WalkingTime: Dynamic Graph Embedding Using Temporal-Topological Flows

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Overview of Lightning Talk

Node embedding - the process of generating a relatively low dimensional vector to summarize a vertice's many roles in a network - has received increased attention in recent years, with many contemporary developments building off of random-walks and NLP-inspired embedding methods, specifically Skip-grams [1]. Of particular focus within the last five years has been the development of techniques more suitable for dynamic networks, aiming to utilize the rich temporal structure present to better inform the embeddings produced. Existing dynamic node embeddings, however, consider the problem as limited to the evolution of a topology over a sequence of global, discrete states. Based on a fundamentally different handling of time, we propose a novel embedding algorithm, WalkingTime. While prior works considered time as a ordered collection of separate networks , WalkingTime allows for the local consideration of continuously occurring phenomena; while others consider global graph snap-shots to be first-order citizens , we hold flows comprised of temporally and topologically local interactions as our primitives. Our temporal-topological flows eloquently extend node2vec's random-walk framework [2], allowing us to leverage a Skip-gram inspired back end to produce the final embeddings while simultaneously sparing the need to discretize or align time-related attributes in the network. In our lightning talk, we plan to overview WalkingTime, discuss its on-going evaluation across a series of tasks, and detail the potential value of both our method and the novel perspective underlying it.

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References

[1] T. Mikolov, K. Chen, G. Corrado, J. Dean, Efficient estimation of word representations in vector space, arXiv preprint arXiv:1301.3781 (2013).

[2] A. Grover, J. Leskovec, node2vec: Scalable feature learning for networks, in: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2016.

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