UNIVERSITY OF JYVÄSKYLÄ

Lecture 6: Data Exchange and Semantic Annotation

TIES4520 Semantic Technologies for Developers
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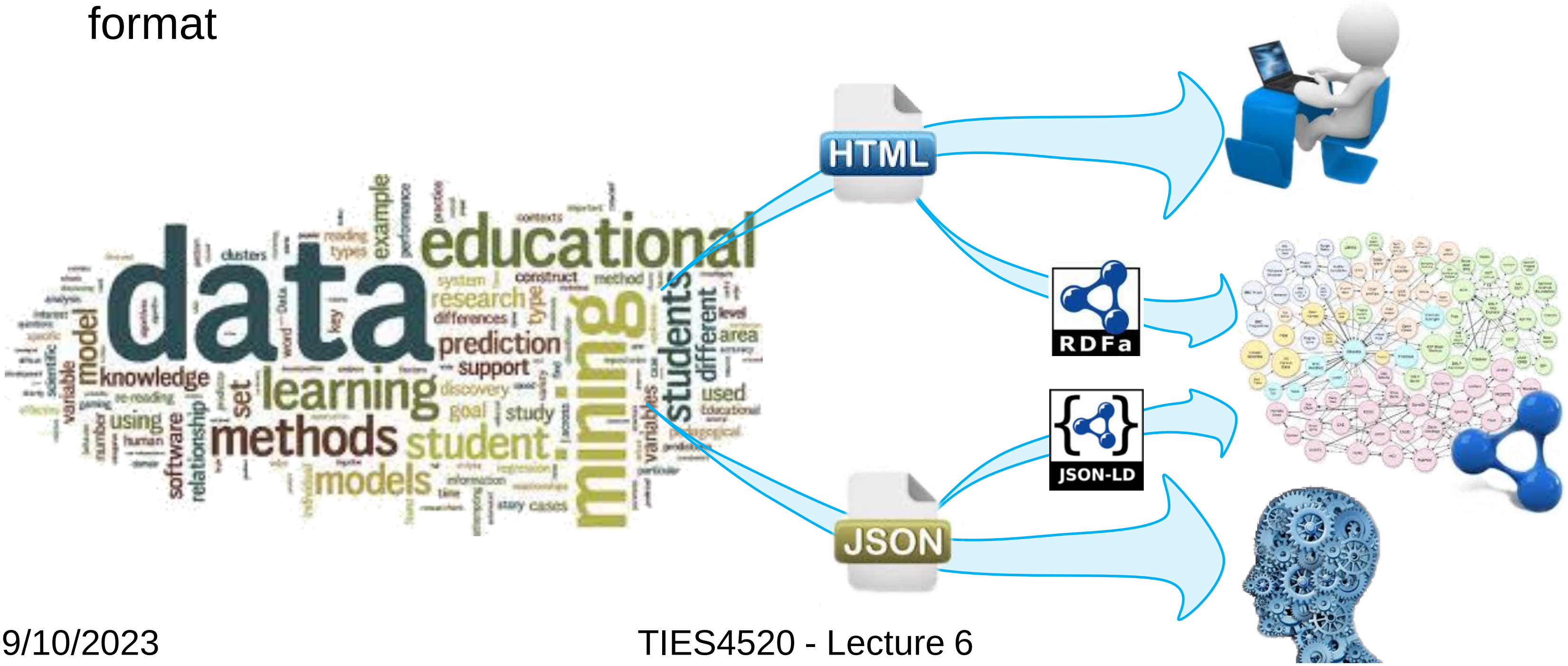
Part 1

Data Exchange

Machine readable data exchange

- ***RDFa*** – Resource Description Framework in attributes (W3C Recommendation). It is a domain-independent way to explicitly embed RDF data in attributes of a web page to:
  - transfer data from an application to another through the web;
  - write data only once for web users and web applications.
- ***JSON-LD*** - JavaScript Object Notation for Linked Data. Extension of JSON - simple property-value type machine readable data exchange format



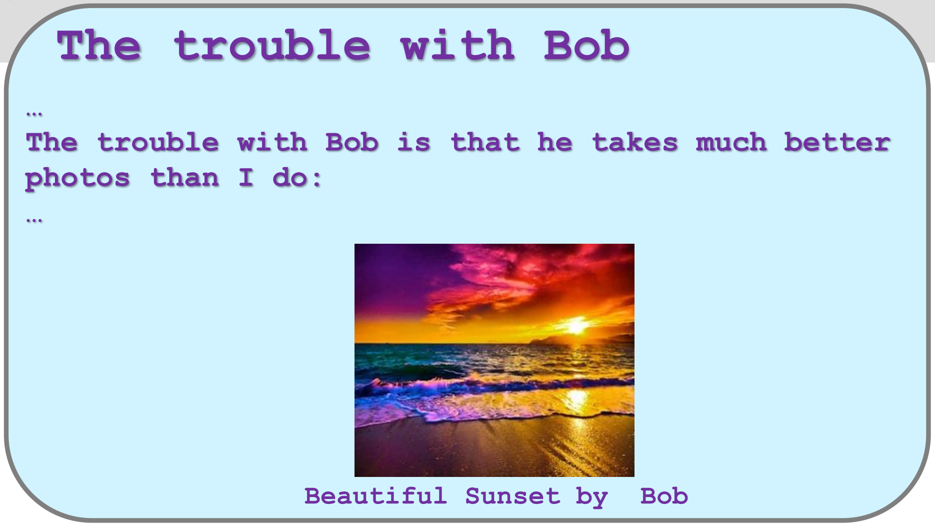
RDFa

- ***RDFa 1.1*** is for XHTML and HTML5, also works for any XML-based languages like SVG. (You can use HTML+RDFa, but it won't be officially valid HTML file)
  - ***RDFa Lite 1.1*** - is a minimal subset of RDFa (*http://www.w3.org/TR/rdfa-lite/*)
  - ***RDFa 1.1 Prime*** – is Rich Structured Data Markup for Web Documents (*http://www.w3.org/TR/rdfa-primer/*)
  - ***RDFa Core 1.1*** – is complete specification of RDFa (*http://www.w3.org/TR/rdfa-syntax/*)

- Useful links:
  - Basic presentation: *http://www.slideshare.net/fabien_gandon/rdfa-in-a-nutshell-v1*
  - RDFa materials for users and developers: *http://rdfa.info/* , *http://rdfa.info/dev/*
  - Real-time RDFa 1.1 editor: *http://rdfa.info/play/*
  - RDFa Online Parser: *http://rdf-translator.appspot.com/*
  - RDFa 1.1 Distiller: *http://www.w3.org/2012/pyRdfa/*

RDFa

```
<div vocab=“http://schema.org/”
     prefix=“ex: http://example.com/”
     resource="ex:alice/posts/trouble_with_bob“
     typeof=“Article”>
   <h2 property="title">The trouble with Bob</h2>
    ...
   The trouble with Bob is that he takes much better photos than I do:
    ...
   <div resource="ex:bob/photos/sunset.jpg"
        prefix=“dc: http://purl.org/dc/terms/” >
      <img src="http://example.com/bob/photos/sunset.jpg" />
      <span property=“title">Beautiful Sunset</span>
      by <span property=“dc:creator">Bob</span>.
   </div>
</div>
```



The trouble with Bob

…
The trouble with Bob is that he takes much better photos than I do:
…

Beautiful Sunset by Bob

RDFa

```
<div vocab=“http://schema.org/”
     prefix=“ex: http://example.com/”
     resource="ex:alice/posts/trouble_with_bob“
     typeof=“Article”>
   <h2 property="title">The trouble with Bob</h2>
    ...
   The trouble with Bob is that he takes much better photos than I do:
    ...
   <div resource="ex:bob/photos/sunset.jpg"
        prefix=“dc: http://purl.org/dc/terms/” >
      <img src="http://example.com/bob/photos/sunset.jpg" />
      <span property=“title">Beautiful Sunset</span>
      by <span property=“dc:creator">Bob</span>.
   </div>
</div>
```

```
@prefix  sc: <http://schema.org/> .
@prefix  ex: <http://example.com/> .
@prefix  dc: < http://purl.org/dc/terms/> .

ex:alice/posts/trouble_with_bob a sc:Article; sc:title ”The trouble with Bob”.
ex:bob/photos/sunset.jpg sc:title ”Beautiful Sunset” ; dc:creator “Bob” .
```

RDFa Lite 1.1

- ***RDFa Lite*** consists of five simple attributes: ***vocab*** (default vocabulary, applied until be redefined), ***typeof***, ***property***, ***resource*** and ***prefix***.

```
<div vocab=“http://schema.org/”
     prefix=“ex: http://example.com/”
     resource="ex:alice/posts/trouble_with_bob‟
     typeof=“Article”>
   <h2 property="title">The trouble with Bob</h2>
    ...
   The trouble with Bob is that he takes much better photos than I do:
    ...
   <div resource="ex:bob/photos/sunset.jpg"
        prefix=“dc: http://purl.org/dc/terms/” >
     <img src="http://example.com/bob/photos/sunset.jpg" />
     <span property=“title">Beautiful Sunset</span>
     by <span property=“dc:creator">Bob</span>.
   </div>
</div>
```

- A full list of pre-declared prefixes: *http://www.w3.org/2011/rdfa-context/rdfa-1.1*

```
@prefix  sc: <http://schema.org/> .
@prefix  ex: <http://example.com/> .
@prefix  dc: < http://purl.org/dc/terms/> .

ex:alice/posts/trouble_with_bob a sc:Article; sc:title ”The trouble with Bob”.
ex:bob/photos/sunset.jpg sc:title ”Beautiful Sunset” ; dc:creator ”Bob” .
```

More of RDFa

- It is possible to define a *blank node* by named blank node (e.g. “*_:name*”) or just by mentioning a type of the node.
- If the element contains the *href* (or *src*) attribute, property is automatically associated with the value of the attribute rather than the textual content of the <*a*> element.

```
<div vocab="http://xmlns.com/foaf/0.1/">
   <ul>
      <li typeof="Person">
        <a property="homepage" href="http://example.com/bob/">Bob</a>
      </li>
      <li typeof="Person">
        <a property="homepage" href="http://example.com/eve/">Eve</a>
      </li>
   </ul>
</div>
```

```
<div vocab="http://xmlns.com/foaf/0.1/" typeof="Person">
 <span property="name">Alice Birpemswick</span>,
 <ul>
  <li property="knows" typeof="Person">
   <a property="homepage" href="http://example.com/bob/"><span property="name">Bob</span></a>
  </li>
  <li property="knows" typeof="Person">
   <a property="homepage" href="http://example.com/eve/"><span property="name">Eve</span></a>
  </li>
 </ul>
</div>
```

