Semantic Knowledge for Commodity Computing

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Semantics as the study of Meaning

- Data semantics – extract and map from structured and semi-structured sources into ontologies
- Lexical semantics – identify/learn concepts, roles from sentences (e.g. Powerset; MindNet)
- Statistical semantics – discover meaning from patterns of use (e.g. concept similarity)
- Computational semantics – automate the process of constructing and reasoning with meaning representations
- Semantic web – linked data via URI, common graph structure with RDF, inferences via ontologies and OWL
- Formal semantics – in linguistics? in logic?
Semantics is hard

- At a Santa Fe (NM) petrol station
  - “We will sell gasoline to anyone in a glass container”

- On a long-established NM dry cleaning store
  - “Thirty eight years on the same spot”

- In the offices of a loan company
  - “Ask about our plans for owning your home”

- “Laptops under $1000 and with 2 or more GB of RAM”

- “Are there any friends of a friend of mine at the next conference?”

- “I’m really hungry”
Vision – Enable *Next Generation Experiences* by working with academia, stakeholders from industry, government, and consumers/innovators to make sense of data.
Data/Information

To help explore the data value chain, Microsoft’s collaborations provide access to data that enables:

- **Innovation** – By having access to real-world data, researchers can unveil new analysis or research directions based on shared assets and explore new questions.
- **Science** – By allowing wider use of data, repeatability of experiments can be performed and data misrepresentations or faulty results avoided.
- **Training** – Real-world large-scale data is a powerful tool for training the next generation of data analysts and researchers.

**Cloud-based services: Web Language and Query Language Models**

- Used to research topics such as human speech, spelling, information extraction, learning, and machine translation.
Data-Driven Research

Researchers need **access** to large scale real world data, and infrastructure to drive innovation, enable science (repeatability)

- **Search Summit 2007** new asks:
  - Need more data, larger scale;
  - Need to follow a user (privacy!)

- **Beyond Search – Semantic Computing and Internet Economics 2009**
  new asks:
  - Need data access (as opposed to data release);
  - Compute power

- **Language Model Services** (Web Ngram and Query Language Models)
  - Access to large scale real world data via cloud-based Services
Multi-word Tag Cloud from Government Dataset Titles

Ref: Dr. Li Ding, Rensselaer Polytechnic Institute
Next Generation Experiences

- Shift from users understanding computers to computers understanding users
  - Data → Information → Knowledge → Intelligence

- Data is a 1st-class citizen under different multimedia encoding: text, speech, gesture, image, pen, sensor, touch, video
  - Semantics is emerging as a unifying paradigm
  - Context, beliefs need to be taken into account
Knowledge/Intelligence

- From *data services* to *knowledge services*
  - Future of information processing and discovery at web-scale?
  - Role of collective intelligence?

- Transforming semantic knowledge into commodity computing
  - Opportunities
  - Challenges
Semantic Knowledge for Commodity Computing: Myth or Reality?

- **Ontologies for Real World**—Deborah McGuinness, Rensselaer Polytechnic Institute
- **A Probabilistic Knowledgebase for Text Understanding**—Haixun Wang, Microsoft Research
- **Data Challenges in the Real World**—Shoshanna Budzianowski, Microsoft
Semantic Knowledge for Commodity Computing: Myth or Reality?

- **Text and Context: Using Context to Better Understand Searcher’s Intentions**—Susan Dumais, Microsoft Research
- **Learning to Map Sentences to Meaning**—Luke Zettlemoyer, University of Washington
- **Citizen Sensing—Opportunities and Challenges in Mining Social Signals and Perceptions**—Amit Sheth, Wright University
- **Semantics and Knowledge-Enabled Experiences for Search and Discovery**—M. Srikanth, Microsoft
Thanks!

- Questions?
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