the KNOWLEDGE GRAPH as the default data model for machine learning

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The knowledge graph as the default data model for learning on heterogeneous knowledge
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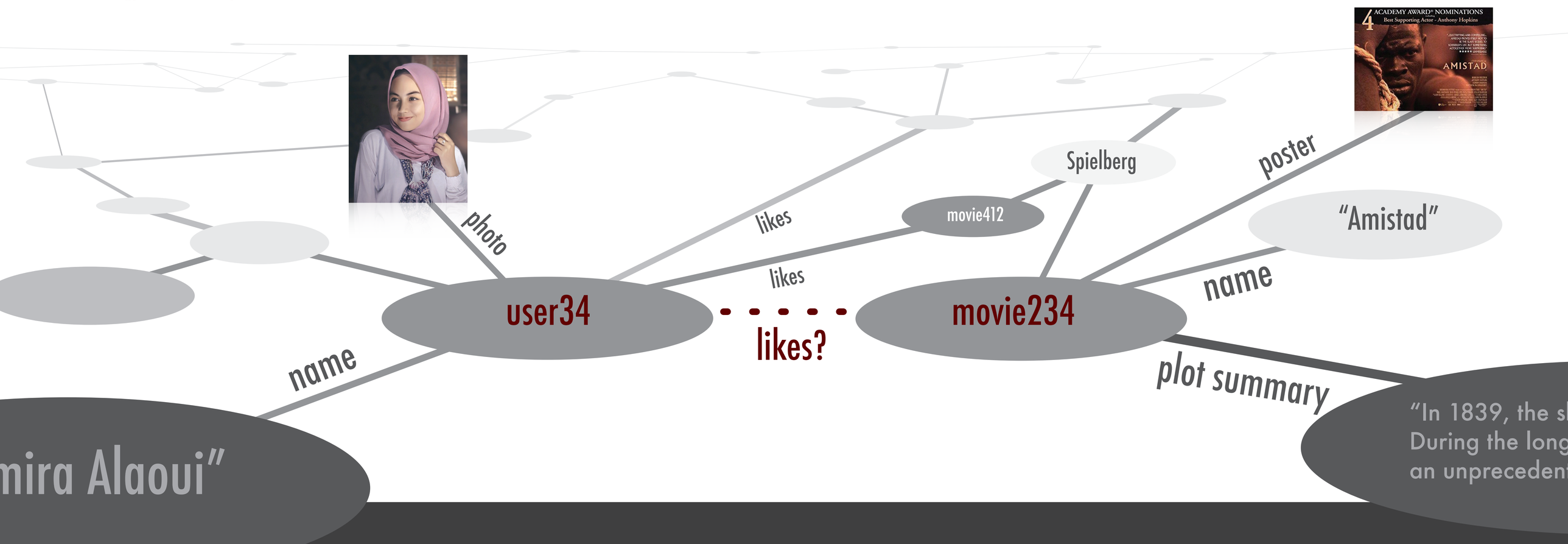
doi.org/10.3233/DS-170007

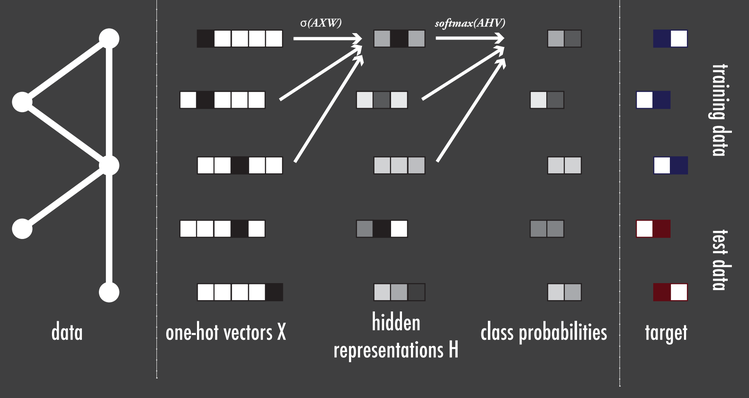
End-to-end learning is crucial in complex pipelines, to combat error propagation. When input knowledge is encoded in different modalities (images, language, facts) we must design models that consume all the data as-is and convert it to the target attribute in an end-to-end fashion. To achieve this, we can represent our data as a knowledge graph, and design models that consume knowledge graphs natively.



Graph convolutions for heterogeneous knowledge

Graph convolutions are one of the most promising ways of processing data encoded in graphs. The *RGCN model*[1] extends this idea to knowledge graphs.

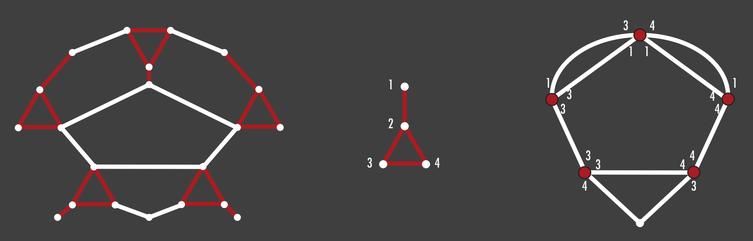
A more refined version is the *LGCN model*[2] which can learn edge weights adaptively.



Meaningful subunits: network motifs for knowledge graphs

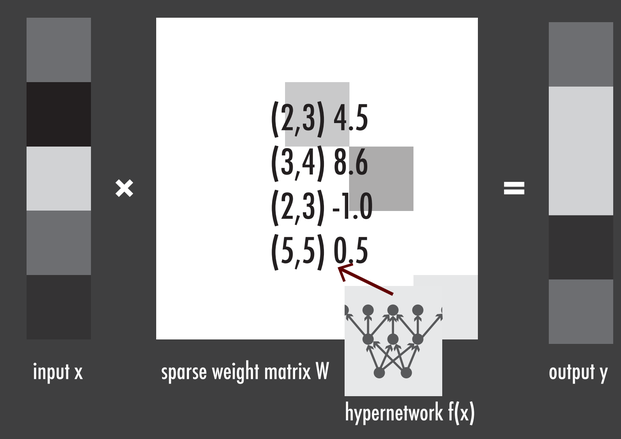
How do we extract all information about user34 from the graph, when everything is connected to everything else?

Network motifs allow us to extract the fundamental building blocks of a graph, and determine which nodes "belong together."



Sparse, adaptive hyperlayers

To learn a transformation from one graph to another, or to learn a generative model over graphs, we need a *sparse transformation*. Many sparse layers exist already (like convolutional layers), but the sparse structure must be known in advance. When the sparsity is informed by the data, and changes from one instance to the next, a new approach is required.



[1]Modeling Relational Data with Graph Convolutional Networks
arxiv.org/abs/1703.06103

[2]End-to-end learning of latent edge weights for Graph Convolutional Networks (MSc thesis)
esc.fnwi.uva.nl/thesis/apart/ki

Finding Network Motifs in Large Graphs using Compression as a Measure of Relevance
arxiv.org/abs/1701.02026

Detecting Motifs in Knowledge Graphs using Compression
github.com/MaestroGraph/motive-rdf

Sparse adaptive, hyperlayers
github.com/MaestroGraph/sparse-hyper

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AAA Data Science project: The structure of knowledge