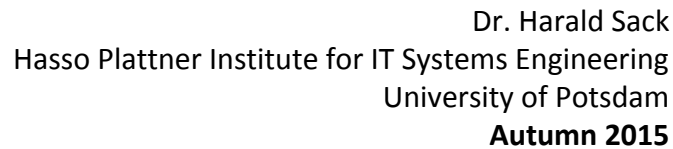
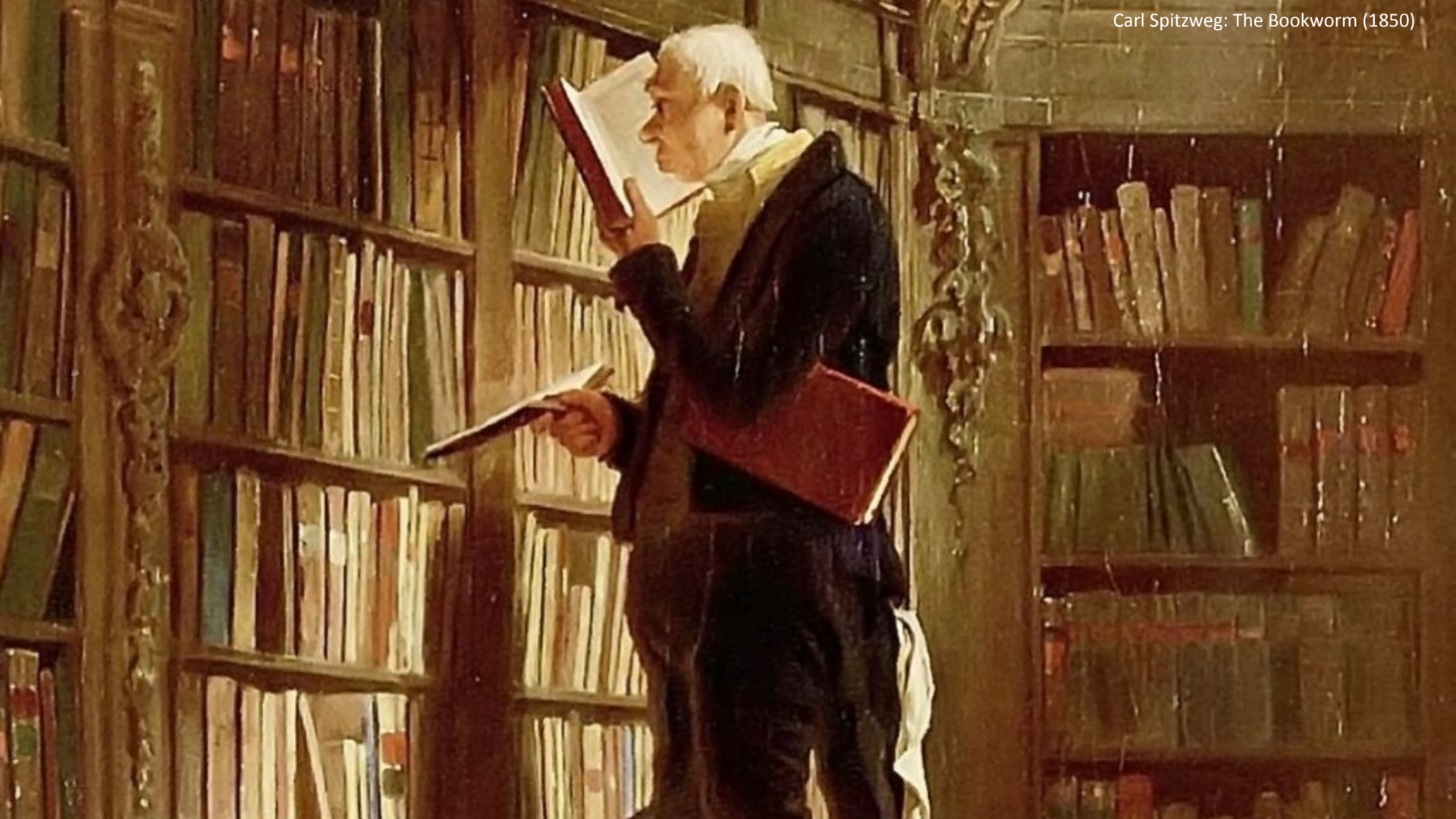


This detail from Sandro Botticelli's 'Birth of Venus' focuses on the central figure, Venus, as she reclines on a large, scallop shell. She is depicted with a fair complexion and long, flowing blonde hair, wearing a pinkish-red mantle that is partially draped over her. Her gaze is directed towards the viewer. To her left, a figure in a green garment is partially visible, and to her right, another figure in a pinkish-red mantle is seen. The background is a lush, green landscape with a small body of water in the foreground. The overall style is characteristic of the Italian Renaissance, with soft, flowing lines and a focus on idealized beauty.

