Knowledge for Explainable AI

Internship Proposal

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Location: Télécom Paris (19 Place Marguerite Perey, 91120 Palaiseau)
Duration: 4 to 6 months
Supervisors: Thomas Bonald & Fabian Suchanek
Contact: {thomas.bonald, fabian.suchanek}@telecom-paris.fr

1 Context

The spread of AI in society will be possible only if its decisions can be explained to humans. One of the most promising research directions in this perspective is to connect AI to human knowledge. This requires knowledge to be very well structured, through a so-called knowledge base, so that machines can easily access, process and exploit it.

Formally, a knowledge base (KB) consists of entities (e.g., people, places, concepts, objects) linked with relations. For example, Wikidata[1] contains the fact `Paris` (entity), `capital of` (relation), `France` (entity). In the last ten years, many KBs have been built automatically by extracting information from the Web or from text documents. These include ConceptNet[2] (MIT), DBpedia[3] (Free Univ. Berlin, Univ. Mannheim, & Univ. Leipzig), Wikidata[1] (Wikimedia Foundation) and YAGO[4] (Télécom Paris & Max Planck Institute), to quote a few. Most companies have also built their own, private KB, the largest being most likely that of Google[5]. These KBs contain millions to billions of facts linking millions of entities.

2 Objectives

Most existing KBs are based on binary relations, following the RDF[6] model [1]. For instance, Wikidata contains the relations `date of birth` and `place of birth`, without any specific link between them. The objective of this internship is to propose, analyse and test different ways of aggregating these binary relations so as to build a KB with a limited number of n-ary relations (e.g., `birth`), making facts more expressive and knowledge easier to retrieve and process.

3 Skills

The candidate should have strong skills in **Python** programming and in one of the following fields: **machine learning**, **natural language processing**, and **graph mining**.

References

[1] G. Weikum, J. Hoffart, and F. M. Suchanek. Knowledge harvesting: Achievements and challenges. In Springer, editor, *Computing and Software Science (LNCS)*, 2019.

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[1] https://www.wikidata.org
[2] https://www.conceptnet.io
[3] https://wiki.dbpedia.org
[4] https://yago-knowledge.org
[5] https://en.wikipedia.org/wiki/Knowledge_Graph
[6] https://en.wikipedia.org/wiki/Resource_Description_Framework