



A Technology Intelligence Recommendation System based on Multiplex Networks

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Introduction

- Our research work focuses on recommendation systems for **technology intelligence**.
- Data targeted in this domain correspond to technological evolutions visible on the Web for which a **domain expert** wishes to remain informed of the competition or the uses.
- The amount of data produced on the Web leads to information overload.
- Thus, there is a significant challenge in recommending documents where the mass of data must be searched, sorted and evaluated against the needs of the experts.

Objectives

The **multidimensional profile** of the experts is considered by modeling them via an interaction graph. This representation poses the following problems:

- Find the representation of interactions to facilitate **recommendations** in a relevant and efficient way,
- Promote **multi-faceted** recommendations linked to the multiple nature of the information of interest to the expert,
- Make **real time** recommendations.

References

- Cozzo, E., De Arruda, G.F., Rodrigues, F.A., Moreno, Y.: Multiplex networks: basic formalism and structural properties. Springer (2018)
- Ning, N., Yang, Y., Song, C., Wu, B.: An adaptive node embedding framework for multiplex networks. Intelligent Data Analysis 25(2), 483–503 (2021)
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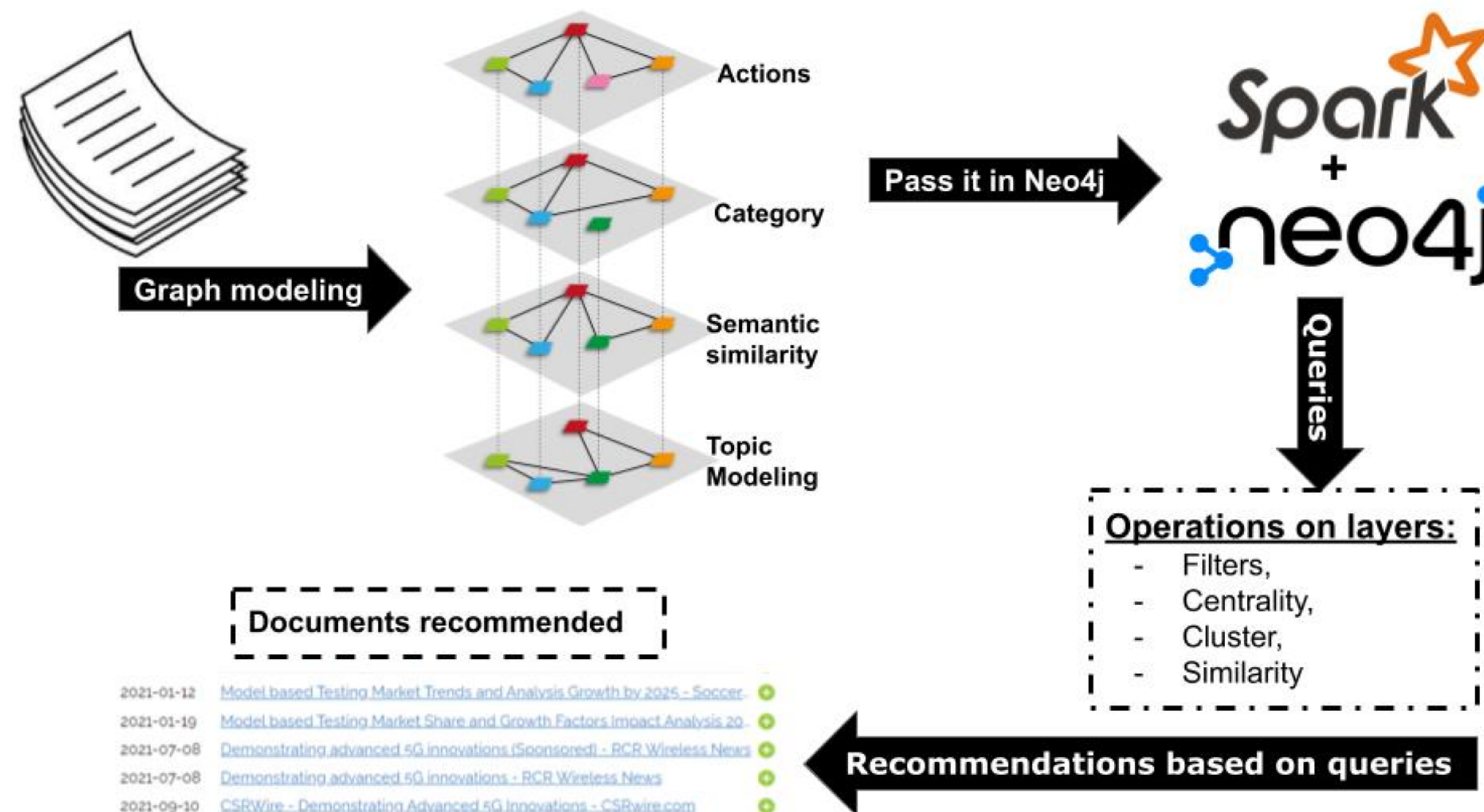