6.10 EXTRA: Semantic Recommender Systems



IT Systems Engineering
University of Potsdam
Autumn 2015



From Exploration to Recommendation

- **Exploratory Search** represents the activities carried out by searchers who are either:
 - unfamiliar with the domain of their goal (i.e. need to learn about the topic in order to understand how to achieve their goal)
 - unsure about the ways to achieve their goals (either the technology or the process)
 - or even unsure about their goals in the first place.
- **Recommender Systems** seek to predict the preference a user would give to an item

Recommender Systems

- **Collaborative filtering** approaches
 - construct a model from a **user's past behavior** (items previously purchased or selected and/or numerical ratings given to those items)
 - as well as **similar decisions made by other users**.
- **Content-based filtering** approaches
 - utilize a series of discrete characteristics of an item in order to recommend additional items with **similar properties**

Linked Data Based Recommendations

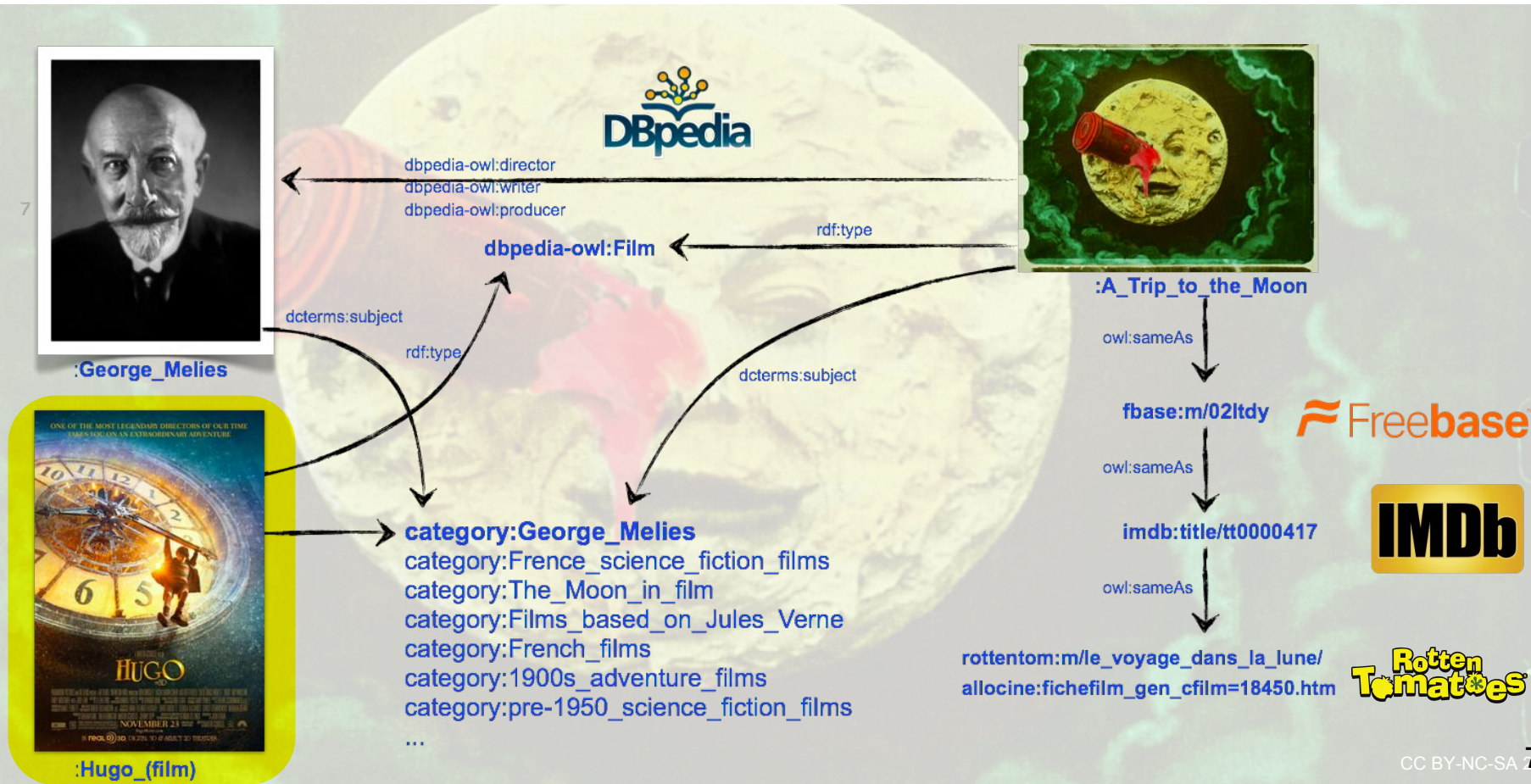
- **Linked Data Based Recommendation**
 - special variant of content-based filtering
 - based on Linked Data resources
 - terminological data (ontologies)
 - assertional data (entities)
 - utilizes data **similarities** as well as data **relationships**
- **Example:**
 - **Movie Recommendations**