More of RDFa

- HTML+RDFa allows ”*Property copying*” in case you have repeating set of data. It is possible to collect a number of statements as a pattern (***rdfa:Pattern***) and refer to it using the property ***rdfa:copy***.

```
<body vocab="http://purl.org/dc/terms/">
   <div resource="/alice/posts/trouble_with_bob">
      <h2 property="title">The trouble with Bob</h2>
      /some repeating part/
   </div>
   <div resource="/alice/posts/jims_concert">
      <h2 property="title">I was at Jim's concert the other day</h2>
      /some repeating part/
   </div>
</body>
```

```
<body vocab="http://purl.org/dc/terms/">
   <div resource="/alice/posts/trouble_with_bob">
      <h2 property="title">The trouble with Bob</h2>
      <link property="rdfa:copy" href="#cpattern"/>
   </div>
   <div resource="/alice/posts/jims_concert">
      <h2 property="title">I was at Jim's concert the other day</h2>
      <link property="rdfa:copy" href="#cpattern"/>
   </div>
   <div resource="#cpattern" typeof="rdfa:Pattern">
      /some repeating part/
   </div>
</body>
```

More of RDFa

- RDFa allows the value of a ***property*** and ***typeof*** attributes to be a list of values

```
...
<div resource="ex:me" typeof="foaf:Person schema:Person" >
   ...
   <h3 property="dc:creator schema:creator" resource="ex:me">John</h3>
</div>
...
```

- Human readability vs. unambiguity for machine readability (*RDFa Core*)

```
...
<p>Date: <span property="http://purl.org/dc/terms/created">2020-11-28</span></p>   ...
<p>Date: <span property="http://purl.org/dc/terms/created">28th of November, 2020</span></p>
...
```

  – RDFa makes it possible to re-use the ***content*** attribute of HTML

```
...
<p>Date: <span property="http://purl.org/dc/terms/created" content="2020-11-28">28th
of November, 2020</span></p>
...
```

  – also, ***content*** attribute can be useful when we define some statements through *meta* element (that may have no text content) in the header of the document

```
<head prefix="og: http://ogp.me/ns#" >
   ...
   <meta property="og:title" content="The Trouble with Bob" />
   ...
</head>
```

More of RDFa

- *RDFa Core* introduces attribute ***about*** that can be used as an alternative to **resource** in setting the context (the *subject* of the statement)
  - Attribute *resource* may be used to present subject or object of a statement

```
<div resource="/alice/posts/trouble">
   <h2 property="title">The trouble ...</h2>
   <h3 property="creator" resource="#me">Alice</h3>
</div>
```

Example: We need to set up a separate index page for all different blogs

```
<ul resource="/alice/posts">
  <li resource="/alice/posts/trouble" property="title">The trouble ...</li>
  <li resource="/alice/posts/jos" property="title">Jo’s Barbecue</li>
</ul>
```

The combination of *property* and *resource* inside the same element would be considered as ***predicate*** and ***object*** and would generate a different statement than originally intended.

```
<ul>
  <li resource="/alice/posts/trouble"><span property="title">The trouble ...</span></li>
  <li resource="/alice/posts/jos"><span property="title">Jo's Barbecue</span></li>
</ul>
```

… Current solution becomes a little bit complicated. Therefore ***about*** could be used…

```
<ul>
  <li about="/alice/posts/trouble" property="title">The trouble ...</li>
  <li about="/alice/posts/jos" property="title">Jo's Barbecue</li>
  ...
</ul>
```

More of RDFa

- *RDFa Core* allows definition of datatypes and language tag

```
<span property="dc:date" datatype="xsd:gYear">2011</span>
<span property="dc:name" xml:lang="en">John</span>
```

- *RDFa Core* attribute ***rel*** can be used as an alternative to ***property***
  - In contrast to *property*, *rel* *never* considers the textual content of an element (or the value of the *content* attribute). Instead, if no clear target has been specified for a link via, e.g., a *resource* or an *href* attribute, the processor is supposed to go “down” and find one or more targets in the hierarchy and use those.

```
<div vocab="http://xmlns.com/foaf/0.1/" resource="#me">
   <ul>
      <li property="knows" resource="http://example.com/bob/#me" typeof="Person">
         ...
      </li>
      <li property="knows" resource="http://example.com/eve/#me" typeof="Person">
         ...
      </li>
   </ul>
</div>
```

```
<div vocab="http://xmlns.com/foaf/0.1/" resource="#me">
   <ul rel="knows">
      <li resource="http://example.com/bob/#me" typeof="Person">
         ...
      </li>
      <li resource="http://example.com/eve/#me" typeof="Person">
         ...
      </li>
   </ul>
</div>
```

More of RDFa

```
<html version="xhtml+RDFa 1.1" xmlns="http://www.w3.org/1999/xhtml"
      prefix=“dbp: http://dbpedia.org/property/
              dbp-owl: http://dbpedia.org/ontology/
              dbr: http://dbpedia.org/resource/
              foaf: http://xmlns.com/foaf/0.1/
              xsd: http://www.w3.org/2001/XMLSchema#">
  <head>
    <title>Albert Einstein</title>
  </head>
  <body>
    <div about=“dbr:Albert_Einstein">
      <span property="foaf:name">Albert Einstein</span>
      <span property="dbp:dateOfBirth" datatype="xsd:date">1879-03-14</span>
      <div rel="dbp:birthPlace" resource="dbp:German_Empire">
        <span property="dbp:conventionalLongName">the German Empire</span>
        <span rel="dbp-owl:capital" resource="dbr:Berlin" />
      </div>
    </div>
  </body>
</html>
```

```
@prefix …

dbr:Albert_Einstein foaf:name "Albert Einstein" .
dbr:Albert_Einstein dbp:dateOfBirth "1879-03-14"^^xsd:date .
dbr:Albert_Einstein dbp:birthPlace dbr:German_Empire .

dbr:German_Empire dbp:conventionalLongName "the German Empire" .
dbr:German_Empire dbp-owl:capital dbr:Berlin .
```

JSON-LD

- ***JSON*** (JavaScript Object Notation) is a lightweight data-interchange format that is completely language independent but uses conventions that are familiar to programmers of most of the programming languages (an *object* is an unordered set of name/value pairs).
- ***JSON-LD*** is a lightweight Linked Data format that extends JSON:
  - easy for humans to read and write
  - it is based on the already successful JSON format
  - provides a way to help JSON data interoperate at Web-scale

```
{
  "@context": "http://json-ld.org/contexts/person.jsonld",
  "@id": "http://dbpedia.org/resource/John_Lennon",
  "name": "John Lennon",
  "born": "1940-10-09",
  "spouse": "http://dbpedia.org/resource/Cynthia_Lennon"
}
```

- JSON for Linked Data: *http://json-ld.org*
- JSON-LD Playground: *http://json-ld.org/playground/index.html*
- JSON-LD parser/serializer for RDFLib (Python lib): *https://github.com/RDFLib/rdflib-jsonld*
- JSON-LD Processor and API implementation in JavaScript: *https://npmjs.org/package/jsonld*

JSON-LD

- Ambiguity

```
{    “name”:“Oleksiy”,
     “homepage”:“http://users.jyu.fi/~olkhriye” }
```

```
{    “name”:“olkhriye”,
     “homepage”:“http://users.jyu.fi/~olkhriye” }
```

- To be specific

```
{    “http://ex1.com/name”:“Oleksiy”,
     “http://ex1.com/homepage”:“http://users.jyu.fi/~olkhriye” }
```

- To be very concise use ***JSON-LD Context***
  - used to define the short-hand names

```
{    “@context”:“http://ex1.com/myApp.jsonld”,
     “name”:“Oleksiy”,
     “homepage”:“http://users.jyu.fi/~olkhriye” }
```

```
{    “@context”:{ “schema”:“http://schema.org/”,
                  “name”:“schema:givenName”,
                  “homepage”:“schema:url” },
     “name”:“Oleksiy”,
     “homepage”:“http://users.jyu.fi/~olkhriye” }
```

JSON-LD

- ***JSON-LD Identifiers***
  - uniquely identifies *things*

```
{   “@context” {
       “name”:“http://schema.org/givenName”,
       “homepage”:“http://schema.org/url”
    },
    “@id”:“http://people.com/OleksiyKhriyenko”,
    “name”:“Oleksiy”,
    “homepage”:{“@id”:“http://users.jyu.fi/~olkhriye”}
}
```

```
{   “@context” {
       “name”:“http://schema.org/givenName”,
       “homepage”:{
          “@id”:“http://schema.org/url”,
          “@type”:“@id” }
    },
    “@id”:“http://people.com/OleksiyKhriyenko”,
    “name”:“Oleksiy”,
    “homepage”:“http://users.jyu.fi/~olkhriye”
}
```

JSON-LD

- ***JSON-LD Type***
  - sets the data type of a *node* or *typed value*

```
{    “@context” {
        “name”:“http://schema.org/givenName”,
        “homepage”:{“@id”:“http://schema.org/url”,“@type”:“@id”}
     },
     “@id”:“http://people.com/OleksiyKhriyenko”,
     “@type”:“http://schema.org/Person”,
     “name”:“Oleksiy”,
     “homepage”:“http://users.jyu.fi/~olkhriye”
}
```

- ***JSON-LD Value***
  - specifies the data that is associated with a particular *property* in the graph

```
{    “@context”:“http://context-jsonld.com/person”,
     “@id”:“http://people.com/OleksiyKhriyenko”,
     “@type”:“http://schema.org/Person”,
     “name”:[
                 {“@value”:“Oleksiy”},
                 …
            ] ,
     “birthDate”:{“@value”:“1981-08-13”, “@type”:“xsd:date”}
}
```

JSON-LD

- ***JSON-LD language***
  - specifies the language for a particular string value or the default language of a JSON-LD document

```
{  “@context” {
      “schema”:“http://schema.org/”,
      “name_ua”:{“@id”:“schema:givenName”, “@language”:“ua”},
      “name_ru”:{“@id”:“schema:givenName”, “@language”:“ru”},
      “birthDate”:{“@id”:“schema:birthDate”, “@type”:“xsd:date”}
   },
   “@id”:“http://people.com/OleksiyKhriyenko”,
   “@type”:“http://schema.org/Person”,
   “name_ua”:“Oleksiy”,
   “name_ru”:“Aleksey”,
   “birthDate”:“1981-08-13”
}
```

JSON-LD

- ***JSON-LD arrays***
  - *@container* is used to set the default container type for a *term*
  - *@list* represents *ordered* collection of values
  - *@set* describes *unordered* set of values

```
{  "@context":{ ...
                "nick":{ "@id": "http://xmlns.com/foaf/0.1/nick",
                         "@container": "@list“ },
                "name":{ "@id": "http://xmlns.com/foaf/0.1/name",
                         "@container": "@set“ }
              },
   "@id": "http://example.org/people#joebob",
   "nick": [ "joe", "bob", "jaybee" ],
   "name": [ { “@value”:“John”,
               “@language”:“en” },
             { “@value”:“Jonie”,
               “@language”:“fr” }
           ],
   “homepage”: [ “http://users.jyu.fi/~joe”,
                 “http://examplepage.com/~bob”,
                 “http://myPage.org/~jaybee”
                ],
   ...
}
```

