Global Knowledge Communication

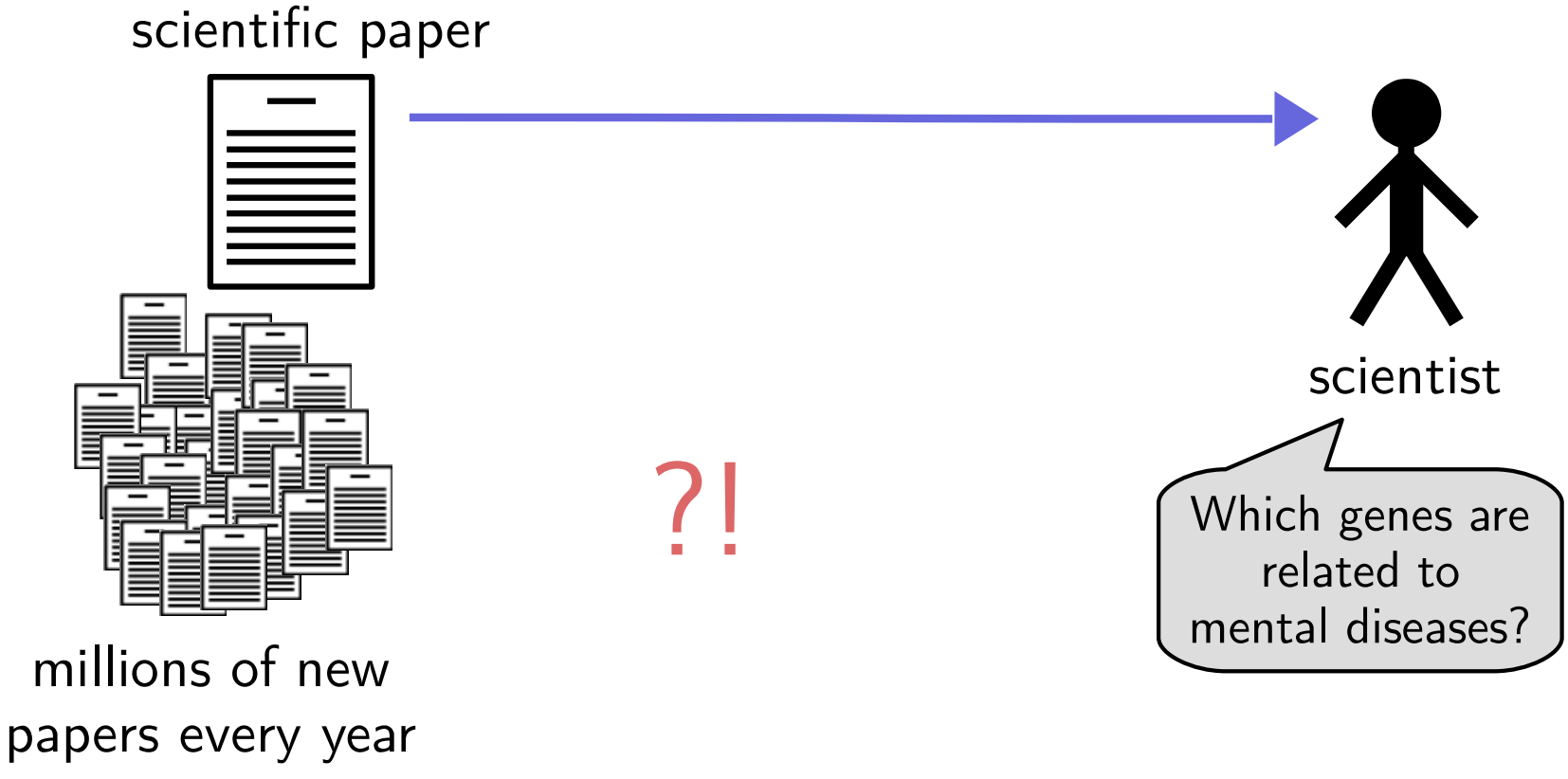
and How to Make it Efficient and Reliable