Now, which movie should I watch next?



...and please ...don't make boring suggestions!

Linked Data Based Recommendations



Linked Data Based Recommendations

- **Example:**
 - **Movie Recommendations**
- **Idea:**
 - search a similar movie,
i.e. search a movie that shares the most **categories**

```
SELECT COUNT(?movie) SAMPLE(?movie)
FROM <http://en.dbpedia.org>
WHERE
{
  dbr:A_Trip_to_the_Moon dct:subject ?o .
  ?movie dct:subject ?o
  FILTER (?movie != dbr:A_Trip_to_the_Moon) .
} GROUP BY ?movie
ORDER BY DESC(COUNT(?movie))
```

callret-0	callret-1
6	http://dbpedia.org/resource/Gulliver's Travels Among the Lilliputians and the Giants
6	http://dbpedia.org/resource/The Impossible Voyage
5	http://dbpedia.org/resource/Cinderella (1899 film)
5	http://dbpedia.org/resource/The Bewitched Inn
5	http://dbpedia.org/resource/Under the Seas
5	http://dbpedia.org/resource/Arrival of a Train at Vincennes Station
5	http://dbpedia.org/resource/The Haunted Castle (1896 film)
5	http://dbpedia.org/resource/Watering the Flowers
5	http://dbpedia.org/resource/Gugusse and the Automaton
5	http://dbpedia.org/resource/The Astronomer's Dream
5	http://dbpedia.org/resource/The Conquest of the Pole
5	http://dbpedia.org/resource/Satan in Prison
5	http://dbpedia.org/resource/The Magician (1898 film)
5	http://dbpedia.org/resource/The Four Troublesome Heads
5	http://dbpedia.org/resource/The Dreyfus Affair (film series)
5	http://dbpedia.org/resource/Joan of Arc (1900 film)
5	http://dbpedia.org/resource/The Vanishing Lady
4	http://dbpedia.org/resource/The Temptation of Saint Anthony (film)
4	http://dbpedia.org/resource/The Rajah's Dream
4	http://dbpedia.org/resource/A Lightning Sketch
4	http://dbpedia.org/resource/The Assassination of the Duke of Guise
4	http://dbpedia.org/resource/The Crazy Ray
4	http://dbpedia.org/resource/The Famous Box Trick
4	http://dbpedia.org/resource/The Last Cartridges
4	http://dbpedia.org/resource/The Mysterious Knight
4	http://dbpedia.org/resource/Addition and Subtraction
4	http://dbpedia.org/resource/Robbing Cleopatra's Tomb
4	http://dbpedia.org/resource/The Cook's Revenge
4	http://dbpedia.org/resource/The Surrender of Tournavos
4	http://dbpedia.org/resource/Le Cochon Danseur

