

# Semantic Knowledge for Commodity Computing

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## Semantics as the study of Meaning

- Data semantics extract and map from structured and semistructured 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 > KNOWLEDGE > INTELLIGENCE

## 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)

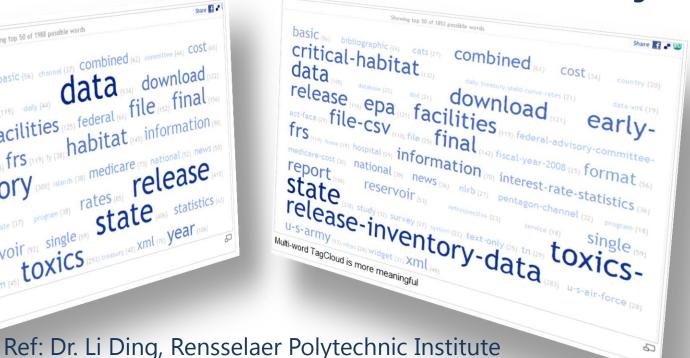
- Search Summit 2007 new asks:
  - Need more data, larger scale;
  - Need to follow a user (privacy!)
- Beyond Search Semantic Computing and Internet Economics 2009 new asks:
  - Need data access (as opposed to data release);
  - Compute power
- <u>Language Model Services</u> (Web Ngram and Query Language Models)
  - Access to large scale real world data via cloud-based Services

### Multi-word Tag Cloud from Government Dataset Titles

**Single Tag Cloud** 



#### **Multi Tag Cloud**



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## Next Generation Experiences

- Shift from users understanding computers to computers understanding users
  - Data → Information → Knowledge → Intelligence
- Data is a 1<sup>st</sup> -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—<u>Luke Zettlemoyer</u>, 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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