Introductional Presentation

"Graph Kernels for RDF Data"*- Summary and implementation ideas

Dennis Oliver Kubitza

5. Dezember 2017

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* **Graph kernels for RDF data.**
  Lösch, U., Bloehdorn, S., & Rettinger, A. (2012).
  The Semantic Web: Research and Applications, 134-148
  10.1007/978-3-642-30284-8_16
  2012

Content Overview

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Combining RDF with Machine learing

Goal

We want to apply Machine learning algorithms on RDF.

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- Rescource Description Frameworks (RDF) impose a Graph structure on the Data
- Machine learning algorithms are optimzed on certain Data Structures (Tables etc.)

Kernel based machine learning

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Definition

Let D be the Space of Data, $\psi : D \to F$ a mapping representing the Data as $F \subset \mathbb{R}^n$. A function with a represenation

$$K : D \times D \to \mathbb{R}$$

$$K(d_1, d_2) = < \psi(d_1), \psi(d_2) >$$

is called Kernel.

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Kernels for RDF

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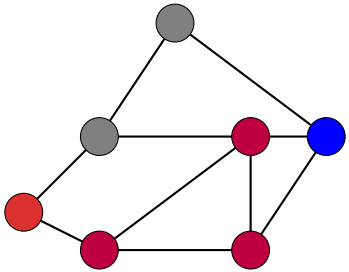
What Kernels exists on can we define for Graphs ?

1. Walk Kernel (of maximimum path length l)
2. Path Kernel (of maximimum path length l)
3. Full Subtree Kernel (of depth d)
4. Partial Subtree Kernel (of depth d)

These are the examples provided by the authors. Of course infinite many definitions can be made.

Example



$$\kappa_{l,\lambda} = \sum_{i=1}^{l} |\{p | p \in paths_i(G_1 \cap G_2)\}$$

Content Overview

Example

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Lösch U., Bloehdorn, S., Rettinger, A. showed that this approach of applying Graph Kernels to RDF show almost the same peformance as retailoring ML algorithms to RDF structure.

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  - Give the possibility to use User defined Update/Deletation algorithms and kernels.
  - Provide the defined example Kernels with efficient implementation of Update/Deletation

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+ Faster than Sparks RDD querying.
+ Computational Performance will scale up with SANSA's performance.

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1. Store Kernel-Values directly in original RDF
   - \+ All information is provied in Consistent Format.
   - \+ Induces a Distance Graph on Original RDF.
   - \+ Can be used for further analysis outside of Sansa

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   - \- What size ? (Has to be Scalable, e.g updates)
   - \- What structure ? (f.e Distance Matrix: Inefficient if Sparse)
   - \- Has to be a know format ! Otherwise not user friendly.

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+ Same implementation for both variants. Only different target for saving the values
+ User can pick which one he favours.
+ In each way the user is familiar with the storage format.
+ A posteriori the RDFs can still be merged.