[Link to SPARQL query](#)

callret-0	callret-1	callret-2
6	http://dbpedia.org/resource/Gulliver's Travels Among the Lilliputians and the Giants	http://dbpedia.org/resource/Category:Articles_containing_video_clips , http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:1902_films , http://dbpedia.org/resource/Category:French_silent_short_films
6	http://dbpedia.org/resource/The Impossible Voyage	http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:French_science_fiction_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films , http://dbpedia.org/resource/Category:Pre-1950_science_fiction_films
5	http://dbpedia.org/resource/Cinderella (1899 film)	http://dbpedia.org/resource/Category:Articles_containing_video_clips , http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films
5	http://dbpedia.org/resource/The Bewitched Inn	http://dbpedia.org/resource/Category:Articles_containing_video_clips , http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films
5	http://dbpedia.org/resource/Under the Seas	http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:French_science_fiction_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films
5	http://dbpedia.org/resource/Arrival of a Train at Vincennes Station	http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:Films_produced_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films
5	http://dbpedia.org/resource/The Haunted Castle (1896 film)	http://dbpedia.org/resource/Category:Black-and-white_films , http://dbpedia.org/resource/Category:French_films , http://dbpedia.org/resource/Category:Films_directed_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:Films_produced_by_Georges_M%C3%A9li%C3%A8s , http://dbpedia.org/resource/Category:French_silent_short_films

http://dbpedia.org/resource/Category:Black-and-white_films

Linked Data Based Recommendations

- **Example:**

- **Movie Recommendations**

- **Idea:**

- search a similar movie,
i.e. search a movie that shares the most **types**

```
SELECT COUNT(?movie) SAMPLE(?movie)
FROM <http://en.dbpedia.org>
WHERE
{
  dbr:A_Trip_to_the_Moon rdf:type ?o .
  ?movie rdf:type ?o
  FILTER (?movie != dbr:A_Trip_to_the_Moon) .
} GROUP BY ?movie
ORDER BY DESC(COUNT(?movie))
```

callret-0	callret-1
8	http://dbpedia.org/resource/The Man with the Rubber Head
8	http://dbpedia.org/resource/The Little Match Seller
8	http://dbpedia.org/resource/Barbe-bleue (film)
8	http://dbpedia.org/resource/The Extraordinary Waiter
8	http://dbpedia.org/resource/Le Voyage de Gulliver %C3%A0 Lilliput et chez les g%C3%A9ants (film)
7	http://dbpedia.org/resource/Tarzan's Peril
7	http://dbpedia.org/resource/La folie du doute
7	http://dbpedia.org/resource/My Heart Sings
7	http://dbpedia.org/resource/The Spy in Black
7	http://dbpedia.org/resource/The Lonely Trail
7	http://dbpedia.org/resource/Matzor
7	http://dbpedia.org/resource/Rikon
7	http://dbpedia.org/resource/A Rainbow Plays in My Heart
7	http://dbpedia.org/resource/K%C3%BC1%C3%B6n%C3%B6s h%C3%A1zass%C3%A1g
7	http://dbpedia.org/resource/The Saint's Vacation
7	http://dbpedia.org/resource/Three Dark Horses
7	http://dbpedia.org/resource/Shot in the Frontier
7	http://dbpedia.org/resource/Shadow of the Thin Man
7	http://dbpedia.org/resource/The Renegade Ranger
7	http://dbpedia.org/resource/Margin for Error
7	http://dbpedia.org/resource/Pasamalar
7	http://dbpedia.org/resource/Spooks Run Wild
7	http://dbpedia.org/resource/The Habit of Happiness
7	http://dbpedia.org/resource/Chang (film)
7	http://dbpedia.org/resource/Luke's Society Mixup
7	http://dbpedia.org/resource/Flying Wild
7	http://dbpedia.org/resource/Without Love
7	http://dbpedia.org/resource/Cracked Nuts
7	http://dbpedia.org/resource/The Divided Heart
7	http://dbpedia.org/resource/It came from Beyond

[Link to SPARQL query](#)

