

„Understanding“ the Web of Data

- Named Entity Resolution

Saint-Étienne, August 26, 2014

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

- Research Topics

- Semantic Web Technologies
- Knowledge Discovery
- Ontological Engineering
- Multimedia Analysis & Retrieval
- Social Networking
- Data/Information Visualization



- Research Projects:





“Understanding“ the Web of Data

Named Entity Resolution

Overview

(1) How to make sense of the Web?

and why we are not really content with it...

(2) Words and Meaning

to be able to better „understand“ the content

(3) Named Entity Resolution

from words to semantic entities...

(4) Application Scenarios

Exploratory Search and intelligent Recommendations

How Do You Make Sense of the Web...?

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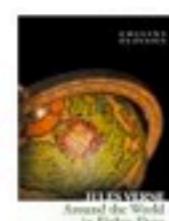
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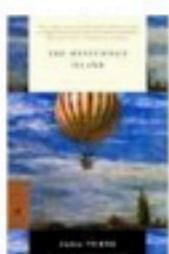
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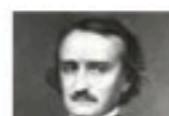
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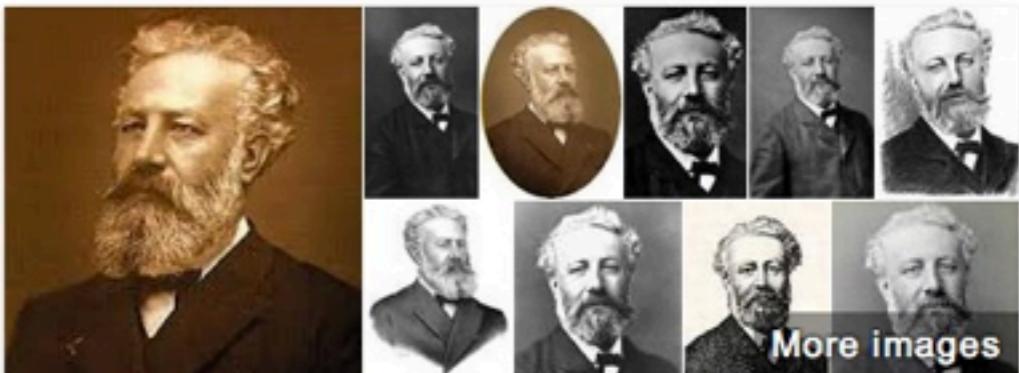
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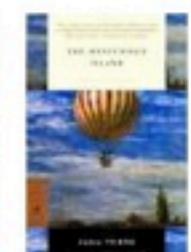
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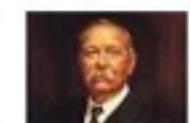
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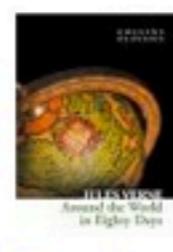
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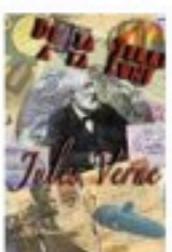
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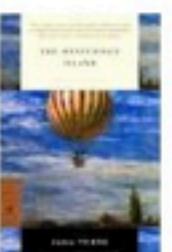
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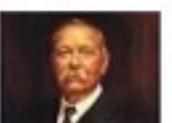
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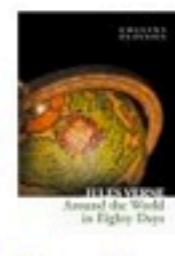
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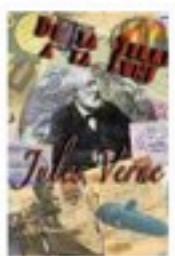
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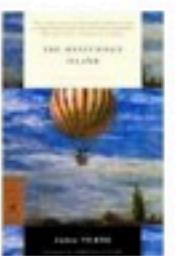
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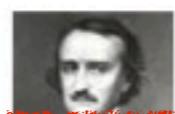
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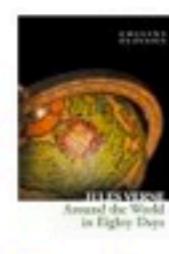
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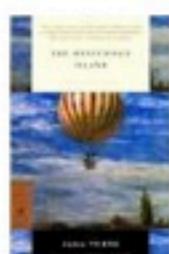
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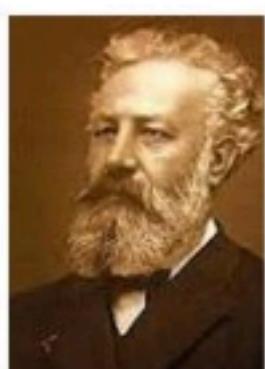
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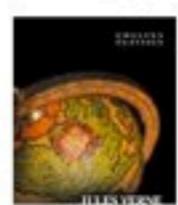
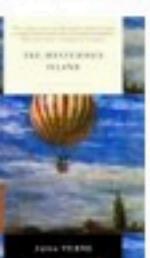
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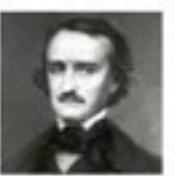
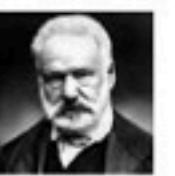
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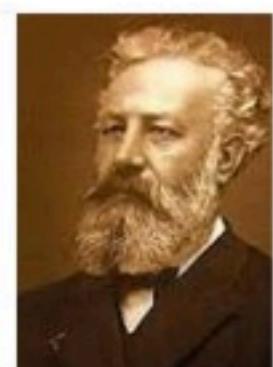
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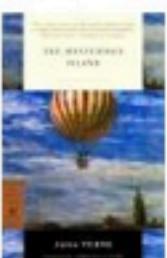
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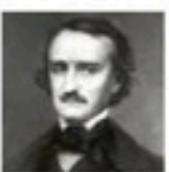
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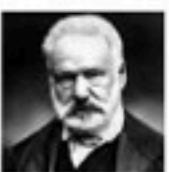
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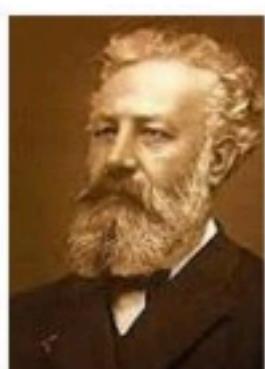
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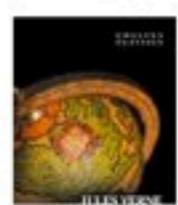
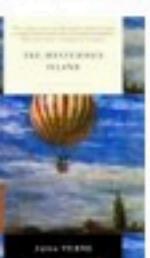
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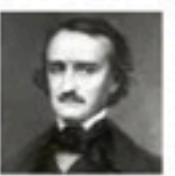
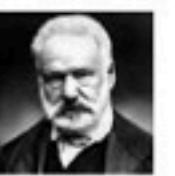
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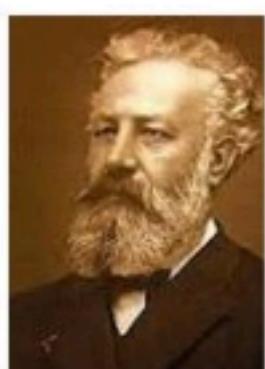
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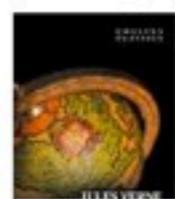
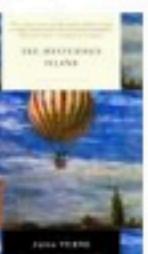
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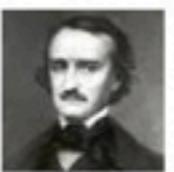
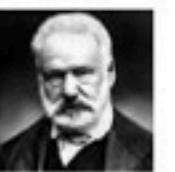
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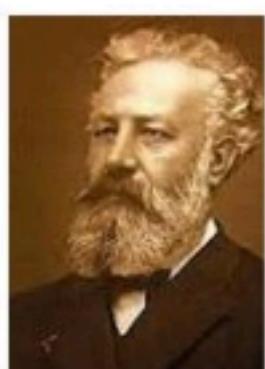
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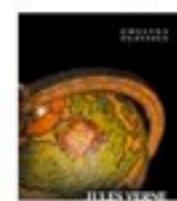
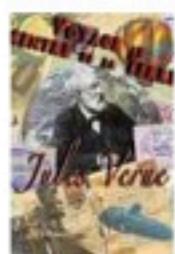
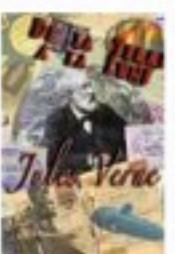
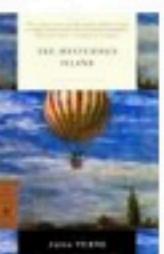
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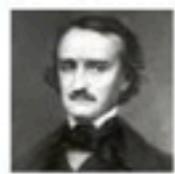
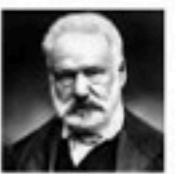
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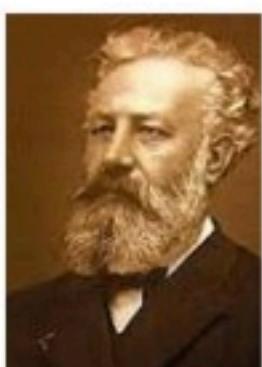
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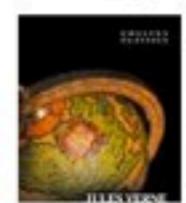
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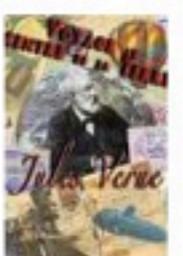
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Under the
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1870



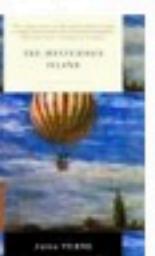
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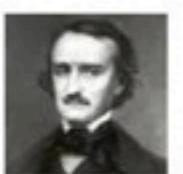
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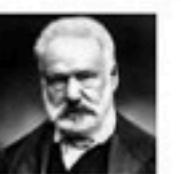
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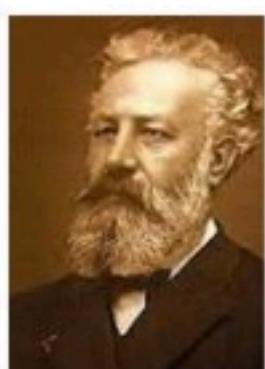
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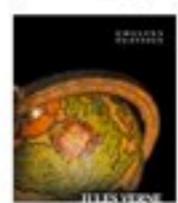
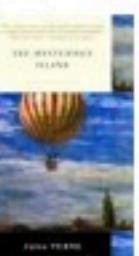
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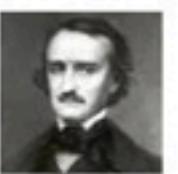
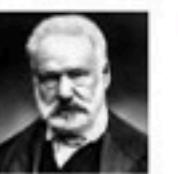
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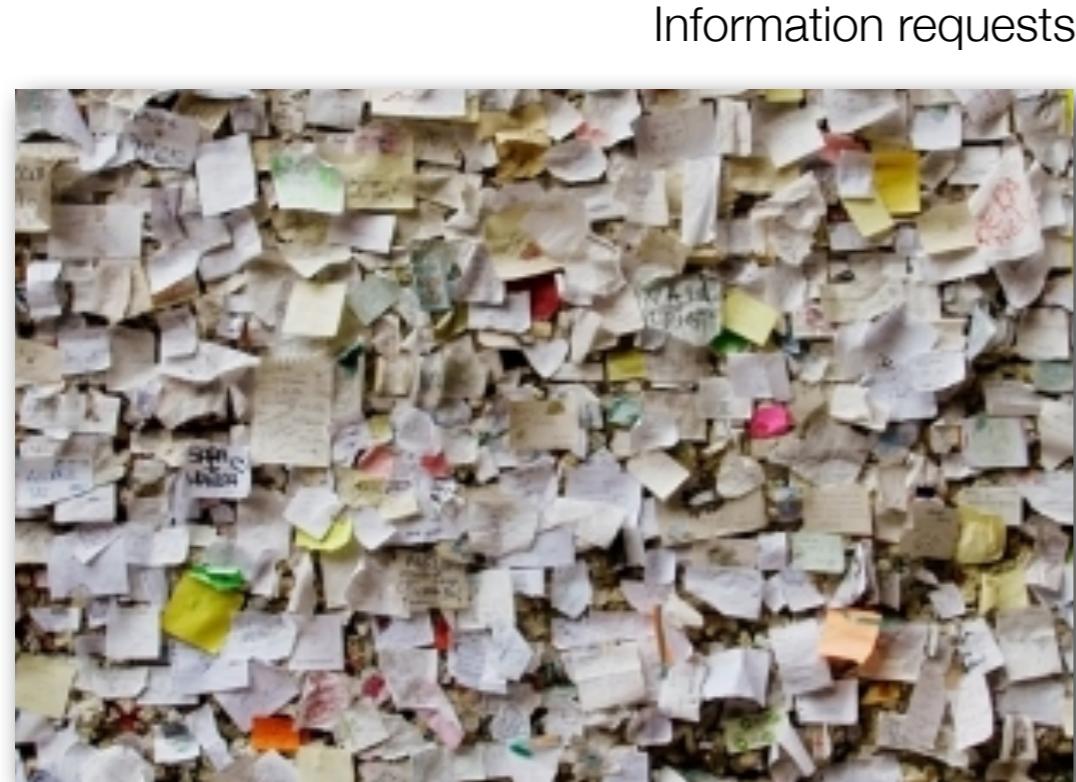
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But, how does Search & Retrieval usually work?

7

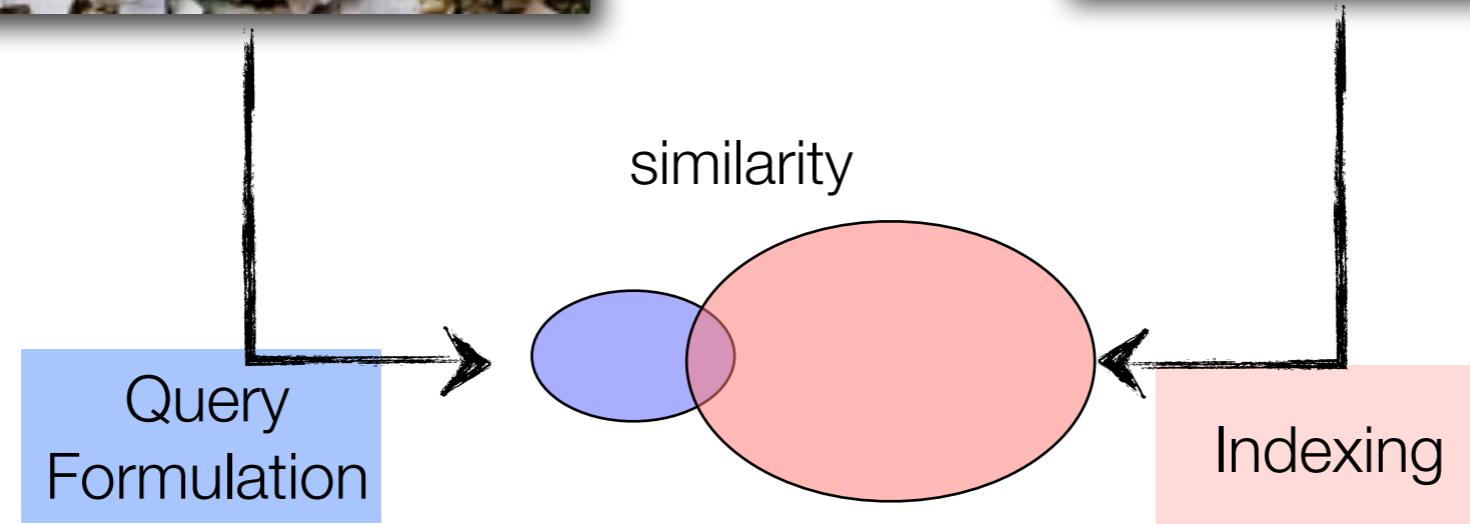


Set of Queries

Files of records



Set of Documents



Let's assume
you are looking for
something you
don't know how to
phrase the search
correctly....

Let's assume
you are looking for
something you
don't know how to
phrase the search
correctly....



Exercise 1:

Search this Book in Google image search.

The query should not contain:

- (1) the title
- (2) the author

The book should be no.1 search result in
Google image search.

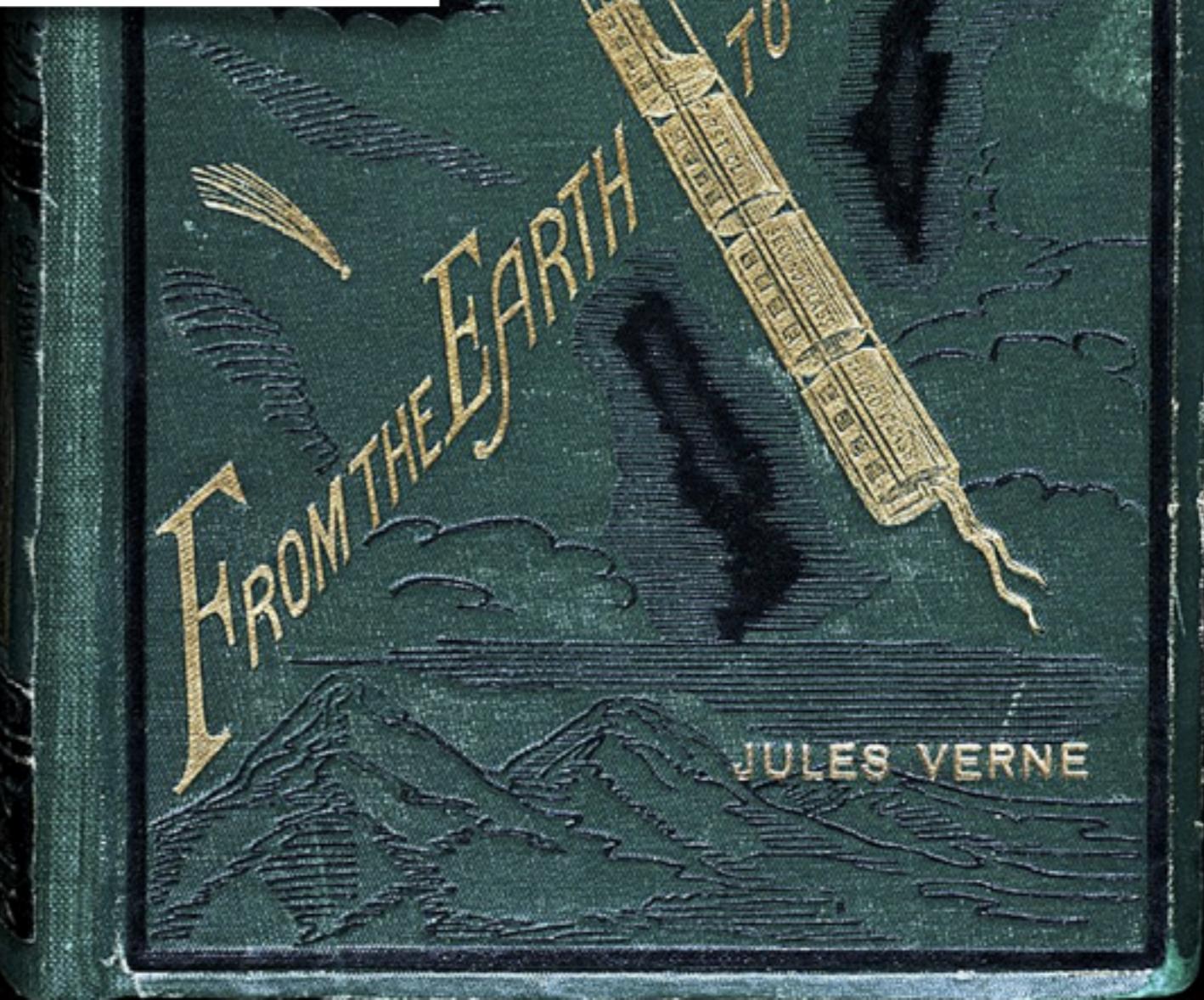
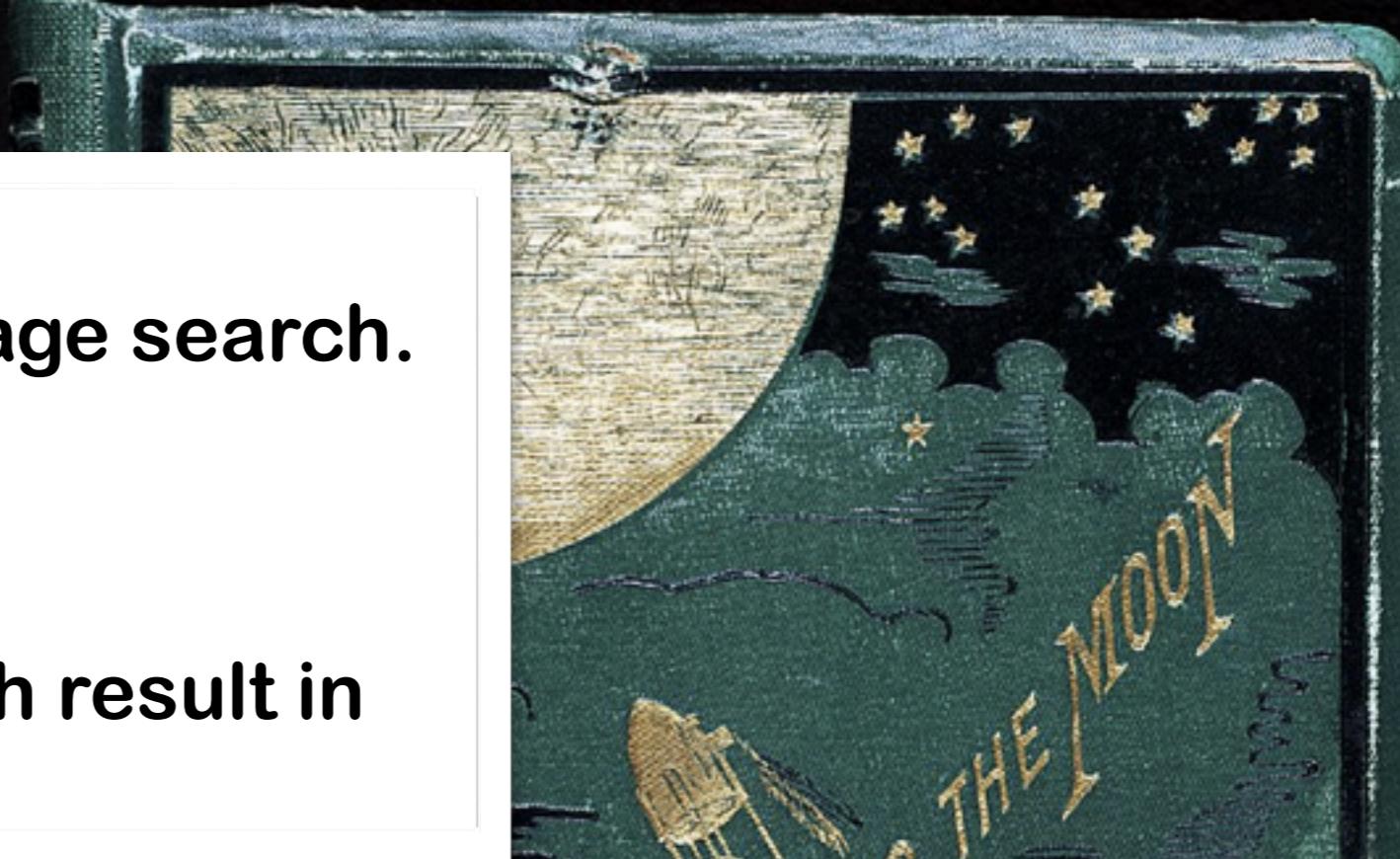
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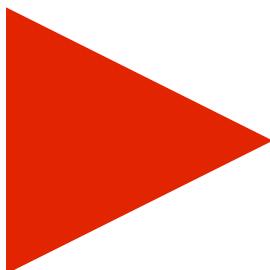
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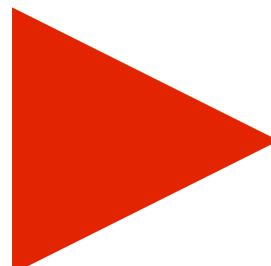


- sometimes **simple query matching** with content or metadata alone is not sufficient to fulfill the user's information needs
- what is missing are often the relational connections and circumstances, i.e. **contextual information** is needed to answer the query
- therefore you have to „understand“ the content



Semantic Analysis

- sometimes **simple query matching** with content or metadata alone is not sufficient to fulfill the user's information needs
- what is missing are often the relational connections and circumstances, i.e. **contextual information** is needed to answer the query
- therefore you have to „understand“ the content



Semantic Analysis





“Understanding“ the Web of Data

Named Entity Resolution

Overview

(1) How to make sense of the Web?

and why we are not really content with it...

(2) Words and Meaning

to be able to better „understand“ the content

(3) Named Entity Resolution

from words to semantic entities...

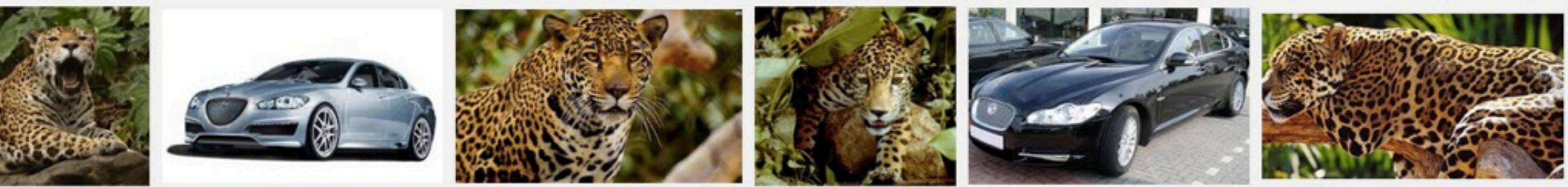
(4) Application Scenarios

Exploratory Search and intelligent Recommendations

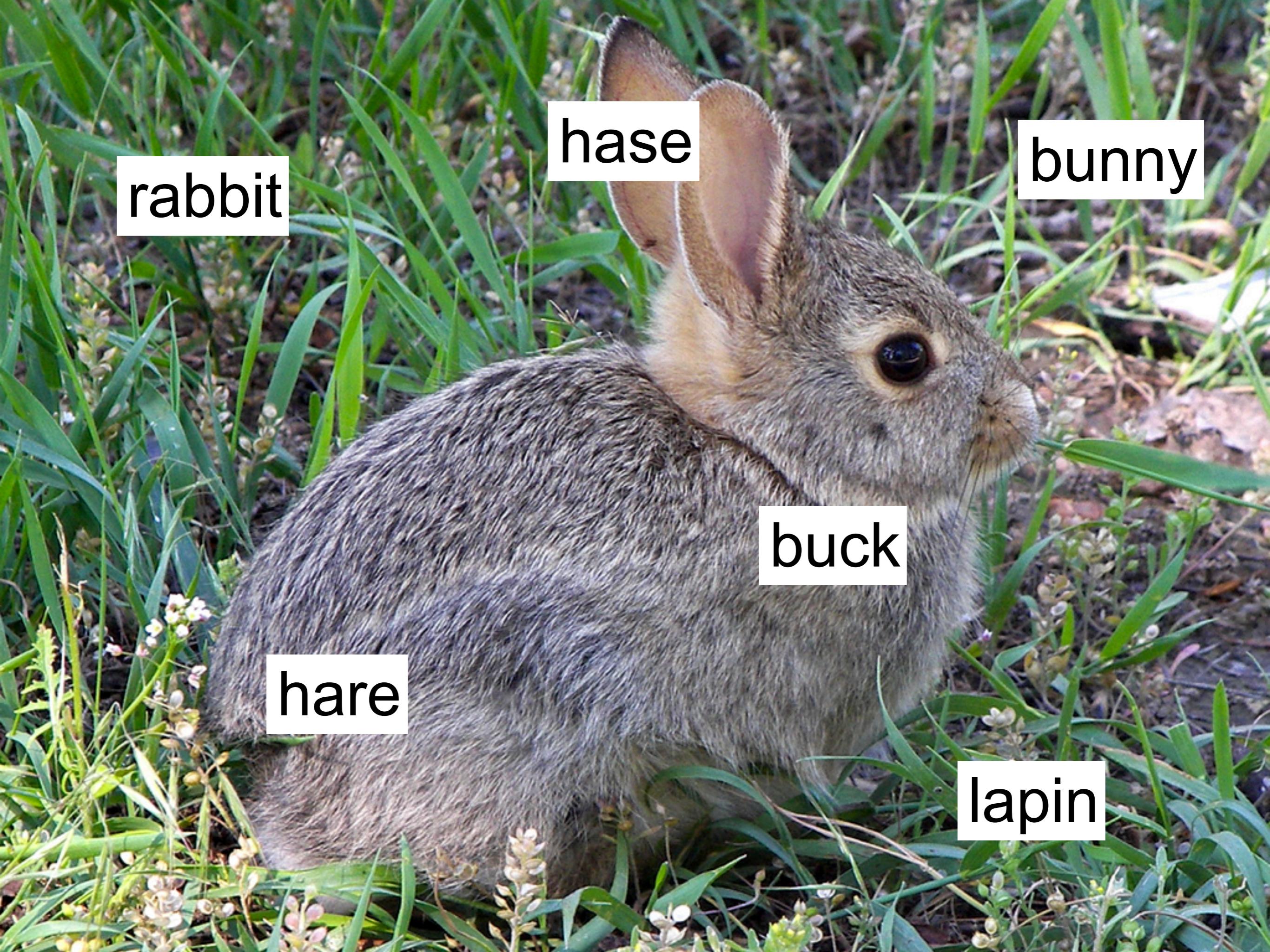
What is the
Meaning of a
Word?

What is the Meaning of a Word?

Jaguar







rabbit

hase

bunny

hare

buck

lapin

Meaning



Semant

Cognit

symbolizes

Concept

Symbol

refers to

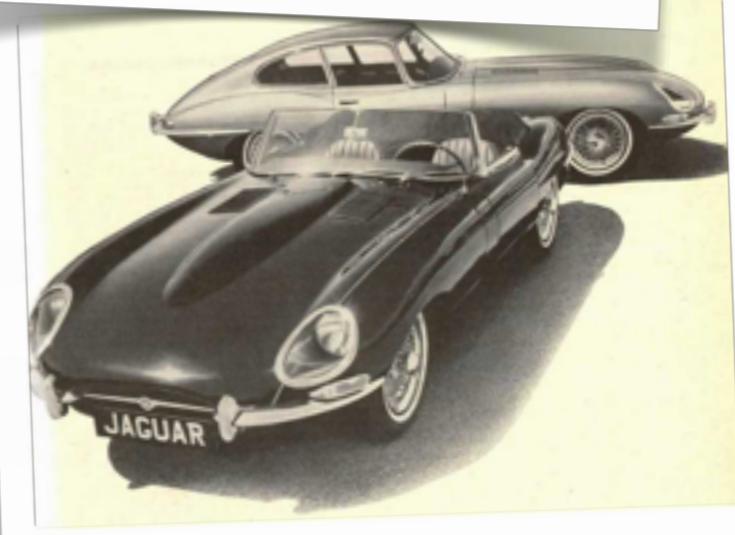
Object

„Jaguar“

stands for

Experi

Pragmatics

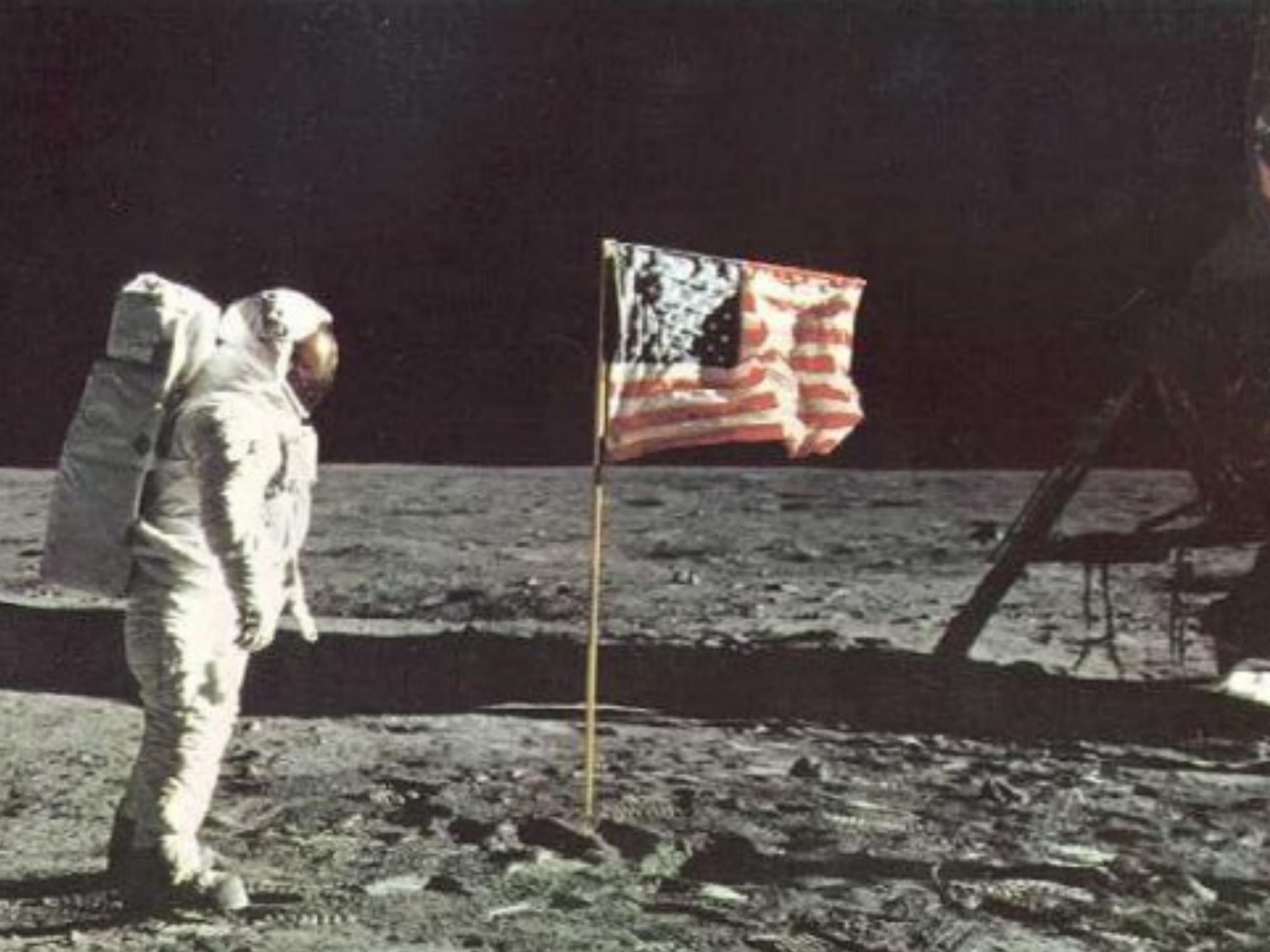


what does it
mean to mean
something?