JSON-LD

- ***JSON-LD reverse property*** *allows bidirection in directed graph*

```
[ { "@id": "#john",
    "http://myontology.com/onto#name": “John“ },
  { "@id": "#peter",
    "http://myontology.com/onto#name": “Peter",
    "http://myontology.com/onto#parent": { "@id": "#John" } },
  { "@id": "#mary",
    "http://myontology.com/onto#name": “Mary",
    "http://myontology.com/onto#parent": { "@id": "#John" } }
]
```

```
{ "@id": "#john",
  "http://myontology.com/onto#name": “John",
  "@reverse": { "http://myontology.com/onto#parent": [
                   { "@id": "#peter",
                     "http://myontology.com/onto#name": “Peter" },
                   { "@id": "#mary",
                     "http://myontology.com/onto#name": “Mary" } ] }
}
```

```
{ "@context": { "name": "http://myontology.com/onto#name",
                "children": { "@reverse": "http://myontology.com/onto#parent" } },
  "@id": "#john",
  "name": “John",
  "children": [ { "@id": "#peter", "name": “Peter" },
                { "@id": "#mary", "name": “Mary" } ]
}
```

JSON-LD

- **@base** sets the base IRI against which *relative IRIs* are resolved

http://myJSON.com/document.jsonld

```
{ "@context": {
                   "label": "http://www.w3.org/2000/01/rdf-schema#label"
               },
  "@id": "",
  "label": "A simple document"
}
```

```
{ "@context": {    "@base": "http://myJSON.com/document.jsonld"   },
  "@id": "",
  "label": "A simple document"
}
```

- **@vocab** expands *properties* and *values* in **@type** with a common prefix IRI.

If certain keys *should not be expanded* using the vocabulary IRI, a term can be explicitly set to *null* in the context.

```
{ "@context": {
                   "@vocab": "http://schema.org/",
                   "dbID": null
               },
  "@id": "http://example.org/places#SalsaOrchidea",
  "@type": "Restaurant",
  "name": "Salsa Orchidea",
  "dbID": "12345678"
}
```

JSON-LD

- ***JSON-LD graph*** - used to group a set of *nodes*. Make statements about a *graph* itself, rather than just a single *node*.

```
{ "@context": { "generatedAt": {
                    "@id": "http://www.w3.org/ns/prov#generatedAtTime",
                    "@type": "http://www.w3.org/2001/XMLSchema#date"
                 }
              },
  "@id": "http://example.org/graphs/13",
  "generatedAt": "2013-11-26",
  "@graph": [ { "@id": "http://example.org/about#manu",
                ... },
              { "@id": "http://http://example.org/foaf#me",
                ... }
            ]
}
```

- Explicit expression of default graph

```
{ "@context": ...,
  "@graph": [ {... },
              {... } ]
}
```

```
[ { "@context": ...,
    ... },
  { "@context": ...,
    ... } ]
```

JSON-LD

- ***JSON-LD compact IRI*** - expressing an IRI using a *prefix* and *suffix* separated by a colon (:):
- *prefix* matches a term defined within the *active context;*
- *suffix* does not begin with two slashes (*//*);
- if the *prefix* is not defined in the active context, or the *suffix* begins with two slashes (e.g. *http://example.com*), the value is interpreted as *absolute IRI* instead;
- if the *prefix* is an underscore (_), the value is interpreted as *blank node* identifier instead.

```
{
  "@context":
  {
    "foaf": "http://xmlns.com/foaf/0.1/"
  ...
  },
  "@type": "foaf:Person",
  "foaf:name": "Dave Longley",
  ...
}
```

JSON-LD and RDF

- ***JSON-LD***

```
{   “@context”:{
                  “schema”:“http://schema.org/”
               },
    “@id”:“http://people.com/OleksiyKhriyenko”,
    “@type”:“schema:Person”,
    “schema:name”:“Oleksiy”,
    “schema:knows”:{
          “@id”:“http://people.com/JohnDou”,
          “@type”:“schema:Person”,
          “schema:name”:“John”,
          “schema:knows”:“http://people.com/OleksiyKhriyenko”
     }
}
```

- ***RDF***

```
@prefix schema: <http://schema.org/>.
<http://people.com/OleksiyKhriyenko> a schema:Person ;
          schema:name “Oleksiy” ;
          schema:knows <http://people.com/JohnDou> .
<http://people.com/JohnDou> a schema:Person ;
          schema:name “John” ;
          schema:knows <http://people.com/OleksiyKhriyenko> .
```

JSON-LD and HTML

- ***JSON-LD*** content can be easily embedded in HTML by placing it in a script element with the *type* attribute set to *application/ld+json*.

```
<script type=“application/ld+json”>
{
    “@context”:“http://context-jsonld.com/person”,
    “@id”:“http://people.com/OleksiyKhriyenko”,
    “@type”:“Person”,
    “name”:“Oleksiy”,
    “knows”:{
              “@id”:“http://people.com/JohnDou”,
              “@type”:“Person”,
              “name”:“John”,
              “knows”:“http://people.com/OleksiyKhriyenko”
            }
}
</script>
```

JSON-LD and RDFa

```
<div prefix="foaf: http://xmlns.com/foaf/0.1/">
   <ul>
      <li typeof="foaf:Person">
        <a rel="foaf:homepage" href="http://example.com/bob/"
                                                    property="foaf:name">Bob</a>
      </li>
      <li typeof="foaf:Person">
        <a rel="foaf:homepage" href="http://example.com/eve/"
                                                    property="foaf:name">Eve</a>
      </li>
      <li typeof="foaf:Person">
        <a rel="foaf:homepage" href="http://example.com/manu/"
                                                    property="foaf:name">Manu</a>
      </li>
   </ul>
</div>
```

```
{ "@context":{ "foaf": "http://xmlns.com/foaf/0.1/" },
  "@graph":[ { "@type": "foaf:Person",
               "foaf:homepage": "http://example.com/bob/",
               "foaf:name": "Bob" },
             { "@type": "foaf:Person",
               "foaf:homepage": "http://example.com/eve/",
               "foaf:name": "Eve" },
             { "@type": "foaf:Person",
               "foaf:homepage": "http://example.com/manu/",
               "foaf:name": "Manu"}
           ]
}
```

Part 2

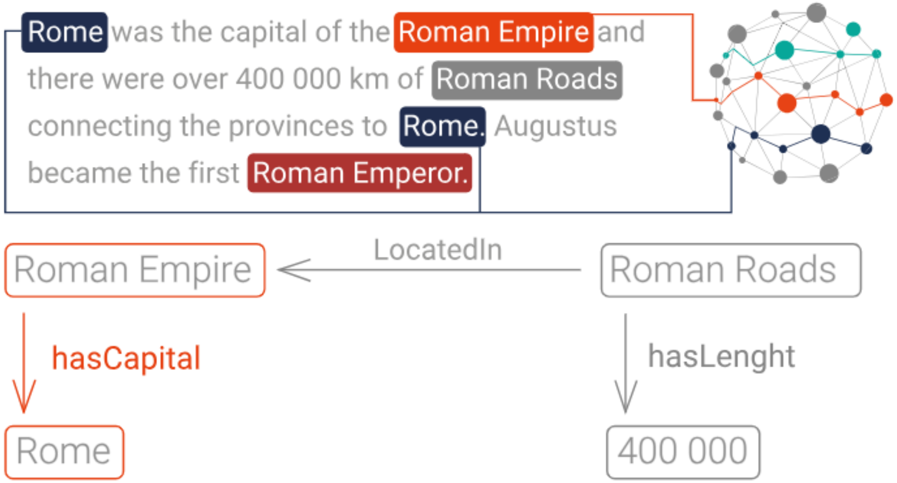
Semantic Annotation

Semantic Annotation

Semantic Annotation enriches content with machine-processable information by linking background information to extracted concepts. These concepts, found in a document or another piece of content, are unambiguously defined and related to each other within and outside the content. (*http://ontotext.com/knowledgehub/fundamentals/semantic-annotation/*)

A typical process of ***semantic enrichment*** includes:

- ***Text Identification*** Text could be extracted from any form of unstructured data: articles, documents, non-textual sources such as PDF files, videos, voice recordings etc.
- ***Text Analysis*** Algorithms split sentences and identify concepts, such as people, things, places, events, numbers.
- ***Concept Extraction*** All recognized concepts are classified (they are defined as people, organizations, numbers etc.) and disambiguated (they are unambiguously defined according to a domain-specific knowledge base). For example, Rome is classified as a city and further disambiguated as Rome, Italy not Rome, Iowa. This is the most important stage of semantic annotation. It includes Named Entity Recognition and makes them machine-processable and understandable data pieces by linking them to a broader sets of already existing data.
- ***Relationship Extraction*** The relationships between the extracted concepts are identified and interlinked with related external or internal domain knowledge.
- ***Indexing and storing in a semantic graph database*** All the recognized and enriched with machine-readable data mentions of people, things, numbers etc. and the relationships between them are indexed and stored in a semantic graph database for further reference and use.


Rome was the capital of the Roman Empire and
there were over 400 000 km of Roman Roads
connecting the provinces to Rome. Augustus
became the first Roman Emperor.
Roman Empire
LocatedIn
Roman Roads
hasCapital
hasLenght
Rome
400 000

Related materials: *http://www.slideshare.net/dianamaynard/text-analysis-in-gate*

https://libraryconnect.elsevier.com/articles/knowledge-discovery-through-text-analytics-advances-challenges-and-opportunities

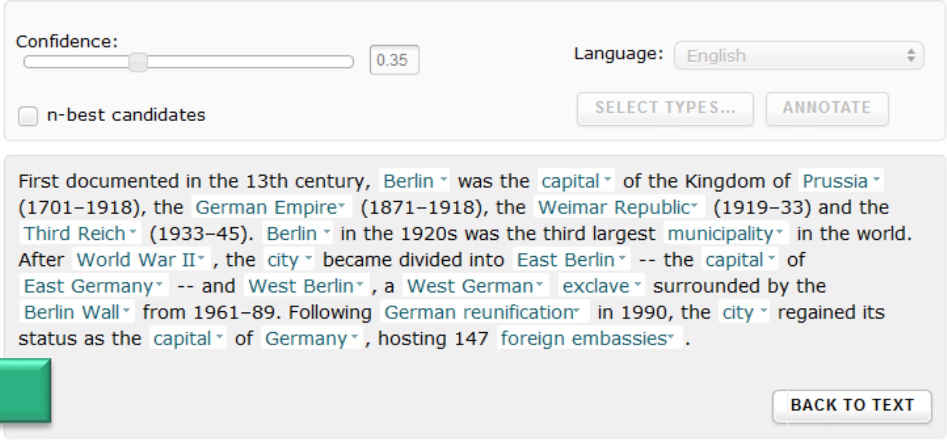
DBpedia Spotlight

- ***DBpedia Spotlight*** is a tool for automatically annotating mentions of *DBpedia* resources in text, providing a solution for linking unstructured information sources to the Linked Open Data cloud through *DBpedia*.

