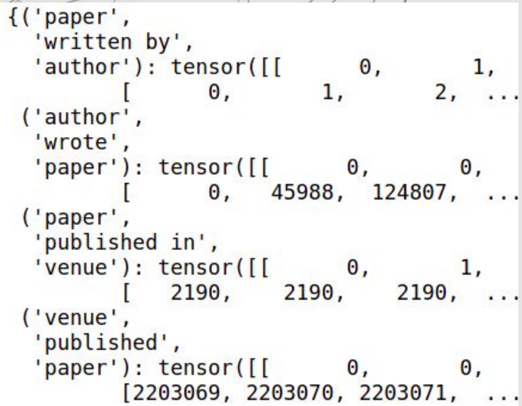

Size of the output embedding



CLASS **MetaPath2Vec** (edge_index_dict, embedding_dim, metapath, walk_length, context_size, walks_per_node=1, num_negative_samples=1, num_nodes_dict=None, sparse=False) [source]

04 Training



```
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  'venue'): tensor([[       0,        1,
         [    2190,     2190,     2190,  ...
 ('venue',
  'published',
  'paper'): tensor([[       0,        0,
         [2203069, 2203070, 2203071,  ...
```
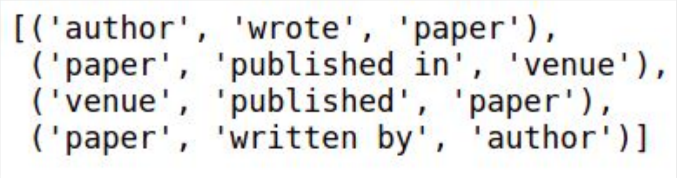
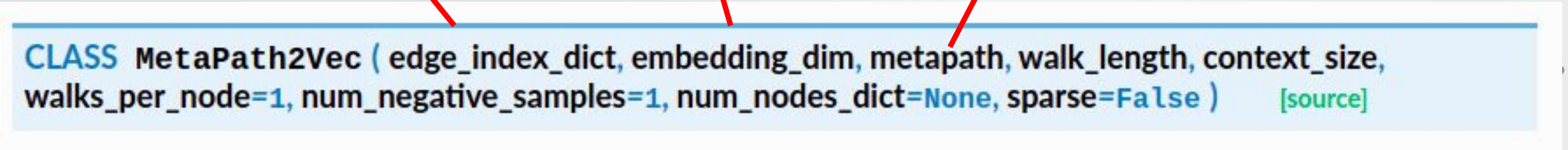

Size of the output embedding

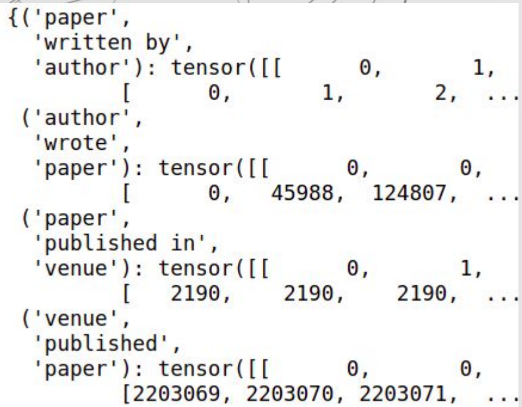


```
[('author', 'wrote', 'paper'),
 ('paper', 'published in', 'venue'),
 ('venue', 'published', 'paper'),
 ('paper', 'written by', 'author')]
```



CLASS **MetaPath2Vec** (edge_index_dict, embedding_dim, metapath, walk_length, context_size, walks_per_node=1, num_negative_samples=1, num_nodes_dict=None, sparse=False) [source]

04 Training



```
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  'venue'): tensor([[      0,       1,
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```
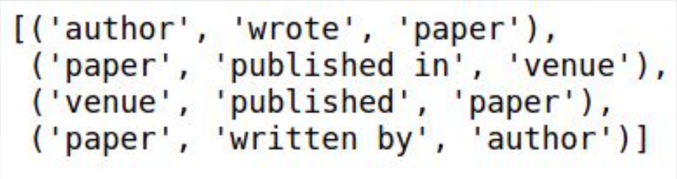
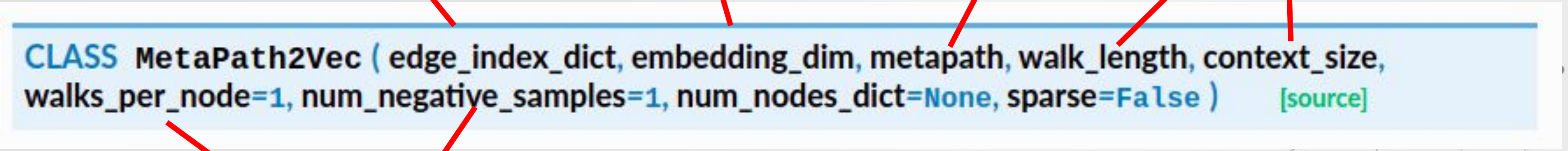



```
[('author', 'wrote', 'paper'),
 ('paper', 'published in', 'venue'),
 ('venue', 'published', 'paper'),
 ('paper', 'written by', 'author')]
```

Size of the output embedding

Equal to Node2Vec



CLASS **MetaPath2Vec** (edge_index_dict, embedding_dim, metapath, walk_length, context_size, walks_per_node=1, num_negative_samples=1, num_nodes_dict=None, sparse=False) [source]

Equal to Node2Vec

04 Training

Jupyter notebook

05 Load a pre trained model

Jupyter notebook