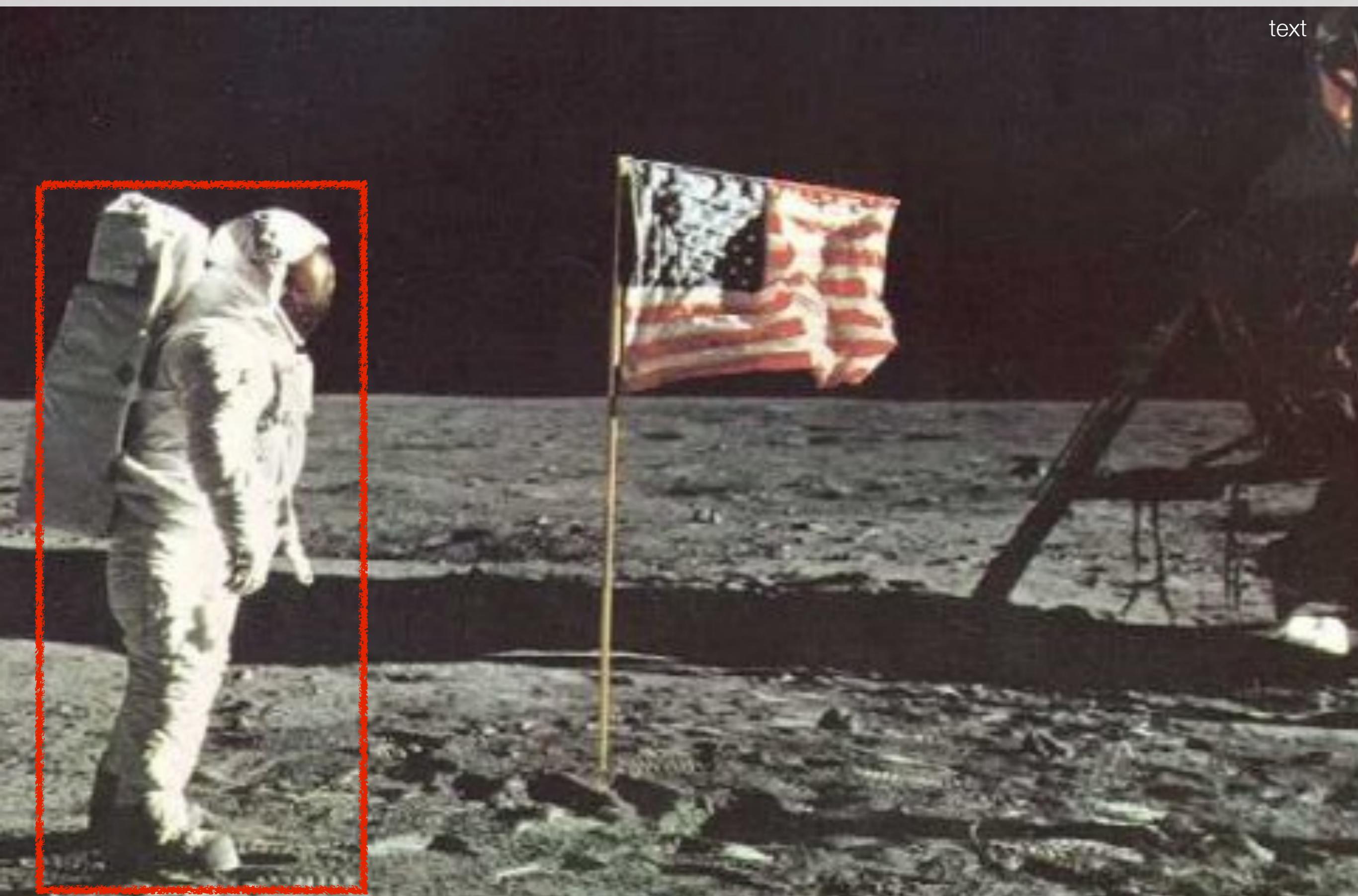
what does it
mean to mean
something?

How to represent Meaning?

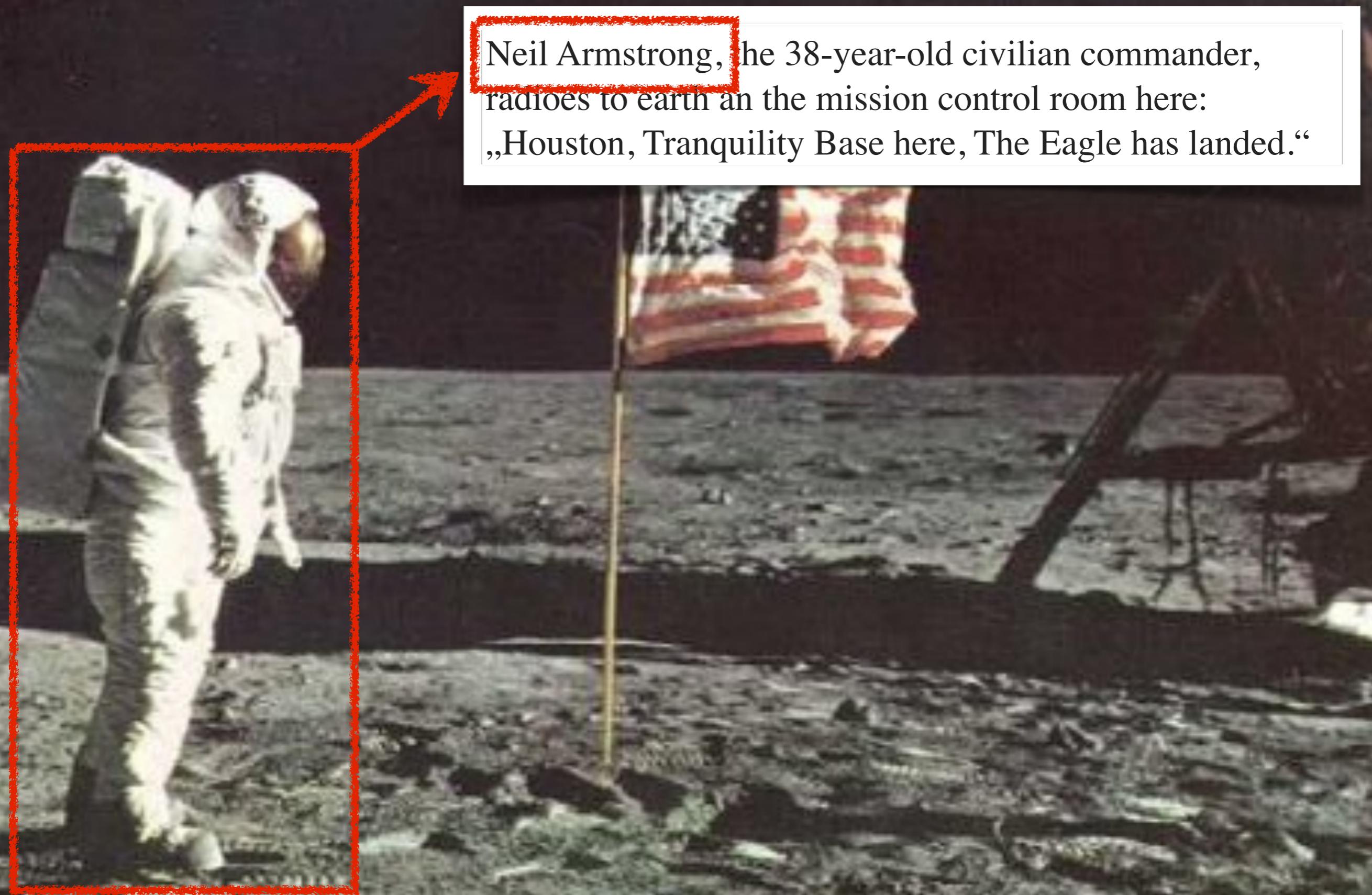




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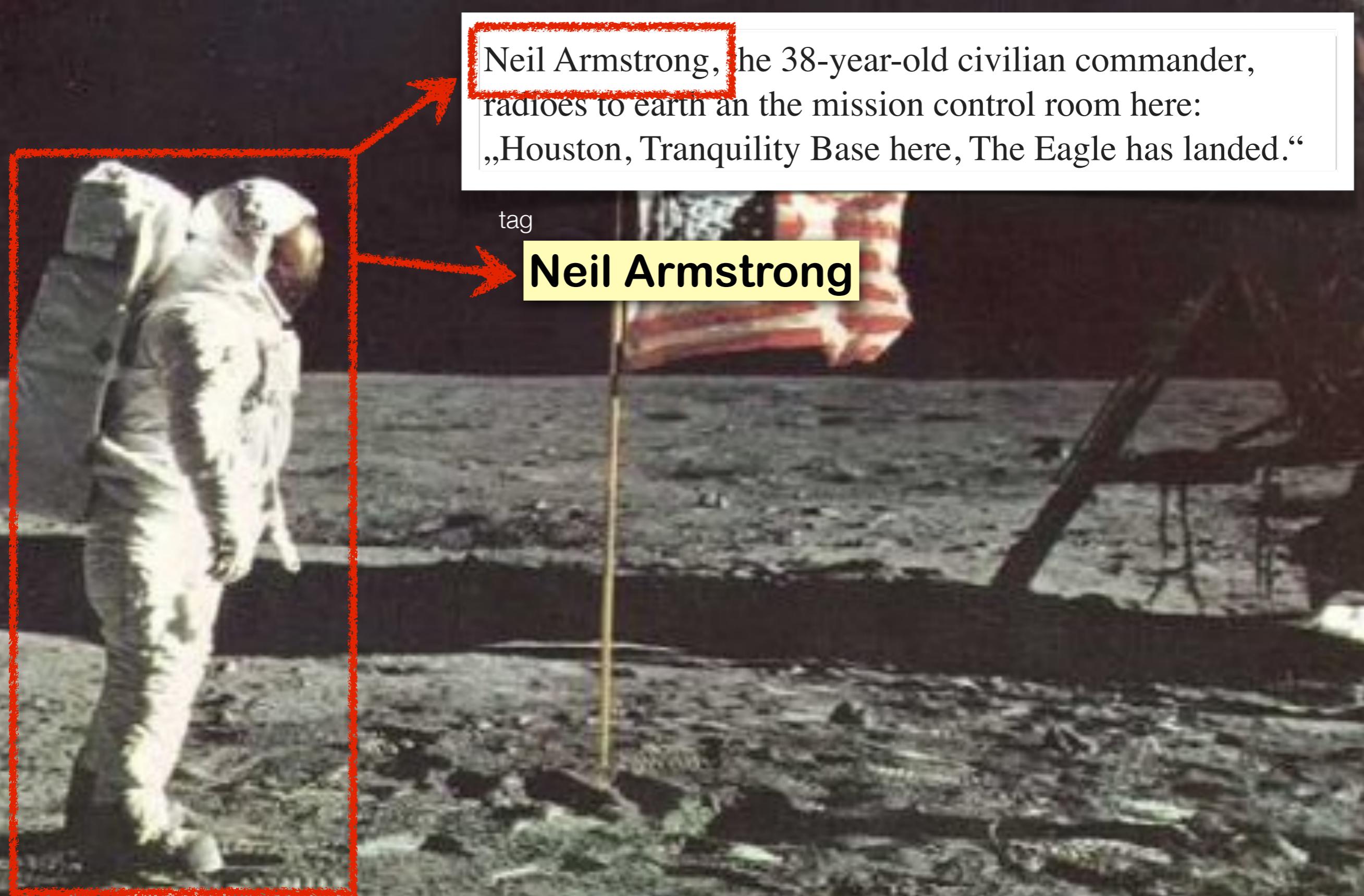
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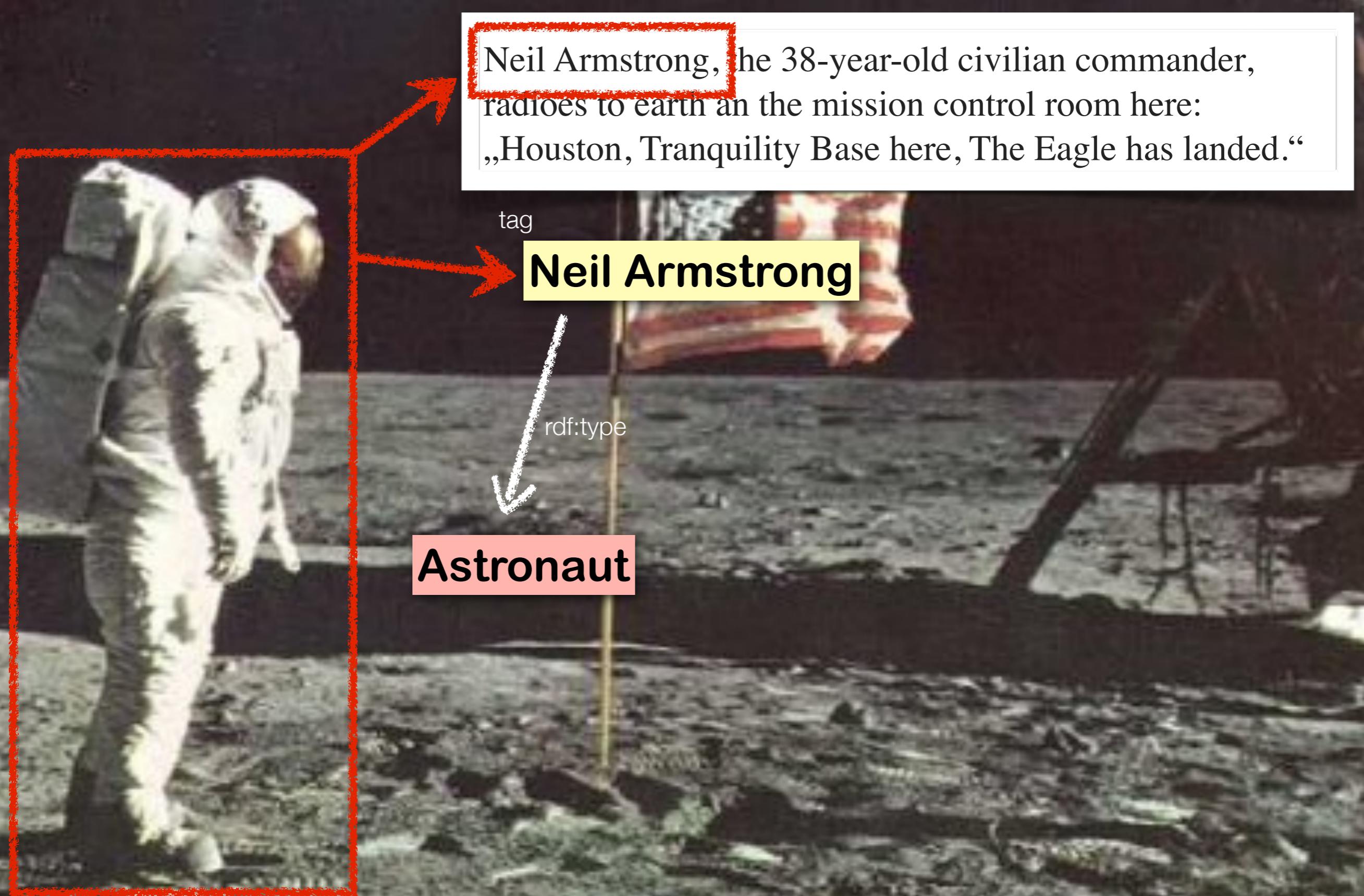
text

Neil Armstrong, the 38-year-old civilian commander, radios to earth an the mission control room here: „Houston, Tranquility Base here, The Eagle has landed.“

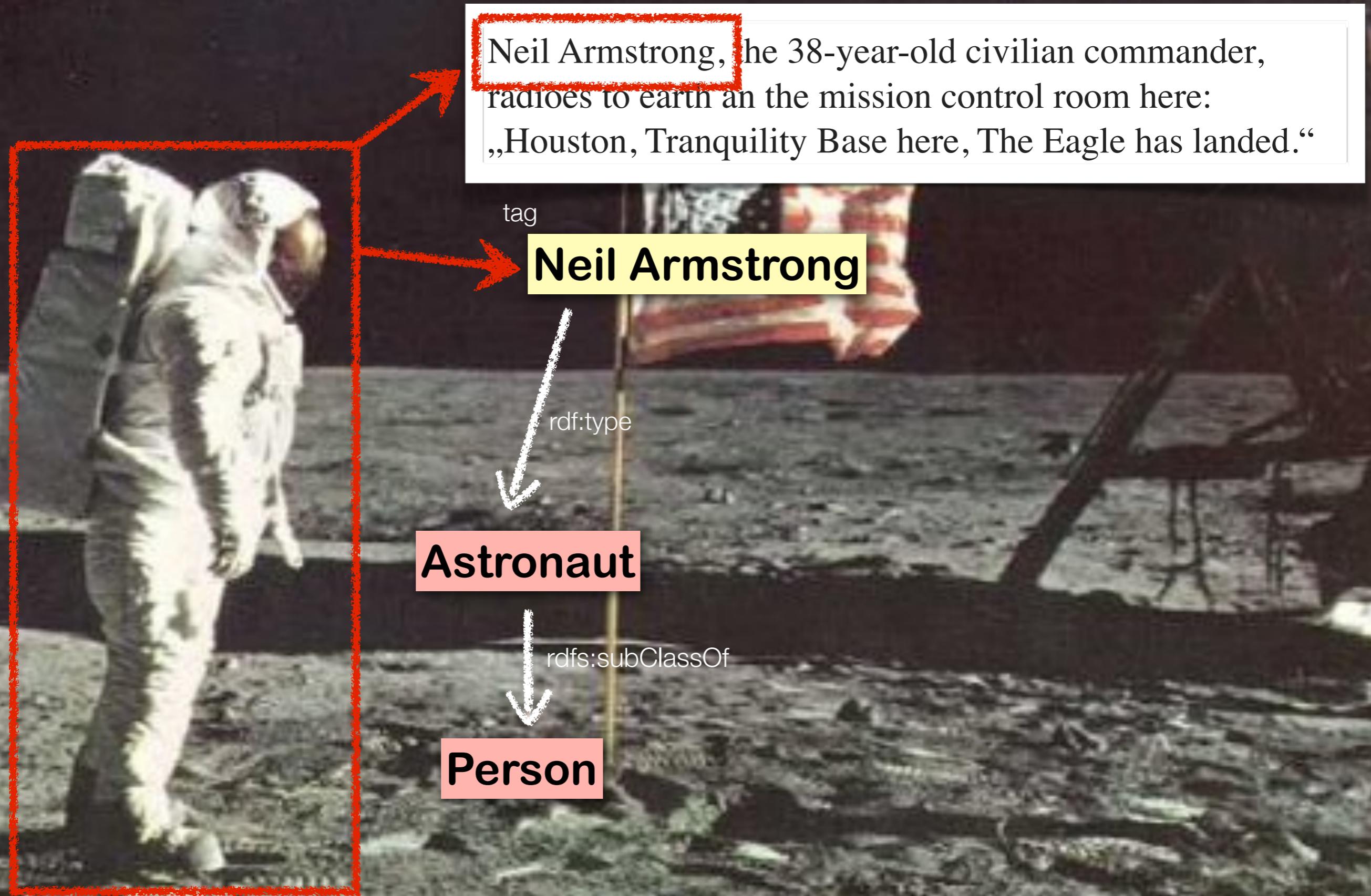
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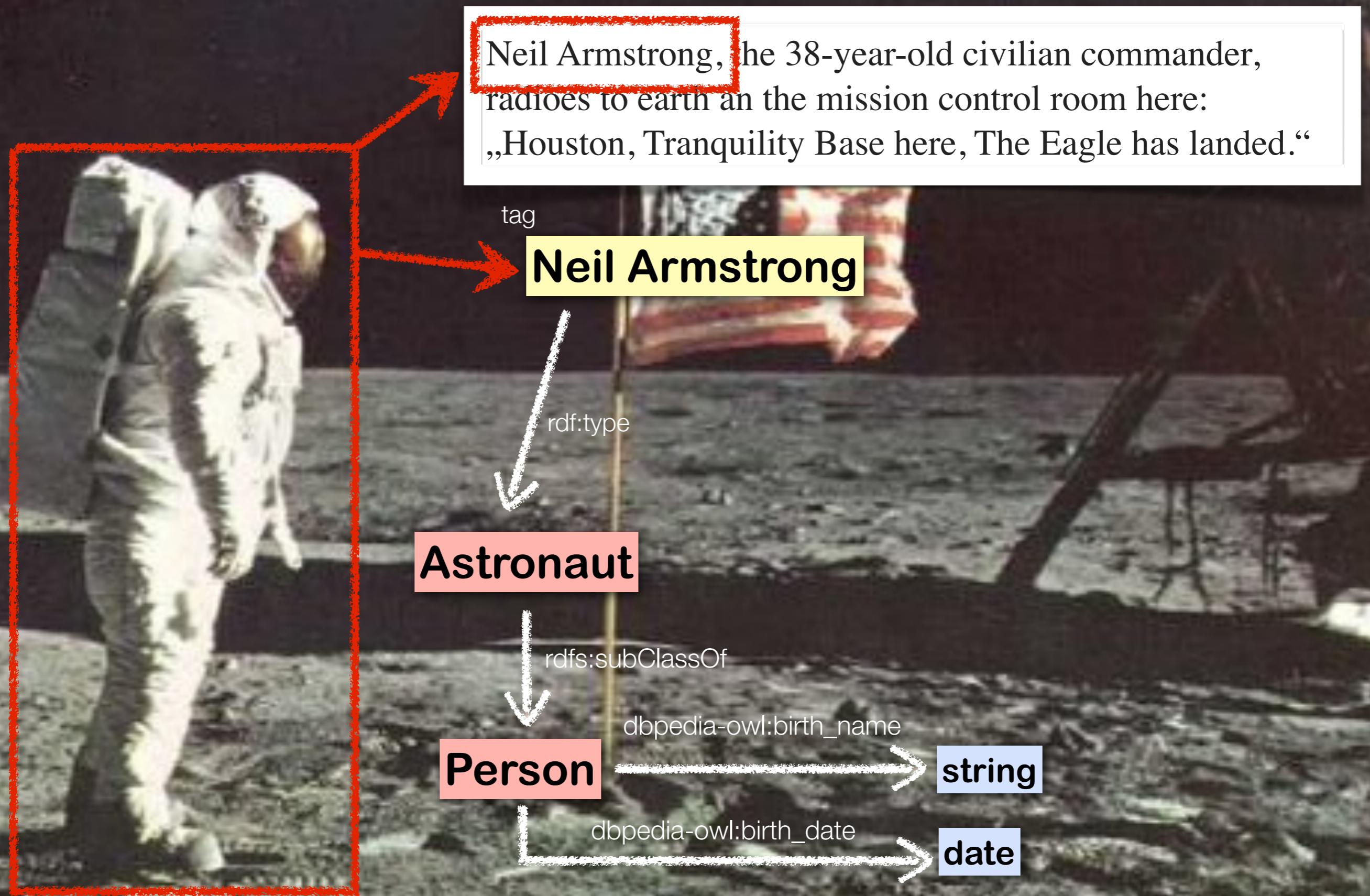
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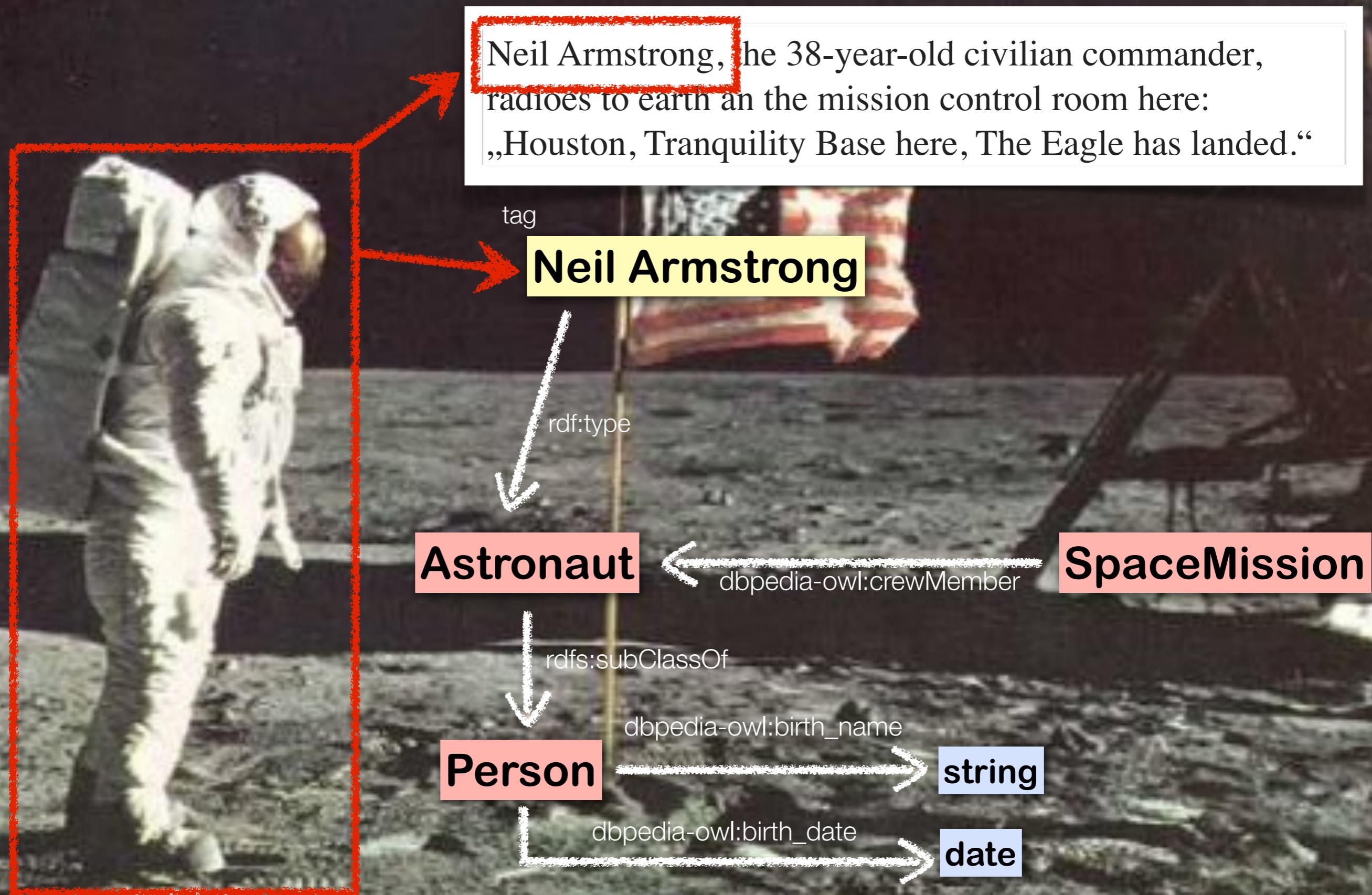
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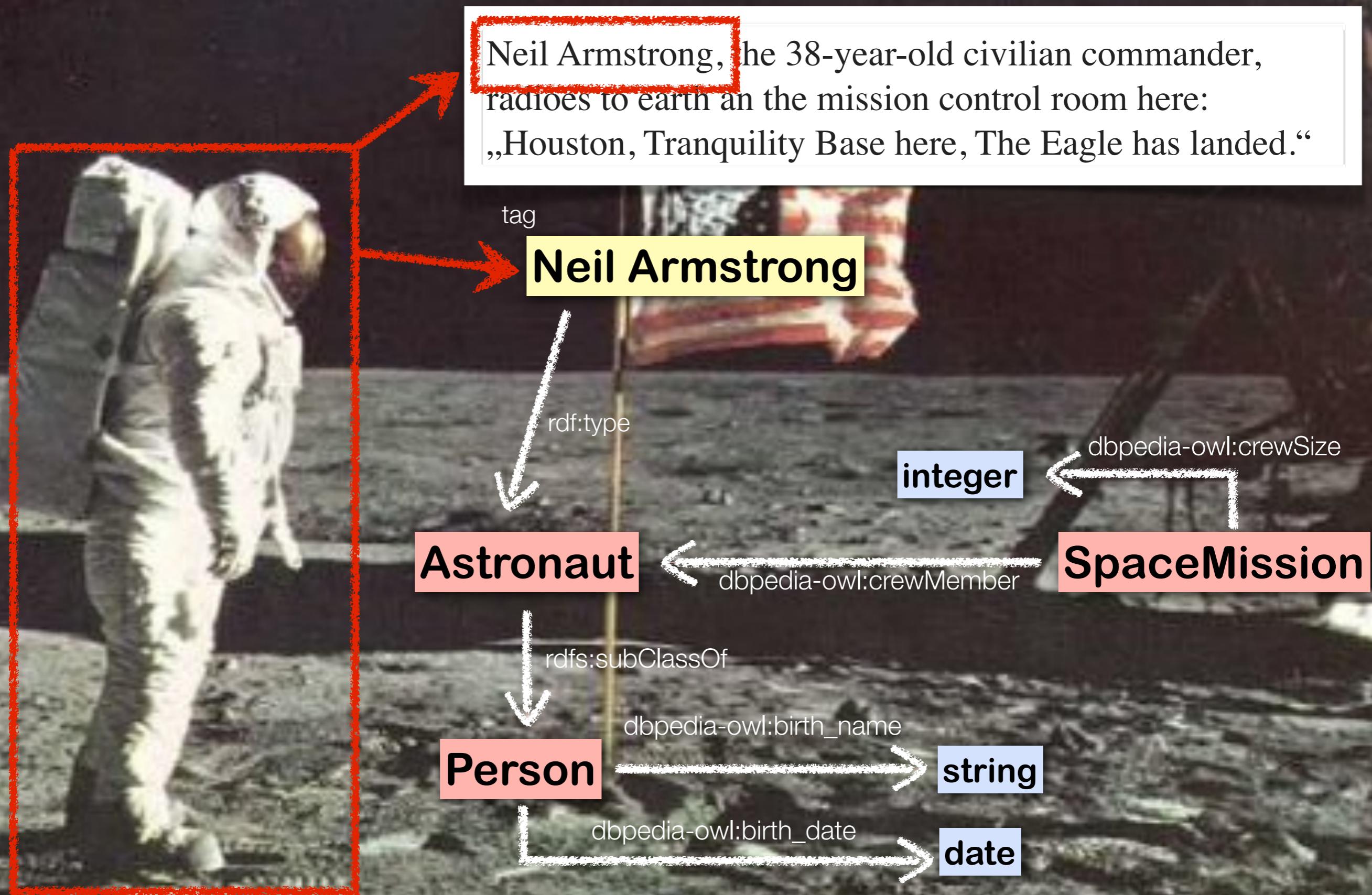
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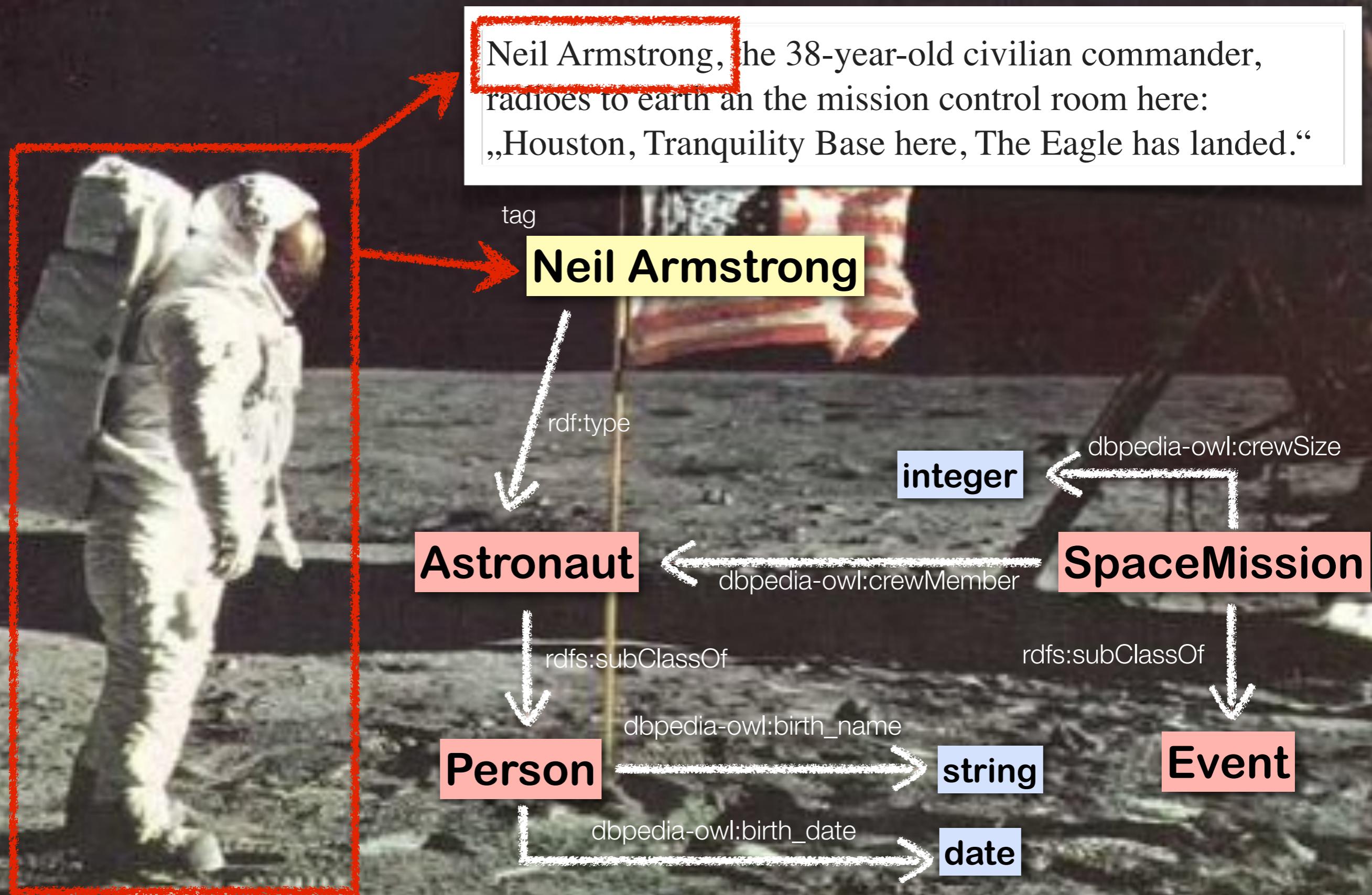
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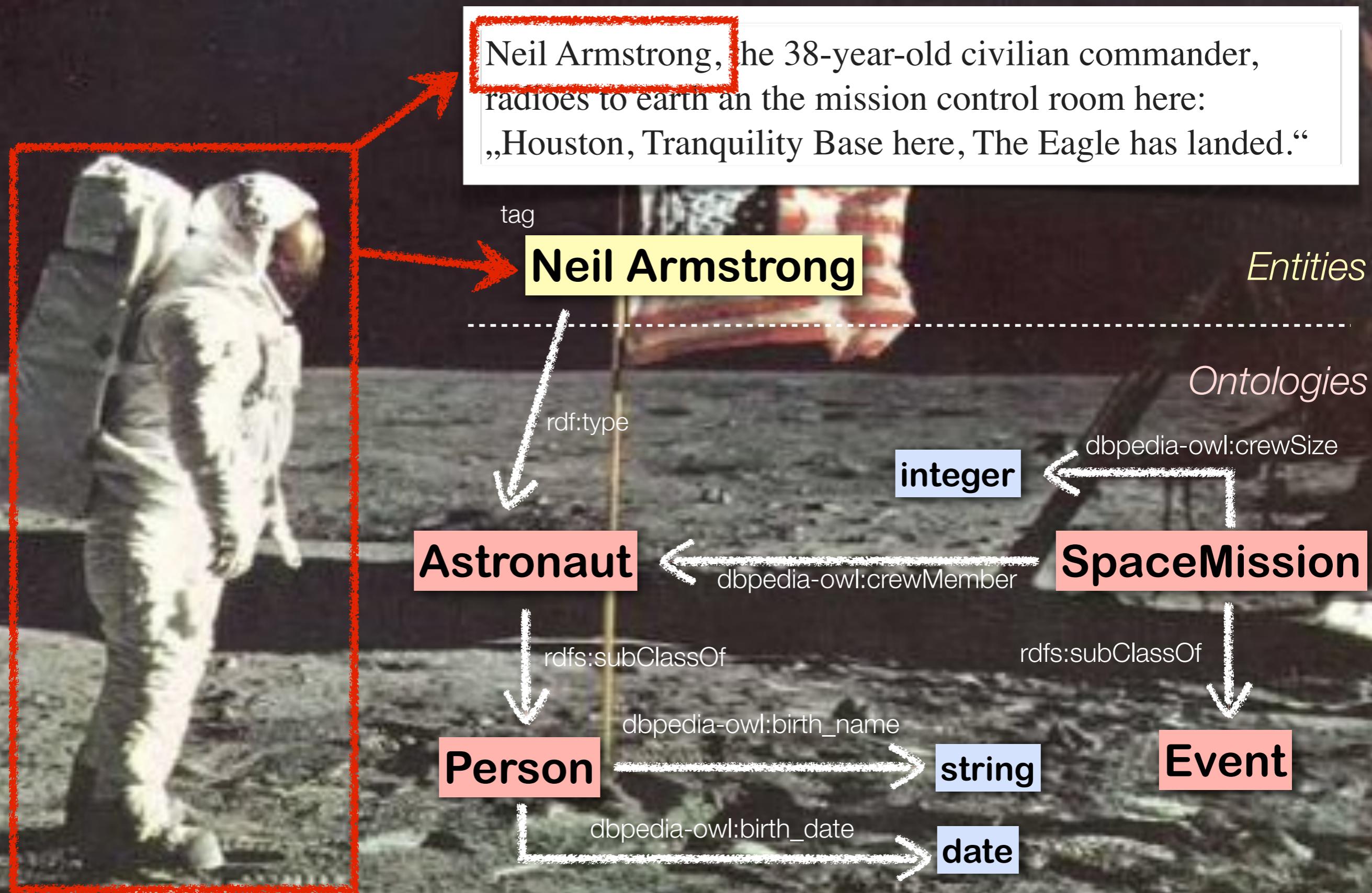
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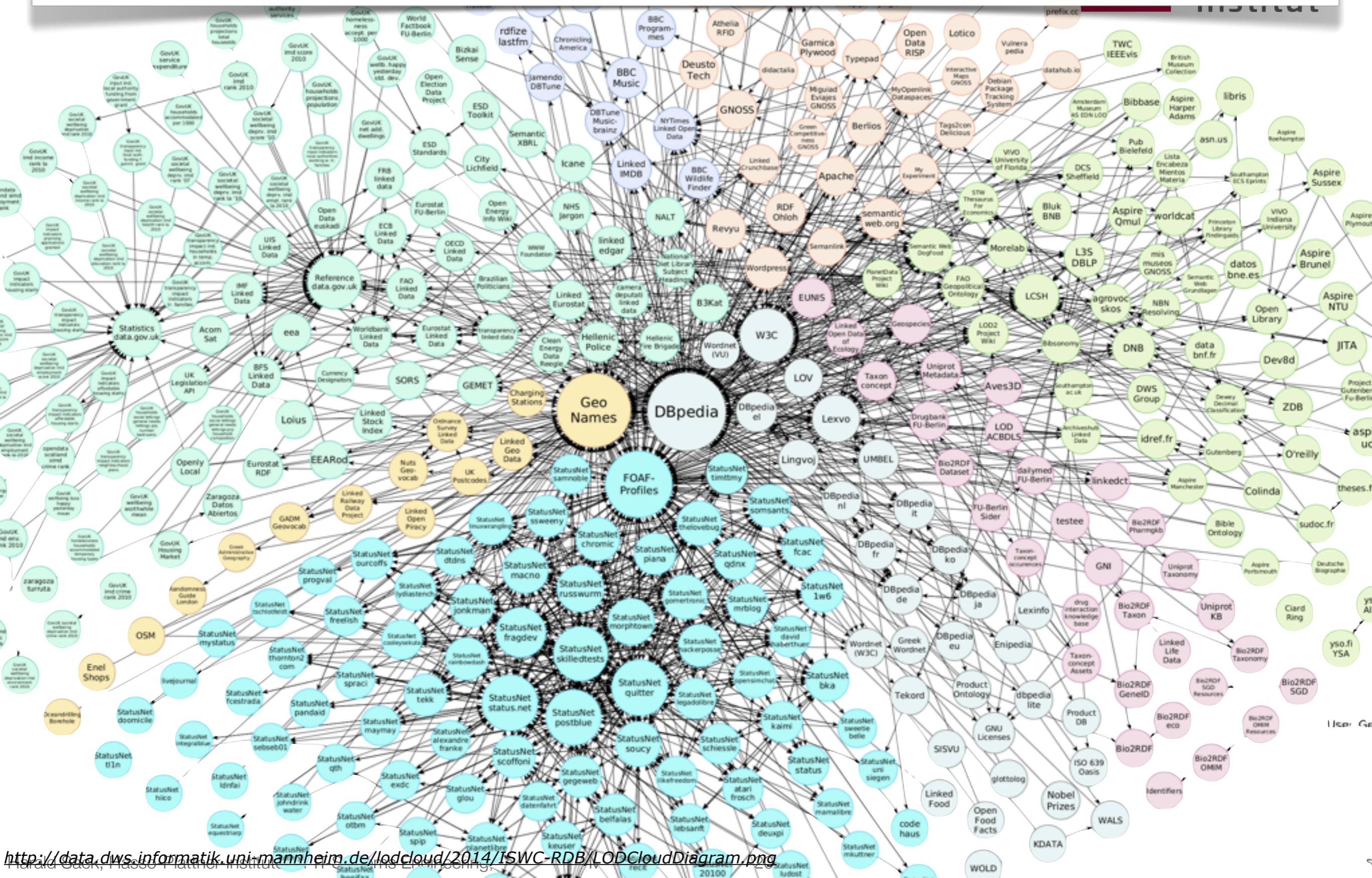
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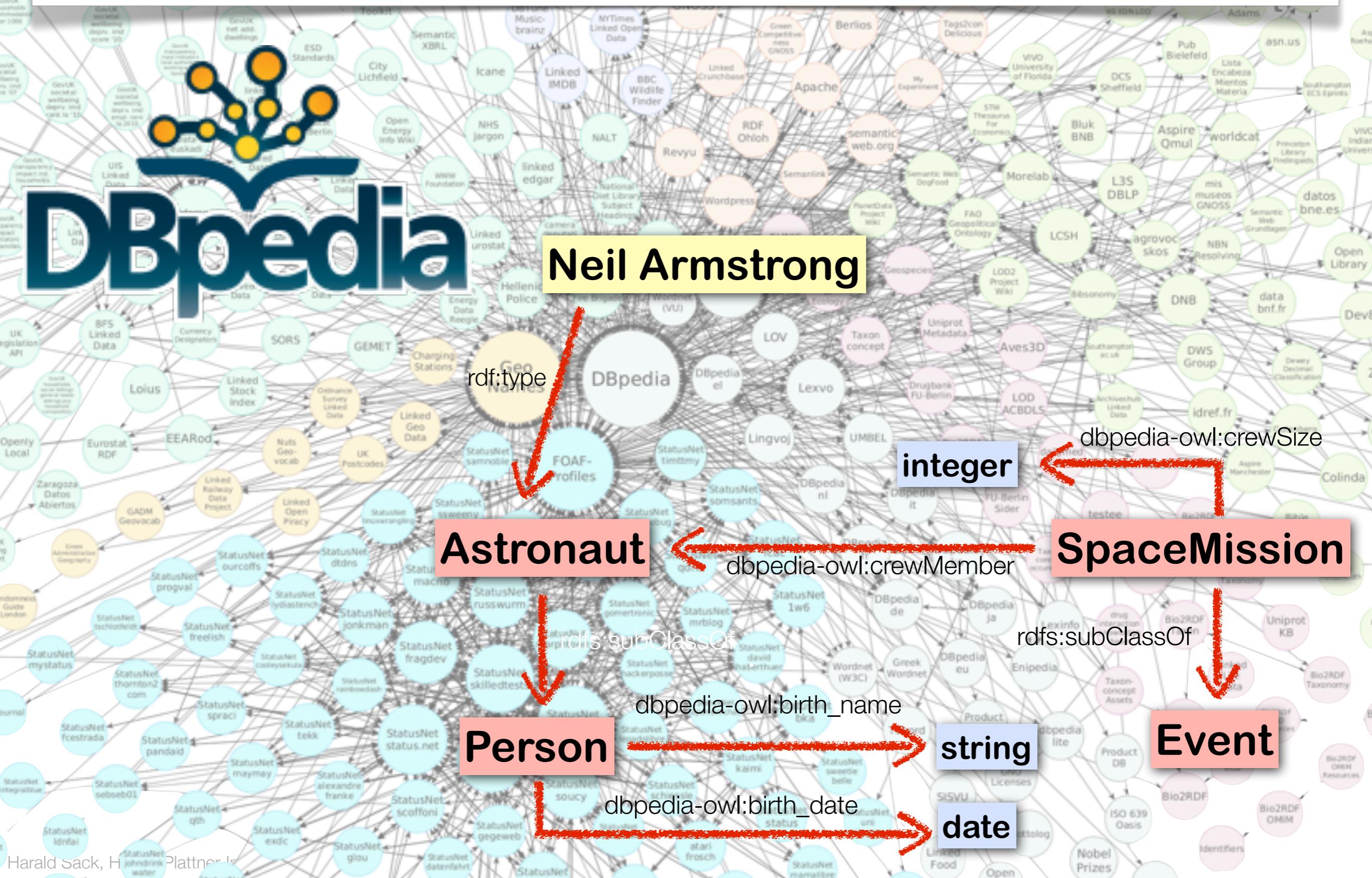
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Web of Data = Linked Open Data