(*https://www.dbpedia-spotlight.org/* , *https://github.com/dbpedia-spotlight/dbpedia-spotlight/wiki*)

- Try out DBpedia Spotlight through Web Application or Web Service endpoints:
  - The ***Web Application*** is a user interface that allows you to enter text in a form and generates an HTML annotated version of the text with links to DBpedia.
  - The ***Web Service endpoints*** provide programmatic access to the demo, allowing you to retrieve data also in XML or JSON.
- Demo: *https://demo.dbpedia-spotlight.org/*
  https://www.dbpedia-spotlight.org/api

DBpediaSpotlight



Confidence: 0.35

Language: English

☐ n-best candidates

First documented in the 13th century, Berlin was the capital of the Kingdom of Prussia (1701–1918), the German Empire (1871–1918), the Weimar Republic (1919–33) and the Third Reich (1933–45). Berlin in the 1920s was the third largest municipality in the world. After World War II , the city became divided into East Berlin -- the capital of East Germany -- and West Berlin , a West German exclave surrounded by the Berlin Wall from 1961–89. Following German reunification in 1990, the city regained its status as the capital of Germany , hosting 147 foreign embassies .

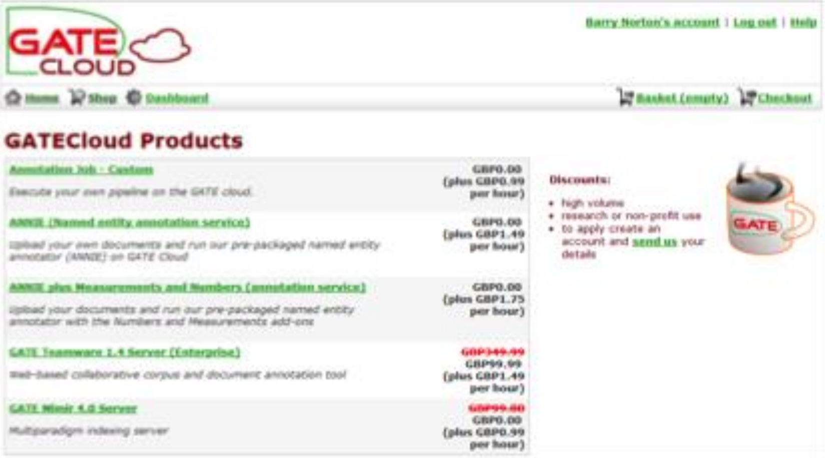
demo

GATE

- ***GATE*** *(General Architecture for Text Engineering)* is an open-source framework for text engineering. Started in 1996, *GATE* has a large developer community and can be more readily customized for text annotation in different domains and for different purposes. *GATE* is used worldwide to build bespoke solutions by organizations including the Press Association and National Archive. Information extraction is supported in many languages. (*https://gate.ac.uk*)

- There is a possibility to build a *GATE processing pipeline* specifically for your domain. For this we take an RDF dataset and use this to produce what is called a *GATE Gazetteer*, which is a list of entities in a domain and associated text labels used to refer to those entities. We can produce a gazetteer using the RDF data from chosen domain.

- A *GATE pipeline* can be run locally or uploaded to the *GATE cloud*. Once set up, text can be submitted and then annotated using the domain specific data. The annotated text can then be output in a format such as RDFa. (*https://cloud.gate.ac.uk/*).



GATECloud Products

Annotation Job - Custom *Execute your own pipeline on the GATE cloud.*	GBP0.00 (plus GBP0.99 per hour)
ANNIE (Named entity annotation service) *Upload your own documents and run our pre-packaged named entity annotator (ANNIE) on GATE Cloud*	GBP0.00 (plus GBP1.49 per hour)
ANNIE plus Measurements and Numbers (annotation service) *Upload your documents and run our pre-packaged named entity annotator with the Numbers and Measurements add-ons*	GBP0.00 (plus GBP1.75 per hour)
GATE Teamware 1.4 Server (Enterprise) *Web-based collaborative corpus and document annotation tool*	~~GBP349.99~~ GBP99.99 (plus GBP1.49 per hour)
GATE Mimir 4.0 Server *Multiparadigm indexing server*	~~GBP99.00~~ GBP0.00 (plus GBP0.99 per hour)

Discounts:

- high volume
- research or non-profit use
- to apply create an account and send us your details

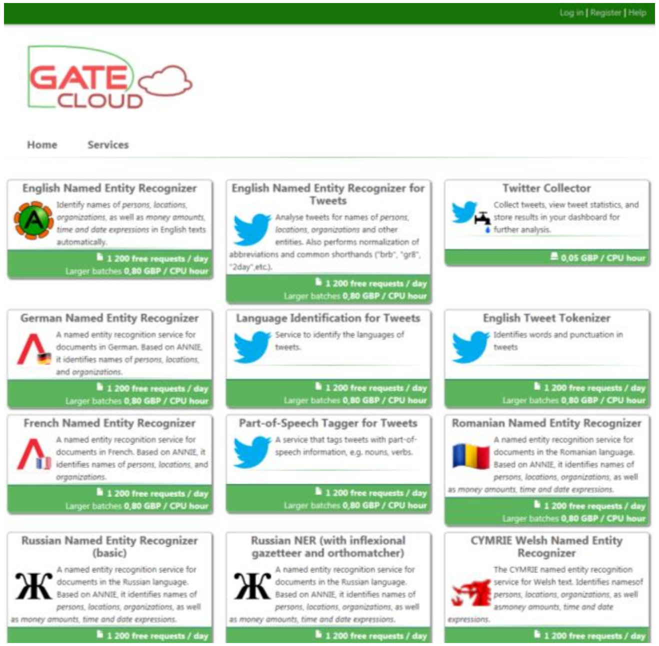
- *Related materials:*

http://www.slideshare.net/dianamaynard/text-analysis-in-gate

GATE Cloud

Text Analytics-as-a-Service. ***GATE Cloud*** – the home of affordable text analytics solutions from the world-leading open source ***GATE platform***. Collect and/or process documents and social media, using freemium pre-packaged annotation services, or scale out and run your own GATE pipeline on millions of documents. View and export the results in structured formats, or run your own private instance of our highly scalable GATE Mímir semantic search platform.

(*https://cloud.gate.ac.uk/*)



English Named Entity Recognizer
Identify names of *persons*, *locations*, *organizations*, as well as *money amounts*, *time and date expressions* in English texts automatically.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

English Named Entity Recognizer for Tweets
Analyse tweets for names of *persons*, *locations*, *organizations* and other entities. Also performs normalization of abbreviations and common shorthands ("brb", "gr8", "2day",etc.).
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

Twitter Collector
Collect tweets, view tweet statistics, and store results in your dashboard for further analysis.
0,05 GBP / CPU hour

German Named Entity Recognizer
A named entity recognition service for documents in German. Based on ANNIE, it identifies names of *persons*, *locations*, and *organizations*.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

Language Identification for Tweets
Service to identify the languages of tweets.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

English Tweet Tokenizer
Identifies words and punctuation in tweets
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

French Named Entity Recognizer
A named entity recognition service for documents in French. Based on ANNIE, it identifies names of *persons*, *locations*, and *organizations*.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

Part-of-Speech Tagger for Tweets
A service that tags tweets with part-of-speech information, e.g. nouns, verbs.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

Romanian Named Entity Recognizer
A named entity recognition service for documents in the Romanian language. Based on ANNIE, it identifies names of *persons*, *locations*, *organizations*, as well as *money amounts*, *time and date expressions*.
1 200 free requests / day
Larger batches 0,80 GBP / CPU hour

Russian Named Entity Recognizer (basic)
A named entity recognition service for documents in the Russian language. Based on ANNIE, it identifies names of *persons*, *locations*, *organizations*, as well as *money amounts*, *time and date expressions*.
1 200 free requests / day

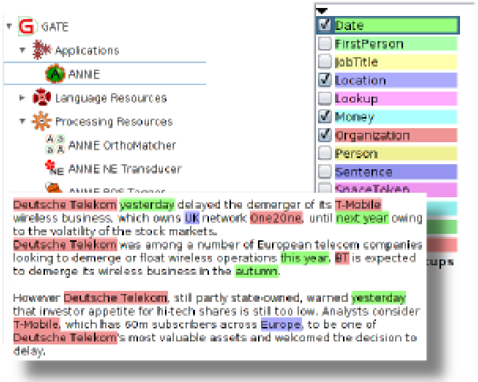
Russian NER (with inflexional gazetteer and orthomatcher)
A named entity recognition service for documents in the Russian language. Based on ANNIE, it identifies names of *persons*, *locations*, *organizations*, as well as *money amounts*, *time and date expressions*.
1 200 free requests / day

CYMRIE Welsh Named Entity Recognizer
The CYMRIE named entity recognition service for Welsh text. Identifies namesof *persons*, *locations*, *organizations*, as well asmoney *amounts*, *time and date expressions*.
1 200 free requests / day

- Free Semantic Text Analysis APIs
- On-demand, Large-Scale Text Analytics
- Customized services and local cloud deployments

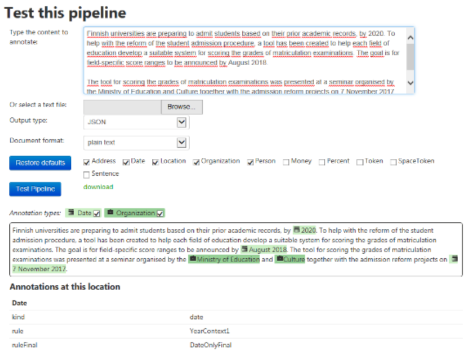
Set of ***services*** on GATE Cloud: *https://cloud.gate.ac.uk/shopfront*

demo



Deutsche Telekom yesterday delayed the demerger of its T-Mobile wireless business, which owns UK network One2One, until next year owing to the volatility of the stock markets.
Deutsche Telekom was among a number of European telecom companies looking to demerge or float wireless operations this year. BT is expected to demerge its wireless business in the autumn.

However Deutsche Telekom, still partly state-owned, warned yesterday that investor appetite for hi-tech shares is still too low. Analysts consider T-Mobile, which has 60m subscribers across Europe, to be one of Deutsche Telekom's most valuable assets and welcomed the decision to delay.



Test this pipeline

Type the content to annotate: Finnish universities are preparing to admit students based on their prior academic records, by 2020. To help with the reform of the student admission procedure, a tool has been created to help each field of education develop a suitable system for scoring the grades of matriculation examinations. The goal is for field-specific score ranges to be announced by August 2018.

