RDF Data Model & How Linking Works

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Decentralized Information Group
The Web has made people smarter

Slide courtesy of Li Ding
But what about machines?

Machines still have a very minimal understanding of text and images.
Semantic Web: machine-understandable data

- **Natural Language**
  - Alice *is a person*

- **XML – represent structures**
  - `<person> Alice </person>`

- **Semantic Web**
  - represent structures
  - enable common vocabulary
  - associate symbols with logic interpretation for inference

Slide courtesy of Li Ding
What the Web looks like
What the Web looks like

Images modified from Hendler & Miller, 2002
What the Web looks like
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What the Semantic Web looks like (birds eye view)
What the Semantic Web looks like (birds eye view)
What the Semantic Web looks like (birds eye view)
Inside the Semantic Web (zooming in)

Image courtesy of Eric Prud'hommeaux
http://www.w3.org/2009/Talks/1005-jaoo-egp/
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Inside the Semantic Web (zooming in)
Inside the Semantic Web (zooming in)
Inside the Semantic Web (still closer)
Inside the Semantic Web (still closer)

- What does it mean?
  - Circles - concepts or instances
    - Classes: Person & Primary Care Physician
    - Instances: Alice
  - Arrows - relationships/properties
    - Properities/Links: is a, has role
- Diagram is read: Alice is a person and has role primary care physician
- Note: Named links (relationships/properties) is one of the differences between SW and Web
RDF Data Model

- RDF data is represented as RDF graphs
- RDF graphs are collections of statements called triples
- Each triple contains a subject, verb (also called predicate) and object
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subject - Alice
verb/predicate - is a
object - Person
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verb/predicate - is a  
object - Person

subject - Alice  
verb/predicate - has role  
object - PrimaryCarePhysician
RDF Data Model

- Statements/triples describe properties of resources
- A resource is any object that can be pointed to by a URI:
  - a document, a picture, a paragraph on the Web;
  - a book in the library, a real person
  - ISBN://5031-4444-3333
  - Alice, Person, PrimaryCarePhysician
- Properties themselves are resources and have URIs
Exercise 1
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- Properties: is a and has role
- Concepts: Eve, Person, Specialist Physician
- Eve is a person and has role Specialist physician

Image courtesy of Eric Prud'hommeaux
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Exercise 2

Diagram:
- **Drug1** has ingredient **Compound**
- **Compound** is a **Illumdium Phosdex**
- **Illumdium Phosdex** has function **Active Ingredient**

Image courtesy of Eric Prud'hommeaux
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Exercise 2

- Drug1 has ingredient Illudium Phosdex
- Illudium Phosdex is a Compound and has function Active Ingredient

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Exercise 3

Diagram:

- Drug1
  - has ingredient
  - Compound
    - is a
      - Illudium Phosdex
  - Active Ingredient
    - has function
      - Illudium Phosdex

Diagram:

- Drug1
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  - Compound
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      - Illudium Phosdex
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Exercise 4

Image courtesy of Eric Prud'hommeaux
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Exercise 4

- Concepts: Bob, Dave, Alice, Eve, Person
- Properties: foaf:knows, is a

- Bob is a person and knows Alice, who is a person, and Dave, who is a person.
- Dave knows Eve, who is a person
Exercise 5

Image courtesy of Eric Prud'hommeaux
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Why Linked Data?
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  - Queries of the form
    - List of people who worked at the Institute of Advanced Studies and who also had some connection to Austria
Albert Einstein

- deathPlace: Princeton, New Jersey
- citizenship: Austria-Hungary
- workplaces: Institute for Advanc...
Kurt Gödel
Relationship between Einstein and Gödel
DBPedia RelFinder
DBPedia RelFinder

- DBPedia relfinder
DBPedia RelFinder

- DBPedia relfinder
- http://relfinder.dbpedia.org/relfinder.html
DBPedia RelFinder

- DBPedia relfinder
- http://relfinder.dbpedia.org/relfinder.html
- Execute one example from dbpedia and one from linkedmbd
What linking gets you

- Applications
  - Biomedical research
    - connections between diseases, genes, symptoms, environmental factors, identify flu trends
  - Counter terrorism
    - connections between people, locations, attacks, affiliations etc.
  - Providing transparency in government investment
    - discrimination trends, nepotism in contract assignment, etc.