Web of Data = Linked Open Data



From Raw (Text) Data to Semantic Entities



About: [Neil Armstrong](#)

An Entity of Type : [United States Air Force](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)



Neil Alden Armstrong (nascut el 5 d'agost de 1930) és un pilot d'avió, astronauta, pilot de proves, enginyer aeronàutic, professor d'universitat i Aviador Naval dels Estats Units. Va ser la primera persona en trepitjar la Lluna. El 1962, Armstrong va ser seleccionat per la NASA com a astronauta. Va servir de pilot comandant de reemplaçament per a la missió Gemini 5 al 1965.

Property

[dbpedia-owl:Astronaut/timelineSpace](#)

Value

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- 12372.0

[dbpedia-owl:abstract](#)

• Neil Alden Armstrong (nascut el 5 d'agost de 1930) és un pilot d'avió, astronauta, pilot de proves, enginyer aeronàutic, professor d'universitat i Aviador Naval dels Estats Units. Va ser la primera persona en trepitjar la Lluna. El 1962, Armstrong va ser seleccionat per la NASA com a astronauta. Va servir de pilot comandant de reemplaçament per a la missió Gemini 5 al 1965. El seu primer vol espacial va ser a bord de la nau Gemini 8 el 1966, on va ser-hi el comandant, sent un dels primers ciutadans americans en volar a l'espai (Joseph Albert Walker va ser el primer ciutadà americà en anar-hi, a bord de la X-15 Flight 90 pocs anys abans). En aquesta missió espacial, va fer la primera maniobra d'acoblament de dos naus espacials juntament amb David Scott. Malauradament la missió es va avortar poc després de l'acoblament per un mal funcionament dels impulsors de maniobra. El mateix any, va ser el pilot comandant de reserva per a la missió Gemini 11. El 1968 va ser el comandant de la tripulació de reserva de la missió orbital Apollo 8. Armstrong va estar apunt de morir durant un entrenament en un vehicle de recerca lunar (LLRV) el 6 de maig de 1969. El segon i últim vol espacial d'Armstrong va ser com a comandant de l'Apollo 11 aterrant a la Lluna el 20 de juliol de 1969. En aquesta missió, Armstrong i Buzz Aldrin van descendir del mòdul lunar i va passar-se 2 hores i mitja explorant mentre Michael Collins quedava en òrbita al mòdul de comandament. Armstrong ha rebut la Medalla d'Honor del Congrés dels Estats Units.

• Neil Alden Armstrong je bývalý americký pilot, astronaut a univerzitní profesor. Je prvním člověkem, který vstoupil na povrch Měsíce. Než se stal astronautem, sloužil jako pilot v námořnictvu Spojených států amerických, přičemž bojoval ve válce v Koreji. Po odchodu z námořnictva vystudoval letecké inženýrství na Drydenově letecké výzkumné stanici. V roce 1955 byl povýšen na kapitána. Na konci války byl zařazen do Národního komitétu pro leteckou výzkum (NACA), kde se při vývoji raketoplánu X-15 podílel. V roce 1962 byl jmenován členem posádky na misi Gemini 8. V roce 1966 byl jmenován členem posádky na misi Apollo 8. V roce 1969 byl jmenován členem posádky na misi Apollo 11. V roce 1971 byl jmenován členem posádky na misi Apollo 16. V roce 1972 byl jmenován členem posádky na misi Apollo 17. V roce 1974 byl jmenován členem posádky na misi Skylab 3. V roce 1975 byl jmenován členem posádky na misi Skylab 4. V roce 1977 byl jmenován členem posádky na misi STS-1. V roce 1985 byl jmenován členem posádky na misi STS-7. V roce 1999 byl jmenován členem posádky na misi STS-96. V roce 2001 byl jmenován členem posádky na misi STS-102. V roce 2002 byl jmenován členem posádky na misi STS-108. V roce 2005 byl jmenován členem posádky na misi STS-114. V roce 2007 byl jmenován členem posádky na misi STS-117. V roce 2009 byl jmenován členem posádky na misi STS-126. V roce 2011 byl jmenován členem posádky na misi STS-134. V roce 2012 byl jmenován členem posádky na misi STS-135. V roce 2014 byl jmenován členem posádky na misi STS-137. V roce 2015 byl jmenován členem posádky na misi STS-138. V roce 2016 byl jmenován členem posádky na misi STS-139. V roce 2017 byl jmenován členem posádky na misi STS-140. V roce 2018 byl jmenován členem posádky na misi STS-141. V roce 2019 byl jmenován členem posádky na misi STS-142. V roce 2020 byl jmenován členem posádky na misi STS-143. V roce 2021 byl jmenován členem posádky na misi STS-144. V roce 2022 byl jmenován členem posádky na misi STS-145. V roce 2023 byl jmenován členem posádky na misi STS-146. V roce 2024 byl jmenován členem posádky na misi STS-147. V roce 2025 byl jmenován členem posádky na misi STS-148. V roce 2026 byl jmenován členem posádky na misi STS-149. V roce 2027 byl jmenován členem posádky na misi STS-150. V roce 2028 byl jmenován členem posádky na misi STS-151. V roce 2029 byl jmenován členem posádky na misi STS-152. V roce 2030 byl jmenován členem posádky na misi STS-153. V roce 2031 byl jmenován členem posádky na misi STS-154. V roce 2032 byl jmenován členem posádky na misi STS-155. V roce 2033 byl jmenován členem posádky na misi STS-156. V roce 2034 byl jmenován členem posádky na misi STS-157. V roce 2035 byl jmenován členem posádky na misi STS-158. V roce 2036 byl jmenován členem posádky na misi STS-159. V roce 2037 byl jmenován členem posádky na misi STS-160. V roce 2038 byl jmenován členem posádky na misi STS-161. 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V roce 2092 byl jmenován členem posádky na misi STS-315. V roce 2093 byl jmenován členem posádky na misi STS-316. V roce 2094 byl jmenován členem posádky na misi STS-317. V roce 2095 byl jmenován členem posádky na misi STS-318. V roce 2096 byl jmenován členem posádky na misi STS-319. V roce 2097 byl jmenován členem posádky na misi STS-320. V roce 2098 byl jmenován členem posádky na misi STS-321. V roce 2099 byl jmenován členem posádky na misi STS-322. V roce 2000 byl jmenován členem posádky na misi STS-323. V roce 2001 byl jmenován členem posádky na misi STS-324. V roce 2002 byl jmenován členem posádky na misi STS-325. V roce 2003 byl jmenován členem posádky na misi STS-326. V roce 2004 byl jmenován členem posádky na misi STS-327. V roce 2005 byl jmenován členem posádky na misi STS-328. V roce 2006 byl jmenován členem posádky na misi STS-329. V roce 2007 byl jmenován členem posádky na misi STS-330. V roce 2008 byl jmenován členem posádky na misi STS-331. V roce 2009 byl jmenován členem posádky na misi STS-332. V roce 2010 byl jmenován členem posádky na misi STS-333. V roce 2011 byl jmenován členem posádky na misi STS-334. V roce 2012 byl jmenován členem posádky na misi STS-335. V roce 2013 byl jmenován členem posádky na misi STS-336. V roce 2014 byl jmenován členem posádky na misi STS-337. V roce 2015 byl jmenován členem posádky na misi STS-338. V roce 2016 byl jmenován členem posádky na misi STS-339. V roce 2017 byl jmenován členem posádky na misi STS-340. V roce 2018 byl jmenován členem posádky na misi STS-341. V roce 2019 byl jmenován členem posádky na misi STS-342. V roce 2020 byl jmenován členem posádky na misi STS-343. V roce 2021 byl jmenován členem posádky na misi STS-344. V roce 2022 byl jmenován členem posádky na misi STS-345. V roce 2023 byl jmenován členem posádky na misi STS-346. V roce 2024 byl jmenován členem posádky na misi STS-347. V roce 2025 byl jmenován členem posádky na misi STS-348. V roce 2026 byl jmenován členem posádky na misi STS-349. V roce 2027 byl jmenován členem posádky na misi STS-350. V roce 2028 byl

From Raw (Text) Data to Semantic Entities



`:Neil_Armstrong rdf:type dbpedia-owl:Astronaut .`

↓
subject

↓
property

↓
object

`:Neil_Armstrong`

`rdf:type`

`dbpedia-owl:Astronaut`

Named Entity Resolution

text

image annotation

Neil Armstrong



Neil Armstrong, the 38-year-old civilian commander, radios to earth an the mission control room here: „Houston, Tranquility Base here, The Eagle has landed.“

About: [Neil Armstrong](#)

An Entity of Type : [NASA](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)

Neil Alden Armstrong ist ein ehemaliger amerikanischer Testpilot und Astronaut. Er betrat als erster Mensch den Mond.

Property	Value
dbpedia-owl:Astronaut/timeInSpace	<ul style="list-style-type: none">▪ 0.5166666666666667▪ 12372.0
dbpedia-owl:abstract	<ul style="list-style-type: none">▪ Neil Alden Armstrong ist ein ehemaliger amerikanischer Testpilot und Astronaut. Er betrat als erster Mensch den Mond.▪ Neil Alden Armstrong (born August 5, 1930) is an American aviator and former astronaut, test pilot, aerospace engineer, United States Naval Aviator. He was the first person to set foot on the Moon. Before becoming an astronaut, Armstrong and served in the Korean War. After the war, he served as a test pilot at the National Advisory Committee for Aeronautics Station, now known as the Dryden Flight Research Center, where he flew over 900 flights in a variety of aircraft. As a research project pilot on the F-100 Super Sabre A and C variants, F-101 Voodoo, and the Lockheed F-104A Starfighter. He also served as project pilot on the North American X-15, F-105 Thunderchief, F-106 Delta Dart, B-47 Stratojet, KC-135 Stratotanker and Pegasus. He graduated from the University of Southern California. A participant in the U.S. Air Force's Man In Space Soonest and X-20 Dyna-Soar programs, Armstrong joined the NASA Astronaut Corps in 1962. His first spaceflight was the NASA Gemini 8 mission in 1966, for which he became one of the first U.S. civilians to fly in space. On this mission, he performed the first manned docking of two spacecraft. Armstrong's second and last spaceflight was as mission commander of the Apollo 11 moon landing mission on July 20, 1969. Armstrong and Buzz Aldrin descended to the lunar surface and spent 2½ hours exploring while Michael Collins remained in the Command Module. For his spaceflights, Armstrong received the Congressional Space Medal of Honor.▪ Neil Alden Armstrong es un ex astronauta de la NASA y el primer ser humano en pisar la Luna el 21 de julio de 1969, en la misión Apolo 11.▪ Neil Alden Armstrong on entinen yhdysvaltalainen astronautti ja ensimmäinen Kuun pinnalla kävellyt ihmisen. Hän oli myös ensimmäinen avaruudessa kävellyt vieraalla taivaankappaleella. Nykyisin hän on eläkkeellä. Neil Armstrong syntyi Wapakonetaassa, Ohiossa Stephen ja Louise Engelin perheeseen. Hänen vanhempiensa olivat saksalais-irlantilaiset ja sukujuuret ovat olleet Irlannista. Armstrong perässä toistuvasti 15 vuoden ajan asuen kahdessa kymmenessä eri kaupungissa. Perheessä oli myös sisko June ja veljekset James ja William. Nämä kolme sisarusta ovat kaikki edelleen elossa. Armstrong on kaksikko. Hän on nuorena innokas partiolainen.▪ Armstrong nacque in Ohio figlio di Stephen Koenig Armstrong e Viola Louise Engel, famiglia di origine tedesca. Combatté nella marina militare americana nella guerra di Corea. Ha frequentato la Purdue University, dove si laureò in ingegneria aeronautica nel 1955. Fu selezionato come pilota di test per la NASA nel 1962. Fu scelto per la missione Gemini 8, che fu la prima che vide l'aggancio di due oggetti orbitanti, nel 1966, ma subito dopo l'atterraggio, a causa di un malfunzionamento dei propulsori di manovra. Nel 1968 fu comandante dell'equipaggio di riserva nella missione Apollo 8, la prima missione con equipaggio a orbita lunare. Il 20 maggio 1969 sfuggì alla morte in un incidente durante una esercitazione con il simulatore volante (Manned Maneuvering Unit). Nel luglio 1969, Armstrong comandò la missione di allunaggio Apollo 11. Durante la fase di avvicinamento al suolo, si spostò manualmente il modulo lunare (LM) Eagle e lo pilotò fuori da una zona particolarmente rocciosa. Le sue prime parole furono: "Houston, Tranquility Base here. The Eagle has landed." Houston, qui è la base della Tranquillità. L'Aquila è atterrata. Quasi sette ore più tardi divenne il primo essere umano a camminare sulla Luna. Tocò il suolo lunare alle ore 2:56 UTC con lo scarpone sinistro. La sua celebre frase: "That's one small step for [a] man, one giant leap for mankind." Questo è un piccolo passo per un uomo, un grande salto per l'umanità." Dopo il pensionamento dalla NASA, Armstrong insegnò ingegneria all'Università di Cincinnati. È stato membro del consiglio di amministrazione della Boeing e della National Space Society. È stato anche consulente per la NASA e ha partecipato a diversi programmi televisivi.



“Understanding“ the Web of Data

Named Entity Resolution

Overview

(1) How to make sense of the Web?

and why we are not really content with it...

(2) Words and Meaning

to be able to better „understand“ the content

(3) Named Entity Resolution

from words to semantic entities...

(4) Application Scenarios

Exploratory Search and intelligent Recommendations

Named Entity Resolution



Start with the Raw Text

(1) Determine all **Named Entities**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

Named Entity Resolution



Start with the Raw Text

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Start with the Raw Text

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radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

name(s),
noun(s),
combination(s) of nouns,
adjective(s) + noun(s),
determiner + (adjectives) + noun(s)

...

Named Entity Resolution



Start with the Raw Text

(1) Determine all **Named Entities**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

use Part-of-Speech Tagger to determine **Named Entities**

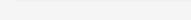
- e.g. Stanford POS Tagger stanford-postagger-2014-06-16.zip
- Tree Tagger online <http://web4u.setsunan.ac.jp/Website/TreeOnline.htm>

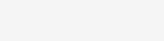
BOOKMARKS (10)

 **NERD: Named Entity Recognition and Disambiguation** 1
http://nerd.eurecom.fr/
a day and 23 hours ago by lysander07
nlp webintelligence2014 

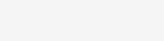
 **Python NLTK POS Tagging, IOB Chunking and Named E...** 2
Part-of-Speech Tagging, Phrase Chunking and Named Entity Recognition with Py...
a day and 23 hours ago by lysander07
nlp webintelligence2014 

 **Named Entity Recognition Demo - Cognitive Computatio...** 1
http://cogcomp.cs.illinois.edu/demo/ner/?id=8
a day and 23 hours ago by lysander07
nlp webintelligence2014 

 **Stanford Named Entity Tagger** 1
Stanford Named Entity Tagger · http://nlp.stanford.edu:8080/ner/
a day and 23 hours ago by lysander07
nlp webintelligence2014 

 **wiki.dbpedia.org : Downloads 39** 1
DBpedia Download page · http://wiki.dbpedia.org/Downloads39
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webintelligence2014 dbpedia 

 **WinEdt.org -- Dictionaries** 1
dictionaries for several languages · http://www.winedt.org/Dict/
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 **Tree Tagger Tags** 1
https://courses.washington.edu/hyperbt/csar-v02/penntable.html
4 days ago by lysander07
postagger documentation webintelligence2014 

 **The Stanford NLP (Natural Language Processing) Group** 5
Stanford Natural Language Processing and Computational Linguistics Group · ht...
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 **NERD: Named Entity Recognition and Disambiguation** 1


PUBLICATIONS

 No matching items.

Named Entity Resolution

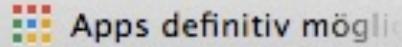
Start with the Raw Text

(1) Determine all **Named Entities**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

use Part-of-Speech Tagger to determine **Named Entities**

```
Macintosh:stanford-pos harald$  
Macintosh:stanford-pos harald$  
Macintosh:stanford-pos harald$  
Macintosh:stanford-pos harald$ ./stanford-postagger.sh models/english-bidirectional-distsim.tagger astronaut.txt  
Loading default properties from tagger models/english-bidirectional-distsim.tagger  
Reading POS tagger model from models/english-bidirectional-distsim.tagger ... done [2,8 sec].  
Neil_NNP Armstrong_NNP _, the_DT 38-year-old_JJ civilian_JJ commander_NN _, radioes_NNS to_T0 earth_NN an_DT the_DT mission_NN c  
ontrol_NN room_NN here_RB :_ Houston_NNP _, Tranquility_NN Base_NN here_RB _, The_DT Eagle_NNP has_VBZ landed_VBN _.  
Tagged 30 words at 115,38 words per second.  
Macintosh:stanford-pos harald$
```

← → C web4u.setsunan.ac.jp/Website/cmd/tt_win.cgi
 Apps definitiv möglich 20 Google Kalender Pin It Projekte In Refind

Neil	NP	Neil	
Armstrong		NP	Armstrong
,	,	,	
the	DT	the	
38-year-old		JJ	38-year-old
civilian		JJ	civilian
commander		NN	commander
,	,	,	
radioes	NNS	radioes	
to	TO	to	
earth	NN	earth	
an	DT	an	
the	DT	the	
mission	NN	mission	
control	NN	control	
room	NN	room	
here	RB	here	
:	:	:	
"	NN	"	
;	:	;	
Houston	NP	Houston	
,	,	,	
Tranquility	NP	Tranquility	
Base	NP	Base	
here	RB	here	
,	,	,	
The	DT	the	
Eagle	NP	Eagle	
has	VHZ	have	
landed.	"	NN	landed."

Neil Armstrong, the 38-year-old civilian commander,
 radioes to earth an the mission control room here:
 „Houston, Tranquility Base here, The Eagle has landed.“

Named Entity Resolution

Start with the Raw Text

- Determine all **Named Entities**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

- is it two entities?
 - Neil and Armstrong
 - or is it only one entity?
 - Neil Armstrong
- what about: mission control room, The Eagle,....?

Named Entity Resolution

Start with the Raw Text

- Determine all **Named Entities**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

How to determine valid composita?

- test sequences of subsequent Named Entity candidates against a dictionary
- consider the longest sequence found in dictionary

Tranquility Base

wins over

Tranquility

Base

Named Entity Resolution

Start with the Raw Text

(1) Determine all **Named Entities**

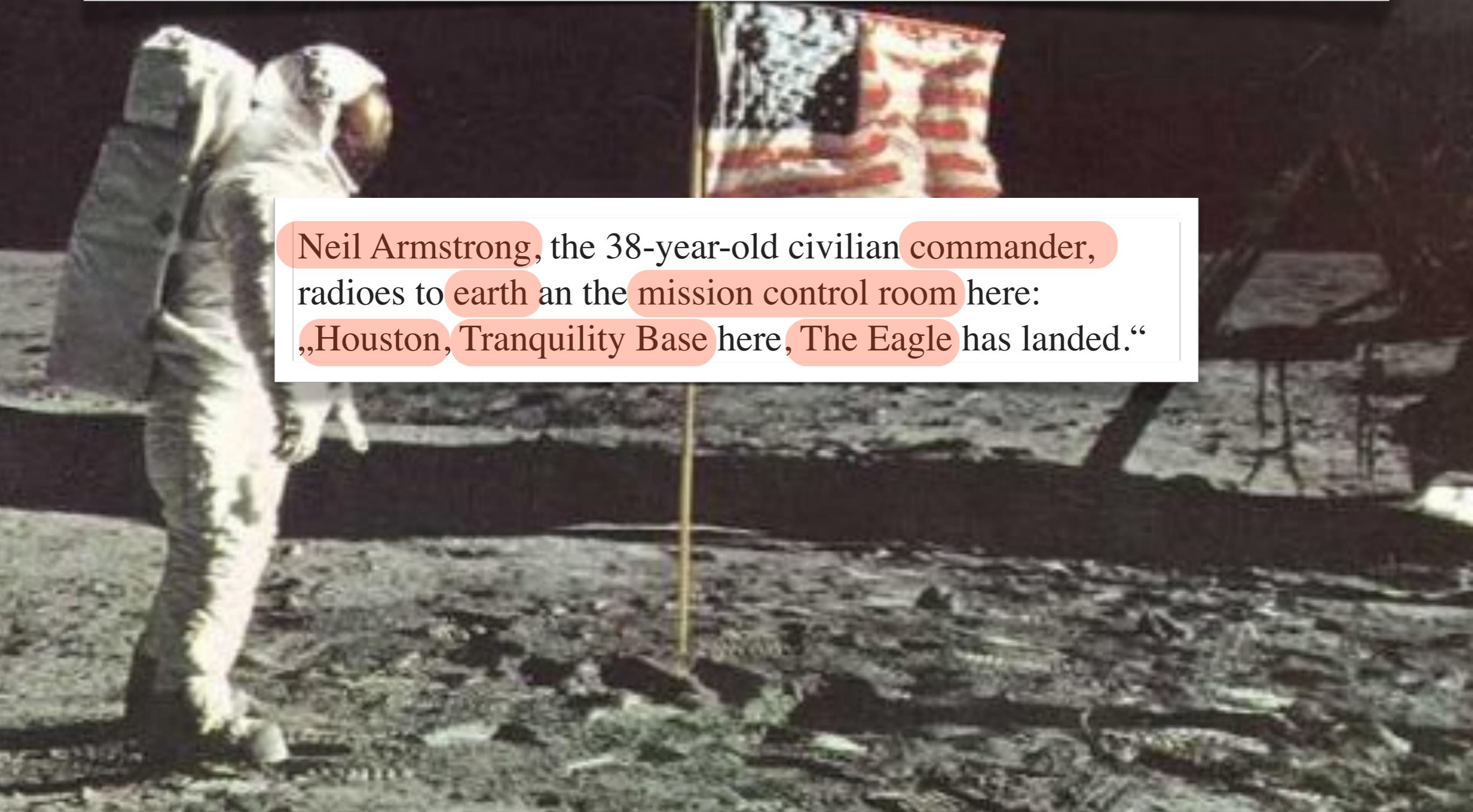
Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
„Houston, Tranquility Base here, The Eagle has landed.“

How to determine valid composita?

- test sequences of subsequent Named Entity candidates against a **dictionary**
- consider the longest sequence found in dictionary
- Dictionary: english.zip -> eng_com.dic

Task:

Determine all Named Entities (correctly) from a given source text.