Fig. 1. Our multiplex framework for technology intelligence recommendation

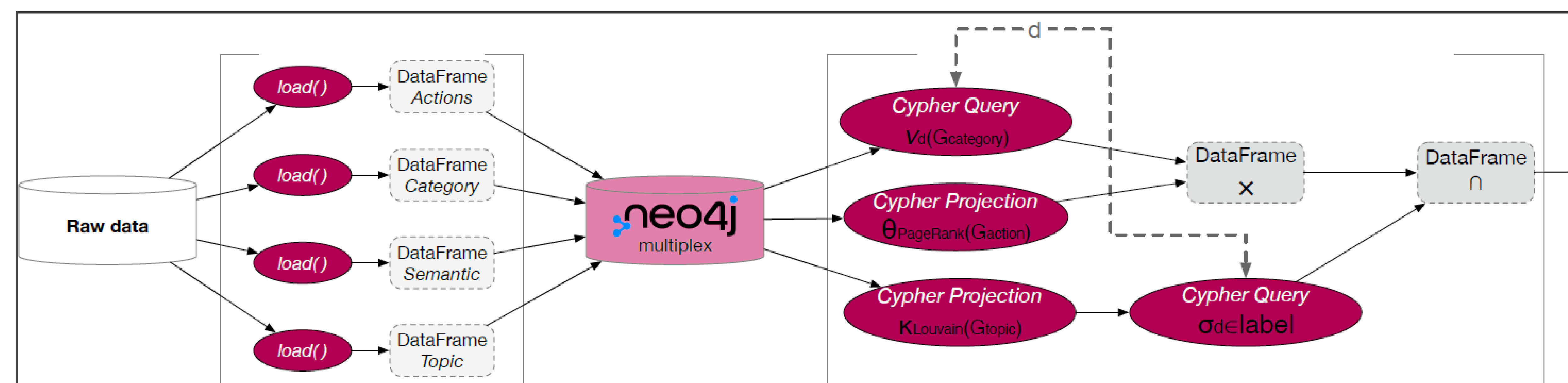


Fig. 2. Interactions of the multiplex network with Neo4j & Spark

Method

- Action layer:** links between documents by similarity of expert behaviors via their actions on them in the system.
- Semantic layer:** the similarity of textual content given between documents is similar.
- Category layer:** membership similarities between predefined categories thanks to the experts' ranking.
- Topic layer:** thanks to an unsupervised LDA topic extraction approach, we can link documents via their common topics.

✓ The operations on the multiplex give rise to transformations of the graph to produce different types of recommendations.

✓ Example: filter on actions & clustering on categories, community of topics & pageRank on semantics, etc.

Conclusion

- We want to offer adaptive recommendations.
- The **flexibility** of Neo4j proves that this approach is promising and could help us manage important aspects such as real-time recommendations.
- In future work, we will experiment with the **framework** to demonstrate its flexibility and effectiveness.