

Uncertain graph embedding

Graph embedding is an efficient approach for unsupervised representation learning for nodes in graphs, which has shown its outperformance in downstream applications [1]. There has been a number of works on different methods for graph embedding, e.g., DeepWalk [2], LINE [3], and Node2vec [4]. Most existing methods however do not consider the uncertainty in the input graphs. Examples of the uncertainty include edges can only be observed probabilistically, and nodes' attributes are not well/fine-grained measured (e.g., young, or middle-aged instead of a number for age).

In this project, we would like to extend and adapt the existing graph embedding methods as well as to develop new ones for working with uncertain graphs. We would also like to explore the efficiency of these methods for downstream applications in different contexts.

An ideal candidate for this project should be:

- a self-motivated learner
- experienced with programming languages (ideally C/C++ and/or Python)
- knowledgeable about basic machine learning models

Interested students are encouraged to email to Dr. Tuan-Anh Hoang at **hoang(at)l3s(dot)de** for scheduling a meeting.

[1] Cui, Peng, et al. "A survey on network embedding." *IEEE Transactions on Knowledge and Data Engineering* 31.5 (2018): 833-852.

[2] Perozzi, Bryan, Rami Al-Rfou, and Steven Skiena. "Deepwalk: Online learning of social representations." *Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining*. ACM, 2014.

[3] Tang, Jian, et al. "Line: Large-scale information network embedding." *Proceedings of the 24th international conference on world wide web*. International World Wide Web Conferences Steering Committee, 2015.

[4] Grover, Aditya, and Jure Leskovec. "node2vec: Scalable feature learning for networks." *Proceedings of the 22nd ACM SIGKDD international conference on Knowledge discovery and data mining*. ACM, 2016.