Neil Armstrong, the 38-year-old civilian commander, radios to earth an the mission control room here: „Houston, Tranquility Base here, The Eagle has landed.“

Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
,Houston, Tranquility Base here, The Eagle has landed.“



person



organization



location



event

<http://nlp.stanford.edu:8080/ner/>

<http://nerd.eurecom.fr/>

Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
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person



organization



location



event

Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
,Houston,, Tranquility Base here, The Eagle has landed.“



person



organization



location



event

(1) <http://nlp.stanford.edu:8080/ner/>

Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
,Houston,, Tranquility Base here, The Eagle has landed.“



person



organization



location



event

- (1) <http://nlp.stanford.edu:8080/ner/>
- (2) <http://nerd.eurecom.fr/>

Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**
- (3) Determine all possible **mappings for entity candidates**

Neil Armstrong

About: [Neil Armstrong](#)

An Entity of Type : [NASA](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)



Neil Alden Arm

Property

dbpedia-owl:As

dbpedia-owl:at

About: [Neil Armstrong \(ice hockey\)](#)

An Entity of Type : [agent](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)



Neil Armstrong (born December 20, 1932, in Plympton, Ontario) is a former professional ice hockey linesman, and is an Honoured Member of the Hockey Hall of Fame.

Property

dbpedia-owl:abstract

Value

- Neil Armstrong ist ein ehemaliger kanadischer Eishockey-Schiedsrichter in der National Hockey League (NHL). Armstrong begann seine Karriere 1957 und nahm an mehr Spielen teil als Gordie Howe. Insgesamt waren es in 22 Jahren 1.744. In seiner Jugend begann er zunächst normal Eishockey zu spielen, wobei klar war, dass er nicht in der NHL würde spielen können. Es bot sich ihm jedoch die Gelegenheit, Schiedsrichter zu werden, und so konnte er doch in dieser Liga arbeiten. Er stieg sehr schnell auf und wurde 1973 in Detroit dafür geehrt, dass er sein 1314tes Spiel leitete und den bis dahin von George Hayes gehaltenen Rekord durchbrach. 1978 zog er sich aus dem aktiven Sport zurück und wurde Talentscout bei den Montréal Canadiens. Sein Verdienst für den Sport wurde 1991 mit der Aufnahme in die Hockey Hall of Fame gewürdigt.
- Neil Armstrong (born December 20, 1932, in Plympton, Ontario) is a former professional ice hockey linesman, and is an Honoured Member of the Hockey Hall of Fame.

dbpedia-owl:birthDate

▪ 1932-12-20 (xsd:date)

dbpedia-owl:birthName

▪ Neil Armstrong

dbpedia-owl:birthPlace

▪ dbpedia:Ontario
▪ dbpedia:Plympton-Wyoming

dbpedia-owl:birthYear

▪ 1932-01-01 00:00:00 (xsd:date)

dbpedia-owl:occupation

▪ dbpedia:Neil_Armstrong_(ice_hockey)_1
▪ dbpedia:National_Hockey_League

dbpedia-owl:wikiPageID

▪ 1987461 (xsd:integer)

Neil Alden Armstrong ist ein ehemaliger amerikanischer Testpilot und Astronaut. Er betrat als erster Mensch den Mond.

Property	Value
dbpedia-owl:Astronaut/timeInSpace	<ul style="list-style-type: none">0.516666666666666712372.0
dbpedia-owl:abstract	<ul style="list-style-type: none">Neil Alden Armstrong ist ein ehemaliger amerikanischer Testpilot und Astronaut. Er betrat als erster Mensch den Mond.Neil Alden Armstrong (born August 5, 1930) is an American aviator and former astronaut, test pilot, aerospace engineer, university professor, and United States Naval Aviator. He was the first person to set foot on the Moon. Before becoming an astronaut, Armstrong was in the United States Navy and served in the Korean War. After the war, he served as a test pilot at the National Advisory Committee for Aeronautics (NACA) High-Speed Flight Station, now known as the Dryden Flight Research Center, where he flew over 900 flights in a variety of aircraft. As a research pilot, Armstrong served as project pilot on the F-100 Super Sabre A and C variants, F-101 Voodoo, and the Lockheed F-104A Starfighter. He also flew the Bell X-1B, Bell X-5, North American X-15, F-105 Thunderchief, F-106 Delta Dart, B-47 Stratojet, KC-135 Stratotanker and Paresev. He graduated from Purdue University and the University of Southern California. A participant in the U.S. Air Force's Man In Space Soonest and X-20 Dyna-Soar human spaceflight programs, Armstrong joined the NASA Astronaut Corps in 1962. His first spaceflight was the NASA Gemini 8 mission in 1966, for which he was the command pilot, becoming one of the first U.S. civilians to fly in space. On this mission, he performed the first manned docking of two spacecraft with pilot David Scott. Armstrong's second and last spaceflight was as mission commander of the Apollo 11 moon landing mission on July 20, 1969. On this mission, Armstrong and Buzz Aldrin descended to the lunar surface and spent 2½ hours exploring while Michael Collins remained in orbit in the Command Module. For his spaceflights, Armstrong received the Congressional Space Medal of Honor.Neil Alden Armstrong es un ex astronauta de la NASA y el primer ser humano en pisar la Luna el 21 de julio de 1969, en la misión del Apolo 11.Neil Alden Armstrong on entinen yhdysvaltalainen astronautti ja ensimmäinen Kuun pinnalla kävellyt ihmisen. Hän oli myös ensimmäinen ihminen joka on kävellyt vieraalla taivaankappaleella. Nykyisin hän on eläkkeellä. Neil Armstrong syntyi Wapakonetassa, Ohiossa Stephen Koenig Armstrongin ja Viola Louise Engelin perheeseen. Hänenä on skotlantilais-irlantilaiset ja saksalaiset sukujuuret. Isä Stephen työskenteli Ohion hallinnolle ja perhe muutti isän perässä toistuvasti 15 vuoden ajan asuen kahdessa kymmenessä eri kaupungissa. Perheessä oli myös sisiko June ja velli Dean. Neil Armstrong oli naimisissa ja hänellä on kaksi poikaa. Hän oli nuorena innokas partiolainen.Armstrong nacque in Ohio figlio di Stephen Koenig Armstrong e Viola Louise Engel, famiglia di origine tedesca. Combatté come pilota di jet per la marina militare americana nella guerra di Corea. Ha frequentato la Purdue University, dove si laureò in ingegneria aeronautica nel 1955. Diventò pilota civile e per la NASA testò l'X-15, in grado di raggiungere i 6.401 km/h. Fu selezionato come astronauta, sempre dalla NASA, nel 1962. Per il Programma Gemini comandò la missione Gemini 8, che fu la prima che vide l'aggancio di due oggetti orbitanti, nel 1966, ma subito dopo l'aggancio la missione fu interrotta a causa di un malfunzionamento dei propulsori di manovra. Nel 1968 fu comandante dell'equipaggio di riserva nella missione Apollo 8, che prevedeva anche orbite lunari. Il 6 maggio 1969 sfuggì alla morte in un incidente durante una esercitazione con il simulatore volante LLRV (Lunar Landing Research Vehicle). Nel luglio 1969, Armstrong comandò la missione di allunaggio Apollo 11. Durante la fase di avvicinamento, Armstrong prese i controlli manuali del modulo lunare (LM) Eagle e lo pilotò fuori da una zona particolarmente rocciosa. Le sue prime parole furono: « Houston, Tranquillity

Exercise:
Which information from DBpedia can be used to determine all candidate DBpedia entities for a given text (representing an entity).

Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- we need a **Dictionary** that maps **semantic entities** to **all possible names**
- in DBpedia exist ca. **50 different properties** expressing names

rdfs:label	11,137,237
foaf:name	2,887,706
foaf:surname	981,923
dbpedia-owl:alias	42,543
dbpedia-owl:birthName	45,324
dbpedia-owl:formerName	20,137
dbpprop:commonName	3,847
dbpprop:conventionalLongName	3,787
dbpprop:alternateName	5,311
dbpprop:alternateNames	973
dbpprop:altName	894
dbpprop:fullname	141,961
dbpprop:formerName	780
dbpprop:formerNames	6,843
dbpprop:fullName	7,269
dbpprop:name	3,409,906
dbpprop:names	10,957
dbpprop:altNames	11,469
dbpprop:altname	3,105
dbpprop:alternativeNames	70,527
dbpedia-owl:longName	386
dbpprop:othername	6,222
dbpprop:othernames	8,773
dbpprop:otherNames	9,349

Semantic Analysis

Named Entity Resolution

Determine possible **Entity Candidates**

- we need a **Dictionary** that maps **semantic entities** to **entity candidates**
- in DBpedia exist ca. **50 different properties** (see table)

dbpedia-owl:formerName	26,167
dbpprop:commonName	3,847
dbpprop:conventionalLongName	3,787
dbpprop:alternateName	5,311
dbpprop:alternateNames	973
dbpprop:altName	894
dbpprop:fullname	141,961
dbpprop:formerName	780
dbpprop:formerNames	6,843
dbpprop:fullName	7,269
dbpprop:name	3,409,906
dbpprop:names	10,957
dbpprop:altNames	11,469
dbpprop:altname	3,105
dbpprop:alternativeNames	70,527
dbpedia-owl:longName	386
dbpprop:othername	6,222
dbpprop:othernames	8,773
dbpprop:otherNames	9,349
dbpprop:alias	16,990
dbpprop:nickname	45,394
dbpprop:nicknames	1,793
dbpprop:nativeNameLang	16,188
dbpprop:nativeName	79,660
dbpprop:officialName	188,622
dbpprop:conventionalLongName	3,783
dbpprop:eventName	1,154
dbpprop:latinName	703
dbpprop:carName	649
dbpprop:shipNickname	514
dbpprop:showName	30,225
dbpprop:realName	3,023
dbpprop:realname	2,516
dbpprop:nonProfitName	2,292
dbpprop:nameNative	1,903
dbpprop:cartoonName	1,462
dbpprop:oldname	1,422
dbpprop:shortname	1,003

Semantic Analysis

Named Entity Resolution

Determine possible **Entity Candidates**

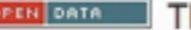
- we need a **Dictionary** that maps **semantic entities** to **entity names**
- in DBpedia exist ca. **50 different properties** to map entities
 - + URI suffixes (/Neil_Armstrong)
 - in DBpedia there are ca. **40 million names** for 9 million entities

dbpedia-owl:commonName	26,167
dbpprop:commonName	3,847
dbpprop:conventionalLongName	3,787
dbpprop:alternateName	5,311
dbpprop:alternateNames	973
dbpprop:altName	894
dbpprop:fullname	141,961
dbpprop:formerName	780
dbpprop:formerNames	6,843
dbpprop:fullName	7,269
dbpprop:name	3,409,906
dbpprop:names	10,957
dbpprop:altNames	11,469
dbpprop:altname	3,105
dbpprop:alternativeNames	70,527
dbpedia-owl:longName	386
dbpprop:othername	6,222
dbpprop:othernames	8,773
dbpprop:otherNames	9,349
dbpprop:alias	16,990
dbpprop:nickname	45,394
dbpprop:nicknames	1,793
dbpprop:nativeNameLang	16,188
dbpprop:nativeName	79,660
dbpprop:officialName	188,622
dbpprop:conventionalLongName	3,783
dbpprop:eventName	1,154
dbpprop:latinName	703
dbpprop:carName	649
dbpprop:shipNickname	514
dbpprop:showName	30,225
dbpprop:realName	3,023
dbpprop:realname	2,516
dbpprop:nonProfitName	2,292
dbpprop:nameNative	1,903
dbpprop:cartoonName	1,462
dbpprop:oldname	1,422
dbpprop:shortname	1,003

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DBpedia 3.9 Downloads

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This page provides downloads of the DBpedia datasets. The DBpedia datasets are licensed under the terms of the [Creative Commons Attribution-ShareAlike License](#) and the [GNU Free Documentation License](#).  The downloads are provided as N-Triples and N-Quads, where the N-Quads version contains additional provenance information for each statement. All files are [bzip2](#) ¹ packed. In addition to the RDF version of the data, we also provide a tabular version of some of the core DBpedia data sets as CSV and JSON files. See [DBpediaAsTables](#).

Older Versions: [DBpedia 3.8](#), [DBpedia 3.7](#), [DBpedia 3.6](#), [DBpedia 3.5.1](#), [DBpedia 3.5](#), [DBpedia 3.4](#), [DBpedia 3.3](#), [DBpedia 3.2](#), [DBpedia 3.1](#), [DBpedia 3.0](#), [DBpedia 3.0RC](#), [DBpedia 2.0](#)

See also the [change log](#) for recent changes and developments.

Contents

- [1. Wikipedia Input Files](#)
- [2. Ontology](#)
- [3. Canonicalized Datasets](#)
- [4. Localized Datasets](#)
- [5. Links to other datasets](#)
- [6. Dataset Descriptions](#)
- [7. NLP Datasets](#)

1. Wikipedia Input Files

The datasets were extracted from [Wikipedia dumps](#) generated in late March / early April 2013. We used a [Wikidata](#) cross-language link dump from June 2013 to interconnect concepts between languages. See also all [specific dump dates and times](#).

2. Ontology

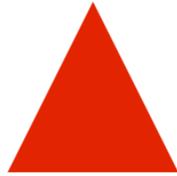
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

[http://dbpedia.org/resource/Neil_Armstrong_\(disambiguation\)](http://dbpedia.org/resource/Neil_Armstrong_(disambiguation))



http://dbpedia.org/resource/Neil_Armstrong_%28disambiguation%29



“Neil Armstrong”

Semantic Analysis

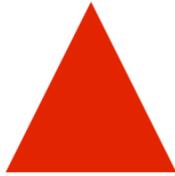
Named Entity Resolution



Determine possible **Entity Candidates**

- URI suffixes

`http://dbpedia.org/resource/Neil_Armstrong_(disambiguation)`



`http://dbpedia.org/resource/Neil_Armstrong_%28disambiguation%29`



`"Neil Armstrong"`

Semantic Analysis

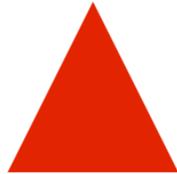
Named Entity Resolution



Determine possible **Entity Candidates**

- URI suffixes

[http://dbpedia.org/resource/Neil_Armstrong_\(disambiguation\)](http://dbpedia.org/resource/Neil_Armstrong_(disambiguation))



http://dbpedia.org/resource/Neil_Armstrong_%28disambiguation%29



“Neil Armstrong”

- huge text files are easier transformed with UNIX command line tools:
 - `tr`, `sed`, `awk`

Unfortunately,
DBpedia
doesn't make it
so simple for
you...

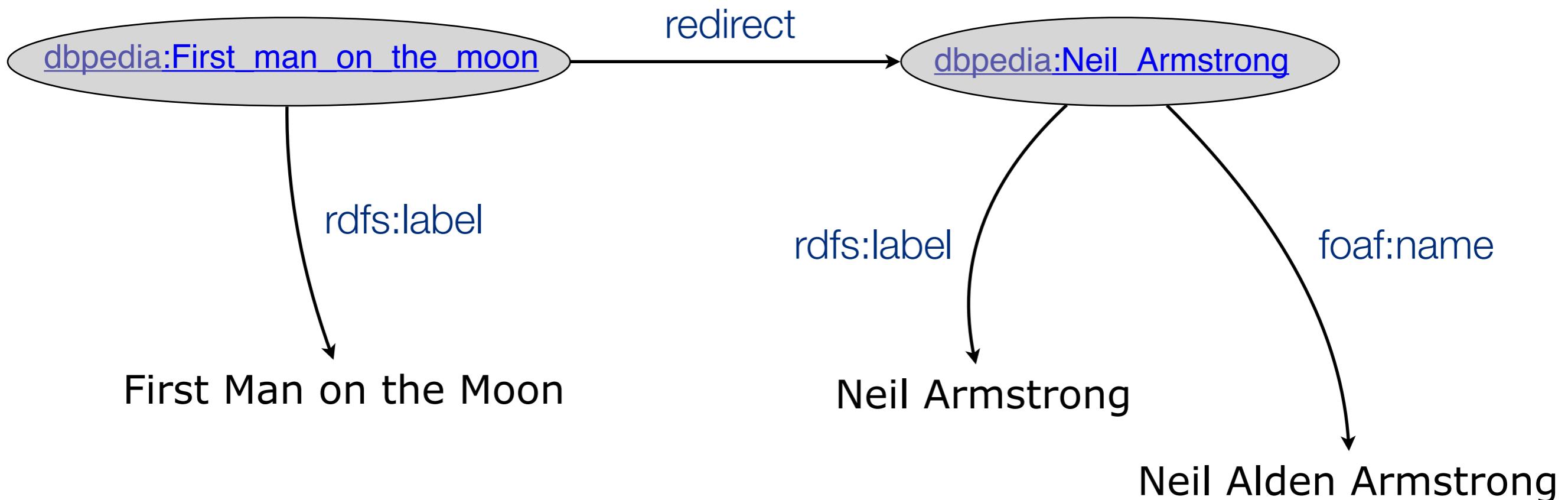
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Synonyms:**
 - redirects via dbpedia-owl:wikiPageRedirects



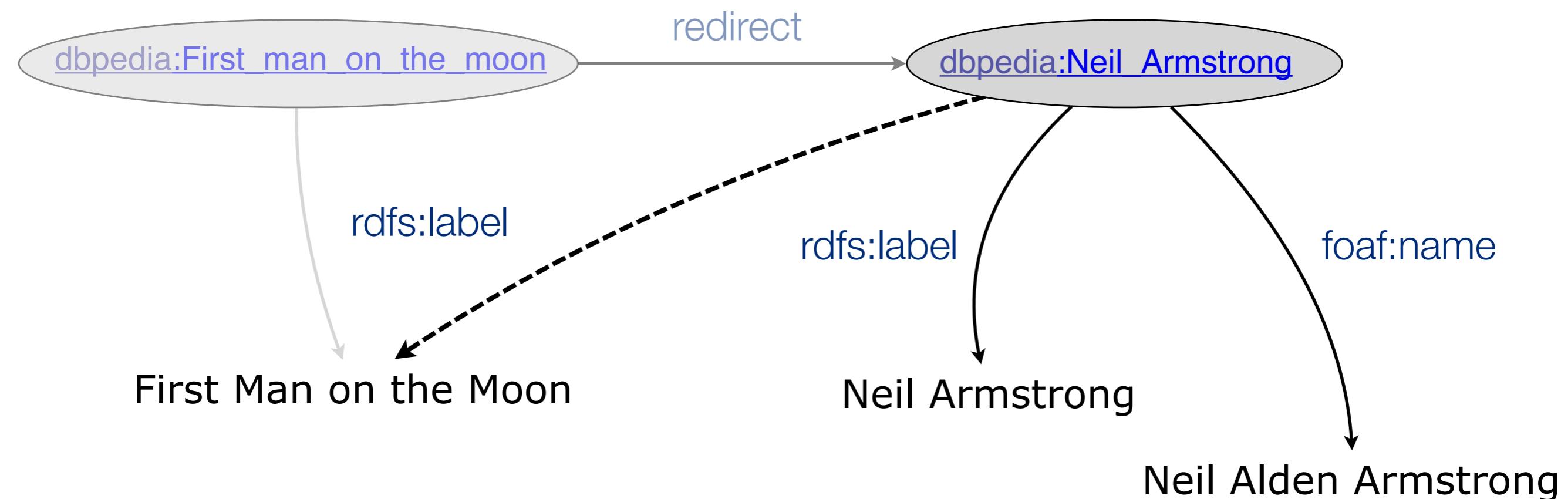
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Synonyms:**
 - redirects via dbpedia-owl:wikiPageRedirects



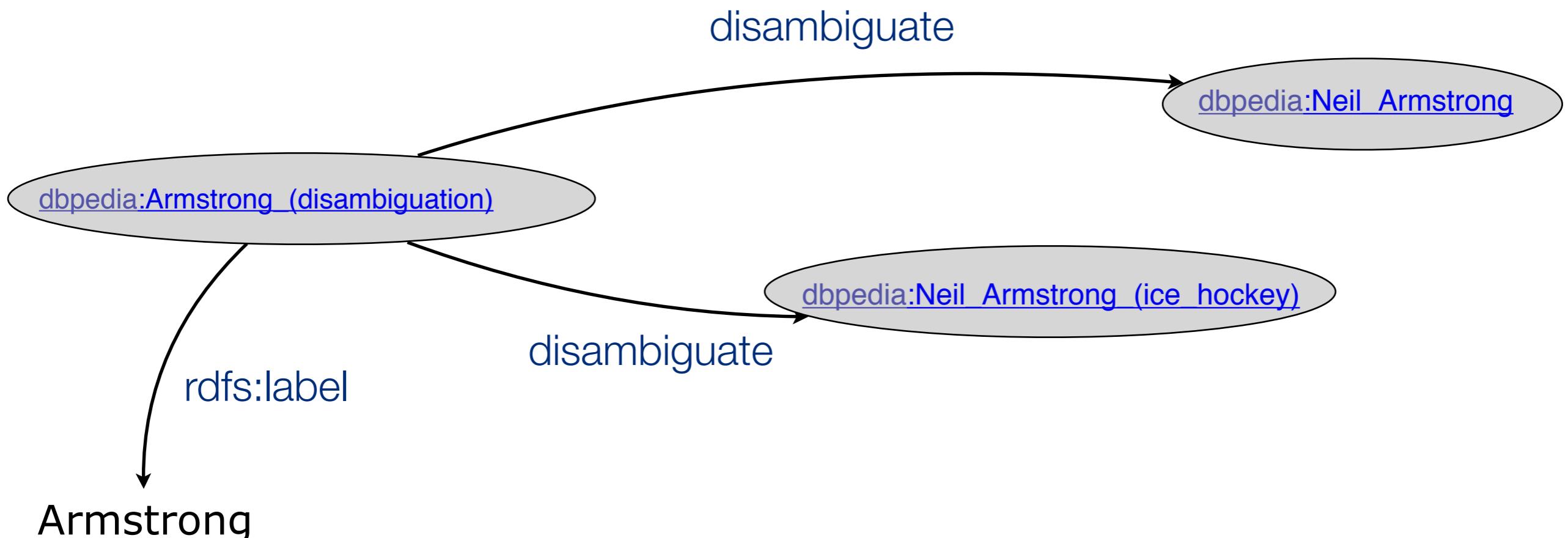
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Homonyms:**
 - disambiguation pages via
`dbpedia-owl:wikiPageDisambiguates`



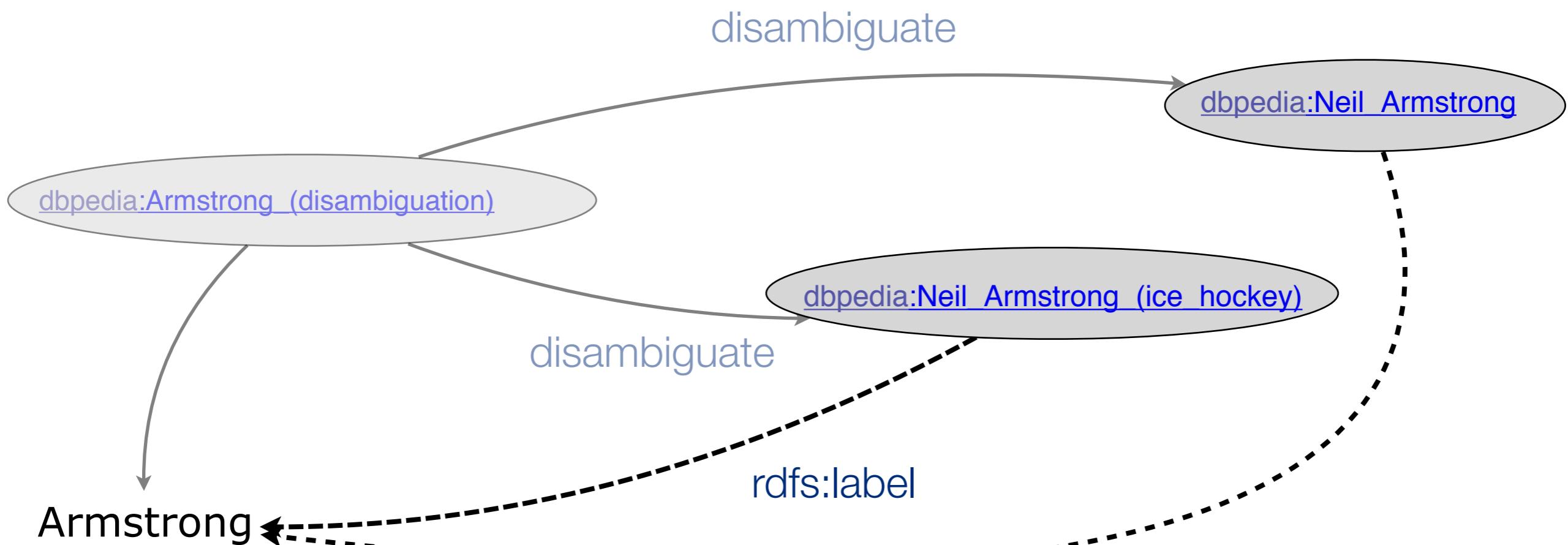
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Homonyms:**
 - disambiguation pages via
`dbpedia-owl:wikiPageDisambiguates`



It is even more
complicated...

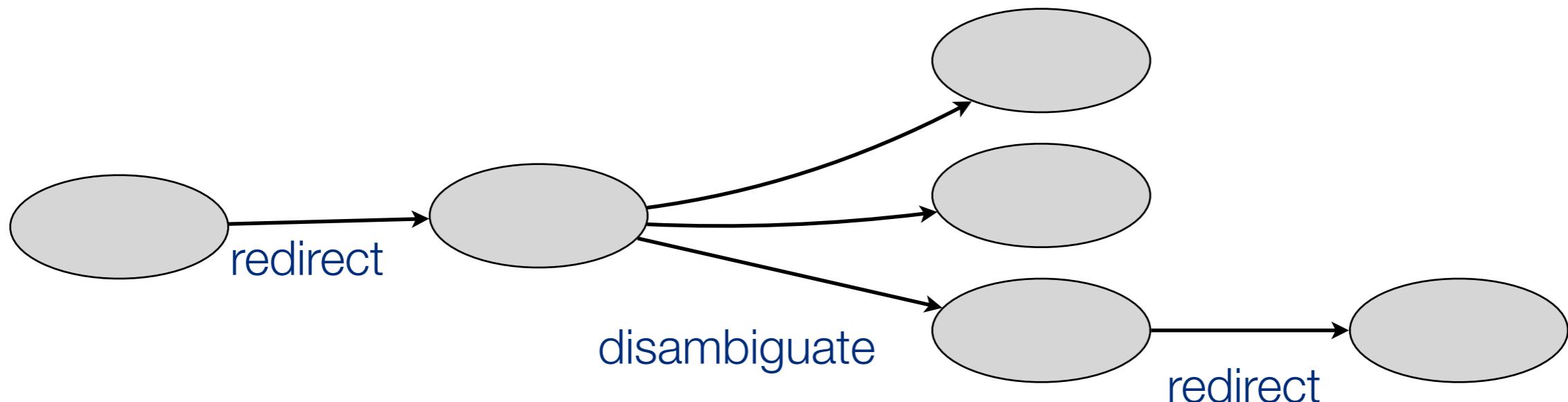
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Resolve** Chains and Circles



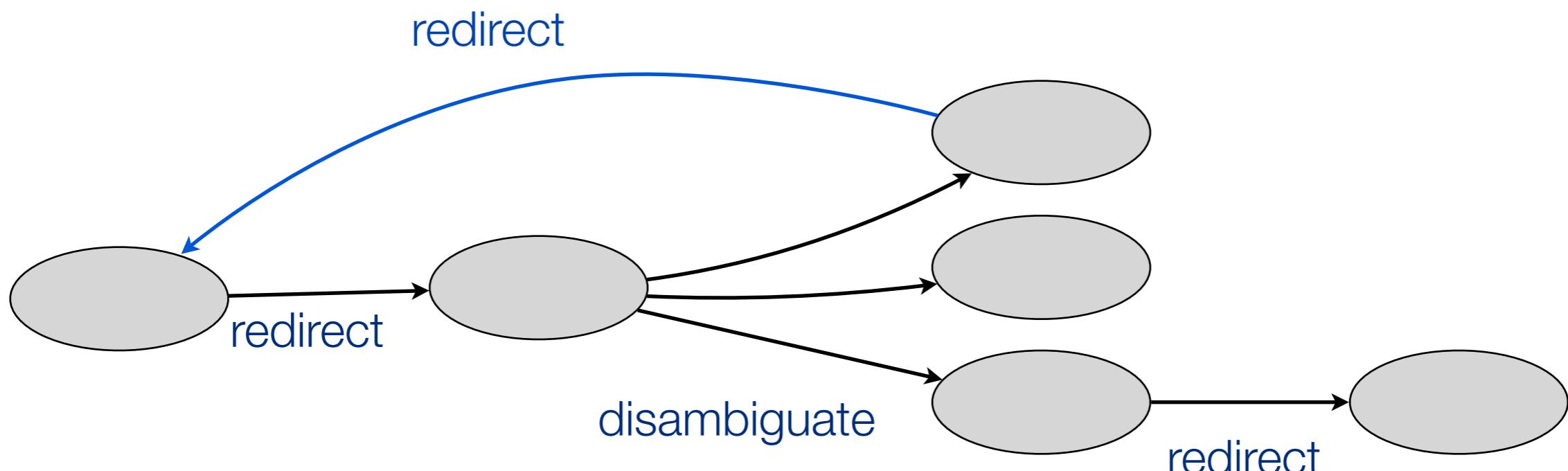
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Resolve** Chains and Circles



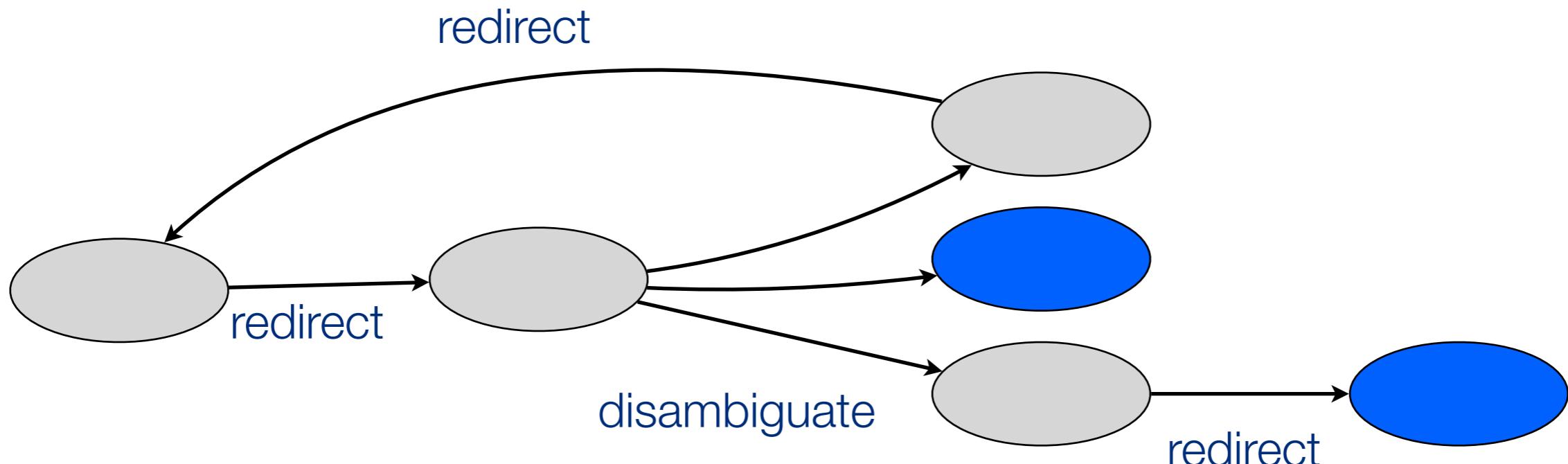
Semantic Analysis

Named Entity Resolution



Determine possible **Entity Candidates**

- **Resolve** Chains and Circles
- Collect all name references from redirect & disambiguation paths in the leaf nodes



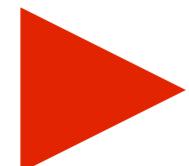
Named Entity Resolution

Start with the Raw Text

- (1) Determine all **Named Entities**
- (2) Determine **Entity Type (Named Entity Recognition)**
- (3) Determine all possible **mappings for entity candidates**

text

Neil Armstrong

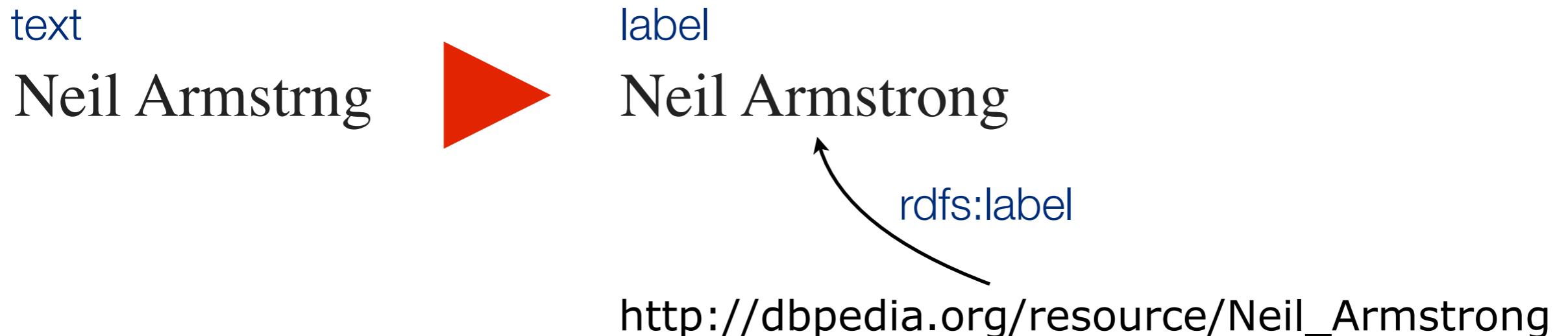


all labels for all DBpedia entities



exact string mapping vs. **fuzzy** mapping

Fuzzy String Matching



- (1) Determine **String Similarity**
- (2) Match according to previously defined **Threshold**
- or
- (3) Apply **String normalization** to both text and label

String Similarity Measures

- (1) Levenshtein Distance
- (2) Jaro-Winkler Distance
- (3) String Normalization via Stemming / Lemmatization

(1) Levenshtein Distance

- Levenshtein distance between two words is the **minimum number of single-character edits**, i.e. insertions, deletions or substitutions required to change one word into the other
- Example:
 - Armttrng → Armstrong (substitution of "s" for "t")
 - Armstrng → Armstrong (insertion of "o")
- 2 edit operations:
Levenshtein Distance (Armttrng, Armstrong) = 2

(2) Jaro-Winkler Distance

- designed and best suited for short strings such as person names
- normalized score: 0 equates to no similarity and 1 is an exact match.
- For two given strings s_1 and s_2 , the Jaro distance d_j is

$$d_j = \begin{cases} 0 & \text{if } m = 0 \\ \frac{1}{3} \left(\frac{m}{|s_1|} + \frac{m}{|s_2|} + \frac{m-t}{m} \right) & \text{otherwise} \end{cases}$$

m is the number of **matching characters**
 t is half the number of **transpositions**

- match only if $d_j \leq \left\lfloor \frac{\max(|s_1|, |s_2|)}{2} \right\rfloor - 1$

(2) Jaro-Winkler Distance

- in addition, Jaro-Winkler gives a preference **boost** p for matching **prefixes**

$$d_w = d_j + (\ell p(1 - d_j))$$

where ℓ is the **length of a matching prefix**

(2) Jaro-Winkler Distance

- Example:

Given the strings **MARTHA** and **MARHTA** we find:

- $m=6$ (matching)
- $s_1=6$ (length s_1)
- $s_2=6$ (length s_2)
- mismatching characters **T/H** and **H/T**
- $t = 2/2 = 1$ (half the number of transpositions)
- Jaro: $d_j = 1/3 (6/6 + 6/6 + (6-1)/6) = 0.944$
- Jaro-Winkler: $d_j = 0.944 + (3 * 0.1(1 - 0.944)) = 0.961$
with $l=3$, $p=0.1$

(3) String Normalization

- process for reducing inflected (or sometimes derived) words to their stem, base or root form
- e.g. cats -> cat
fishing -> fish
- various algorithms available for
 - suffix stripping
 - lemmatisation
 - n-gram analysis, stochastic algorithms, etc.