Tenure Interview of Tobias Kuhn

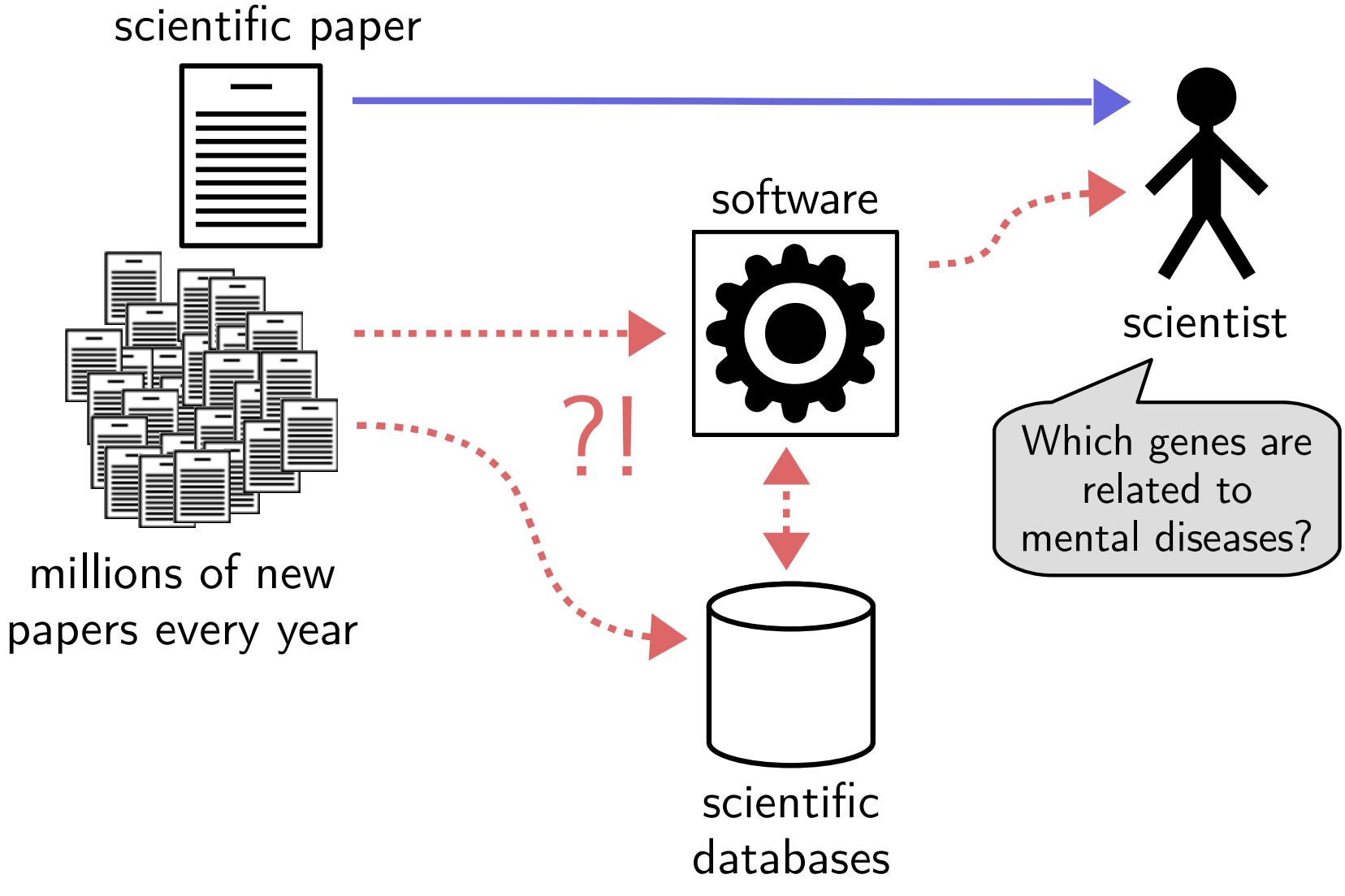
VU Amsterdam, 8 March 2019

Global Knowledge Communication Crisis

Global Knowledge Communication Crisis



Global Knowledge Communication Crisis



My Research on Global Knowledge Communication

Communication Methods:

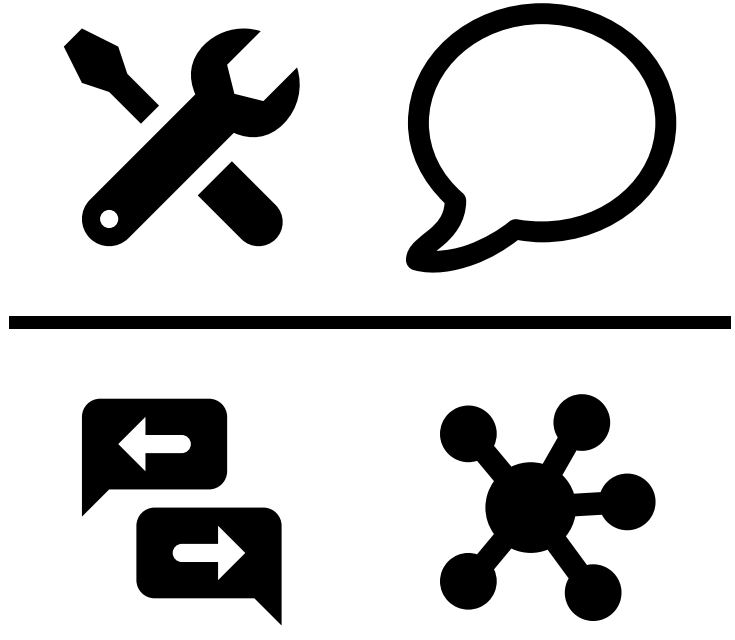
Nanopublications and FAIR

Expressive Controlled Natural Languages

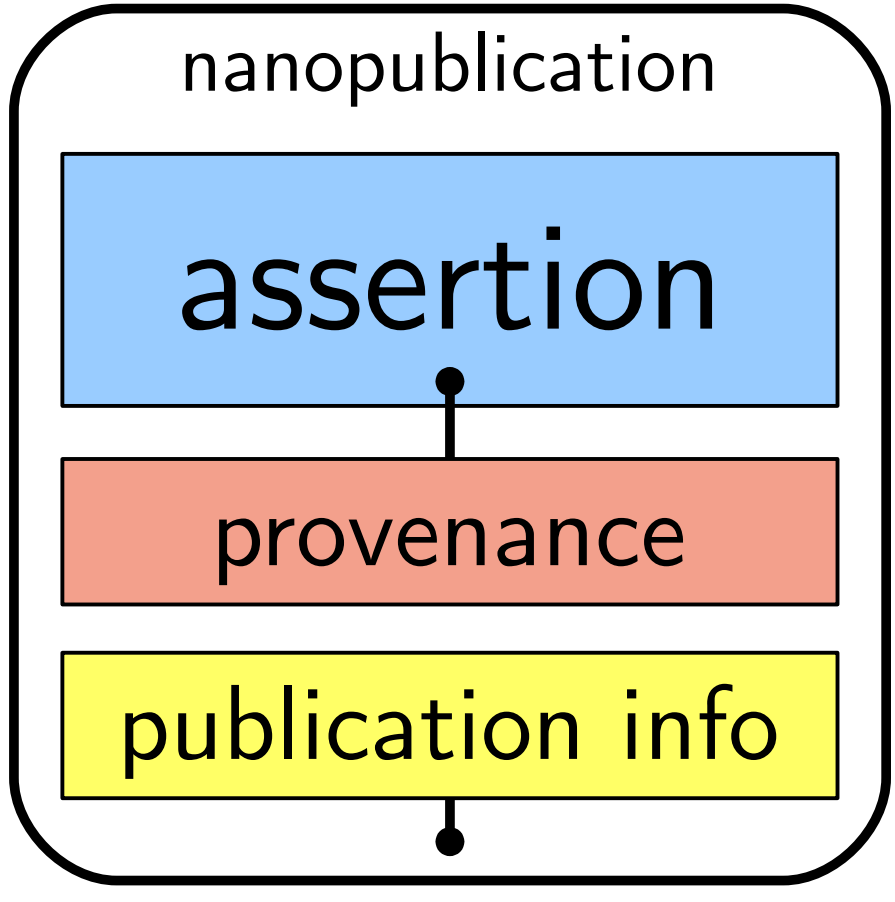
Communication Content:

