SFB/TR 8 SPATIAL COGNITION

IQN

SFB/TR 8 Spatial Cognition / IQN
Video Conference

Steven Schockaert

Cardiff University

A data-driven approach to commonsense reasoning based on qualitative spatial representations from the web

Conceptual spaces (sometimes also called semantic spaces) are high-dimensional geometric spaces in which entities are modelled as points and categories as convex regions. Given a relevant text corpus, conceptual spaces can be induced from data by using dimensionality reduction methods such as multi-dimensional scaling. To date, conceptual spaces are mainly used for measuring similarity. In this talk, I will argue that many aspects of semantic relatedness can be identified with qualitative spatial relations in conceptual spaces, and that this allows us to learn symbolic knowledge about categories in a purely data-driven way.

As a simple example, the spatial part-of relation corresponds to the conceptual is-a relation, which is useful for automatically refining taxonomies. Second, spatial betweenness in conceptual spaces is useful for identifying “intermediary concepts”. For example, we can think of a tapas bar as being intermediate between a pub and a restaurant, and accordingly we can expect the representation of “tapas bar” to be geometrically between the representations of “restaurant” and “pub” in a conceptual space of places. Finally, relative attributes such as “more violent than” (for films) or “more tannic than” (for wines) can be associated with direction relations in a conceptual space.

The aforementioned spatial relations are useful for implementing various patterns of commonsense reasoning. Betweenness, for example, can be used to implement a symbolic counterpart to numerical interpolation, e.g. from the knowledge that bars and restaurants sell drinks, we derive that tapas-bars are also likely to sell drinks. Direction relations are useful for implementing a fortiori inference (and other forms of analogical reasoning). For example, given that Die Hard has received an 18 certificate from the British Board of Film Classification and that Drive is more violent than Die Hard, we can plausibly derive that Drive has also received an 18 certificate.

I will report the result of experiments that show the usefulness of the aforementioned patterns of commonsense reasoning. For example, we have found that a betweenness based classifier, using a conceptual space of place types induced from Flickr, outperforms humans in categorising places from the Foursquare and Geonames taxonomies. Similarly, by identifying qualitative direction relations in a conceptual space of films (derived from a large corpus of film reviews), we can implement a form of analogical reasoning which outperforms standard classifiers such as SVMs, kNN and C4.5 in a variety of film related categorisation tasks.

- Freitag,27. Juni 2014
  informelle Kaffeerunde: 15:15
  Vortragsbeginn:15:30

  - Rotunde Cartesium,
    Enrique-Schmidt-Str. 5
    Universität Bremen
  - Geb. 106, Raum 04 007,
    Universität Freiburg

- Kontakt:

  Prof. C. Freksa, Ph.D.
  freksa@informatik.uni-bremen.de
  0421 – 218 - 64230

Universität Bremen

ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

Deutsche
Forschungsgemeinschaft
DFG