Task:

Play around with String Similarities and DBpedia Labels

The Rest of the Mapping Process

Semantic Analysis

Named Entity Resolution

Text

Neil Armstrong, he 38-year-old civilian commander,
radios to earth an the mission control room here:
,Houston, Tranquility Base here, The Eagle has landed.“



Determine possible **Entity Candidates**

CandidateResources
http://wikidata.dbpedia.org/resource/Q1615
http://dbpedia.org/resource/Neil_Armstrong
http://wikidata.dbpedia.org/resource/Q594654
http://wikidata.dbpedia.org/resource/Q6988246
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey)
http://dbpedia.org/resource/Neil_Armstrong_(Ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_Air_and_Space_Museum
http://wikidata.dbpedia.org/resource/Q689196
http://dbpedia.org/resource/Neil_Armstrong_Airport
http://wikidata.dbpedia.org/resource/Q3015988
http://dbpedia.org/resource/Neil_Armstrong_Achievement
http://dbpedia.org/resource/Neil_Armstrong_Hall_of_Engineering
http://dbpedia.org/resource/Neil_armstrong_air_and_space_museum
http://dbpedia.org/resource/Neil_Armstrong_Elementary_School
http://dbpedia.org/resource/Neil_armstrong
http://dbpedia.org/resource/Neil_Armstrong_Lunar_Outpost

- linguistic analysis (POS tagging)
- n-gram analysis
- normalization (stemming)
- encoding and spelling
- language dependent spellings
- abbreviations & acronyms
- type dependent spellings
- alternative names and synonyms
- fuzzy string mapping
- ...

Semantic Analysis

Named Entity Resolution

Text

Neil Armstrong, the 38-year-old civilian commander,
radioes to earth an the mission control room here:
,**Houston, Tranquility Base** here, The Eagle has landed.“



Subsequent Filtering of **Entity Candidates**

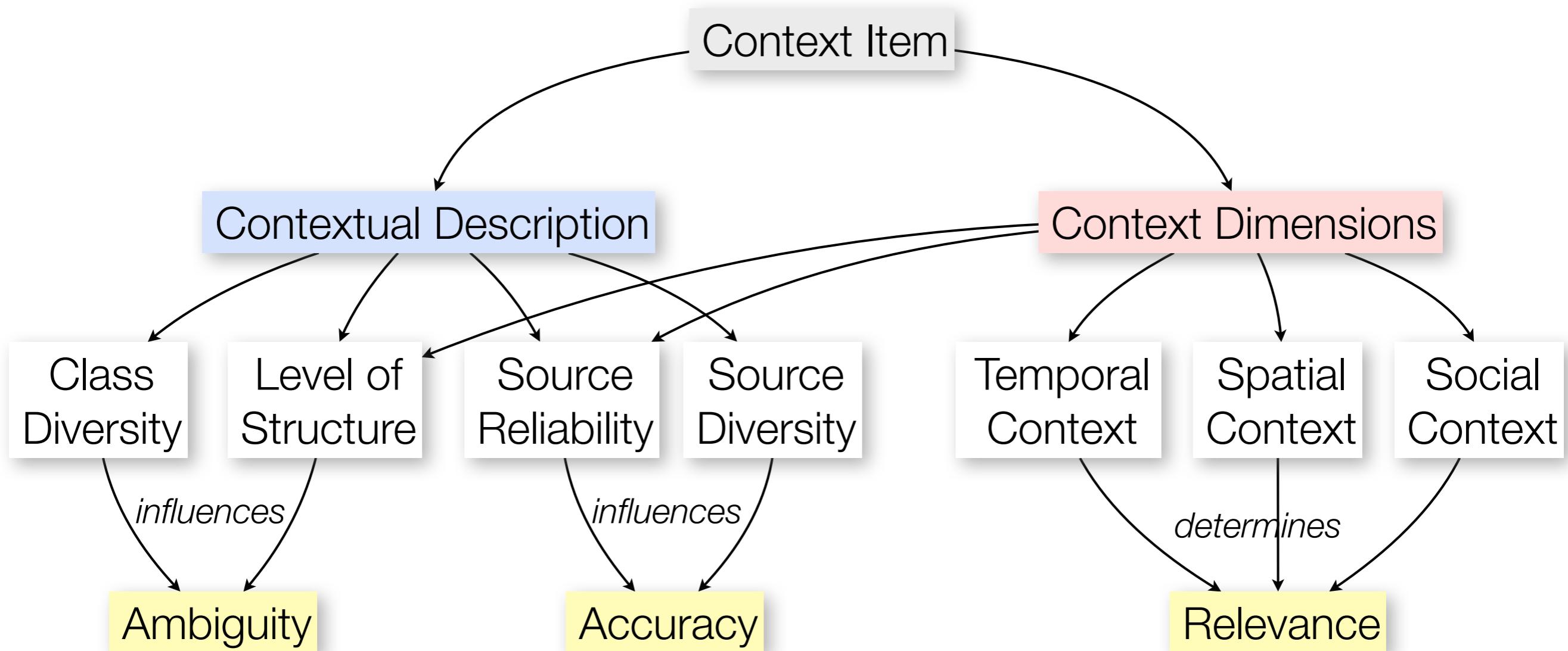
CandidateResources
http://wikidata.dbpedia.org/resource/Q1615
http://dbpedia.org/resource/Neil_Armstrong
http://wikidata.dbpedia.org/resource/Q594654
http://wikidata.dbpedia.org/resource/Q6988246
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey)
http://dbpedia.org/resource/Neil_Armstrong_(Ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_Air_and_Space_Museum
http://wikidata.dbpedia.org/resource/Q689196
http://dbpedia.org/resource/Neil_Armstrong_Airport
http://wikidata.dbpedia.org/resource/Q3015988
http://dbpedia.org/resource/Neil_Armstrong_Achievement
http://dbpedia.org/resource/Neil_Armstrong_Hall_of_Engineering
http://dbpedia.org/resource/Neil_Armstrong_air_and_space_museum
http://dbpedia.org/resource/Neil_Armstrong_Elementary_School
http://dbpedia.org/resource/Neil_armstrong
http://dbpedia.org/resource/Neil_Armstrong_Lunar_Outpost

- **Named Entity Tagging**
- **Persons**
- **Locations**
- **Organization**
- Time
- Date
- Money
- ...



(3) Disambiguation of Correct Entity

- Which entity candidate to choose depends on the context
- **Context Analysis**
 - takes into account **Ambiguity**, **Accuracy**, and **Reliability** of source data and mapping



Semantic Analysis

Named Entity Resolution



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Neil Armstrong, the 38-year-old civilian commander,
radios to earth an the mission control room here:
„**Houston, Tranquility Base** here, The Eagle has landed.“

Neil Armstrong

CandidateResources

http://wikidata.dbpedia.org/resource/Q1615
http://dbpedia.org/resource/Neil_Armstrong
http://wikidata.dbpedia.org/resource/Q594654
http://wikidata.dbpedia.org/resource/Q6988246
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey)
http://dbpedia.org/resource/Neil_Armstrong_(Ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_(ice_hockey_official)
http://dbpedia.org/resource/Neil_Armstrong_Air_and_Space_Museum
http://wikidata.dbpedia.org/resource/Q689196
http://dbpedia.org/resource/Neil_Armstrong_Airport
http://wikidata.dbpedia.org/resource/Q3015988
http://dbpedia.org/resource/Neil_Armstrong_Achievement
http://dbpedia.org/resource/Neil_Armstrong_Hall_of_Engineering
http://dbpedia.org/resource/Neil_armstrong_air_and_space_museum
http://dbpedia.org/resource/Neil_Armstrong_Elementary_School
http://dbpedia.org/resource/Neil_armstrong
http://dbpedia.org/resource/Neil_Armstrong_Lunar_Outpost

Houston

CandidateResources

http://dbpedia.org/resource/Houston
http://dbpedia.org/resource/Houston_Texans
http://dbpedia.org/resource/Houston,_Delaware
http://dbpedia.org/resource/Houston_Astros
http://dbpedia.org/resource/Houston_County
http://dbpedia.org/resource/Houston_Rockets
http://dbpedia.org/resource/Houston_Stewart_Chamberlain
http://dbpedia.org/resource/Houston_(disambiguation)
http://dbpedia.org/resource/Category:Houston_Aeros_players
http://dbpedia.org/resource/Category:Houston_Colt_45s_players
http://dbpedia.org/resource/Houston_County,_Minnesota
http://dbpedia.org/resource/Category:Houston_County,_Minnesota
http://dbpedia.org/resource/Houston_Independent_School_District
http://dbpedia.org/resource/Houston_Symphony
http://dbpedia.org/resource/Thelma_Houston
http://dbpedia.org/resource/Sam_Houston
http://dbpedia.org/resource/USS_Houston_(CA-30)
http://dbpedia.org/resource/Whitney_Houston
http://dbpedia.org/resource/Category:Houston_Astros_field_personnel
http://dbpedia.org/resource/Category:Houston_Astros_managers
http://dbpedia.org/resource/Category:Houston_Astros_players
http://dbpedia.org/resource/Category:Houston_County,_Alabama

Tranquility Base

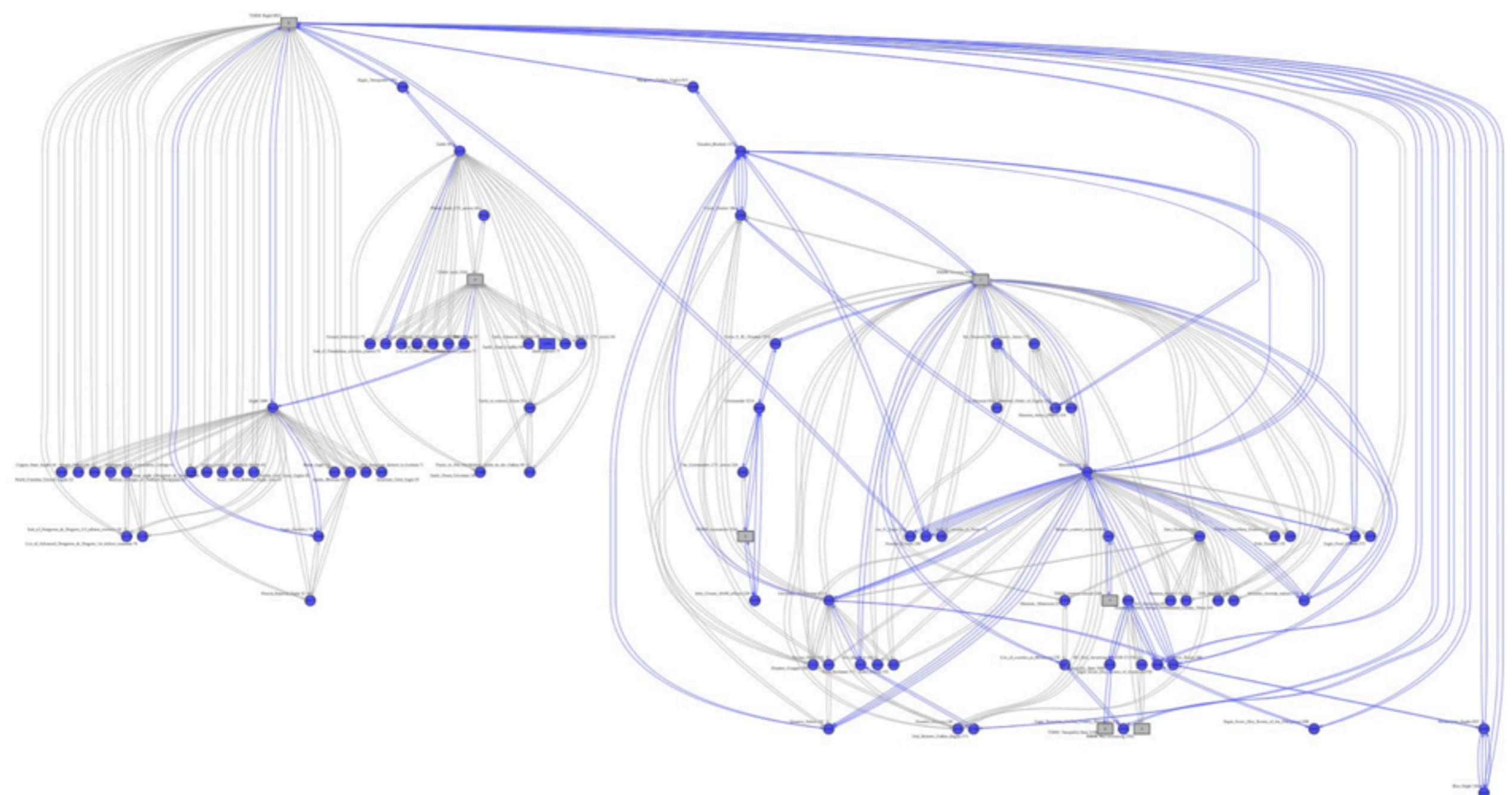
CandidateResources

http://dbpedia.org/resource/Tranquility_Base
http://wikidata.dbpedia.org/resource/Q732758

(3) Disambiguation of Correct Entity

- Link Graph Analysis

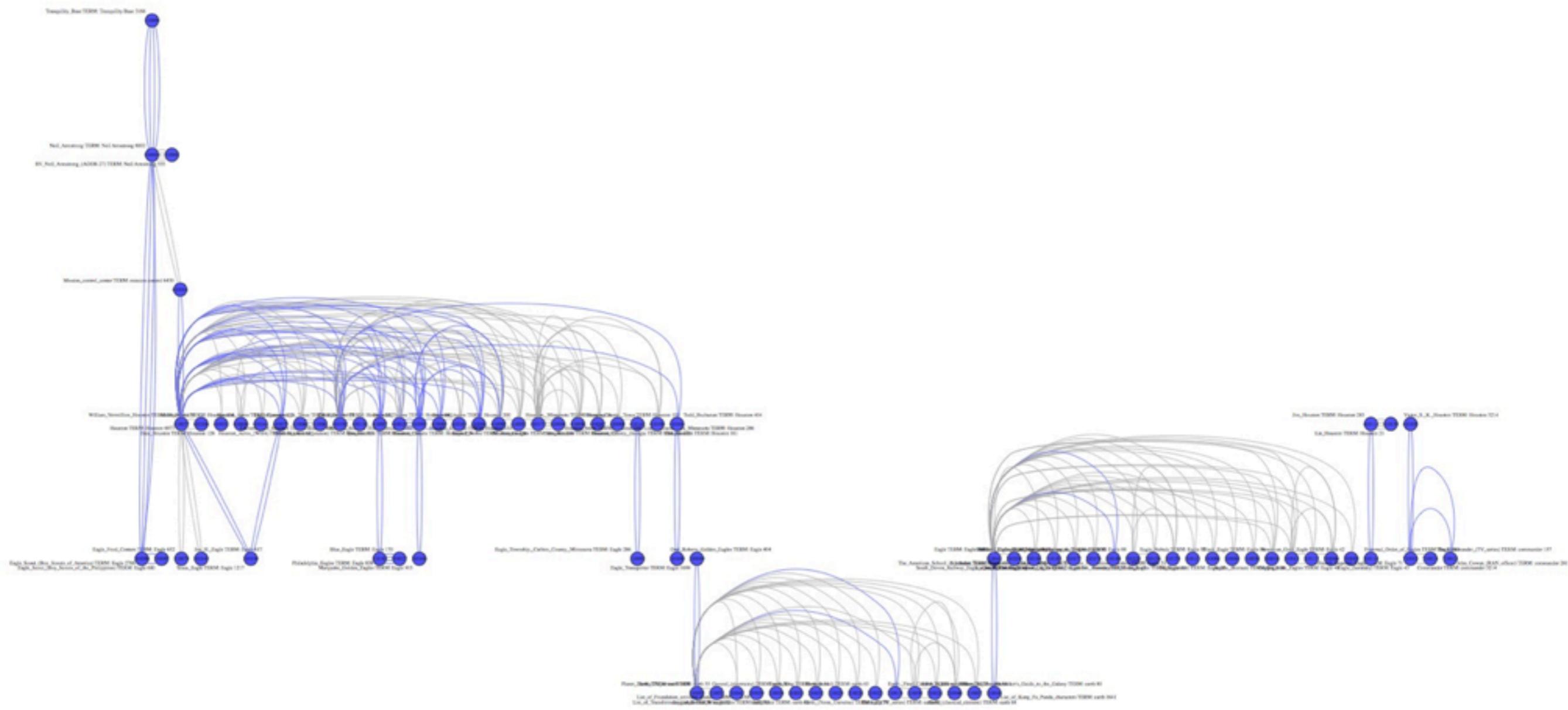
Neil Armstrong, the 38-year-old civilian **commander**,
radios to **earth** an the **mission control room** here:
„Houston, Tranquility Base here, The Eagle has landed.“



(3) Disambiguation of Correct Entity

- Link Graph Analysis

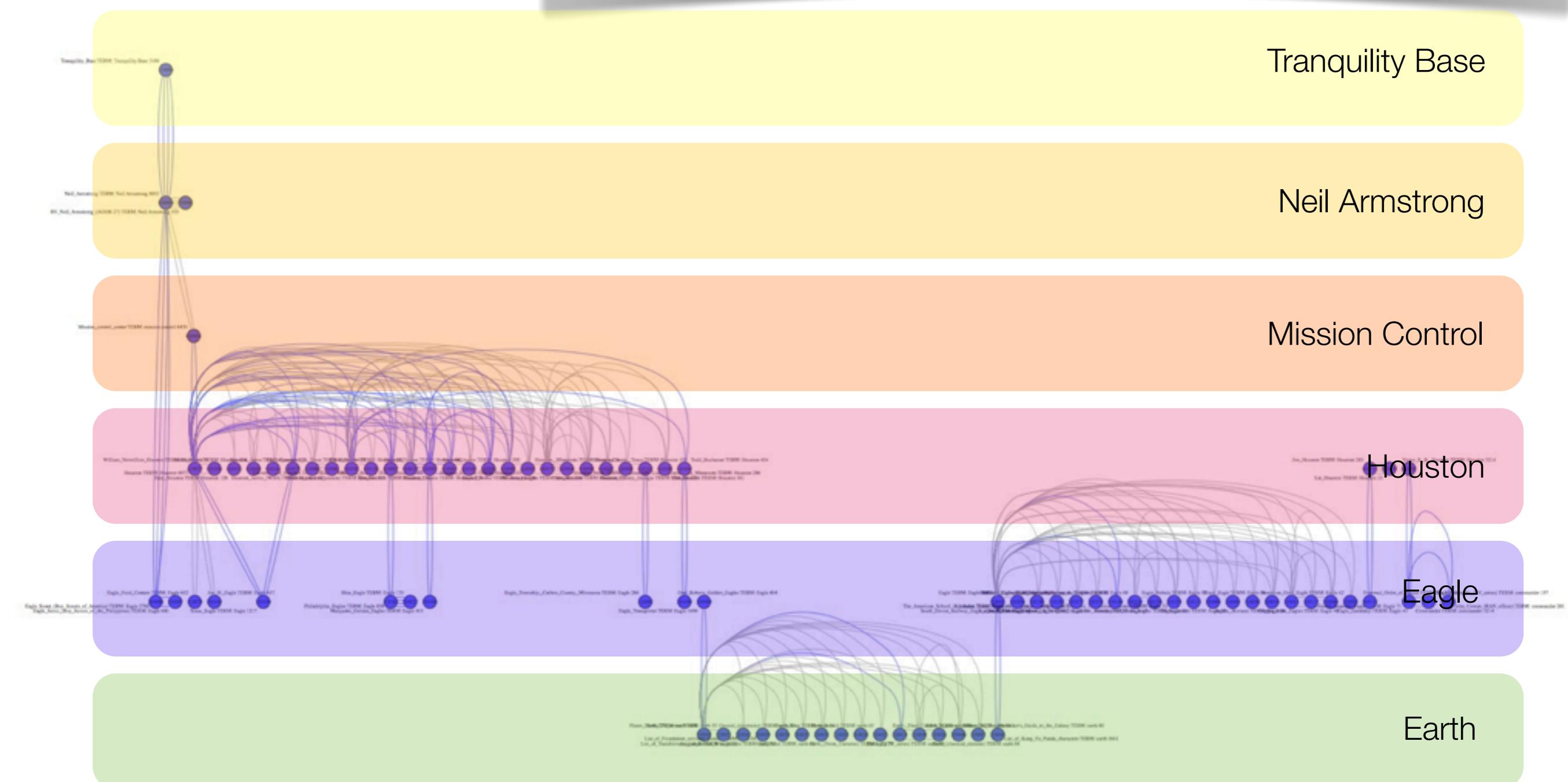
Neil Armstrong, the 38-year-old civilian **commander**,
 radios to **earth** an the **mission control** room here:
„Houston, Tranquility Base here, The Eagle has landed.“



(3) Disambiguation of Correct Entity

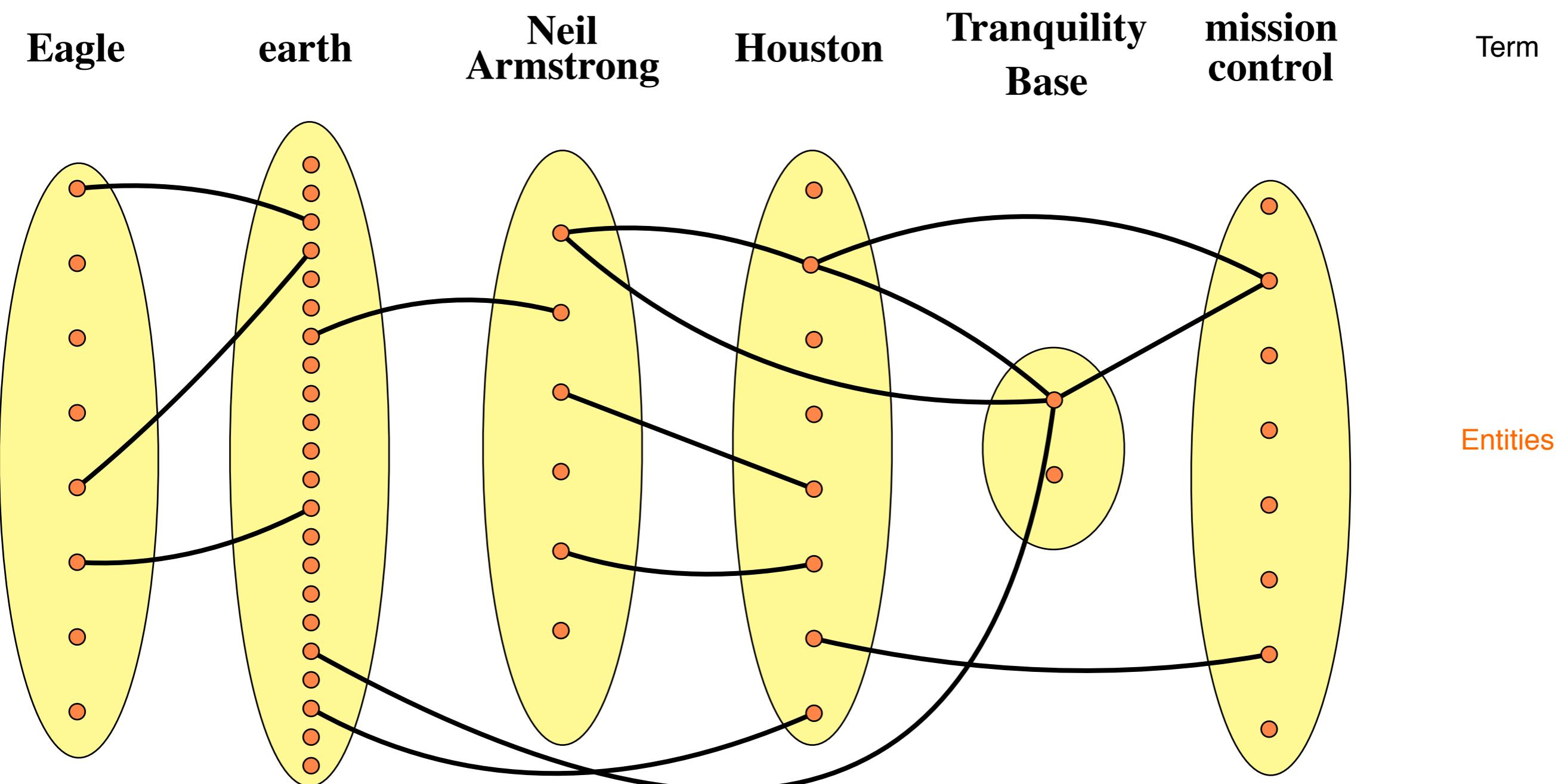
• Link Graph Analysis

Neil Armstrong, the 38-year-old civilian **commander**, radioes to **earth** an the **mission control** room here:
„**Houston, Tranquility Base** here, The **Eagle** has landed.“



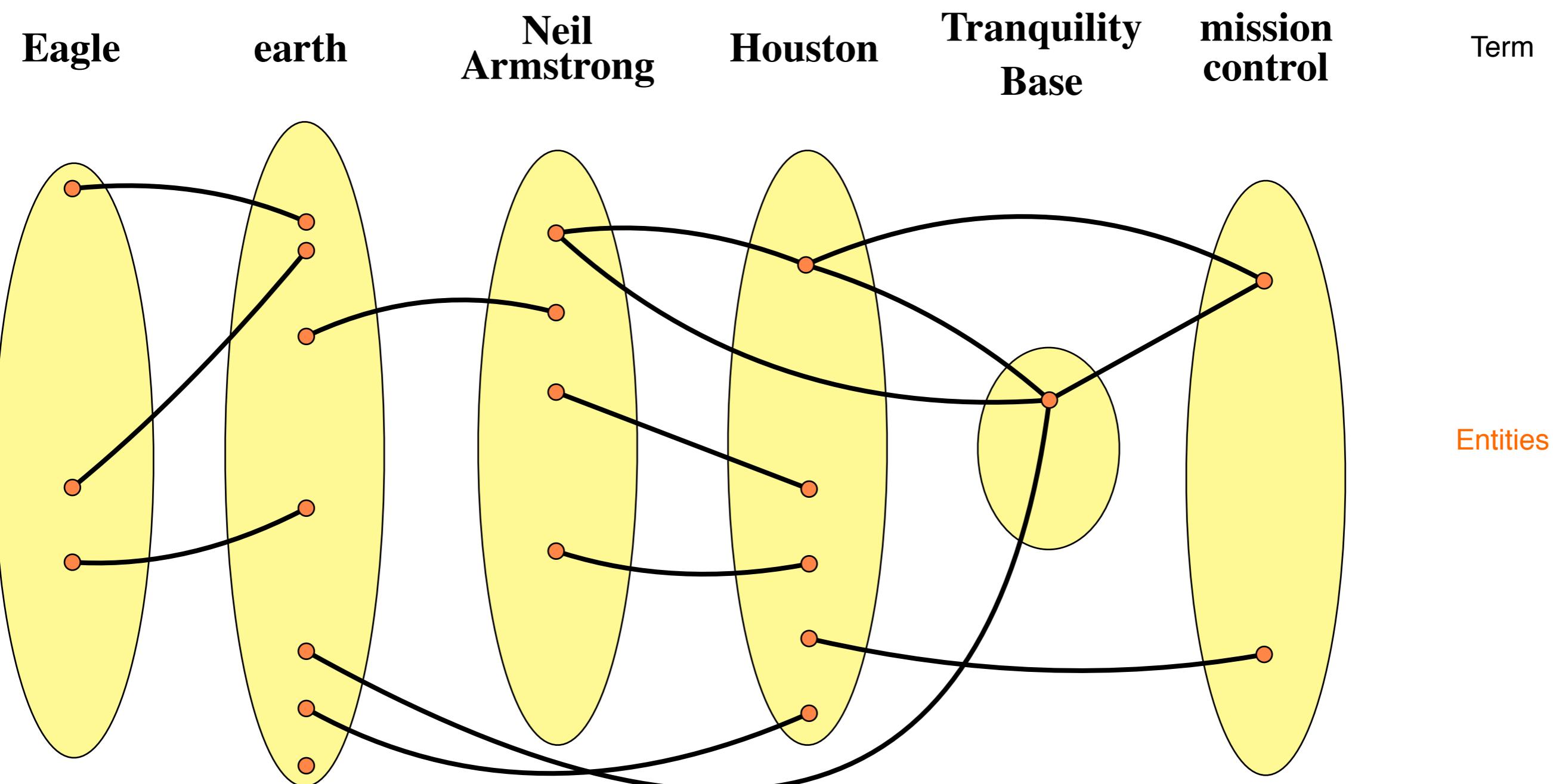
(3) Disambiguation of Correct Entity

- **Link Graph Analysis**
- remove inner partition links
- identify **connected components**



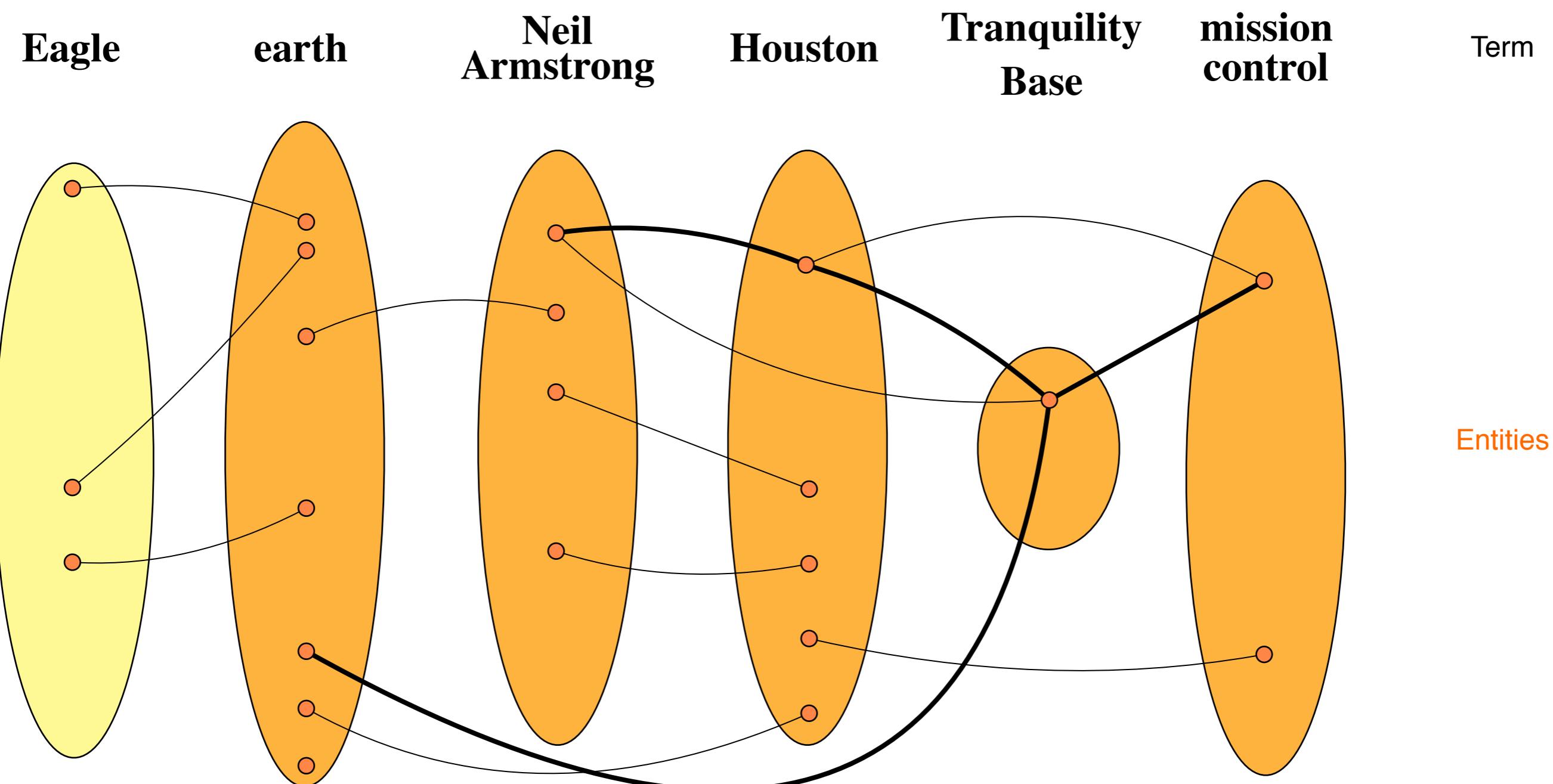
(3) Disambiguation of Correct Entity

- **Link Graph Analysis**
- identify **connected components**
- remove nodes not connected to other term partitions