Controversy and Bias

Knowledge Networks

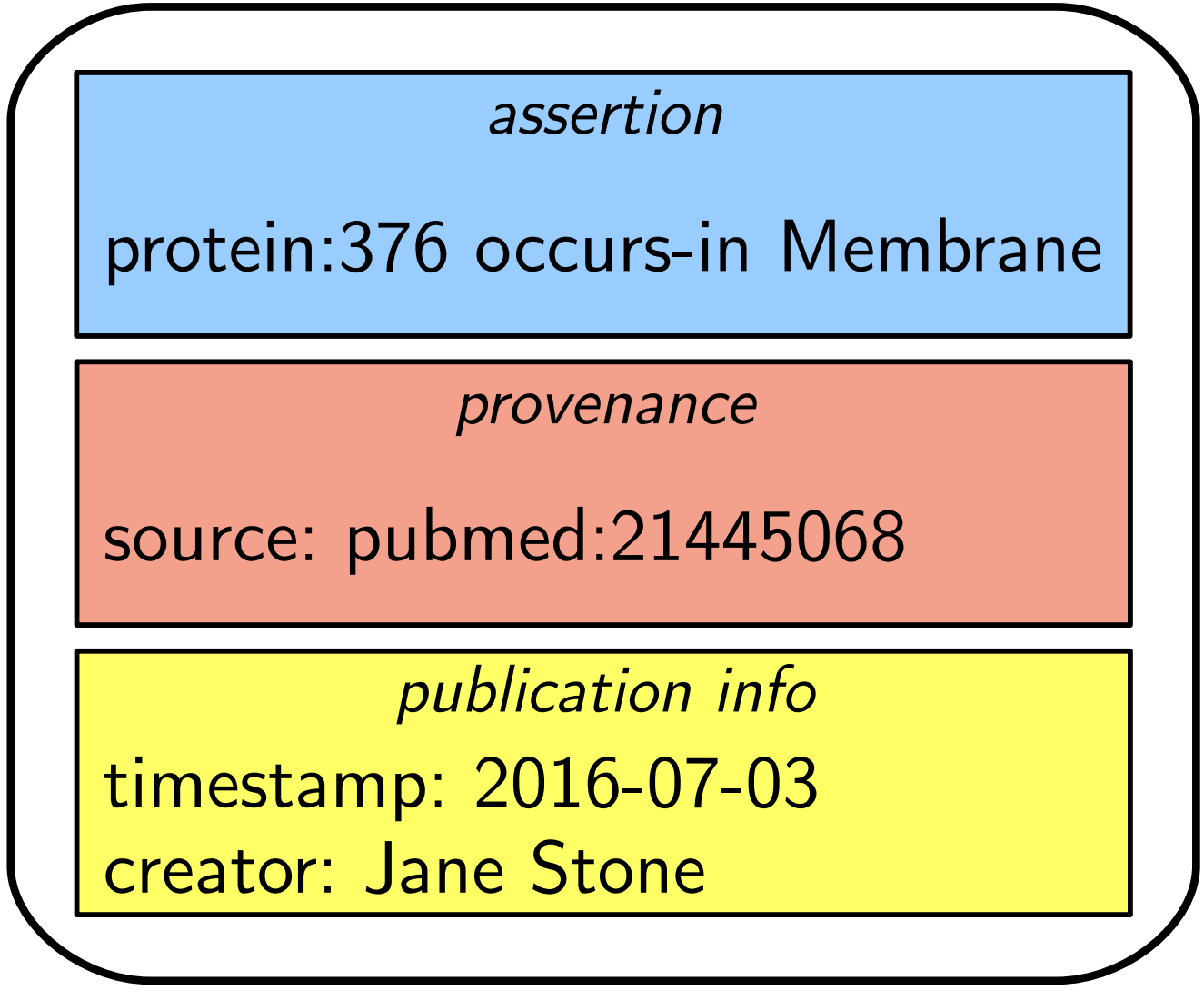


Background: Nanopublications



http://nanopub.org

Nanopublication: Simplified Example



Nanopublication: Real Example

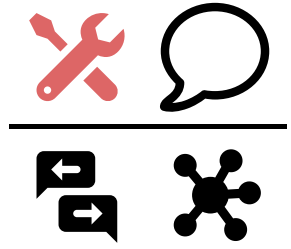
```
@prefix this: <http://purl.org/np/RAzquSkwsTAZm61nReG6MOjXEXUx8fNVfdWnAzyn6sOhU> .
...

sub:Assertion {
  sub:Interaction occurs-in: obo:ENVO_01000240 ;
    has-participant: sub:Organism_1 , sub:Organism_2 ;
    a obo:GO_0044419 ;
    prov:atTime "1962-12-01T00:00:00Z"^^xsd:dateTime .
  sub:Organism_1 eats: sub:Organism_2 ;
    rdfs:label "Picoides villosus" .
  sub:Organism_2 a itis:114936 ;
    rdfs:label "Ips" .
}

sub:Provenance {
  sub:Assertion prov:wasDerivedFrom sub:Study .
  sub:Study dcterms:bibliographicCitation "Otvos, I. S. and R. W. Stark. 1985. Arthropod food of