The tool for scoring the grades of matriculation examinations was presented at a seminar organised by the Ministry of Education and Culture together with the admission reform projects on 7 November 2017

Or select a text file: Browse...
Output type: JSON
Document format: plain text

Restore defaults ☑ Address ☑ Date ☑ Location ☑ Organization ☑ Person □ Money □ Percent □ Token □ SpaceToken □ Sentence

Test Pipeline download

Annotation types: Date ☑ Organization ☑

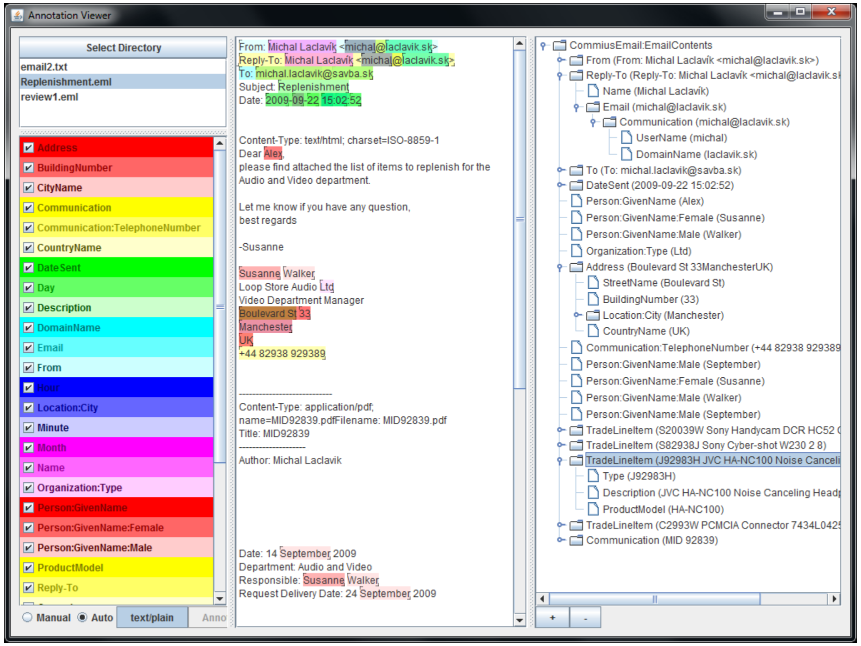
Finnish universities are preparing to admit students based on their prior academic records, by 2020. To help with the reform of the student admission procedure, a tool has been created to help each field of education develop a suitable system for scoring the grades of matriculation examinations. The goal is for field-specific score ranges to be announced by August 2018. The tool for scoring the grades of matriculation examinations was presented at a seminar organised by the Ministry of Education and Culture together with the admission reform projects on 7 November 2017.

Annotations at this location

Date	
kind	date
rule	YearContext1
ruleFinal	DateOnlyFinal

OnTeA

- ***OnTeA*** *(Ontology based Text Annotation)* is a Pattern based Semantic Annotation Platform. OnTeA search or create semantic meta data from text or documents using pattern-based approaches. The Platform contains also graphical user interface, which shows identified objects in the text of email message or text file. The Platform also analyses HTML, PDF and Word email attachments.
- OnTeA uses two main techniques for information extraction:
  - patterns based on regular expressions
  - gazetteers: place names, locations, days of the weeks, etc. (now working with GATE or OntoText gazetteers).
- Link: *http://ontea.sourceforge.net/*

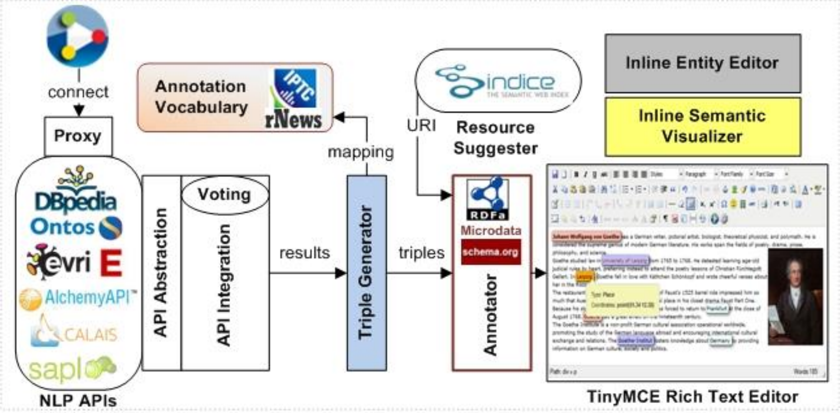


```
From: Michal Laclavík <michal@laclavik.sk>
Reply-To: Michal Laclavík <michal@laclavik.sk>
To: michal.laclavik@savba.sk
Subject: Replenishment
Date: 2009-09-22 15:02:52


Content-Type: text/html; charset=ISO-8859-1
Dear Alex,
please find attached the list of items to replenish for the
Audio and Video department.

Let me know if you have any question,
best regards

-Susanne

Susanne Walker
Loop Store Audio Ltd
Video Department Manager
Boulevard St 33
Manchester
UK
+44 82938 929389


----------------------------
Content-Type: application/pdf;
name=MID92839.pdfFilename: MID92839.pdf
Title: MID92839
--------------------
Author: Michal Laclavik




Date: 14 September 2009
Department: Audio and Video
Responsible: Susanne Walker
Request Delivery Date: 24 September 2009
```

```
CommiusEmail:EmailContents
    From (From: Michal Laclavík <michal@laclavik.sk>)
    Reply-To (Reply-To: Michal Laclavík <michal@laclavik.sk
        Name (Michal Laclavík)
        Email (michal@laclavik.sk)
            Communication (michal@laclavik.sk)
                UserName (michal)
                DomainName (laclavik.sk)
    To (To: michal.laclavik@savba.sk)
    DateSent (2009-09-22 15:02:52)
    Person:GivenName (Alex)
    Person:GivenName:Female (Susanne)
    Person:GivenName:Male (Walker)
    Organization:Type (Ltd)
    Address (Boulevard St 33ManchesterUK)
        StreetName (Boulevard St)
        BuildingNumber (33)
        Location:City (Manchester)
        CountryName (UK)
    Communication:TelephoneNumber (+44 82938 929389
    Person:GivenName:Male (September)
    Person:GivenName:Female (Susanne)
    Person:GivenName:Male (Walker)
    Person:GivenName:Male (September)
    TradeLineItem (S20039W Sony Handycam DCR HC52 (
    TradeLineItem (S82938J Sony Cyber-shot W230 2 8)
    TradeLineItem (J92983H JVC HA-NC100 Noise Canceli
        Type (J92983H)
        Description (JVC HA-NC100 Noise Canceling Headp
        ProductModel (HA-NC100)
    TradeLineItem (C2993W PCMCIA Connector 7434L0425
    Communication (MID 92839)
```

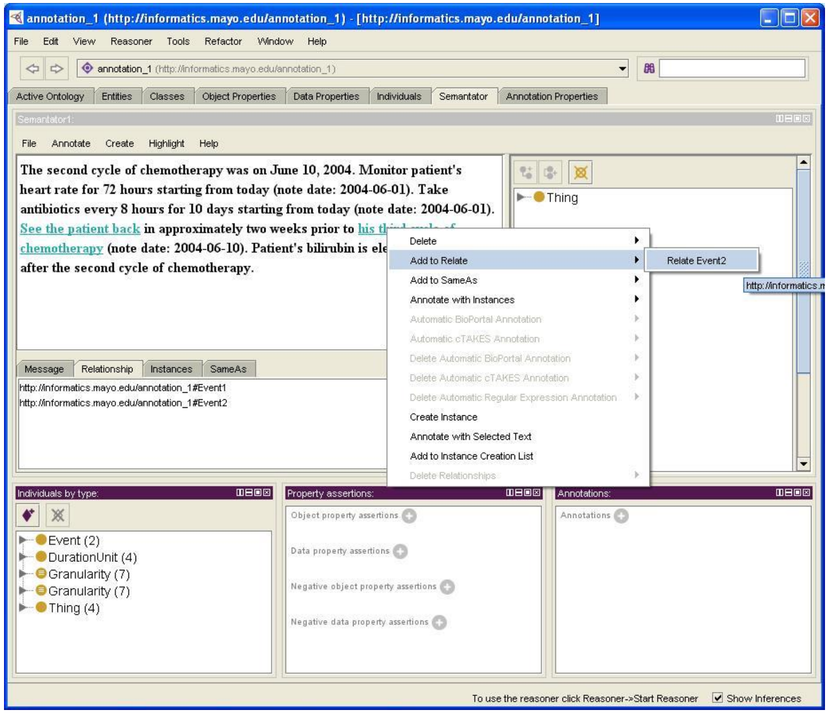
RDFaCE

- ***RDFaCE*** *(RDFa Content Editor)* is a Semantic content editor based on TinyMCE WYSIWYG editor. ***RDFaCE*** is an implementation for WYSIWYM (What You See Is What You Mean) concept (*http://youtu.be/wxtlAol4HB0*). WYSIWYM aims to enable end-users to easily annotate their content using ***RDFa*** and ***Microdata*** markups based on ***Schema.org*** vocabularies. (*http://ali1k.com/rdface/*)(*http://youtu.be/W5CdPq0C1GU*)(*http://aksw.org/Projects/RDFaCE.html*)
- ***RDFaCE*** supports automatic content annotation employing *Sindice*, *Swoogle* and *Prefix.cc* APIs for resource suggestion (providing appropriate URIs for subjects, properties and namespaces) as well as using external ***NLP APIs*** (*Alchemy, Extractiv, Open Calais, Ontos, Evri, Saplo, Lupedia* and *DBpedia spotlight*).
- Available as a plugin for ***WordPress*** blogging platform (*http://wordpress.org/plugins/rdface/*).
- ***RDFaCE –lite*** is based on lite-weight version of RDFa. It supports RDFa and Microdata on ***rNews schema*** (limited to news-specific metadata: person, location, organization entities, etc.)
- Demos: *http://ali1k.com/rdface/*



Semantator

- ***Semantator*** *(Semantic Annotator)* is a tool developed in Mayo Clinic for users to semantically annotate data of interest with respect of domain ontologies in plain text. (*http://informatics.mayo.edu/CNTRO/index.php/Semantator*)
- *Semantator* is implemented as a Protege plug-in that allows users to view the ontology used for annotation, and the annotation results in the same environment. *Semantator* provides two modes:
  - ❑ *Manual annotation*. Expert can choose a document to be annotated and a domain ontology, highlight different pieces of information from the original text, and then mark which ontology concepts the information belongs to, link the instances together using the properties defined in the domain ontology.
  - ❑ *Semi-automatic annotation*. Users can choose to use different automatic annotation tools such as the National Center for Biomedical Ontologies (NCBO) annotator and Mayo Clinic's Clinical Text Analysis and Knowledge Extraction System (cTAKES), which are well-acknowledged tools for annotating biomedical and clinical text. Annotation results can be reviewed and modify as needed.



annotation_1 (http://informatics.mayo.edu/annotation_1) - [http://informatics.mayo.edu/annotation_1]

annotation_1 (http://informatics.mayo.edu/annotation_1)

The second cycle of chemotherapy was on June 10, 2004. Monitor patient's heart rate for 72 hours starting from today (note date: 2004-06-01). Take antibiotics every 8 hours for 10 days starting from today (note date: 2004-06-01). See the patient back in approximately two weeks prior to his th chemotherapy (note date: 2004-06-10). Patient's bilirubin is ele after the second cycle of chemotherapy.