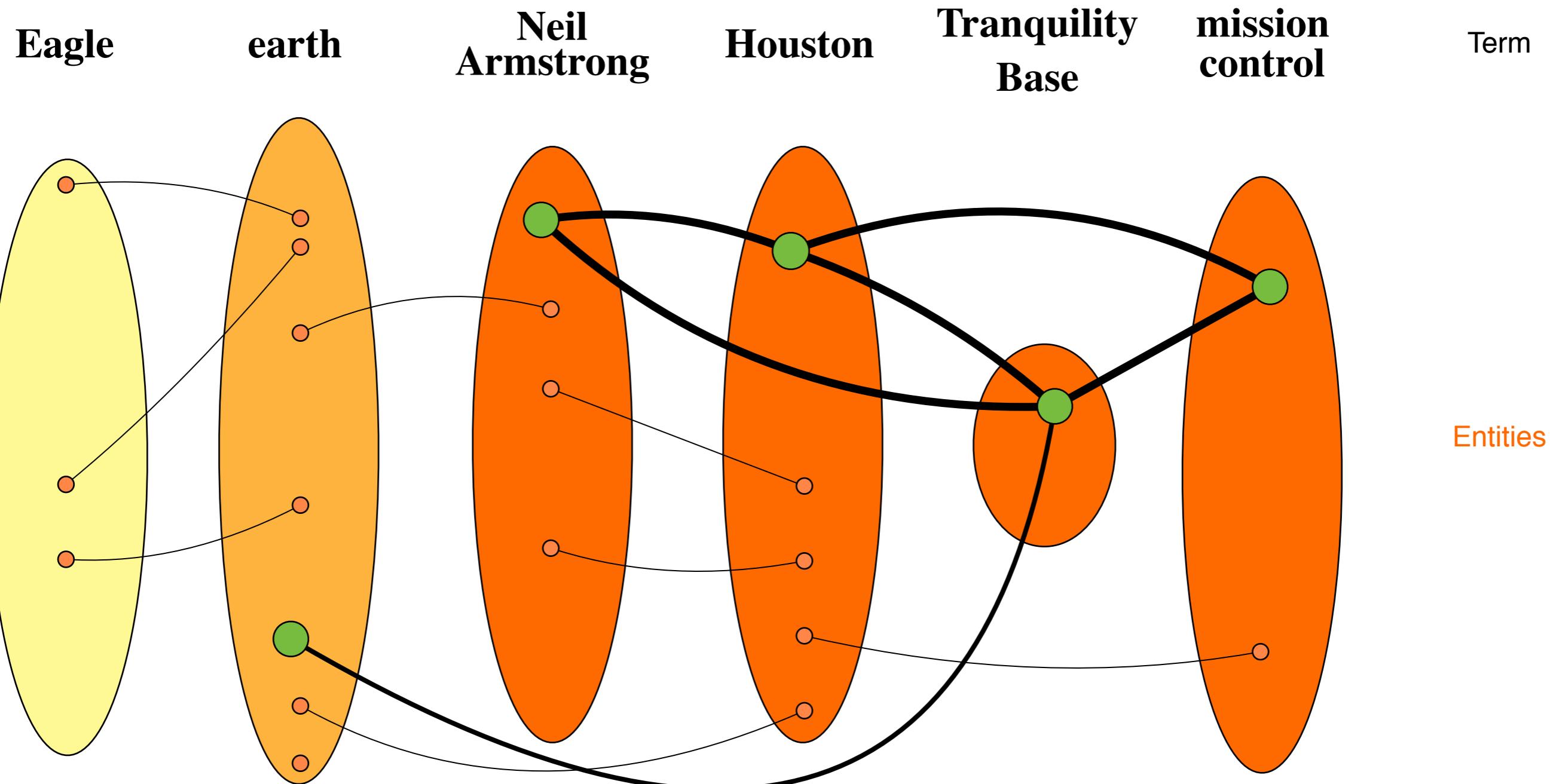
(3) Disambiguation of Correct Entity

- **Link Graph Analysis**
- identify **connected components that cover the most term partitions**



(3) Disambiguation of Correct Entity

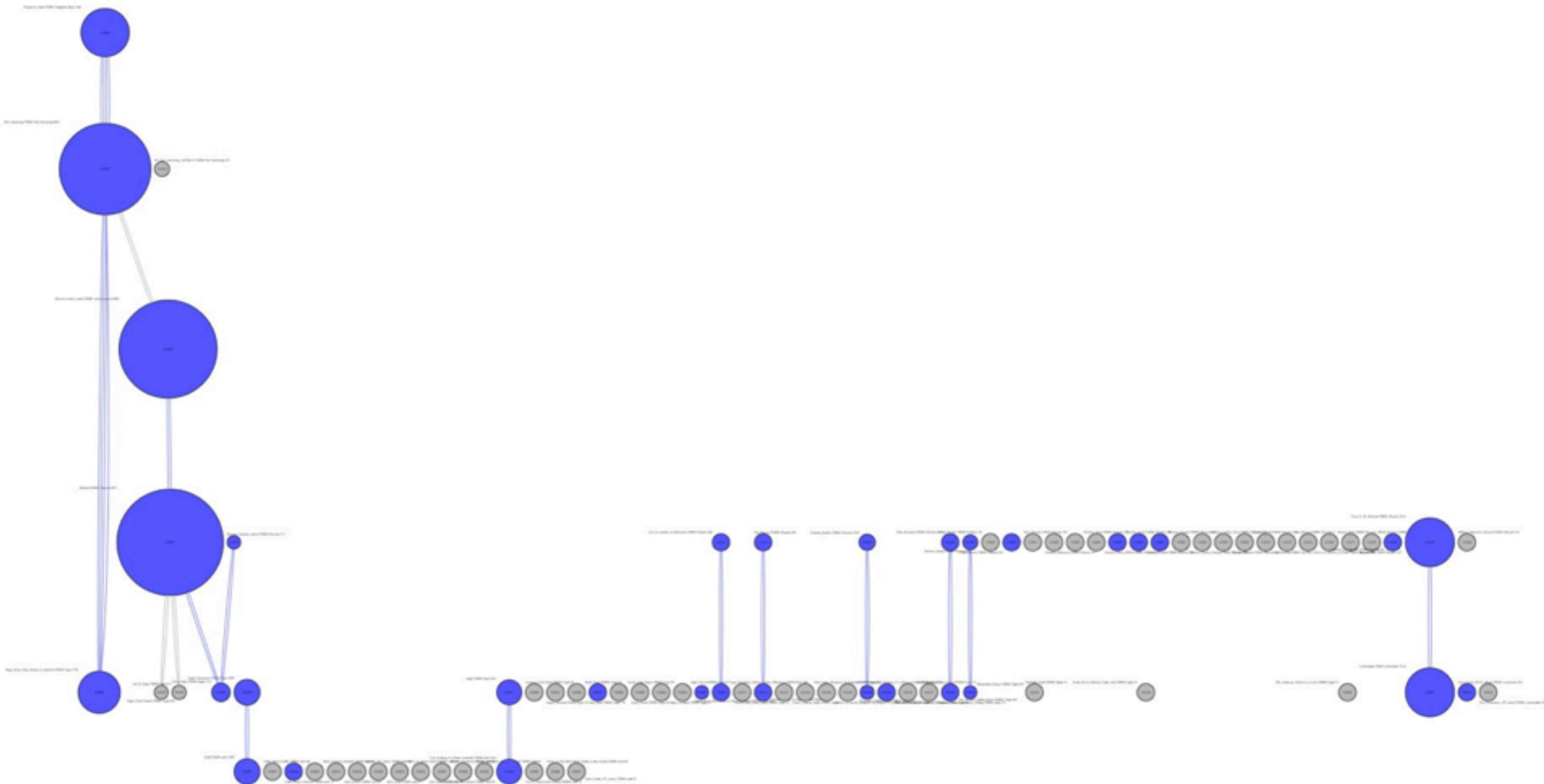
- **Link Graph Analysis**
- identify **connected components** that cover the most term partitions
- only **one node per partition** should be covered
- **strongly connected components** consolidate the disambiguation



(3) Disambiguation of Correct Entity

- for our example

Neil Armstrong, the 38-year-old civilian **commander**,
radios to **earth** an the **mission control** room here:
„Houston, Tranquility Base here, The Eagle has landed.“

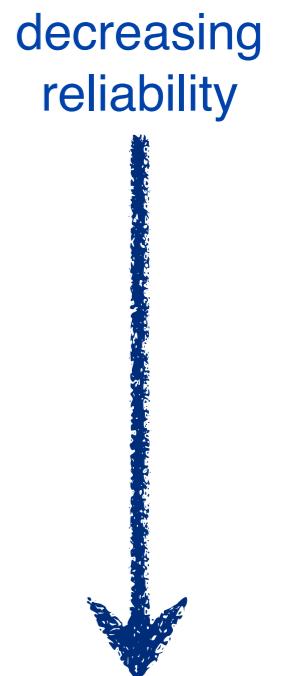


General Approach

1. Apply most reliable method first
2. Try to solve remaining ambiguity by subsequent application of less reliable methods

NER Algorithms

- Link Graph Analysis to detect connected components
- Co-Occurrence Analysis
- Popularity-Based Link Graph Analysis
 - In Degree, PageRank, Hubs&Authorities
- Negative Context Analysis



Disambiguation of Correct Entity

- Co-Occurrence Analysis
- + Co-Reference Analysis

Neil Armstrong

From Wikipedia, the free encyclopedia

For other people named Neil Armstrong, see [Neil Armstrong \(disambiguation\)](#).

Neil Alden Armstrong (August 5, 1930 – August 25, 2012) was an American astronaut and the first person to walk on the Moon. He was also an aerospace engineer, naval aviator, test pilot, and university professor. Before becoming an astronaut, Armstrong was an officer in the U.S. Navy and served in the Korean War. After the war, he earned his bachelor's degree at [Purdue University](#) and served as a test pilot at the National Advisory Committee for Aeronautics High-Speed Flight Station, now known as the Dryden Flight Research Center, where he logged over 900 flights. He later completed graduate studies at the University of Southern California.

A participant in the U.S. Air Force's Man in Space Soonest and X-20 Dyna-Soar human spaceflight programs, Armstrong joined the [NASA Astronaut Corps](#) in 1962. He made his first space flight, as command pilot of [Gemini 8](#), in 1966, becoming NASA's first civilian astronaut to fly in space. On this mission, he performed the first docking of two spacecraft, with pilot David Scott.^[1]

Armstrong's second and last spaceflight was as mission commander of the [Apollo 11](#) moon landing, in July 1969. On this mission, Armstrong and [Buzz Aldrin](#) descended to the lunar surface and spent two and a half hours exploring, while [Michael Collins](#) remained in lunar orbit in the Command Module. Along with Collins and Aldrin, Armstrong was awarded the [Presidential Medal of Freedom](#) by [President Richard Nixon](#); President [Jimmy Carter](#) presented Armstrong the [Congressional Space Medal of Honor](#) in 1978; he and his former crewmates received the [Congressional Gold Medal](#) in 2009.

Armstrong died in Cincinnati, Ohio, on August 25, 2012, at the age of 82, after complications from coronary artery bypass surgery.^{[2][3]}

Houston: 5

Tranquility Base: 3

Eagle: 13

Earth: 11

Mission Control: 5

Tranquility Base

From Wikipedia, the free encyclopedia

For the [trance](#) group, see [Above & Beyond \(band\)](#).

Tranquility Base (Latin: [Statio Tranquillitatis](#)) is the site where humans first landed on the Moon and walked on another world, on the flight of [Apollo 11](#). American astronauts [Neil Armstrong](#) and [Buzz Aldrin](#) landed their [Apollo Lunar Module Eagle](#) at approximately 20:17:40 UTC on July 20, 1969. Six hours later, they left the spacecraft and spent 2 hours, 31 minutes on the lunar surface, examining and photographing it, setting up some scientific experiment packages, and collecting 47.5 pounds (21.5 kg) of dirt and rock samples for return to Earth. They lifted off the surface on July 21 at 17:54 UTC. Tranquility Base has remained unvisited since then.

Its lunar coordinates are 00°41'15"N, 23°26'00"E, in the south-western corner of the lunar lava-plain called [Mare Tranquillitatis](#) ("Sea of Tranquility"), east of the craters [Sabine](#) and [Ritter](#), north of the crater [Moltke](#), and near a [rille](#) unofficially called "U.S. Highway Number 1"^[citation needed].

Contents [hide]

- 1 Site selection
- 2 Name
- 3 Status
- 4 Gallery
- 5 See also
- 6 Notes
- 7 External links

Site selection [edit]

For more than two years, NASA planners considered a collection of 30 potential sites for the first

Houston: 2

Neil Armstrong: 3

Eagle: 5

Earth: 2

Mission Control: 1



And How Good
does this really
work...?