some forest-inhabiting birds. Canadian Entomologist 117:971-990." .
}

sub:Pubinfo {
  this: dcterms:license <https://creativecommons.org/licenses/by/4.0/> ;
    pav:createdBy <https://doi.org/10.5281/zenodo.1212599> ;
    prov:wasDerivedFrom <https://github.com/hurlbertlab/dietdatabase> .
  <https://github.com/hurlbertlab/dietdatabase> dcterms:bibliographicCitation "Allen Hurlbert.
2017. Avian Diet Database." .
}
```

http://purl.org/np/RAzquSkwsTAZm61nReG6MOjXEXUx8fNVfdWnAzyn6sOhU



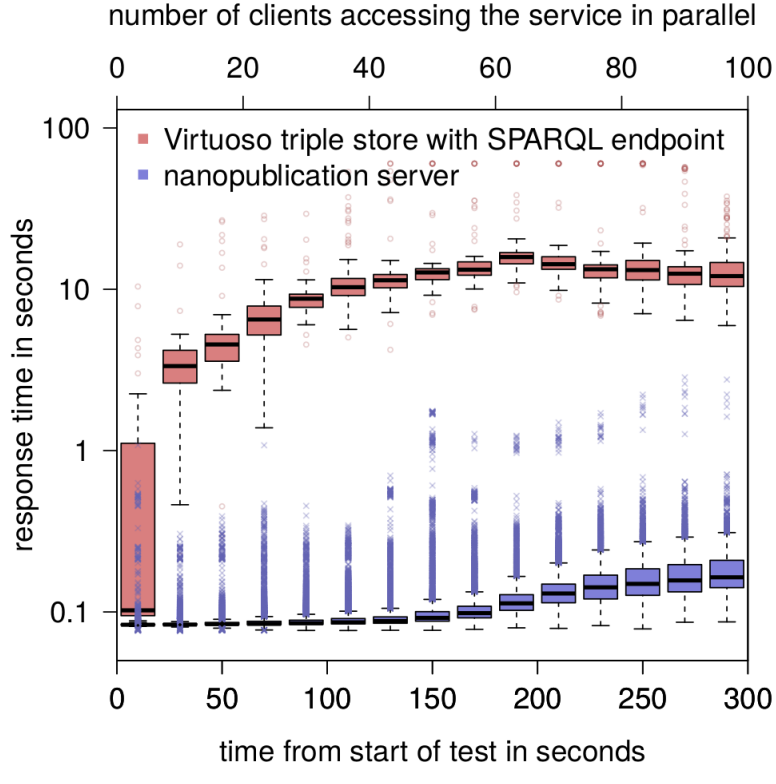
Research Highlights:
Nanopublications and FAIR

Scholarly communication methods for the digital age:

- Reliable Publishing with Nanopublications
- Reproducible and Evolving Datasets
- Uniform Cross-Dataset Interoperability
- Usability for Web Developers and End Users
- Applying it to Peer Reviewing
- Using the FAIR Momentum
- Vision: Genuine Semantic Publishing