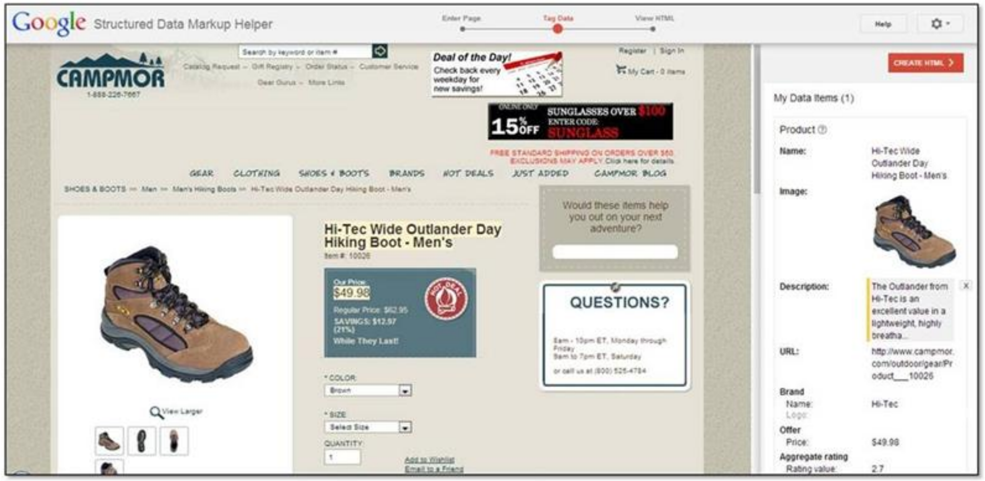
http://informatics.mayo.edu/annotation_1#Event1
http://informatics.mayo.edu/annotation_1#Event2

To use the reasoner click Reasoner->Start Reasoner ☑ Show Inferences

- Useful readings:
  - *http://www.sciencedirect.com/science/article/pii/S1532046413001020#*
  - *http://swat.cse.lehigh.edu/pubs/song12a.pdf*

Structured Data Markup Helper

- ***Structured Data Markup Helper*** helps to update a site with on-page markup that enables search engines (e.g. Google, Bing, Yahoo!, Yandex) and other products to understand the information on web pages and provide richer search results in order to make it easier for users to find relevant information on the web. (*https://www.google.com/webmasters/markup-helper/*)
- Markup Helper uses ***microdata*** and ***JSON-LD*** formats with the ***schema.org*** vocabulary (a collaboration by Google, Microsoft, and Yahoo! to improve data description and interoperability on the web).
- Helpful links:
  - About Markup Helper: https://support.google.com/webmasters/answer/3069489?hl=en
  - Microdata: http://www.w3.org/TR/microdata/
  - JSON-LD: http://json-ld.org/
  - Schema.org: http://schema.org/



My Data Items (1)

Product

Name: Hi-Tec Wide Outlander Day Hiking Boot - Men's

Image:

Description: The Outlander from Hi-Tec is an excellent value in a lightweight, highly breatha...

URL: http://www.campmor.com/outdoor/gear/Product___10026

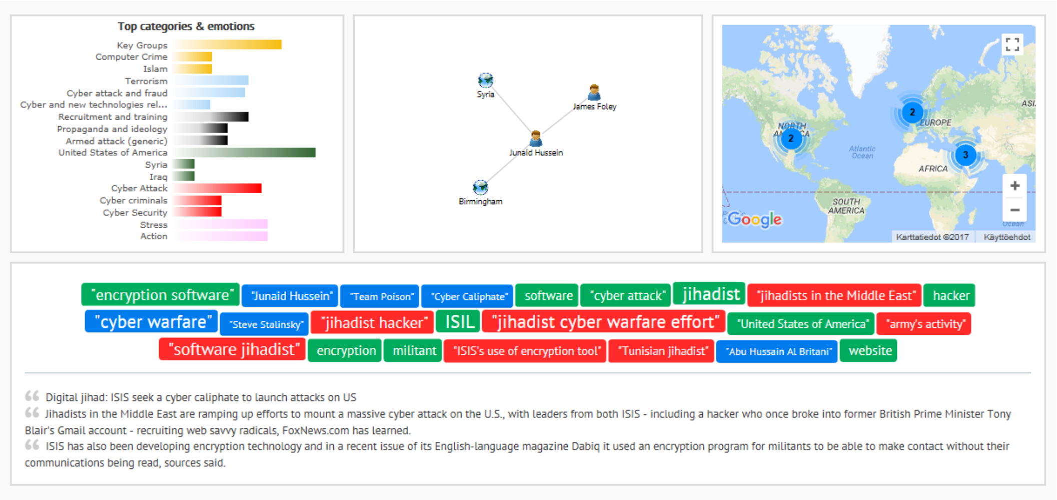
Brand
Name: Hi-Tec
Logo:

Offer
Price: $49.98

Aggregate rating
Rating value: 2.7

Cogito Intelligence API

- ***Cogito Intelligence API*** (*http://www.intelligenceapi.com/*) provides full semantic processing features—text mining (with time references (alpha version), semantic reasoning and inferential entities), categorization, semantic tagging, emotions, sentiment, fact mining, writeprint, and extraction relationships between entities that developers can easily integrate into their analysis platforms and applications for faster evaluation and analysis of documents, web pages, social media data or any big data sets or real-time information streams. The API comes in both SOAP XML-based and RESTful JSON-based flavors, and the features include:
  - **5 specific taxonomies** of terms (in over 1,000 different categories) for Intelligence, Terrorism, Cyber Crime, Crime and Geographic domains
  - A domain ontology **(updated regularly)** with a wide range of diverse topics, for example: weapons, crimes, cyber attacks, points of interest, chemical weapons, controlled substances, terrorist groups, critical infrastructure, world leaders, public companies and more



"encryption software" "Junaid Hussein" "Team Poison" "Cyber Caliphate" software "cyber attack" jihadist "jihadists in the Middle East" hacker "cyber warfare" "Steve Stalinsky" "jihadist hacker" ISIL "jihadist cyber warfare effort" "United States of America" "army's activity" "software jihadist" encryption militant "ISIS's use of encryption tool" "Tunisian jihadist" "Abu Hussain Al Britani" website

❝ Digital jihad: ISIS seek a cyber caliphate to launch attacks on US

❝ Jihadists in the Middle East are ramping up efforts to mount a massive cyber attack on the U.S., with leaders from both ISIS - including a hacker who once broke into former British Prime Minister Tony Blair's Gmail account - recruiting web savvy radicals, FoxNews.com has learned.

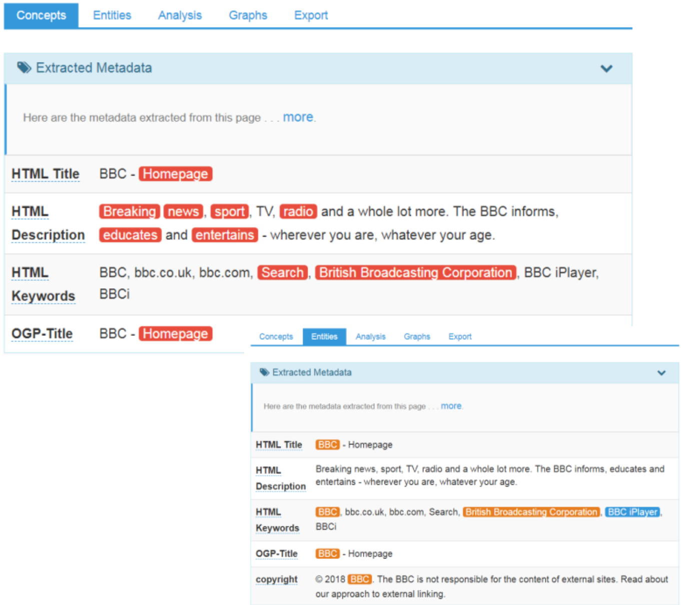
❝ ISIS has also been developing encryption technology and in a recent issue of its English-language magazine Dabiq it used an encryption program for militants to be able to make contact without their communications being read, sources said.

KBpedia

- ***KBpedia*** is a comprehensive knowledge structure for promoting data interoperability and knowledge-based artificial intelligence. It's structure combines seven 'core' public knowledge bases: ***Wikipedia***, ***Wikidata***, ***schema.org***, ***DBpedia***, ***GeoNames***, ***OpenCyc***, and ***UMBEL*** — into an integrated whole. (*http://kbpedia.org/*)

  Knowledge graph: *https://kbpedia.org/knowledge-graph/* *SPARQL Endpoint*: *http://sparql.kbpedia.org/*

Exploits large-scale knowledge bases and semantic technologies for ***machine learning***, ***data interoperability and mapping***, and ***fact extraction and tagging***. It is a flexible and computable knowledge graph that can be sliced-and-diced and configured for all sorts of machine learning tasks, including *supervised*, *unsupervised* and *deep learning*.



Concepts Entities Analysis Graphs Export

Extracted Metadata

Here are the metadata extracted from this page . . . more.

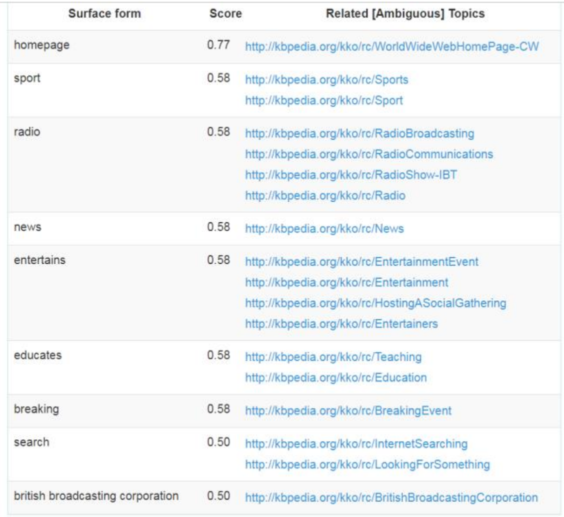
HTML Title	BBC - Homepage
HTML Description	Breaking news, sport, TV, radio and a whole lot more. The BBC informs, educates and entertains - wherever you are, whatever your age.
HTML Keywords	BBC, bbc.co.uk, bbc.com, Search, British Broadcasting Corporation, BBC iPlayer, BBCi
OGP-Title	BBC - Homepage

Concepts Entities Analysis Graphs Export

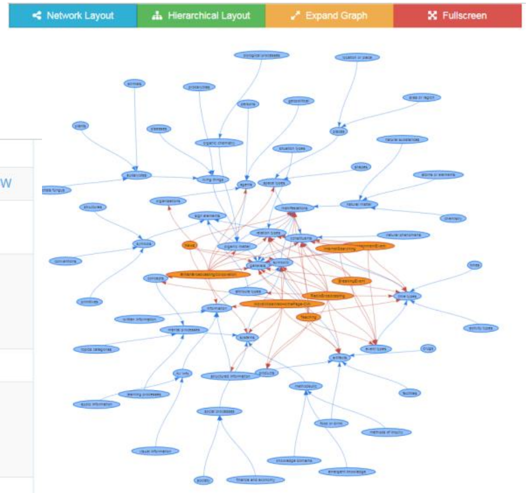
Extracted Metadata

Here are the metadata extracted from this page . . . more.