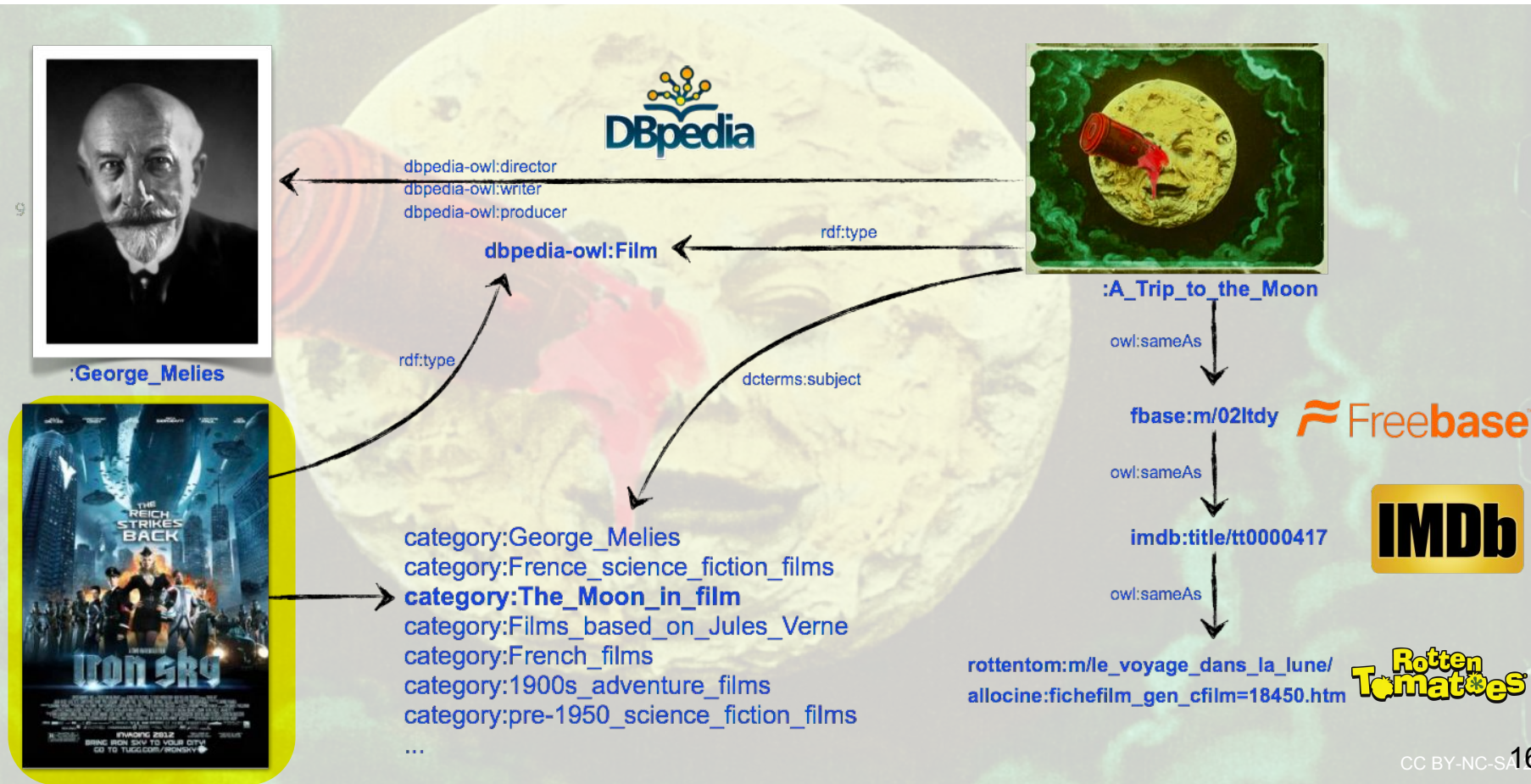
callret-0	callret-1	callret-2
8	http://dbpedia.org/resource/The_Extraordinary_Waiter	http://dbpedia.org/class/yago/1902Films , http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/La_folie_du_doute	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Three_Dark_Horses	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Margin_for_Error	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Spooks_Run_Wild	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
		http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939

callret-0	callret-1	callret-2
8	http://dbpedia.org/resource/The_Extraordinary_Waiter	http://dbpedia.org/class/yago/1902Films , http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/La_folie_du_doute	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Three_Dark_Horses	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Margin_for_Error	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
7	http://dbpedia.org/resource/Spooks_Run_Wild	http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939 , http://dbpedia.org/class/yago/Black-and-whiteFilms , http://dbpedia.org/class/yago/Creation103129123 , http://dbpedia.org/class/yago/Event100029378 , http://dbpedia.org/class/yago/Movie106613686 , http://dbpedia.org/class/yago/Object100002684
		http://dbpedia.org/class/yago/Abstraction100002137 , http://dbpedia.org/class/yago/Artifact100021939