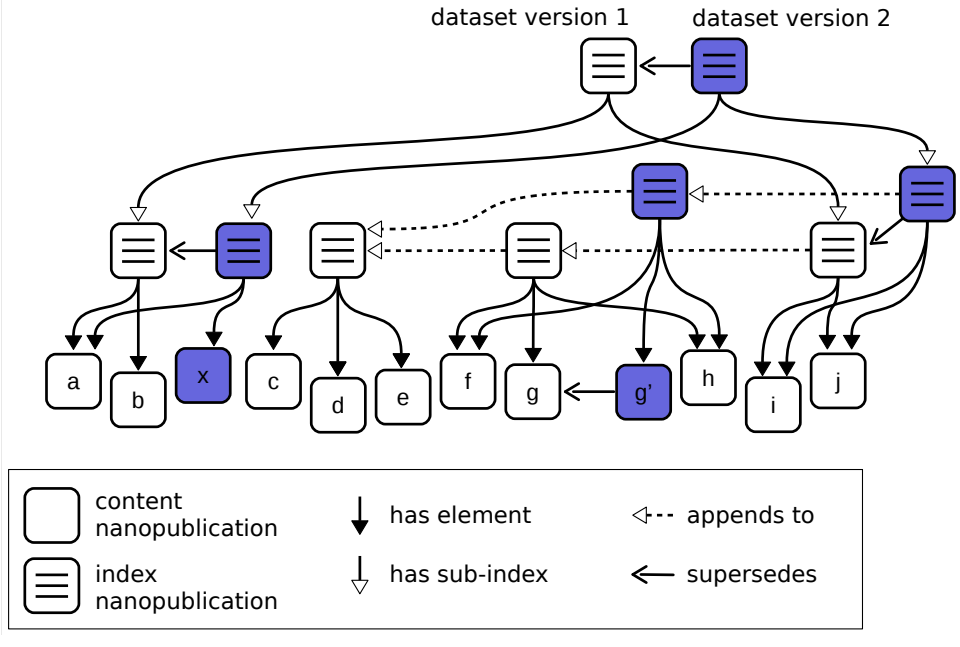
Decentralized Server Network with >10M Nanopublications is Fast and Reliable

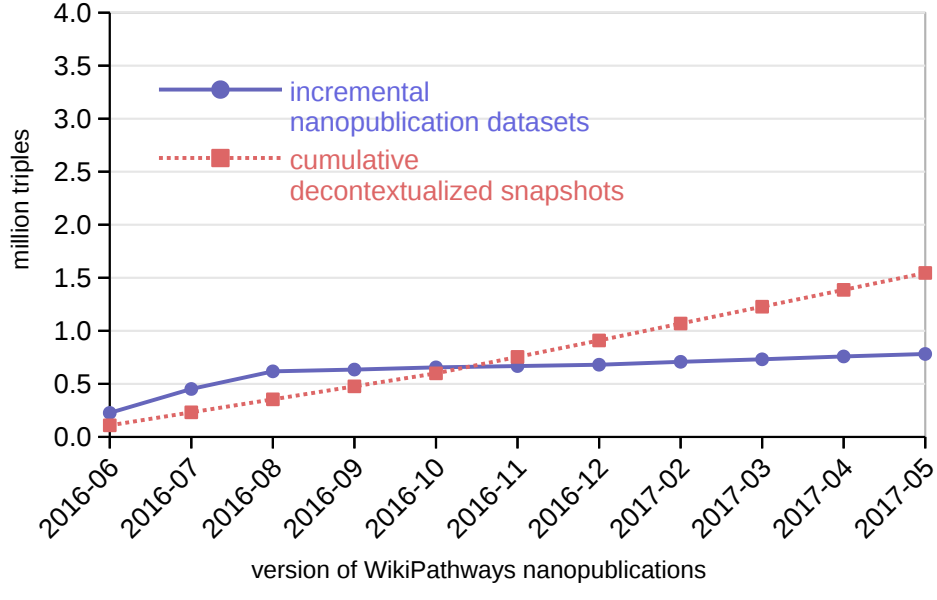
URL	Status	OK Ratio	Resp Time (Dist)	La
http://sprout038.sprout.yale.edu/nanopub-server/	OK	99.747536%	258 ms (6212 km)	2018
http://np.inn.ac/	OK	99.368835%	10 ms (0 km)	2018
http://npx1.inn.ac/	OK	99.368835%	7 ms (0 km)	2018
http://app.tkuhn.eculture.labs.vu.nl/nanopub-server-1/	OK	100.0%	28 ms (606 km)	2018



Tobias Kuhn, Christine Chichester, Michael Krauthammer, Núria Queralt-Rosinach, Ruben Verborgh, George Giannakopoulos, Axel Ngonga, Raffaele Viglianti, Michel Dumontier. Decentralized provenance-aware publishing with nanopublications. *PeerJ Computer Science*, 2:e78, 2016.