Evaluation



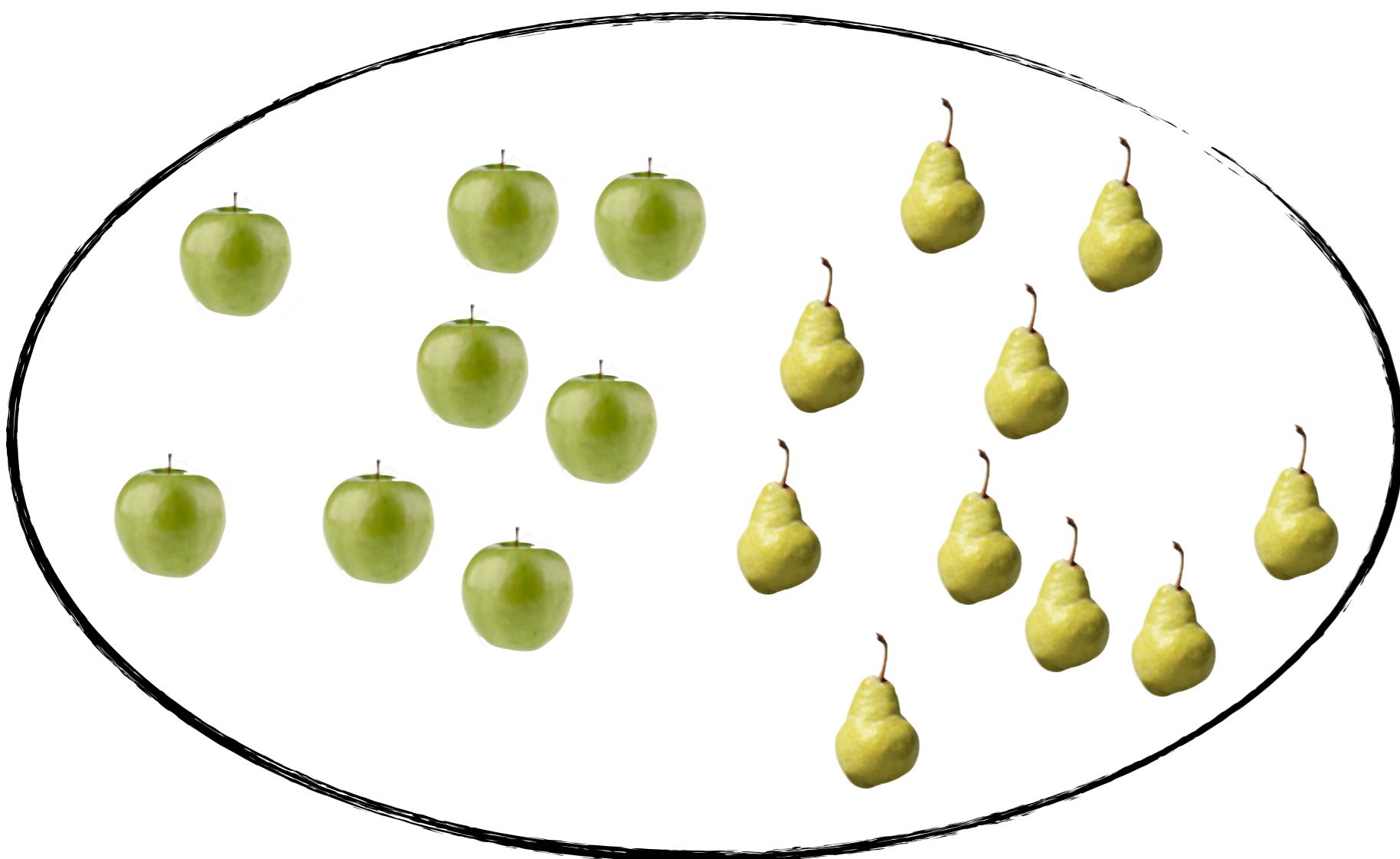
Recall and Precision

71

Evaluation

Recall and Precision

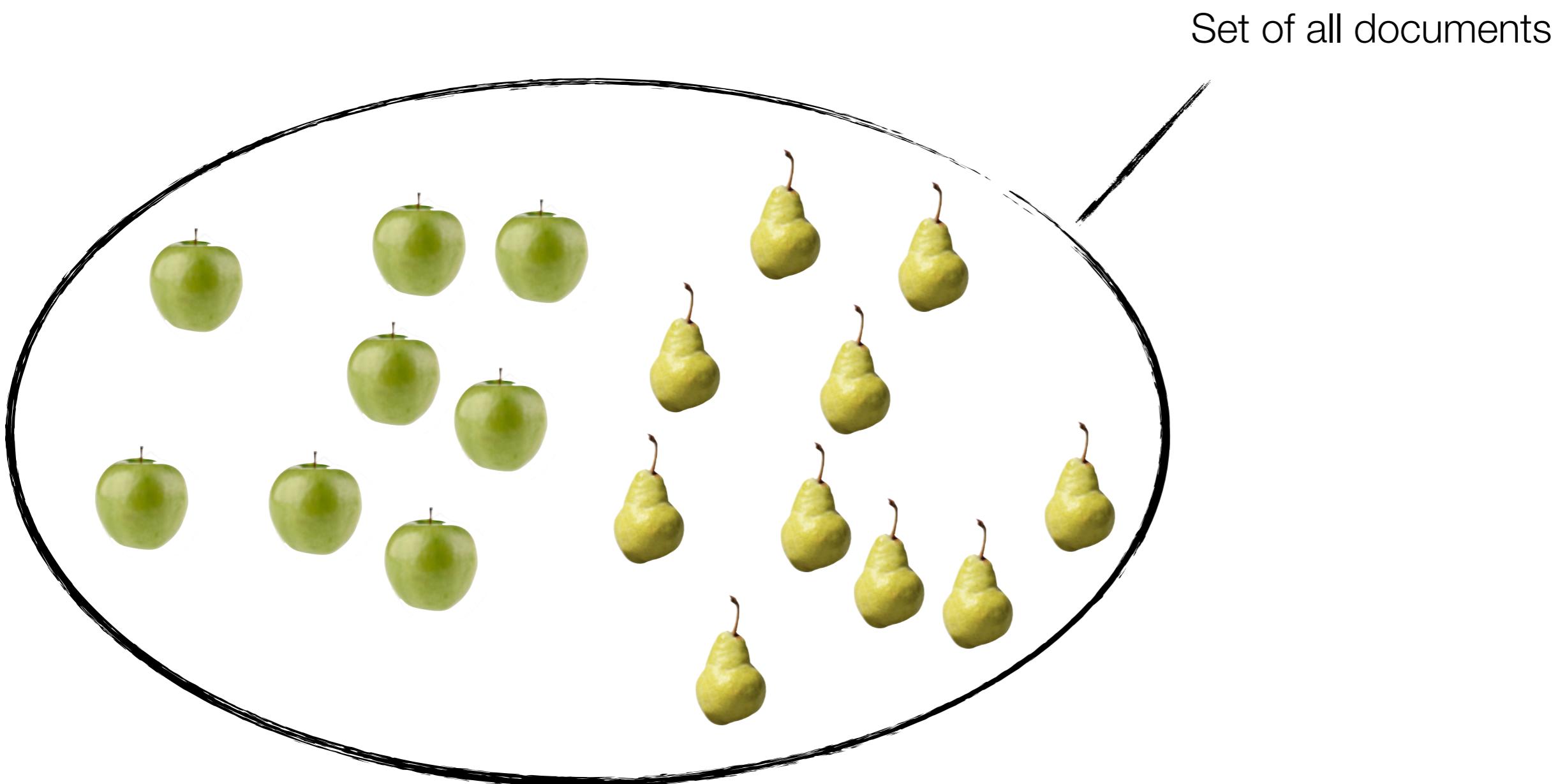
71



Evaluation

Recall and Precision

71



Evaluation

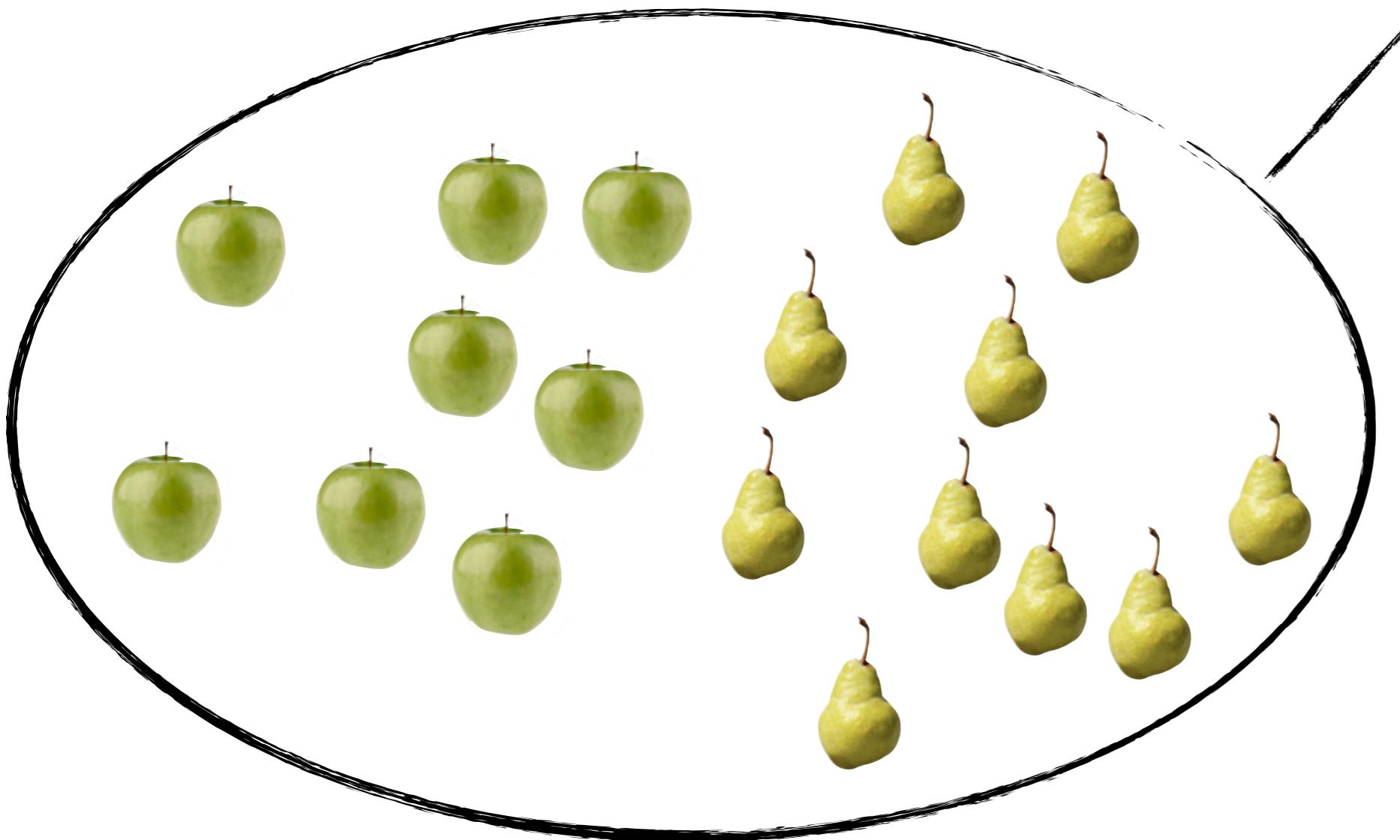
Recall and Precision

71

Task: Find all



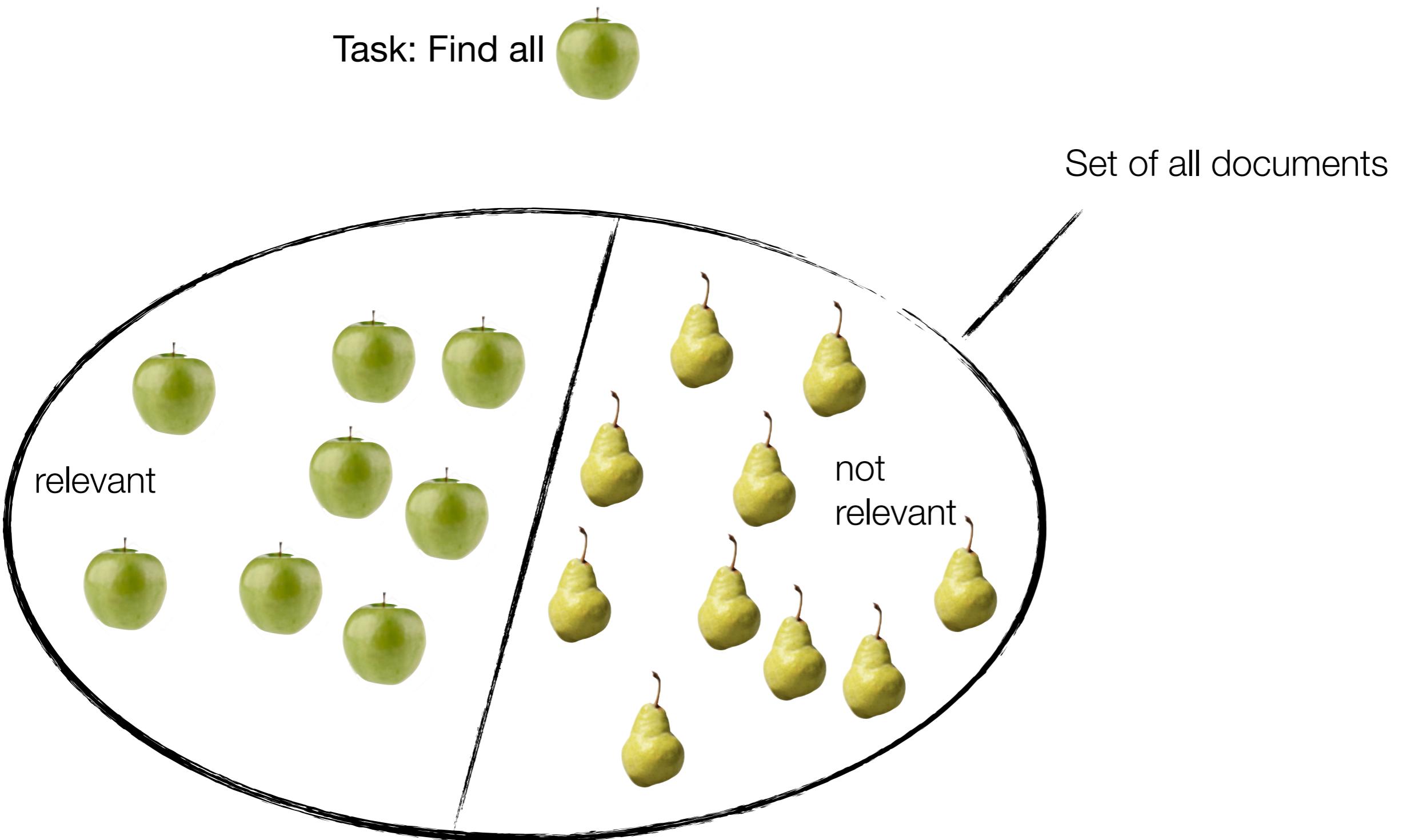
Set of all documents



Evaluation

Recall and Precision

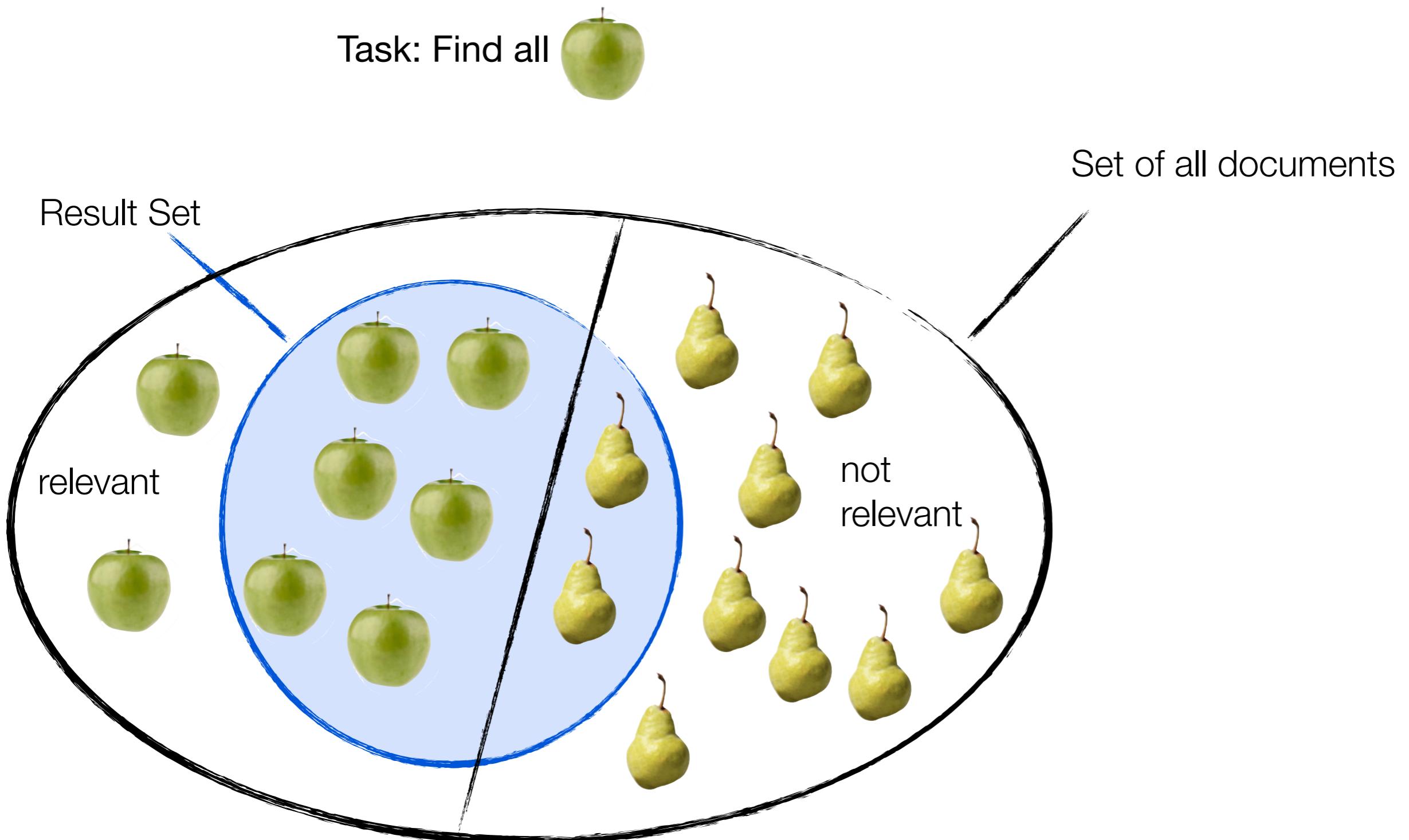
71



Evaluation

Recall and Precision

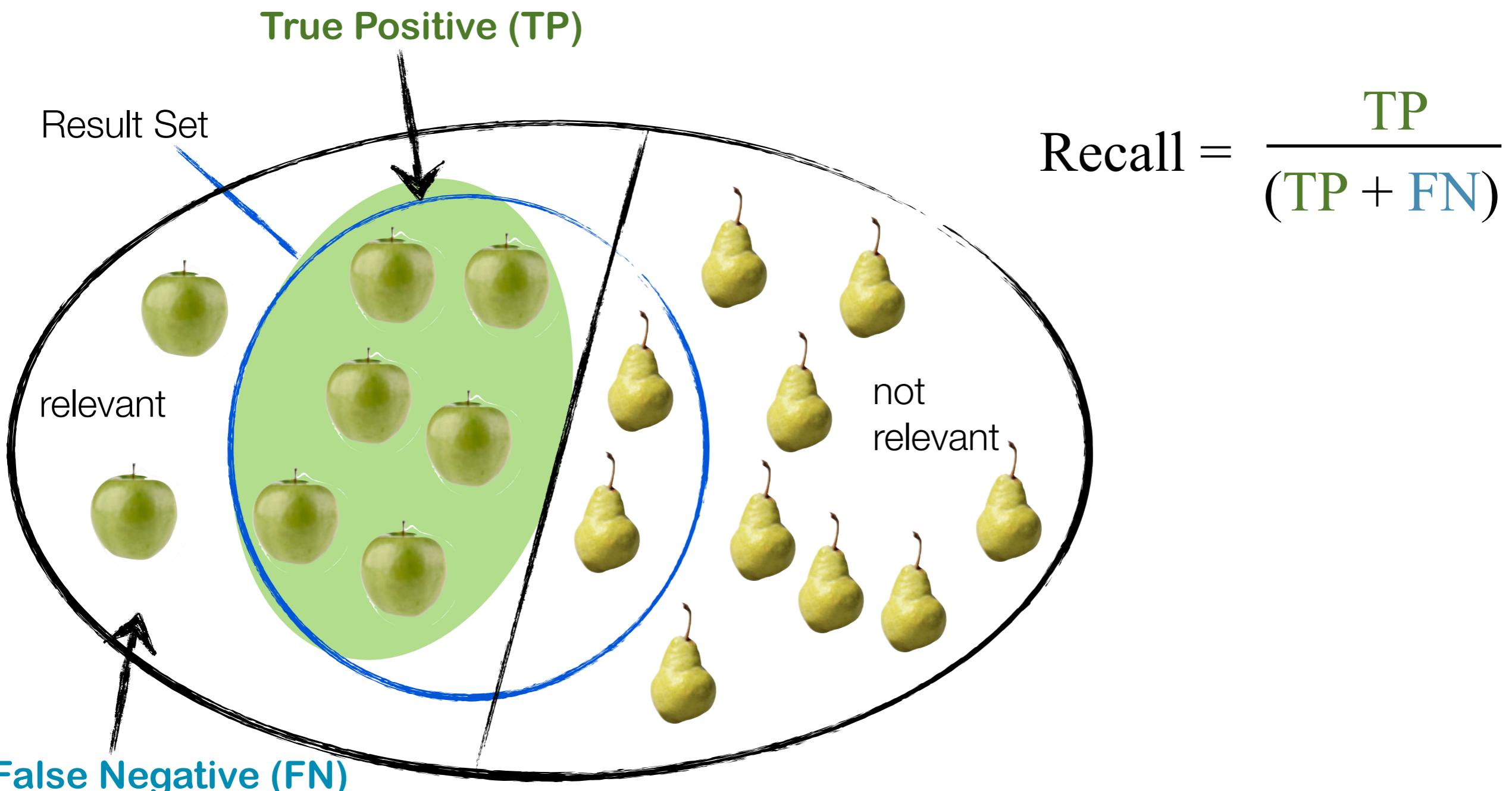
71



Evaluation

Recall and Precision

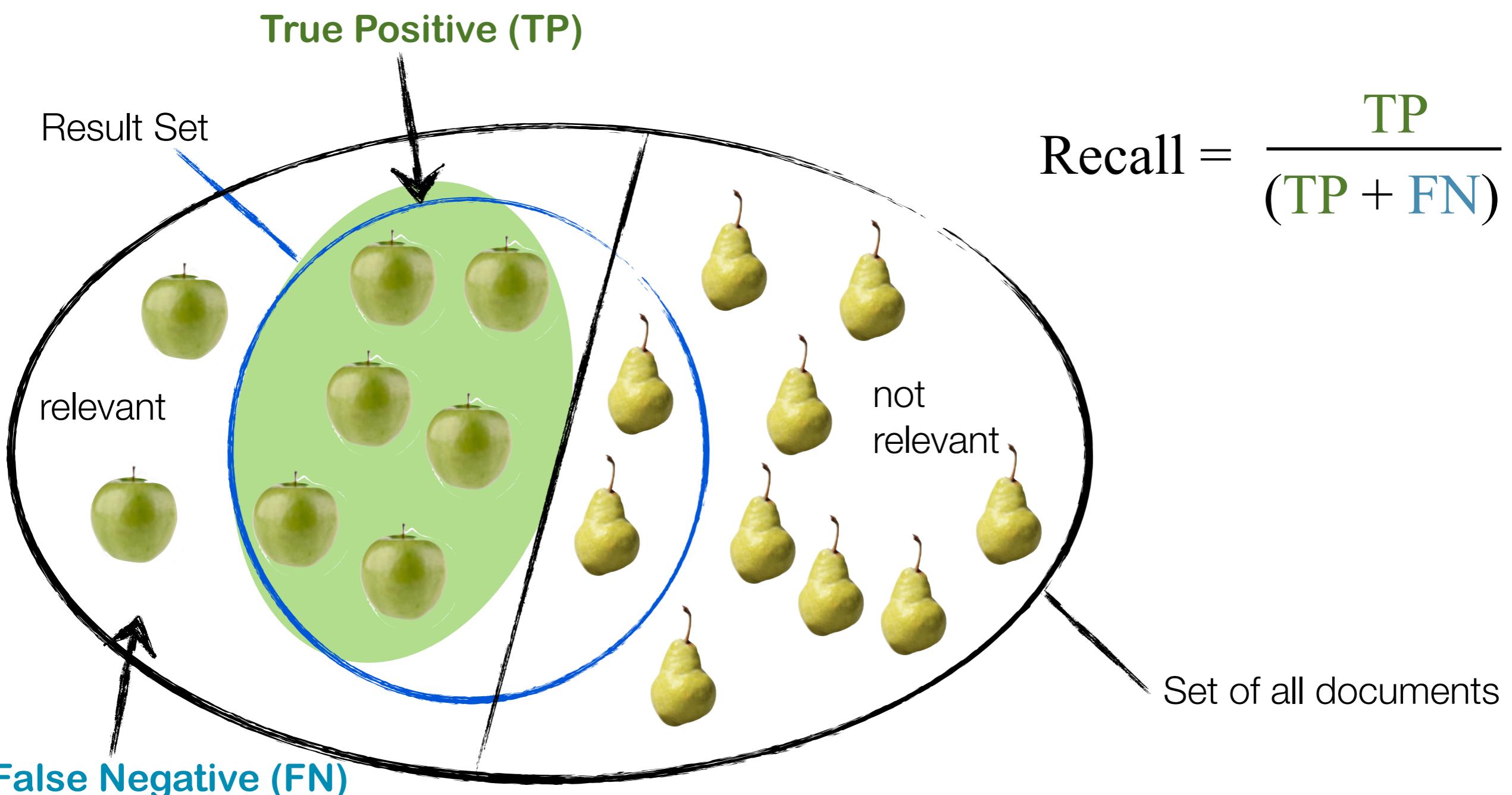
72



Evaluation

Recall and Precision

72

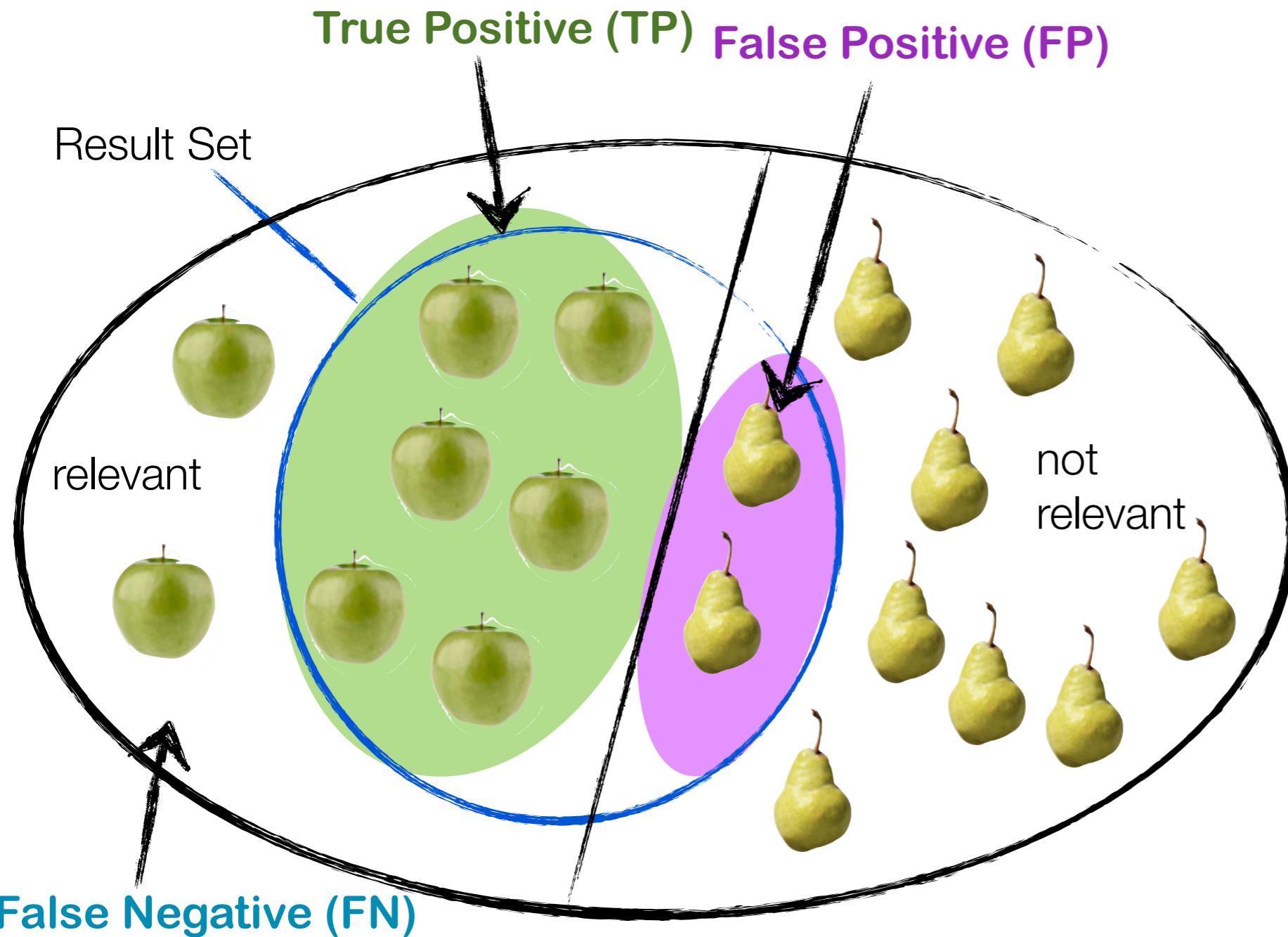


Evaluation

Recall and Precision

73

$$\text{Precision} = \frac{\text{TP}}{(\text{TP} + \text{FP})}$$

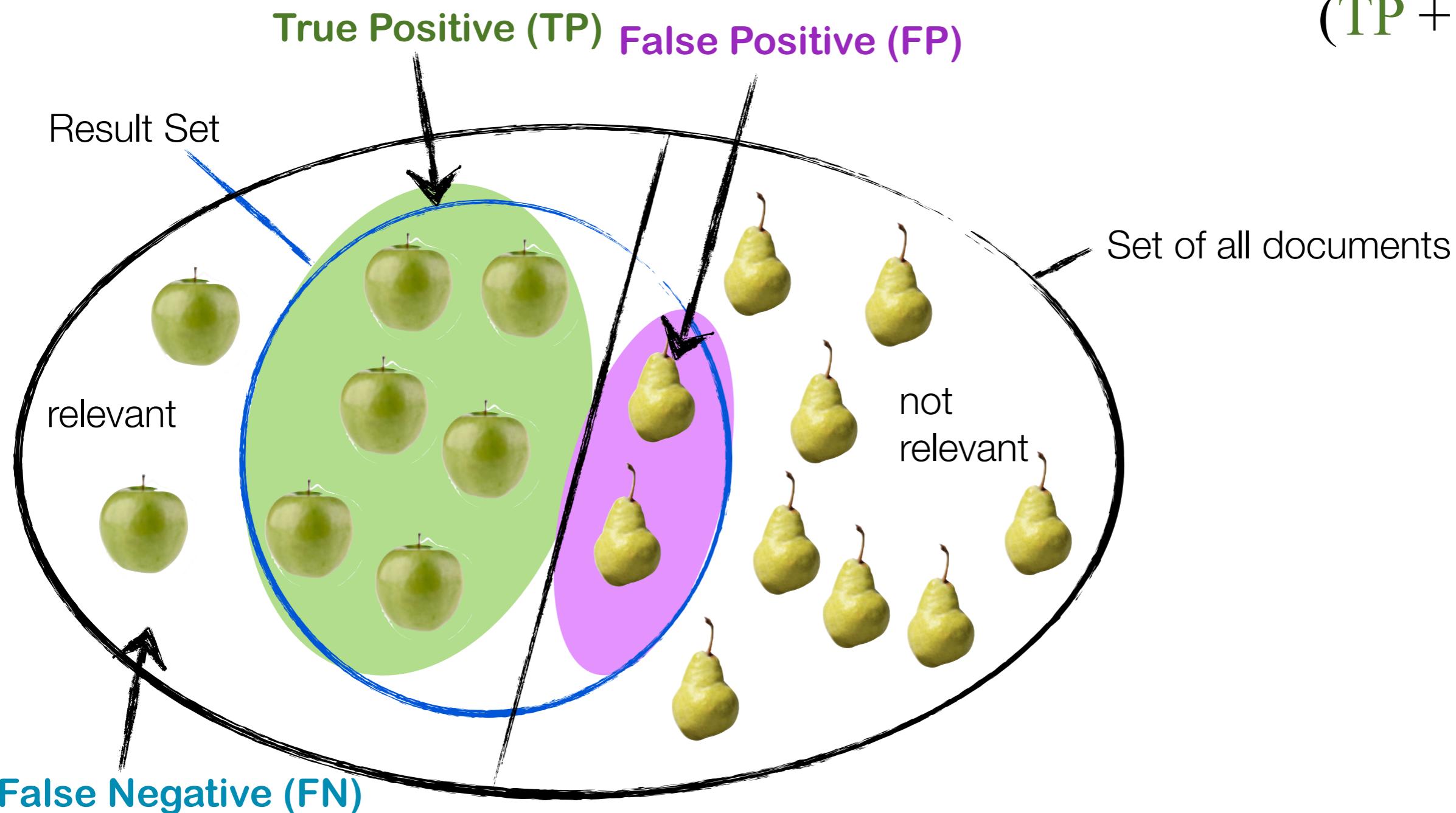


Evaluation

Recall and Precision

73

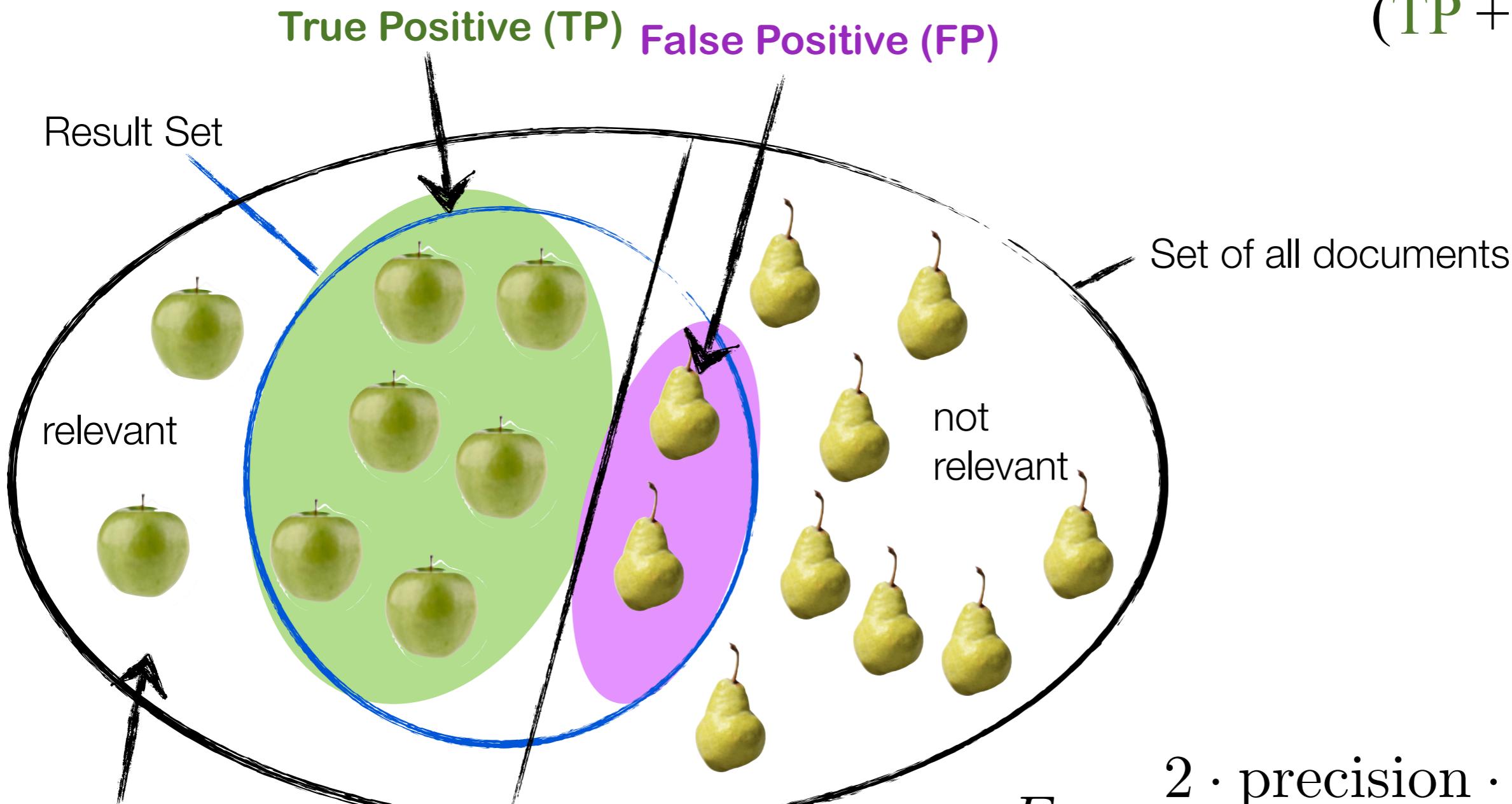
$$\text{Precision} = \frac{\text{TP}}{(\text{TP} + \text{FP})}$$



Evaluation

Recall and Precision

73



$$\text{Precision} = \frac{\text{TP}}{(\text{TP} + \text{FP})}$$

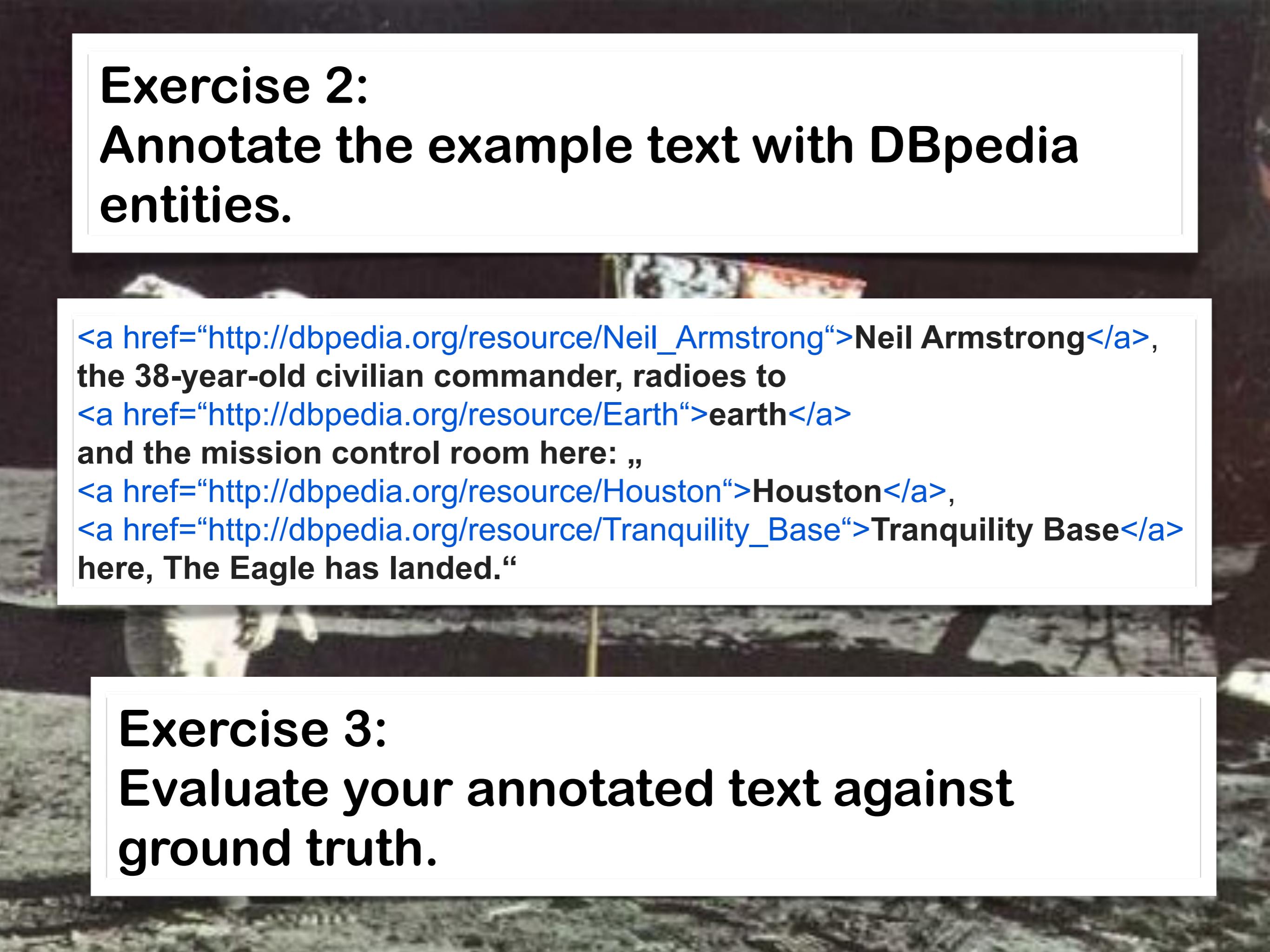
$$F_1 = \frac{2 \cdot \text{precision} \cdot \text{recall}}{\text{precision} + \text{recall}}$$

Exercise 2:
Annotate the example text with DBpedia entities.



Exercise 3:
Evaluate your annotated text against
ground truth.

Exercise 2: Annotate the example text with DBpedia entities.



Neil Armstrong,
the 38-year-old civilian commander, radios to
earth
and the mission control room here: „
Houston,
Tranquility Base
here, The Eagle has landed.“

Exercise 3: Evaluate your annotated text against ground truth.

SEMEX Demonstrator

<http://semex.hpi.uni-potsdam.de/semex>



Hasso
Plattner
Institut



Context-driven Named Entity Mapping

2. Analysis Result

Neil Armstrong , the 38-year-old civilian commander, radioes to earth an the mission control room here: „Houston, Tranquility Base here, The Eagle has landed .”

Found Entities Entity Table

Neil Armstrong Tranquility Base

Room Earth

The Eagle Has Landed

Mission control center



“Understanding“ the Web of Data

Named Entity Resolution

Overview

(1) How to make sense of the Web?

and why we are not really content with it...

(2) Words and Meaning

to be able to better „understand“ the content

(3) Named Entity Resolution

from words to semantic entities...

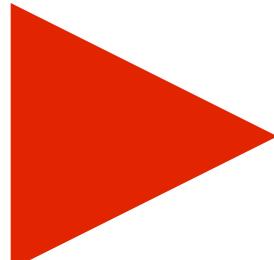
(4) Application Scenarios

Exploratory Search and intelligent Recommendations

Semantic Search



- in difference to keyword based retrieval, query terms are matched with semantic entities (**Entity Based Retrieval**, EBR)
- How to match query terms to semantic entities?
 - Interpretation of natural language queries
 - Query string refinement / extension
 - Entity auto-suggestion / completion
- linguistic ambiguities of traditional keyword based search can be avoided



EBR enables **high precision and high recall retrieval**

Entity Based Search

[http://www.yovisto.com/labs/
autosuggestion/](http://www.yovisto.com/labs/autosuggestion/)

armstrong

12 Persons	10 Things	10 Places	1 MilitaryConflict	10 Organisations
5 MusicalArtists 5 Artists 1 Cyclist 1 Athlete 1 Astronaut	1 MeanOfTransportation 1 Aircraft	7 ArchitecturalStructures 5 Buildings 2 Airports 2 Infrastructures 2 AdministrativeRegions 2 PopulatedPlaces 1 NaturalPlace 1 LunarCrater 1 Stadium	1 Event	7 Companies 3 EducationalInstitutions 2 Schools 1 University
 Louis Armstrong MusicalArtist Artist Person	 Armstrong County, Pennsyl... Thing	 Louis Armstrong New Orlea... Airport ArchitecturalStructure	 Kittanning Expedition MilitaryConflict Event	 Armstrong Whitworth Company Organisation
 Lance Armstrong Cyclist Athlete Person Person	 Armstrong Whitworth Whitl... MeanOfTransportation Aircraft	 Armstrong Tunnel Building ArchitecturalStructure Place		 Armstrong Whitworth Aircr... Company Organisation
 Neil Armstrong Astronaut Person Person	 William Armstrong, 1st Ba... Thing	 Armstrong (crater) NaturalPlace LunarCrater Place		 Armstrong Atlantic State ... University EducationalInstitution Organisation
 Billie Joe Armstrong MusicalArtist Artist Person	 Armstrong County, Texas Thing	 Armstrong-Poventud Reside... Building ArchitecturalStructure		 Armstrong World Industrie... Company Organisation
 Tim Armstrong MusicalArtist Artist Person	 Armstrong Gun Thing	 Armstrong Stadium Stadium Building ArchitecturalStructure Place		 Armstrong Group of Compan... Company Organisation
 Craig Armstrong (composer) MusicalArtist Artist Person	 Archer & Armstrong Thing	 Armstrong County, Pennsyl... AdministrativeRegion		 Armstrong Telephone Compa... Company Organisation
 Alexander Armstrong (comedian) Person	 Armstrong Township, Lycom... Thing	 Armstrong Airport Airport ArchitecturalStructure Place Infrastructure		 Armstrong Tools Company Organisation
 Alun Armstrong (actor) Person	 Clan Armstrong Thing	 Louis Armstrong House Building ArchitecturalStructure Place		 Armstrong Siddeley Company Organisation
 Rollo Armstrong MusicalArtist Artist Person	 CFS Armstrong Thing	 Armstrong Chapel United M... Building ArchitecturalStructure		 Robbinsdale Armstrong Hig... School EducationalInstitution
 Edwin Howard Armstrong Person	 Armstrong Township, India... Thing	 Armstrong County, Texas AdministrativeRegion PopulatedPlace Place		 Armstrong School District... School EducationalInstitution Organisation

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Willkommen

Search ...

Dresden

<http://semex.hpi.uni-potsdam.de/mggui-dev2/>

Einschränken

Personen 79

Walter Ulbricht	9
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Erich Honecker	5
Gregor Strasser	8
Max Ernst	7
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Bertolt Brecht	6
Horst Winter	5

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Kultur	27

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Tag	44
Einzelperson	34
Gewaesser	22
Stadtaufnahme	41
Menschen Massen	28
Kleine Personengr...	21

ASR

OCR

Genres

Relevanz

Titel ▼ ▲

ID ▼ ▲

IX. Kunstausstellung

Info VCD

Alternativer Titel: IX. Kunstausstellung Dresden, Kunstausstellung Dresden Farbe: F Beschreibung: Diskussionsrunde über Gemälde ; Lager von Gemälden und Skulpturen; Stadt Dresden ; Besucher in

Rechtehalter: defa-spektrum GmbH Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA) Schlüsselwort: [Kunst, Malerei, Ausstellung] Originaltitel: IX. Kunstausstellung Dresden

DDR - Magazin 1968/46 #1323

Info ASR VCD

Alternativer Titel: DDR - Magazin 1968/46 Farbe: sw Beschreibung: [1. Bürgermeister aus Europa besuchten Dresden um die Erfahrungen der Städtebauer zu studieren. Sie betrachten ein Modell der Dresdner Innenstadt und die]

Produktionsort: Deutsche Demokratische Republik Rechtehalter: defa-spektrum GmbH Sprecher: Klaus Feldmann Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA)

DDR - Magazin 1978/02 #1471

Info ASR VCD

Alternativer Titel: [GDR Magazine 1978/02, DDR - Magazin 1978/02] Farbe: F Beschreibung: [1. Text, Dresden's art treasures. This film gives impressions of and information about three Dresden]

Produktionsort: Deutsche Demokratische Republik Rechtehalter: defa-spektrum GmbH Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA) Schlüsselwort: [Dresden, Geschichte, Wiederaufbau]

Das blaue Wunder (2/2) #4079

Info OCR VCD

Teil: 2 Film ID: Q6UJ9A00AETF Kamera: Horst Donth Regisseur: Claus Peter Eberwein Lizenzgeber: DEFA-Stiftung

Sammlung: Cintec- Archiv Schlüsselwort: [Dresden, Landschaft, Architektur] Originaltitel: Das blaue Wunder (2/2) Anzahl der Teile: 2 Herstellungsjahr: 1991

DDR - Magazin 1970/03 #1337

Info ASR VCD

Alternativer Titel: DDR - Magazin 1970/03 Farbe: sw Beschreibung: Die Union Diplomatique in Brüssel hatte

Produktionsort: Deutsche Demokratische Republik Rechtehalter: defa-spektrum GmbH Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA)

C. Hentschel, H. Sack, et al.,
Open up cultural heritage in video archives with mediaglobe, I2CS 2012

Willkommen

The interface features a top navigation bar with icons for search, user profile, and settings. A search bar at the top left contains the placeholder "Search ...". To its right is a dropdown menu set to "Dresden". Below the search bar is a section for "Einschränken" (restrictions) with a "Relevanz" slider. The main content area is divided into two columns: a sidebar on the left with "search facets" and a list of search results on the right.

search facets

Personen

79

- Walter Ulbricht 9
- Gregor Strasser 8
- Ernst Gelegs 8
- Adolf Hitler 7
- Max Ernst 7
- Bertolt Brecht 6
- Erich Honecker 5
- Fifi Box 5
- Horst Winter 5

Ereignisse

- Erster Weltkrieg 7
- Koalitionskriege 5
- Schlacht an der S... 4
- German Revolution... 1
- Oktoberrevolution 1
- Leningrader Block... 1
- Spanischer Bürger... 1
- Ten Years' War 1

Orte

- Dresden 46
- Deutsche Demokrat... 40
- Berlin 23
- Deutschland 18
- Leipzig 15
- Europa 12
- Verwaltungsgemeind... 12
- Sowjetunion 11
- Bezirk Mitte 9

Organisation

- Krieg 16
- Ziel 15
- Sozialdemokratisc... 5
- Sozialdemokratische Partei Deutschlands 5
- Berliner AK 07 4
- Showtime 4
- ARD 3
- Allgemeine SS 3
- Christlich Demokratische Union Deutschlands 3

Konzepte

- Jahr 40
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- Land (Deutschland...) 35
- Malerei 32
- Arbeitsmarkt 30
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Bildinhalt

- Aussenaufnahme 45
- Tag 44
- Stadtaufnahme 41
- Innenraum 41
- Einzelperson 34
- Menschen Massen 28
- Parks Felder Gruen... 24
- Gewaesser 22
- Kleine Personengruppen 21

Dresden

ASR OCR Genres Relevanz Titel ID

IX. Kunstausstellung

Info VCD

Alternativer Titel: [IX. Kunstausstellung Dresden, Kunstausstellung Dresden] Farbe: F Beschreibung: Diskussionsrunde über Gemälde ; Lager von Gemälden und Skulpturen; Stadt Dresden ; Besucher in

Rechtehalter: defa-spektrum GmbH Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA) Schlüsselwort: [Kunst, Malerei, Ausstellung] Originaltitel: IX. Kunstausstellung Dresden

DDR - Magazin 1968/46 #1323

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Info OCR VCD

Teil: 2 Film ID: Q6UJ9A00AETF Kamera: Horst Donth Regisseur: Claus Peter Eberwein Lizenzgeber: DEFA-Stiftung

Sammlung: Cintec- Archiv Schlüsselwort: [Dresden, Landschaft, Architektur] Originaltitel: Das blaue Wunder (2/2) Anzahl der Teile: 2 Herstellungsjahr: 1991

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Info ASR VCD

Alternativer Titel: DDR - Magazin 1970/03 Farbe: sw Beschreibung: Die Union Diplomatique in Brüssel hatte

Produktionsort: Deutsche Demokratische Republik Rechtehalter: defa-spektrum GmbH Sammlung: Ministerium für Auswärtige Angelegenheiten (MfAA)

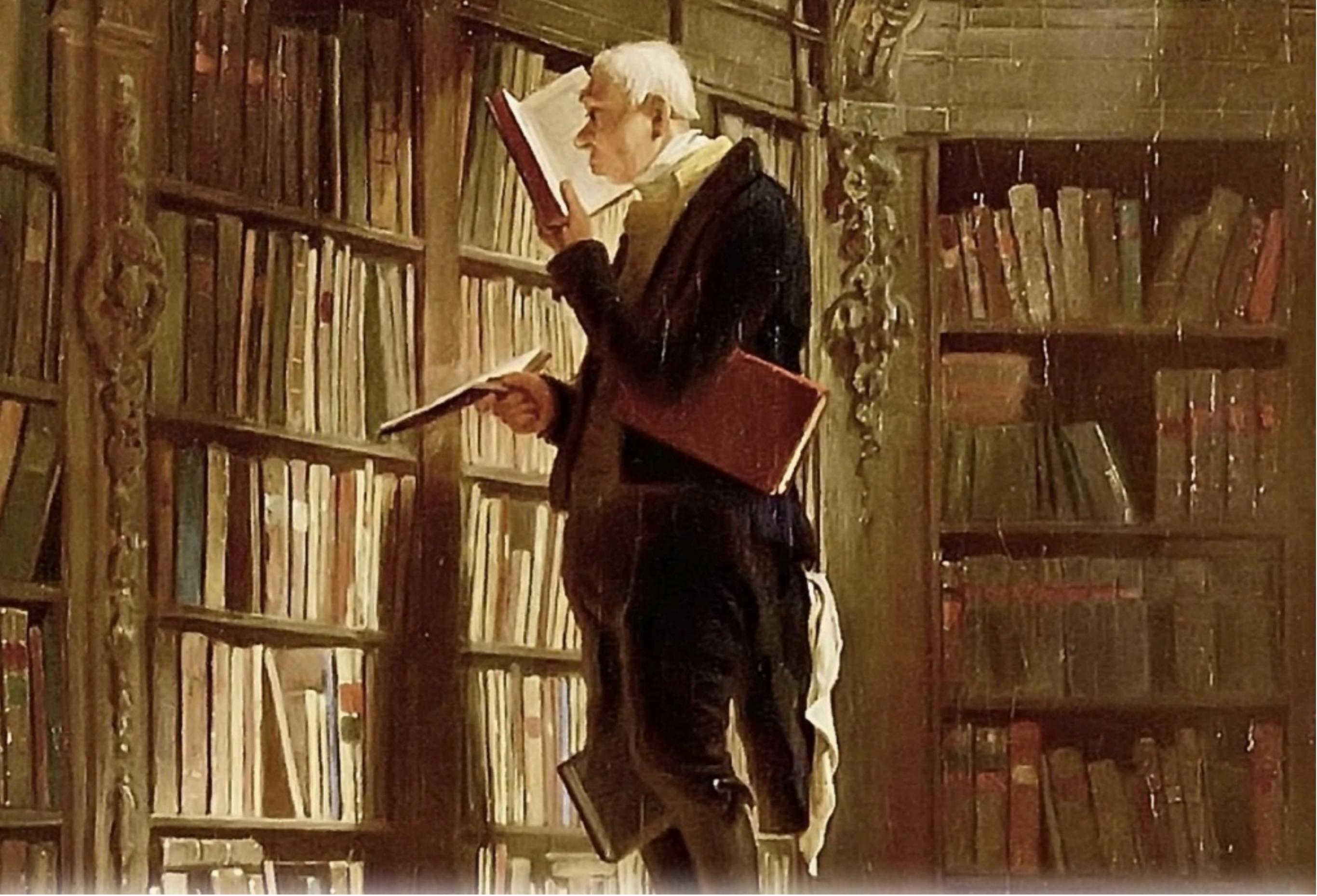
C. Hentschel, H. Sack, et al.,
Open up cultural heritage in video archives with mediaglobe, I2CS 2012

Search vs. Exploration



Exploratory Search

- *What, if the user does not know, **which query string** to use?*
 - *What, if the user is looking for **complex answers**?*
 - *What, if the user **does not know the domain** she is looking for?*
 - *What, if the user wants to get an **overview about a specific topic**?*
-
- **Exploratory Search** enables
 - ... to browse instead of search
 - ... useful suggestions & recommendations
 - ... to find something unexpected but useful (**Serendipity**)



(Traditional) Libraries also enable Browsing and Exploration

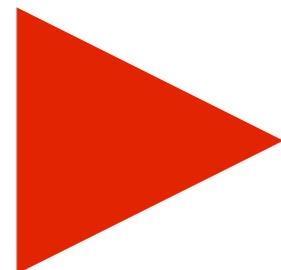
Serendipity helps to improve the Quality of Discovery & Exploration

Serendipity:

- finding a solution to a problem that is **relevant but not intentionally thought of**
- a recommended item is a serendipitous discovery if it is **interesting and positively surprising** because one was not in search for any of its kind

Relevance:

- In the **general case**, often referenced (cited) facts are considered more relevant
- In the **special case**, the relevance of a fact must be adapted to the current (personal) context



combine **accurate** search results with **serendipitous** but **relevant** findings

Exploratory Search based on Linked Open Data

About: From the Earth to the Moon
An Entity of Type :book, from Named Graph :http://dbpedia.org, within Data Space :dbpedia.org

From the Earth to the Moon (French: De la terre à la lune) is an 1865 novel by Jules Verne. It tells the story of the Baltimore Gun Club, a post-American Civil War society of weapons aficionados, and their attempts to build an enormous sky-facing Columbiad space gun and launch three people — the Gun Club's president, his Philadelphian armor-making rival, and a French poet — in a projectile with the goal of a moon landing.

