Fiche de projet tutoré / Project form

Experimentations with analogical learning

Team & Supervisors
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Description / Description
1. Global project

Analogy establishes parallels between two situations that are similar in many respects and dissimilar in others [2]. If such a parallel holds to some extent, there are pairs of items (a, b) and (c, d) such as «a is to b in situation 1 as c is to d in situation 2». A statement of the form «a is to b as c is to d» is called an analogical proportion, e.g., «man is to king what woman is to queen». It expresses that "a differs from b as c differs from d" and «b differs from a as d differs from c». The items a, b, c, d are supposed to be described by the same set of attributes and represented by tuples of attribute values. Attributes may be Boolean, nominal, or numerical.

Analogical inference can support classification tasks in either predicting or recommending classes for new items [3], or enlarging training sets for learning classifiers [4,5], especially in environments with few labeled examples. However, analogical based classification is still in its infancy, and many theoretical and experimental studies have to be carried out for understanding the analogical inference process and the cooperation of analogical inference with other classification methods [1]. There are in fact several types of cooperation that can be thought, for instance, the use of deep approaches for learning or solving analogical relations [7,9] or the use of analogical reasoning to improve machine learning methods [6,8]. We will explore the idea of transfer learning as a kind of analogical reasoning (*transferring by analog*y), to take advantage of what has been learnt on a source domain in order to improve the learning process in a target domain related to the source domain. The methodological and experimental studies to be carried out during this project aim to further attest the interest of analogical reasoning to improving machine learning approaches.

2. biblio. UE 705 (semestre 7)

The aim of the bibliographic part is to get the students acquainted with analogical inference and several useful applications in various ML and NLP related tasks, as well as getting them

familiar with these neural-symbolic approaches : 1, 2, 4, 7, 8

3. réalisation. UE 805 (semestre 8)

The aim of this realization part is to guide students in acquiring implementations and data to setup an emprical study either on analogy learning or on integrating analogical inference in an ML methodology. The results maybe used in the framework of a starting PhD.

Various information: material, context of realization

Most bibliography will be provided, and implementations and datasets can be freely accessible online. After getting familiar with the main topics, the project will focus entirely on implementing analogy learning methodologies and/or setting the analogy based transfer learning framework. Access to computation infrastructure will be provided.

Deliverables and schedule

-October-January : Bibliographic work and getting familiar with some implementations
-February : Empirical setting and dataset preprocessing
-March-April : experiments and analysis of results
-May : Writing of Report

References

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8- J. Lieber, E. Nauer, H. Prade. Improving analogical extrapolation using case pair competence. ICCBR'19, LNCS 11680, 251-265, 2019.
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