HTML Title	BBC - Homepage
HTML Description	Breaking news, sport, TV, radio and a whole lot more. The BBC informs, educates and entertains - wherever you are, whatever your age.
HTML Keywords	BBC, bbc.co.uk, bbc.com, Search, British Broadcasting Corporation, BBC iPlayer, BBCi
OGP-Title	BBC - Homepage
copyright	© 2018 BBC. The BBC is not responsible for the content of external sites. Read about our approach to external linking.



Surface form	Score	Related [Ambiguous] Topics
homepage	0.77	http://kbpedia.org/kko/rc/WorldWideWebHomePage-CW
sport	0.58	http://kbpedia.org/kko/rc/Sports http://kbpedia.org/kko/rc/Sport
radio	0.58	http://kbpedia.org/kko/rc/RadioBroadcasting http://kbpedia.org/kko/rc/RadioCommunications http://kbpedia.org/kko/rc/RadioShow-IBT http://kbpedia.org/kko/rc/Radio
news	0.58	http://kbpedia.org/kko/rc/News
entertains	0.58	http://kbpedia.org/kko/rc/EntertainmentEvent http://kbpedia.org/kko/rc/Entertainment http://kbpedia.org/kko/rc/HostingASocialGathering http://kbpedia.org/kko/rc/Entertainers
educates	0.58	http://kbpedia.org/kko/rc/Teaching http://kbpedia.org/kko/rc/Education
breaking	0.58	http://kbpedia.org/kko/rc/BreakingEvent
search	0.50	http://kbpedia.org/kko/rc/InternetSearching http://kbpedia.org/kko/rc/LookingForSomething
british broadcasting corporation	0.50	http://kbpedia.org/kko/rc/BritishBroadcastingCorporation



Cognitive Services and APIs for NLP

- ***IBM Watson*** NLP related services on IBM cloud (*https://www.ibm.com/watson/products-services*):
  - Natural Language Understanding
  - Discovery
  - Tone Analyzer
  - Personality Insights
  - …
- Similar Cognitive Computing services from other main cloud providers: ***Google***, ***AWS***, ***Azure***…
- ***Cogito API*** a Natural Language Processing API. It is a ready to deploy and fully configured API series that helps developers accelerate creation and deployment of unique applications that leverage large volumes of unstructured information from multiple sources. (*http://www.expertsystem.com/products/api-integrations/*).
- ***Dandelion API*** (Semantic Text Analytics as a service) From text to actionable data: extract meaning from unstructured text and put it in context with a simple API (including *entity* and *keywords/concepts extraction*, *content classification*, *sentiment analysis, semantic similarity, etc.*) (*https://dandelion.eu/*).
- ***Yahoo Content Analysis API*** performs content analysis on text or a URL (*https://developer.yahoo.com/contentanalysis/, https://www.programmableweb.com/api/yahoo-content-analysis*).
- Some other semantic-annotation projects: *https://github.com/topics/semantic-annotation*

Data Analytics Products

Products that address today’s challenges of ***complexity***, ***heterogeneity*** and ***scalability*** to enable ***intelligent search***, ***analysis*** and ***better decisions***.

Such products try to bring meaning to data:

- *analyze data extracted from heterogeneous sources*
- *create new knowledge via linking and fusion of data*
- *get meaning from data and answer the queries via intuitive data visualization*
- *explore data via interactive navigation*

Ontos EIGER comprises a suite of modules for integrating, linking, exploring and analyzing many different data silos. The back-end is based on the W3C standard, especially the linked data paradigm. The build in store serves as the enterprise knowledge graph or corporate knowledgebase. (*http://ontos.com/products/platform/*)

IBM Watson Analytics delivers cloud-based guided analytics, data visualization and predictive analytics that make understanding data easier. Watson Analytics offers a smart data discovery service available on the cloud, it guides data exploration, automates predictive analytics and enables effortless dashboard and infographic creation.

(*https://www.ibm.com/watson-analytics /*)

Explore, Analyze and Interpret your Data with Cognitive Computing

IBM Watson Explorer is an cognitive search and content analysis platform that gives access to insights from all the data that can be used to drive business performance and growth; search and analyze structured, unstructured, internal, external and public content to uncover trends and patterns that improve decision-making, customer service and return-on-investment; Leverage built-in machine learning, natural language processing and next-gen APIs to unlock hidden value in ALL data.

(*https://www.ibm.com/us-en/marketplace/content-analytics /*)

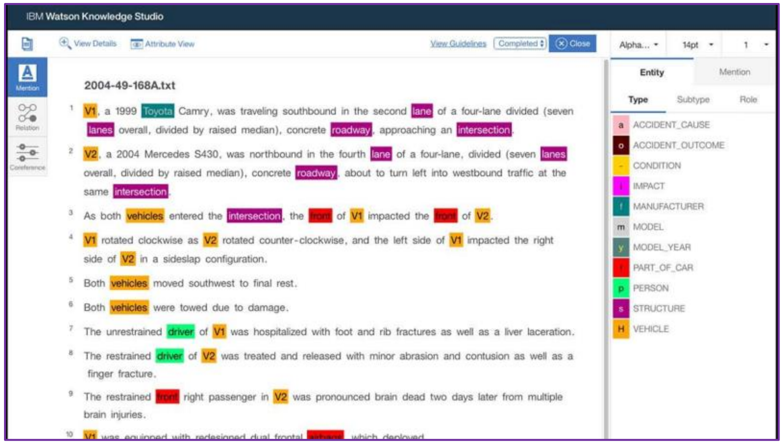
etc.

Watson Knowledge Studio

Watson can be taught to extract meaningful information from unstructured text. User can create annotators that later will be used by Watson to discover relationships in unstructured data.

Watson Knowledge Studio is a cloud-based application that enables developers and domain experts to collaborate and create custom annotator components for unique industries.

- ❑ *These annotators can identify mentions and relationships in unstructured data and be easily administered throughout their lifecycle using one common tool.*
- ❑ *Annotator components can be deployed directly to IBM Watson Explorer and Alchemy Language on IBM Watson Developer Cloud.*



2004-49-168A.txt

1 V1, a 1999 Toyota Camry, was traveling southbound in the second lane of a four-lane divided (seven lanes overall, divided by raised median), concrete roadway, approaching an intersection.

2 V2, a 2004 Mercedes S430, was northbound in the fourth lane of a four-lane, divided (seven lanes overall, divided by raised median), concrete roadway, about to turn left into westbound traffic at the same intersection.

3 As both vehicles entered the intersection, the front of V1 impacted the front of V2.

4 V1 rotated clockwise as V2 rotated counter-clockwise, and the left side of V1 impacted the right side of V2 in a sideslap configuration.

5 Both vehicles moved southwest to final rest.

6 Both vehicles were towed due to damage.

7 The unrestrained driver of V1 was hospitalized with foot and rib fractures as well as a liver laceration.

8 The restrained driver of V2 was treated and released with minor abrasion and contusion as well as a finger fracture.

9 The restrained front right passenger in V2 was pronounced brain dead two days later from multiple brain injuries.

10 V1 was equipped with redesigned dual frontal airbags, which deployed

a	ACCIDENT_CAUSE
o	ACCIDENT_OUTCOME
-	CONDITION
i	IMPACT
f	MANUFACTURER
m	MODEL
y	MODEL_YEAR
r	PART_OF_CAR
p	PERSON
s	STRUCTURE
H	VEHICLE

Link: *https://www.ibm.com/marketplace/cloud/supervised-machine-learning/us/en-us*

https://www.ibm.com/blogs/watson/2016/06/alchemy-knowledge-studio/

https://www.ibm.com/watson/developercloud/doc/wks/wks_overview.shtml

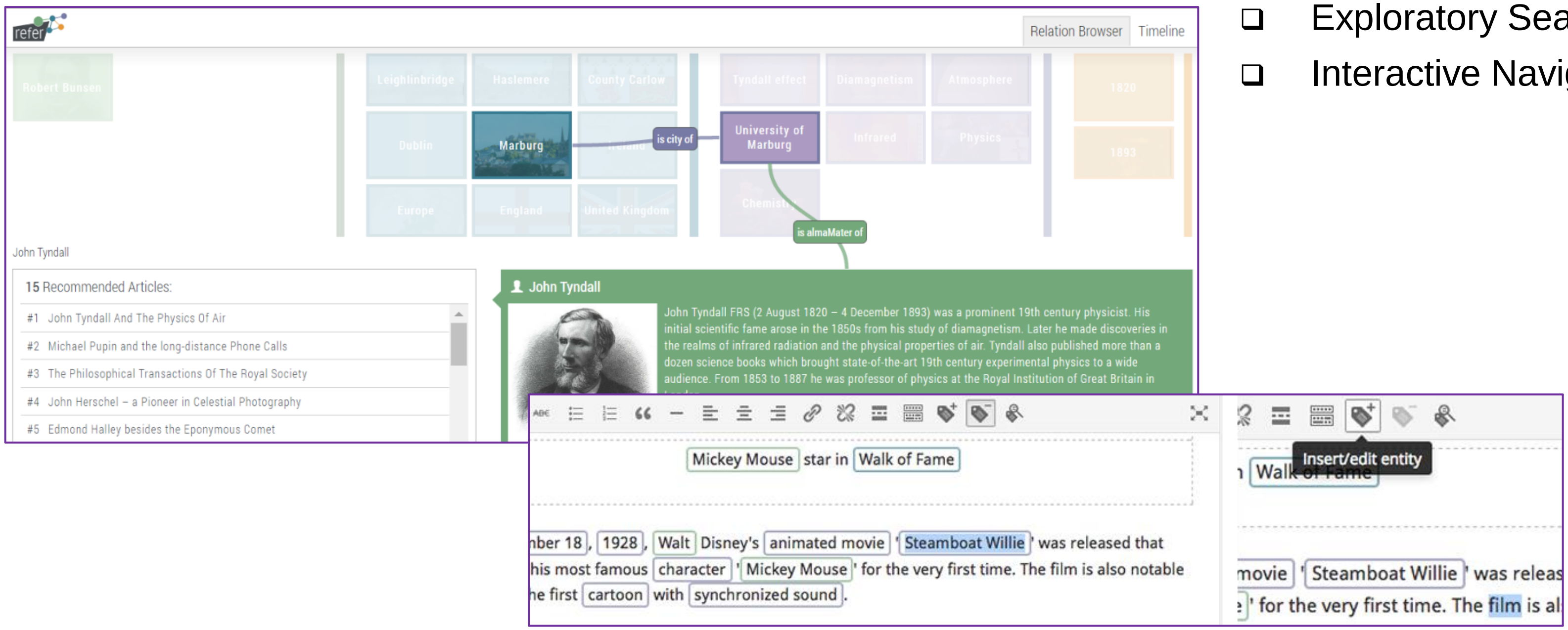
https://www.youtube.com/watch?v=xBoem605XQ4

Refer

Refer is an online-recommendation system based on Linked Open Data and Semantic Web Technologies. It aims to improve the user's and author's experience while curating and navigating in blogs, multimedia platforms, and archives through *Automated Annotation*, *Semantic Analysis*, *Content Enrichment* and *Relation Browser*.