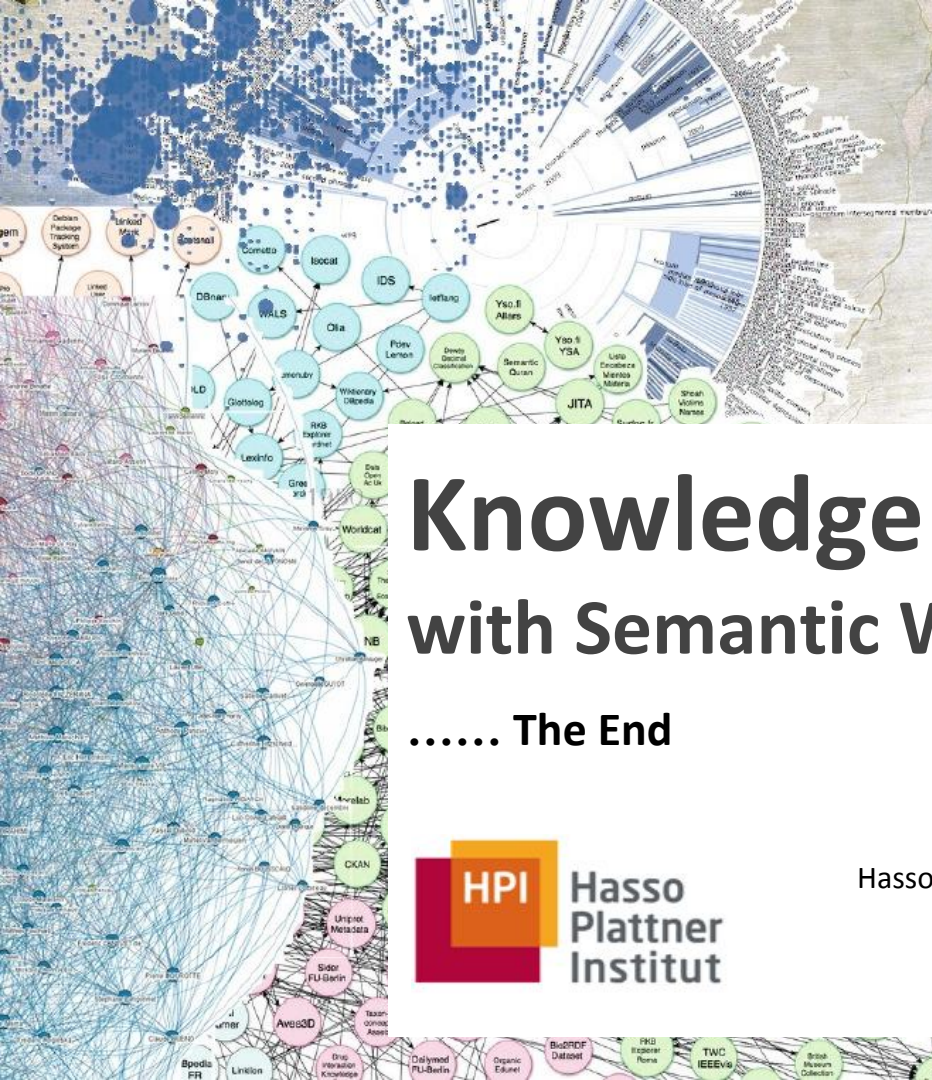
Linked Data Based Recommendations

- **Example:**
 - **Movie Recommendations**
- **Pitfalls to be avoided:**
 - too similar recommendations might be boring
- **Enhance Serendipity:**
 - find something unexpected but nevertheless important/useful

Linked Data Based Recommendations



- Linked Data Based Recommendation makes use of Linked Data Resources to generate content-based recommendations
- Content-based recommendations can be based on **similarity** or **relatedness** of resources
- Avoid to recommend too similar results to enable **serependitious discovery**



Knowledge Engineering with Semantic Web Technologies

..... The End



Dr. Harald Sack
Hasso Plattner Institute for IT Systems Engineering
University of Potsdam
Autumn 2015