Project proposal
Background Knowledge for TuckER

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A knowledge graph is a set of relations between entities coming from real-word knowledge. It is represented as an oriented labeled graph where the vertices are entities and the edges are relations. Since they are typically incomplete, there is an active area of research trying to make link predictions on how to complete it. Several models have recently come to light to tackle this problem. In particular, Balazevic et al. [1] proposed a state-of-the-art model called TuckER, based on the Tucker decomposition.

Our objective is to improve the performance of this model. Sometimes, some relations are known to have particular properties such as symmetry, anti-symmetry or being the inverse of another relation. We refer to this type of knowledge as "background knowledge". We believe that enforcing these properties into a model should improve its performance. This kind of work was already performed by Minervini et al. [2] on three linear models, namely TransE, DistMult and ComplEx, and also by Kazemi et al. [3] on SimplE. The results they obtained support our assumption.

We will investigate the possibility of enforcing background knowledge through parameter tying into a TuckER model. Our main focus will be to incorporate symmetric and anti-symmetric relations and compare the efficiency of the new model on the WordNet dataset.

References

[1] I. Balazevic, C. Allen, and T. M. Hospedales, "Tucker: Tensor factorization for knowledge graph completion," *CoRR*, vol. abs/1901.09590, 2019.

[2] P. Minervini, L. Costabello, E. Muñoz, V. Novácek, and P.-Y. Vandenbussche, *Regularizing Knowledge Graph Embeddings via Equivalence and Inversion Axioms*, pp. 668–683. 01 2017.

[3] S. M. Kazemi and D. Poole, "Simple embedding for link prediction in knowledge graphs," in *Advances in Neural Information Processing Systems 31* (S. Bengio, H. Wallach, H. Larochelle, K. Grauman, N. Cesa-Bianchi, and R. Garnett, eds.), pp. 4284–4295, Curran Associates, Inc., 2018.