Knowledge Representation & Reasoning

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http://krr.cs.vu.nl
Related Courses

• Intelligent Web Applications
• Automated Reasoning
• Knowledge Engineering
• Information Retrieval
• ....
Themes

• Representing knowledge and information
• Reasoning with big data
• Reasoning with noisy data
• Linked Open Data
• Provenance
• New forms of reasoning
• From unstructured knowledge/data to structured knowledge
• Re-use of data/knowledge for other purposes
Domains

• Health
• Semantic Web
• Science
• Social science/Humanities
• Government
• Heterogeneous Content
CTcue improves health care for everyone, by rethinking how people are diagnosed and treated.

CTcue builds innovative tools to assist the medical world in curing people.
Clinical Trials

- **problem**: not enough patients enrolled in clinical trials

- **goal**: to support patient enrollment by automatic interpretation of the (semi-structured) eligibility criteria of a clinical trial.

- **method**: pipeline to move from semi-structured data to SPARQL queries (Krystyna Milian)
Project: Clinical Trials

- How well does this work in other domains than breast cancer, e.g. instance diabetes?

- Can we reuse the same patterns?

- Improvement of pattern recognition algorithm (eg. composition of patterns)

Contact: Annette ten Teije
Project:
Medical Guidelines

• **problem**: often patients have multiple diseases (multimorbidity)

• **Modeling** a number of clinical GP guidelines

• Focus on **interaction** among guidelines

• In **collaboration** with physicians!

Contact: Annette ten Teije
Project: Medical Linked Open Data

- Linking available medical sources on the Web: make the sources more structured
  link the structured sources

- Examples:
  - www.farmacotherapeutischkompas.nl
  - http://www.huidziekten.nl/zakboek

- In collaboration with physicians!

Contact: Annette ten Teije
Project:
Patient Data Generation

- Use APDG to **generate** patient data of diabetes and hypertension

- Extend APDG with more **functionality**, such as sequence encounters

- Support for more **output formats** of APDG, so that it can be loaded into some existing HIS systems,

- **Visual interface** for APDG and its mapping to medical ontologies, such as SNOMED (optional)

Contact: Zisheng Huang / Annette ten Teije
Project:
Automatic Generation of Rule-based formalization of Clinical Trials from Natural Language Texts

- Semantic **annotation** of Eligibility Criteria of Clinical Trials,
- Capture the **relations** between the criteria
- **Generate** a Prolog representation of the criteria,
- **Run** the generated codes in SemanticCT, a semantically-enabled system for clinical trials.

Contact: Zisheng Huang / Annette ten Teije
Theme:
From Bench-to-Bedside

- The OpenPHACTS Explorer allows multiple sources of publicly-available pharmacological and physicochemical data to be intuitively queried.

- **Example:** What compounds are known to be activators of targets which relate to Parkinson or Alzheimer?

- Annotated clinical trials and patient data

- **Project:** Build an application that connects pharmacological data and clinical trials.

- **Analyze** relations that can be found in the pharmacological data and clinical trials (maybe using other sources).

Contact: Annette ten Teije
Collecting evidence for medical guidelines

• Medical guidelines are based on arguments extracted from literature & clinical trials
• Multiple arguments must be combined to form recommendations in a clinical guidelines
• State of the art:
  – Hand extraction of arguments from literature
  – Hand combination of separate arguments into overall argument
• Result: better methods to write medical guidelines
• Spend some time in London

Contact: Zisheng Huang / Annette ten Teije

Expand to: Literature + Clinical trials

Improve to: Automatic ontology-based abstraction
Project:
Extracting Information from Scientific Texts

• **Problem:** scientific papers have very little, or only superficial metadata, which makes them hard to find

• **Solution:** automatically extract information from texts (terms, concepts, authors, references tables, etc.) and use that as annotations.

• **Method:** combine techniques from text mining, NLP and Semantic Web

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Shop What You Watch on LookLive
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LookLive creates a contextual shopping experience by combining the worlds of e-commerce & entertainment.

We will launch in the United States and quickly move to other continents as we grow.
LookLive = • Big Data
           • Semantic Networks
           • Ontologies
           • Content Recognition
           • Fuseki, SPARQL, JSON-LD, Node.js

..but most of all: An exciting startup looking for interns with brilliant minds!

If you feel challenged by any of these topics, get in touch so we can define a project together.

interns@looklive.com
Invitation for graduation projects
INFORMATION SCIENCES (2015)

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Who we are

• Innovator in applying Semantic Modelling techniques and Semantic Web technologies
• Young, multidisciplinary and ambitious team with background in ICT and engineering

What we do

Model Based Consultancy

• Design of (semantic) process- and information models – software neutral
• Implementation of redesigned processes based on process models (Systems Engineering-perspective)
• Implementation of redesigned information models through ‘rapid application development’ software

Software Development

• Development of Semantic Web platform for maintaining semantic models being shared as Linked Open Data

Who we work for

[Logos of various organizations]
**SEMMtech | SEMantic Modelling technologies**

**How we do it**

- We understand semantics to design and apply *scalable semantic structures*
- We are good at developing software to maintain and share *semantic information models*
- We have domain knowledge to populate and use *semantic datasets*
What we aim for:

- scalable solutions for ontology integration, including mapping-guidelines and implementation-scenario’s
  - related to sector-driven initiative (construction industry – CB-nl) on integration of domain ontologies
  - focused on mapping of terminologies, thesaurus’ as well as full ontologies
- use-case designs and implementation (approaches) on incorporating Linked Open Data in non-rdf applications
  - related to own consultancy-offering on implementing complex information models for Infrastructural projects
  - increase accessibility of domain specific knowledge – e.g. regulations, best practices – to accelerate reuse of knowledge
- robust transformation-mechanisms for non-rdf datasets to proper rdf/owl models
  - related to R&D-challenge of Rijkswaterstaat as principal of European Commission-subsidised project on road infrastructures
  - datasets to transform and link are amongst others interoperability standards for geometry (CAD) and geospatial (GIS) data
- evaluation of possible use of rdf/owl as modelling language for conceptual data modelling
  - related to development of own Semantic Web platform incorporating fact-based modelling techniques
  - enforces Semmtech’ proposition of Model Based consultancy \(\rightarrow\) designed models as blueprint to build – implement – operate

... and much more to explore!

As previous slides show, Semmtech is in an excellent position to foresee in a number of challenges related to information sciences in the broadest sense.

As such, if you’re taken by our innovative mindset and want to be part of a young and ambitious team delivering a new perspective on information management, feel free to contact us to discuss topics to research.