Property Value

- dbo:owl:abstract
 - Von der Erde zum Mond ist ein Roman des französischen Autors Jules Verne. Der Roman wurde erstmals 1865 unter dem französischen Titel De la Terre à la Lune von dem Verleger Pierre-Jules Hetzel veröffentlicht. Die erste deutschsprachige Ausgabe erschien 1873 unter dem Titel Von der Erde zum Mond. Der englische Titel des Romans lautet From the Earth to the Moon. Es handelt sich um ein frühes Werk des Science-Fiction-Genres, das die Mondfahrt um etwa hundert Jahre vorwegnimmt. Allerdings geht es hier vor allem noch um die Vorbereitung des Abenteuers. Der Roman Reise um den Mond (Autour de la Lune) von 1870 setzte die Geschichte fort.
 - From the Earth to the Moon (French: De la terre à la lune) is an 1865 novel by Jules Verne. It tells the story of the Baltimore Gun Club, a post-American Civil War society of weapons aficionados, and their attempts to build an enormous sky-facing Columbiad space gun and launch three people — the Gun Club's president, his Philadelphian armor-making rival, and a French poet — in a projectile with the goal of a moon landing. The story is also notable in that Verne attempted to do some rough calculations as to the requirements for the cannon and, considering the comparative lack of any data on the subject at the time, some of his figures are surprisingly close to reality. However, his scenario turned out to be impractical for safe manned space travel since a much longer muzzle would have been required to reach escape velocity while limiting acceleration to survivable limits for the passengers. The character of Michel Ardan, the French poet in the novel, was inspired by the real-life photographer Félix Nadar.
- dbo:owl:author
 - dbo:Jules_Verne
 - dbo:Henri_de_Montaut
- dbo:owl:literaryGenre
 - dbo:Science_fiction
- dbo:owl:mediaType
 - dbo:Hardcover
- dbo:owl:publisher
 - dbo:Pierre-Jules_Hetzel
 - dbo:Voyages_Extraordinaires
- dbo:owl:series
 - http://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/From_the_Earth_to_the_Moon_Jules_Verne.jpg/200px-From_the_Earth_to_the_Moon_Jules_Verne.jpg
- dbo:owl:thumbnail
 - dbo:Lewis_Page_Mercier
 - dbo:Walter_James_Miller
 - dbo:Robert_Baldick
- dbo:owl:translator
 - http://www.literatureaudio.com/livre-audio-gratuit-mp3/verne-jules-de-la-terre-a-la-lune.html/
 - http://www.conceptualfiction.com
 - http://www.conceptualfiction.com/from_earth_to_moon.html
 - http://www.astronautix.com/vs/julongun.htm
 - http://v.gleed.org/8pg/moon/
 - http://www.sil.si.edu/OnDisplay/JulesVerne100/Verne_ImagesSelected.cfm?book_id=SL28-090
 - http://www.gutenberg.org/text/12901
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 - 131 (xsd:integer)
 - 99 (xsd:integer)
 - 546811982 (xsd:integer)
- dbo:owl:wikiPageLinkCount
 - Jules Verne
- dbo:owl:wikiPageOutLinkCount
 - Cover of an early English translation
 - France
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 - 1867 (xsd:integer)
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 - dbo:Novel
 - dbo:Science_fiction
- dbr:hasPhotoCollection
 - http://wifo5-03.informatik.uni-mannheim.de/ticknwrappl/photos/From_the_Earth_to_the_Moon
- dbr:illustrator
 - dbo:Henri_de_Montaut
- dbr:language
 - French
- dbr:mediaType
 - Print
- dbr:name
 - From the Earth to the Moon
 - From the Earth to the Moon; and, Round the Moon
- dbr:nr
 - 83 (xsd:integer)
- dbr:publisher
 - dbo:Pierre-Jules_Hetzel
- dbr:releaseDate
 - 1865 (xsd:integer)
- dbr:series
 - Voyages Extraordinaires #4
 - De la terre à la lune
- dbr:titleOrig
 - dbo:Walter_James_Miller
 - Anonymous
 - L. O. Evans
 - Edward Roth
 - Frederick Paul Walter
 - Harold Salemson
 - J. K. Hoyt
 - Jacqueline and Robert Baldick
 - Louis Mercier & Eleanor Elizabeth King
 - Lowell Bair
 - Thomas H. Linklater
- dbr:translator
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 - category:Moon_in_fiction
 - category:Novels_by_Jules_Verne
 - category:American_Civil_War_novels
- dct:subject
 - category:French_science_fiction_novels
 - category:Moon_in_fiction
 - category:Novels_by_Jules_Verne
 - category:American_Civil_War_novels



http://dbpedia.org/page/From_the_Earth_to_the_Moon

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Related Results: Siblings via Category Membership

About: From the Earth to the Moon

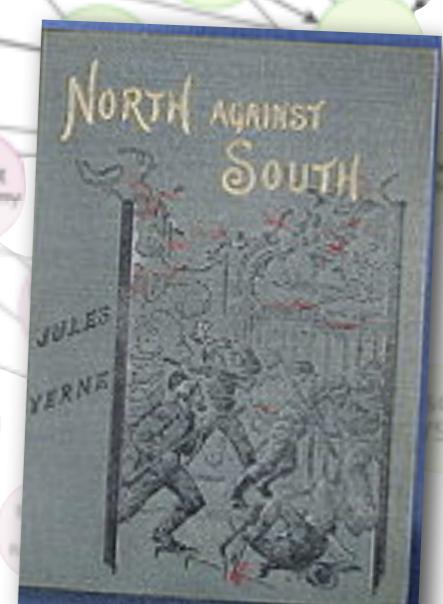
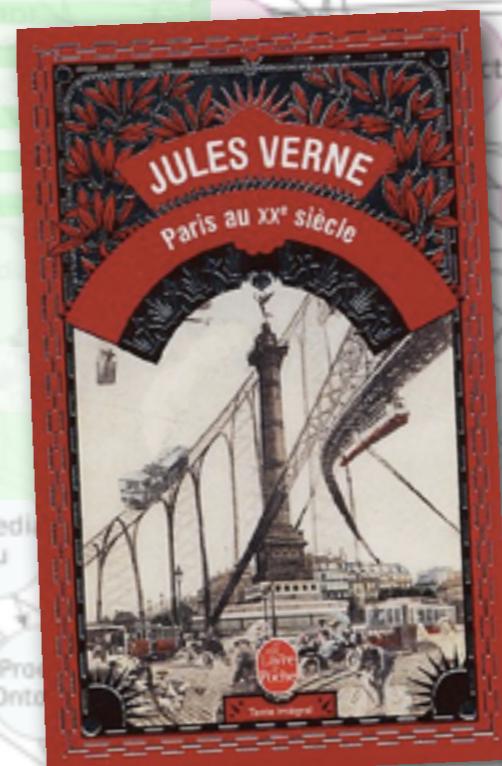
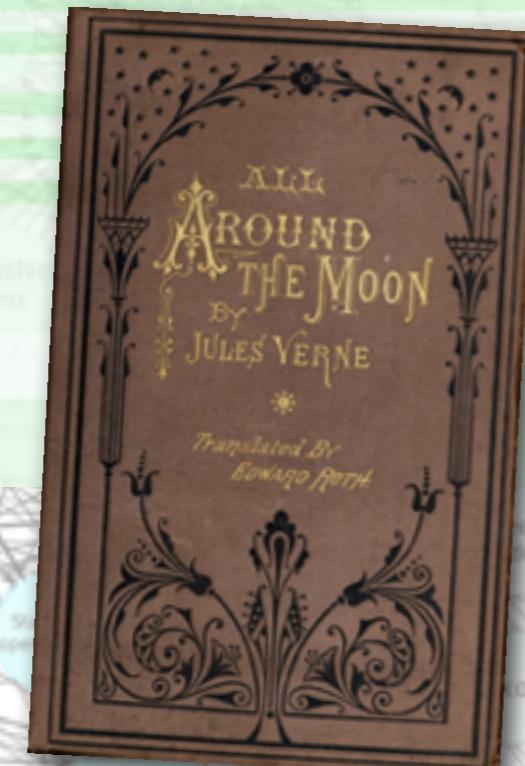
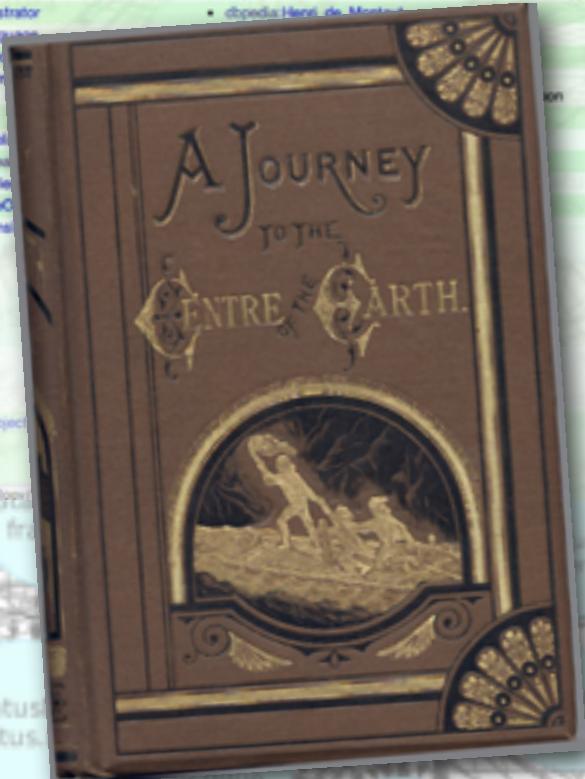
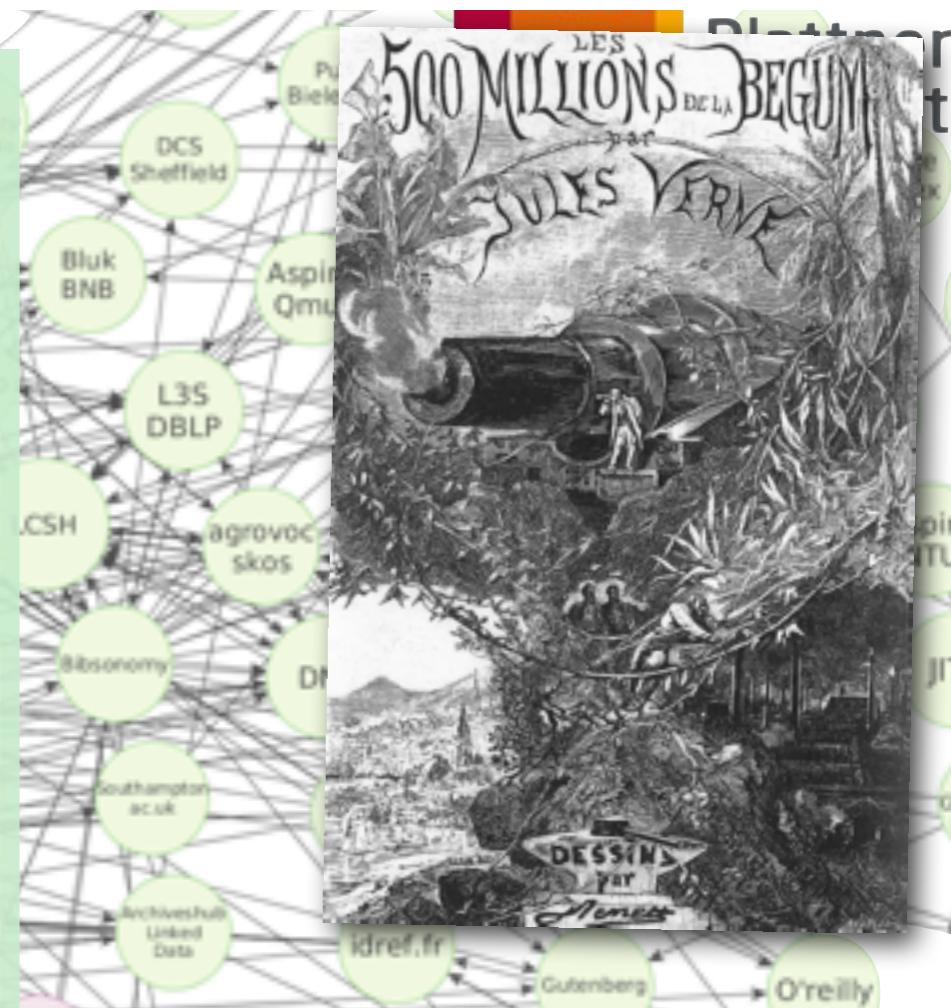
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- category:Moon in fiction
- category:Novels by Jules Verne
- category:American Civil War novels
- category:Novels set in Florida
- category:1860s science fiction novels
- category:1865 novels
- category:Fictional rivalries

DBpedia

is aficionados, and their attempts to build an enormous sky-lab.

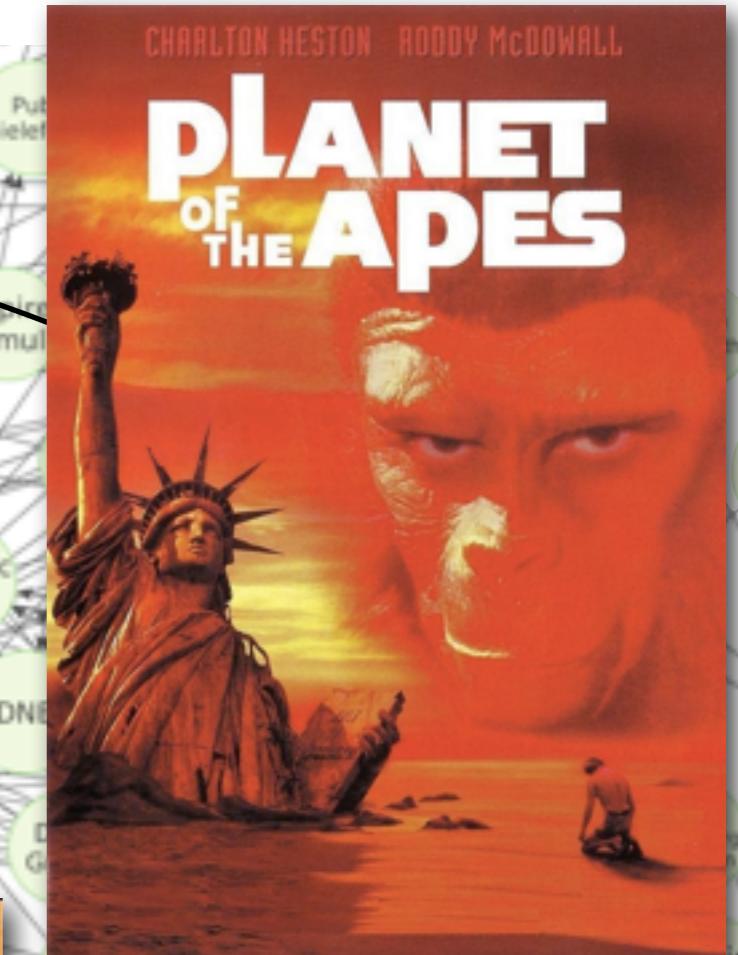
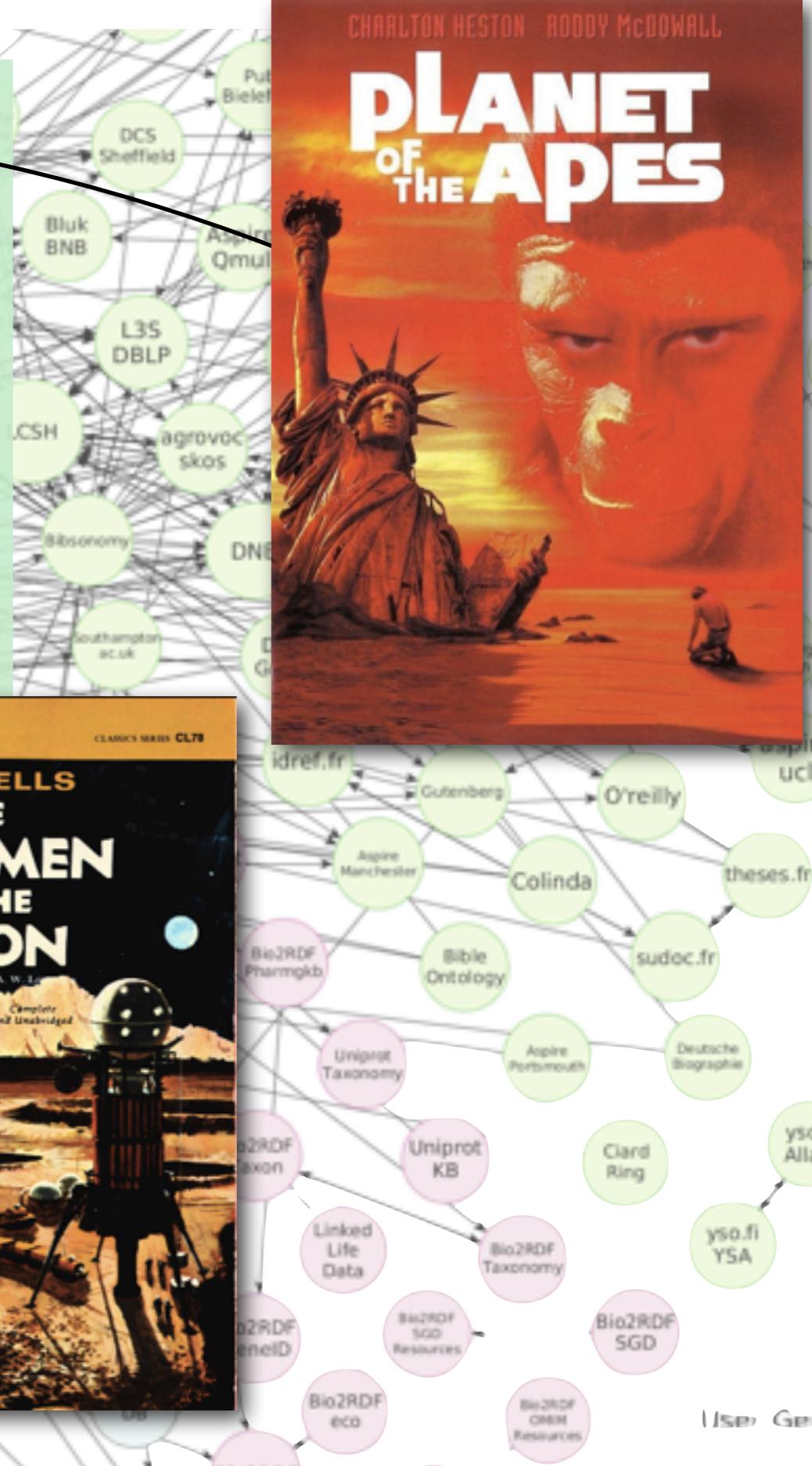
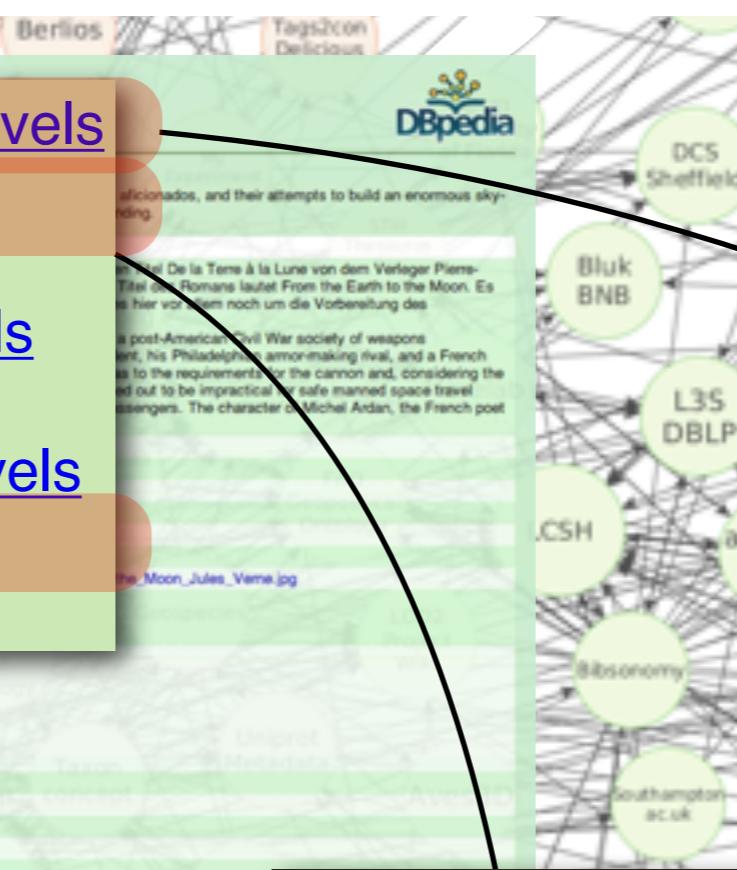
hen Titel De la Terre à la Lune von dem Verleger Pierre-Jules Hetzel ist der Titel des Romans lautet From the Earth to the Moon. Es handelt sich hier vor allem noch um die Vorbereitung des Projekts, eine post-American Civil War society of weapons manufacturers, his Philadelphia armor-making rival, and a French engineer who has to meet the requirements for the cannon and, considering the distance to the moon, has to be impractical for safe manned space travel with passengers. The character of Michel Ardan, the French poet and engineer, is based on the real-life French engineer and writer Jules Verne.

the_Moon_Jules_Verne.jpg



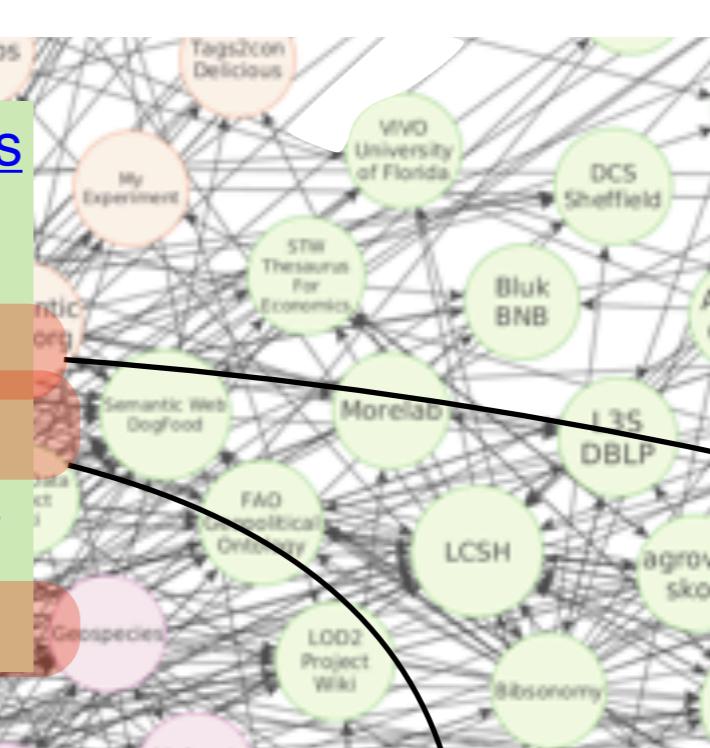
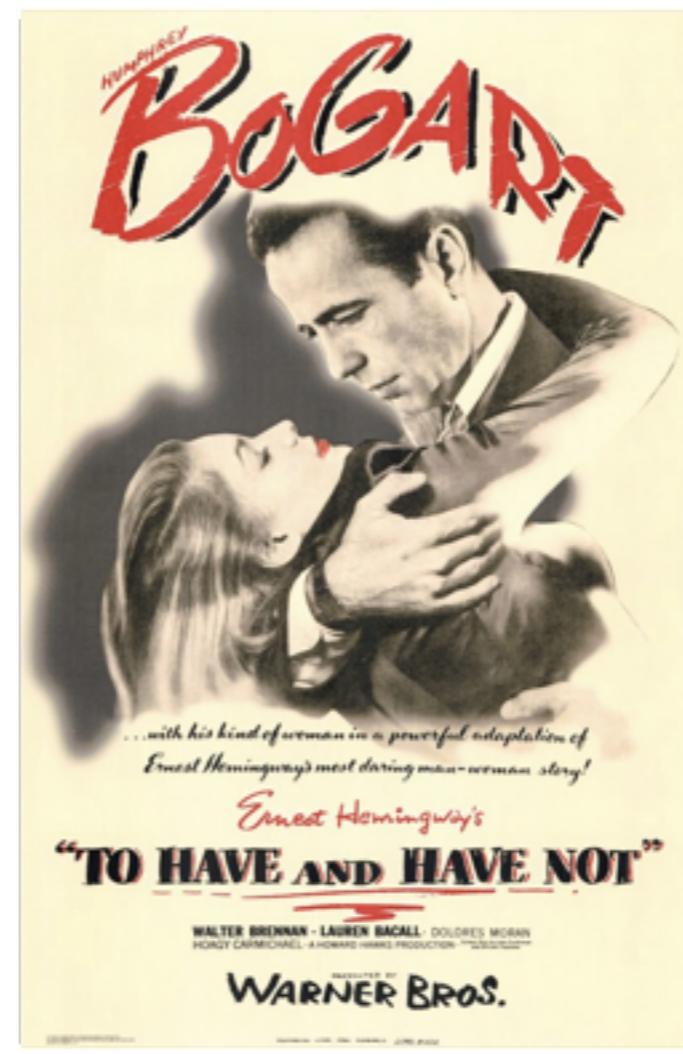
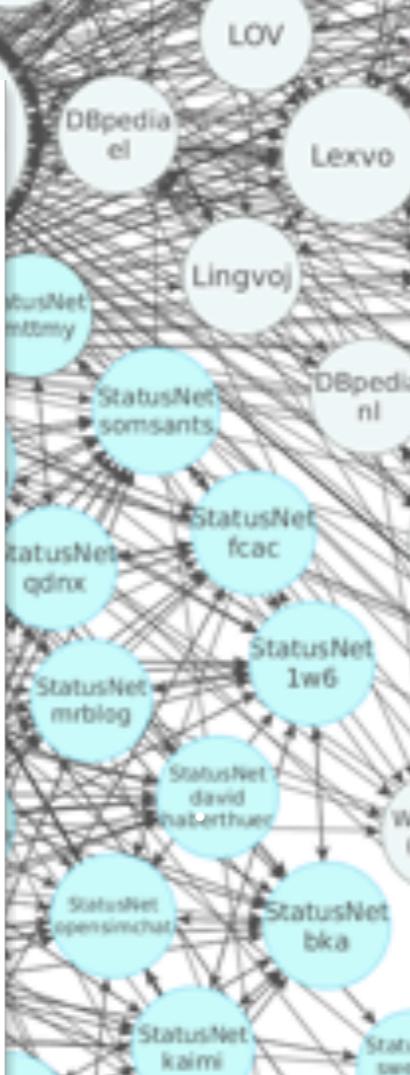
Serendipity: Remove the most common Category...

- [category:French science fiction novels](#)
 - [category:Moon in fiction](#)
 - [category:Novels by Jules Verne](#)
 - [category:American Civil War novels](#)
 - [category:Novels set in Florida](#)
 - [category:1860s science fiction novels](#)
 - [category:1865 novels](#)
 - [category:Fictional/rivalries](#)



Serendipity: Look for the most unexpected yet important

- [category:French science fiction novels](#)
- [category:Moon in fiction](#)
- [category:Novels by Jules Verne](#)
- [category:American Civil War novels](#)
- [category:Novels set in Florida](#)
- [category:1860s science fiction novels](#)
- [category:1865 novels](#)
- [category:Fictional rivalries](#)



Content-Based Recommendations

From the Earth to the Moon

Recommendations ▾

Sort by: Title Score Popularity Rotten Tomatoes Similarity Category Weight Custom Weight Rule Based

A Trip to the Moon
The Moon in film From the Earth to the Moon Technicolor
Science fiction film Films based on works by Jules Verne Jules Verne



Score 20.0

Popularity 987

Rotten Tomatoes 94.5

The War of the Worlds (1953 film)
Films directed by Byron Haskin Technicolor Science fiction film
1950s science fiction films Les Tremayne Byron Haskin



Score 15.0

Popularity 988

Rotten Tomatoes 67.0

The Birth of a Nation
Ulysses S. Grant Films set in the 1860s American Civil War



Score 14.0

Popularity 290

Rotten Tomatoes 77.5



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cENTERTAIN.me video recommendation

<http://mediaglobe.yovisto.com:8080/c.me-gui-0.0.1-SNAPSHOT2/>

Exploratory Search with yovisto

89

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birth place
[Bihar \(52\)](#)
[British Raj \(16\)](#)

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[Upton Sinclair \(1\)](#)
[Jonathan Swift \(1\)](#)
[Arthur Koestler \(1\)](#)
[James Joyce \(1\)](#)
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[Gustave Flaubert \(1\)](#)

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Speaker (13)

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- Others - (21)
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Psychology (6)

Organization
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[Jonathan Swift \(1\)](#)
[Arthur Koestler \(1\)](#)
[James Joyce \(1\)](#)
[Charles Dickens \(34\)](#)
[Gustave Flaubert \(1\)](#)

Search Results Search time: 787ms / Results found: 105 Sort results: relevant | popular | recent

Neusprech im Überwachungsstaat
Martin Haase
25th Chaos Communication Congress
CCC
Politiker wollen ihre Überwachungspläne schmackhaft machen. Neben der inhaltlichen Verharmlosung von Vorratsdatenspeicherung, Onlinedurchsuchung, Videoüberwac... Duration: 01:10:09

Georg Braungart

Georg Carle

George Dyson

Jim George

George Keiser

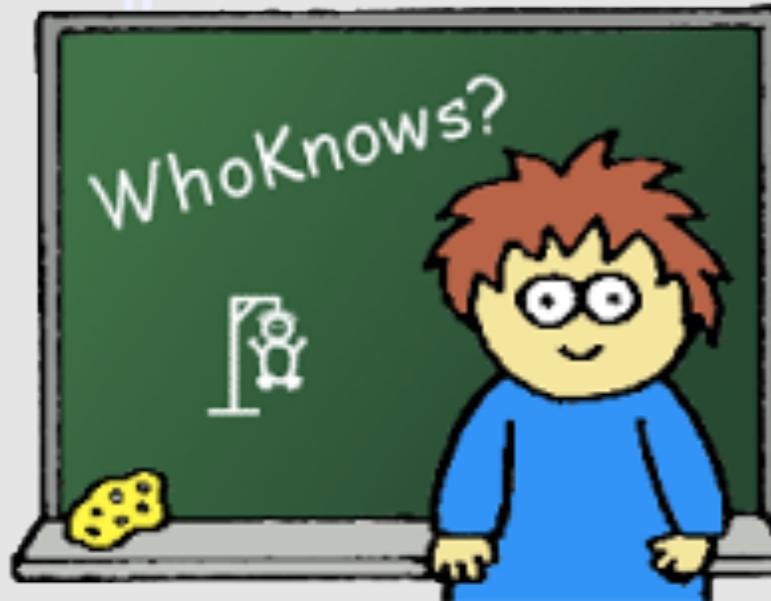
Georg Lausen

George Loannidis

George C. Lusztig

George Melies

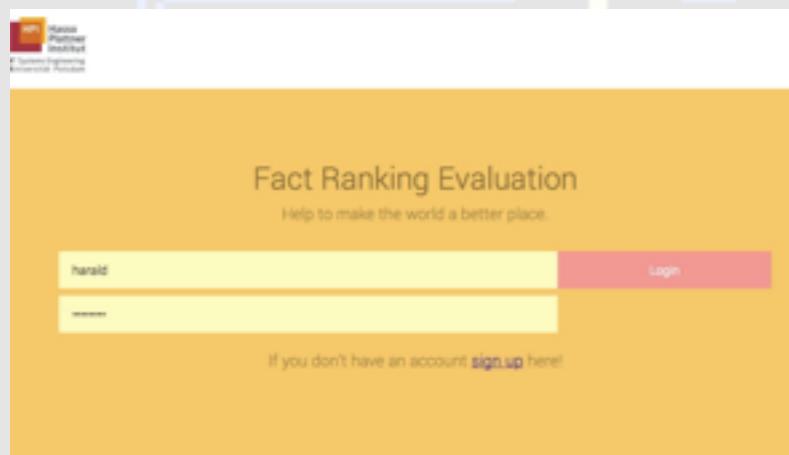
Game Based Evaluation and Annotation



<http://tinyurl.com/whoknowsgame>



<http://bit.ly/WhoKnowsMovies>



FRancO
Current Fact Ranking Challenge
<http://s16a.org/fr/>

- A. Thalhammer, M. Knuth, H. Sack
"Evaluating Entity Summarization Using a Game-Based Ground Truth", ISWC 2012
- L. Wolf, M. Knuth, J. Osterhoff, H. Sack:
"RISQ! Renowned Individuals Semantic Quiz – A Jeopardy like Quiz Game for Ranking Facts", i-SEMANTICS 2011
- N. Ludwig, J. Waitelonis, M. Knuth, H. Sack:
"WhoKnows? - Evaluating Linked Data Heuristics with a Quiz that Cleans Up DBpedia", ESWC 2011 and ITSE, 8:3, 2011



“Understanding“ the Web of Data

Named Entity Resolution

Overview

(1) How to make sense of the Web?

and why we are not really content with it...

(2) Words and Meaning

to be able to better „understand“ the content

(3) Named Entity Resolution

from words to semantic entities...

(4) Application Scenarios

Exploratory Search and intelligent Recommendations

Dr. Harald Sack

Hasso-Plattner-Institut für Softwaresystemtechnik, Universität Potsdam
Prof.-Dr.-Helmert-Str. 2-3, D-14482 Potsdam