Knowledge Graphs: Meeting Point of Knowledge Representation and Representation Learning

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Knowledge Graphs (KGs) in recent years have become a *melting pot* of Artificial Intelligence (AI) technologies. Two at first glance very different types of AI play a particularly important role here: Knowledge Representation and Reasoning (KRR) and Representation Learning (RL). The area of KRR is often associated with traditional AI techniques, while RL is associated with what is typically summarized as machine learning (ML).

Yet, while in Knowledge Graphs both types of technologies come together, there currently is a perceived disconnect between the areas of RL and KRR. Most of the research is currently concentrated on one area or the other, yet arguably representation learning is central to making use of knowledge representation and reasoning techniques in *modern, scalable AI* applications.

This plenary talk opens the *International Workshop on Knowledge Representations and Representation Learning (KR4L) 2020*, part of the *European Conference on Artificial Intelligence (ECAI) 2020*. In this plenary talk, we give an overview of the erea of Knowledge Graphs with a particular focus on KR and RL. In particular it is divided into four parts:

Modern Knowledge Graphs
- A motivation for the use of modern Knowledge Graphs.
- Financial Knowledge Graphs as a particularly interesting area.

A Melting Pot of Technologies
- Types of technologies meeting in Knowledge Graphs
  (data exchange and integration, data wrangling, graph databases, business intelligence tools, reasoners, machine learning frameworks, etc.).

A Meeting Point of Research
- Areas of the narrower and wider research fields related to Knowledge Graphs, and in particular KRR and RL.
- The evolution of these areas in the last few years.

Perspectives and Future
- We are going to consider multiple perspectives on Knowledge Graphs, including the *layered perspective* that looks at KGs as representation tools, management systems and application services.
- The future of KRR and RL in KGs.

We also bridge the six accepted regular papers, one invited paper and two panels of the *International Workshop on Knowledge Representations and Representation Learning (KR4L) 2020*, spanning many aspects of KRR and RL. This includes the use of **RL and ML techniques for KRR**:

- *Traversing Knowledge Graphs with Good Old (and New) Joins*
- *An Evolutionary Algorithm for Rule Learning over Knowledge Graphs*

The use of **KRR in RL and ML**:

- *Cluster Discovery from Sensor Data Incorporating Expert Knowledge*
- *The Effect of Rule Injection in Leakage Free Datasets*
- *A Performance Strategy: Multiple Slices of a KGE Model in Low Dimensions*

And finally those where **KRR and RL/ML techniques are used jointly**:

- *Weaving Enterprise Knowledge Graphs:*
  The Case of Company Ownership Graphs (Invited Paper)
- *Blockchains as Knowledge Graphs – Blockchains for Knowledge Graphs (Vision Paper)*

We also give an overview of the two panels:

- **Emerging Topics in Academia and Industry**
  Lead by Luigi Bellomarini
  (Deputy Director of IT Research, Central Bank of Italy)

- **Future Directions - Looking Ahead**
  Lead by Sahar Vahdati and Mojtaba Nayyeri
  (InfAI and University of Bonn)

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