(*http://refer.cx/*)

- ❑ Content Analysis
- ❑ Exploratory Search
- ❑ Interactive Navigation



15 Recommended Articles:

#1 John Tyndall And The Physics Of Air
#2 Michael Pupin and the long-distance Phone Calls
#3 The Philosophical Transactions Of The Royal Society
#4 John Herschel – a Pioneer in Celestial Photography
#5 Edmond Halley besides the Eponymous Comet

John Tyndall

John Tyndall FRS (2 August 1820 – 4 December 1893) was a prominent 19th century physicist. His initial scientific fame arose in the 1850s from his study of diamagnetism. Later he made discoveries in the realms of infrared radiation and the physical properties of air. Tyndall also published more than a dozen science books which brought state-of-the-art 19th century experimental physics to a wide audience. From 1853 to 1887 he was professor of physics at the Royal Institution of Great Britain in

Mickey Mouse star in Walk of Fame

nber 18, 1928, Walt Disney's animated movie 'Steamboat Willie' was released that
his most famous character 'Mickey Mouse' for the very first time. The film is also notable
he first cartoon with synchronized sound.

n Walk of Fame

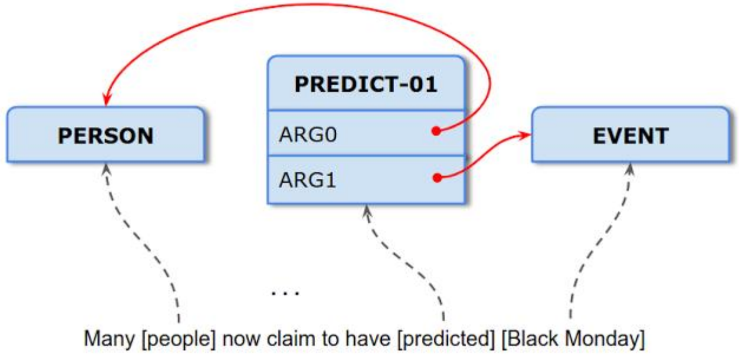
movie 'Steamboat Willie' was releas
' for the very first time. The film is al

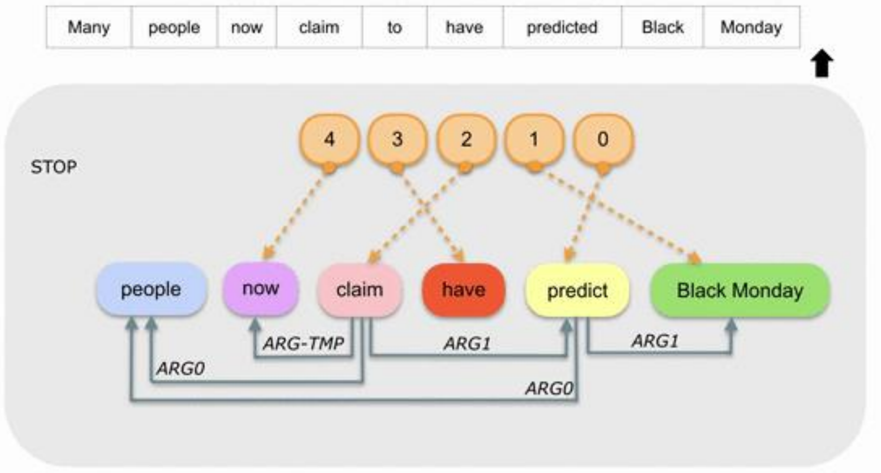
SLING

SLING is a Natural Language Frame Semantic Parser. Unlike the most practical natural language understanding (NLU) systems that used a pipeline of analysis stages, from part-of-speech tagging and dependency parsing to steps that computed a semantic representation of the input text, to avoid errors in earlier stages that would have cascading effects in later stages and the final representation, ***SLING*** parses natural language text directly into a representation of its meaning as a semantic frame graph. SLING uses a special-purpose ***recurrent neural network*** model to compute the output representation of input text through incremental editing operations on the frame graph. SLING's parser is trained using only the input words, bypassing the need for producing any intermediate annotations (e.g. dependency parses).

(*https://research.googleblog.com/2017/11/sling-natural-language-frame-semantic.html*)

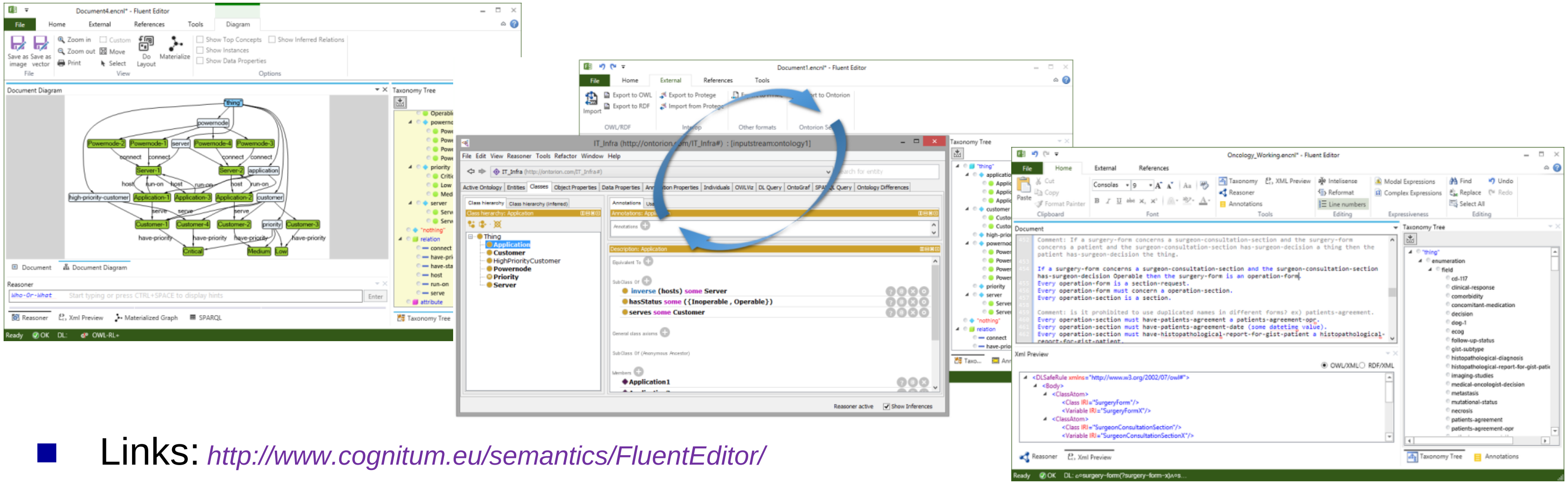
Source: *https://github.com/google/sling*





Fluent Editor

- ***Fluet Editor*** is a comprehensive tool for editing and manipulating complex ontologies that uses ***Controlled Natural Language (CNL):***
  - allows natural-language driven ontology creation and editing;
  - provides a more user-friendly alternative to XML-based OWL editors;
  - uses of ***Controlled English*** as a ***knowledge modeling language***;
  - supported via ***Predictive Editor***, it stops the user from entering any sentence that is grammatically or morphologically incorrect and actively helps the user during sentence writing;
  - can be integrated with any other 3rd party tools compliant with W3C standards;
  - interoperable with ***Protégé*** and uses ***R language package*** to access an ontology from R environment.



```
Comment: If a surgery-form concerns a surgeon-consultation-section and the surgery-form
concerns a patient and the surgeon-consultation-section has-surgeon-decision a thing then the
patient has-surgeon-decision the thing.

If a surgery-form concerns a surgeon-consultation-section and the surgeon-consultation-section
has-surgeon-decision Operable then the surgery-form is an operation-form.
Every operation-form is a section-request.
Every operation-form must concern a operation-section.
Every operation-section is a section.

Comment: is it prohibited to use duplicated names in different forms? ex) patients-agreement.
Every operation-section must have-patients-agreement a patients-agreement-opr.
Every operation-section must have-patients-agreement-date (some datetime value).
Every operation-section must have-histopathological-report-for-gist-patient a histopathological-
report-for-gist-patient.
```

```
SubClass Of
inverse (hosts) some Server
hasStatus some ({Inoperable , Operable})
serves some Customer
Members
Application1
```

```
<DLSafeRule xmlns="http://www.w3.org/2002/07/owl#">
  <Body>
    <ClassAtom>
      <Class IRI="SurgeryForm"/>
      <Variable IRI="SurgeryFormX"/>
```

- Links: *http://www.cognitum.eu/semantics/FluentEditor/*

Fluent Editor

The same SWRL is verbalized in ***pure OWL/XML*** and ***Fluent Editor™***

```
<Body>
   <ClassAtom>
      <Class IRI="#Consent" />
      <Variable IRI="#Consent_0" />
   </ClassAtom>
   <ClassAtom>
      <Class IRI="#Patient" />
      <Variable IRI="#Patient_0" />
   </ClassAtom>
   <ClassAtom>
      <Class IRI="#Therapy" />
      <Variable IRI="#Therapy_0" />
   </ClassAtom>
   <ObjectPropertyAtom>
      <ObjectProperty IRI="#isRecommendedTo" />
      <Variable IRI="#Therapy_0" />
      <Variable IRI="#Patient_0" />
   </ObjectPropertyAtom>
   <ObjectPropertyAtom>
      <ObjectProperty IRI="#signs" />
      <Variable IRI="#Patient_0" />
      <Variable IRI="#Consent_0" />
   </ObjectPropertyAtom>
</Body>
<Head>
   <ObjectPropertyAtom>
      <ObjectProperty IRI="#isAppliedTo" />
      <Variable IRI="#Therapy_0" />
      <Variable IRI="#Patient_0" />
   </ObjectPropertyAtom>
</Head>
```

SWRL rule in Fluent Editor™:

If a patient signs a consent and a therapy is-recommended-to the patient then the therapy is-applied-to the patient.

Asking questions in Fluent Editor™:

Who-Or-What is a city that belongs-to Texas-State and has-latitude greater-or-equal-to 0?

or

Who-Or-What is a customer that lives-in a city that belongs-to California-State and has-firstname equal-to 'John'?

Task 5