Nanopublication Overhead Disappears and Turns Into Advantage for Evolving Datasets



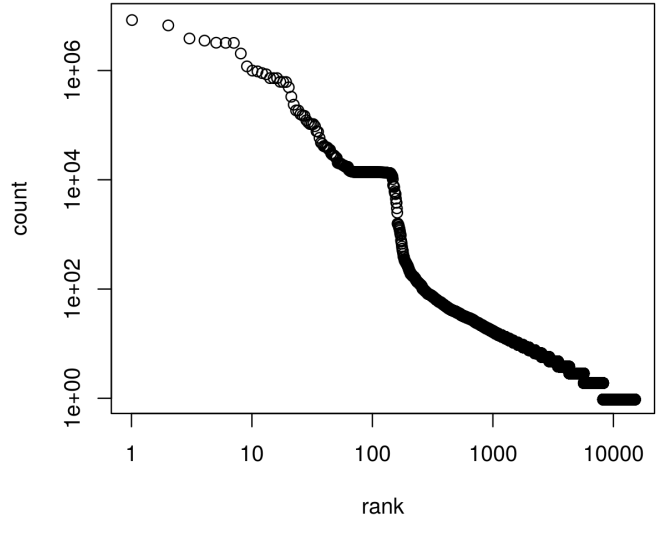


Tobias Kuhn, Egon Willighagen, Chris Evelo, Núria Queralt-Rosinach, Emilio Centeno, Laura I. Furlong. Reliable Granular References to Changing Linked Data. In *Proceedings of ISWC 2017*. Springer, 2017.

Nanopublications Enable Global Data Integrity and Interoperability

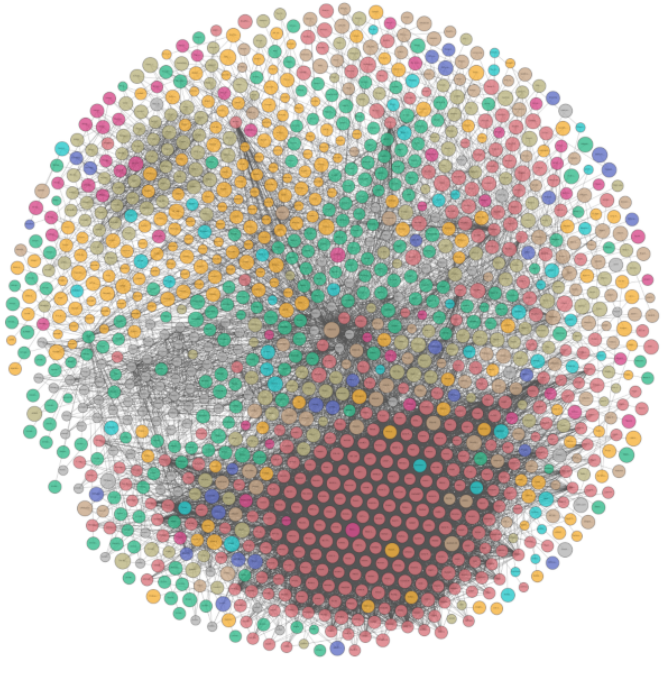
Reliable and uniform cross-dataset processing,
for example to analyze vocabulary use or type distribution:

Graph	subj		pred		obj	
assertion	gda-r	36.13%	rdf	69.61%	sio	44.87%
	ncbi	31.27%	sio	52.43%	ncbi	44.85%
	umls	31.22%	obo	36.24%	umls	44.83%
provenance	nxpt	37.27%	prov	98.95%	eco	45.97%
	nxptq	36.25%	rdf	95.66%	pubmed-id	44.09%
	disgen	22.53%	wi	93.71%	nxpt	37.27%
pubinfo	nxpt	37.27%	dc	100.00%	orcid	98.67%
	disgen	36.13%	pprov	93.71%	cc	50.69%
	disgen-void5	13.60%	swan	49.61%	http://	48.93%



Tobias Kuhn, Albert Meroño, Alexander Malic, Jorrit Poelen, Allen Hurlbert, et al. Nanopublications: A Growing Resource of Provenance-Centric Scientific Linked Data. In *Proceedings of IEEE eScience 2018*.

Data 2 Documents Makes Linked Data Easy to Use for Web Developers and End Users



Hall, Floris Van

Birth: 1791-05-15 (Amsterdam)

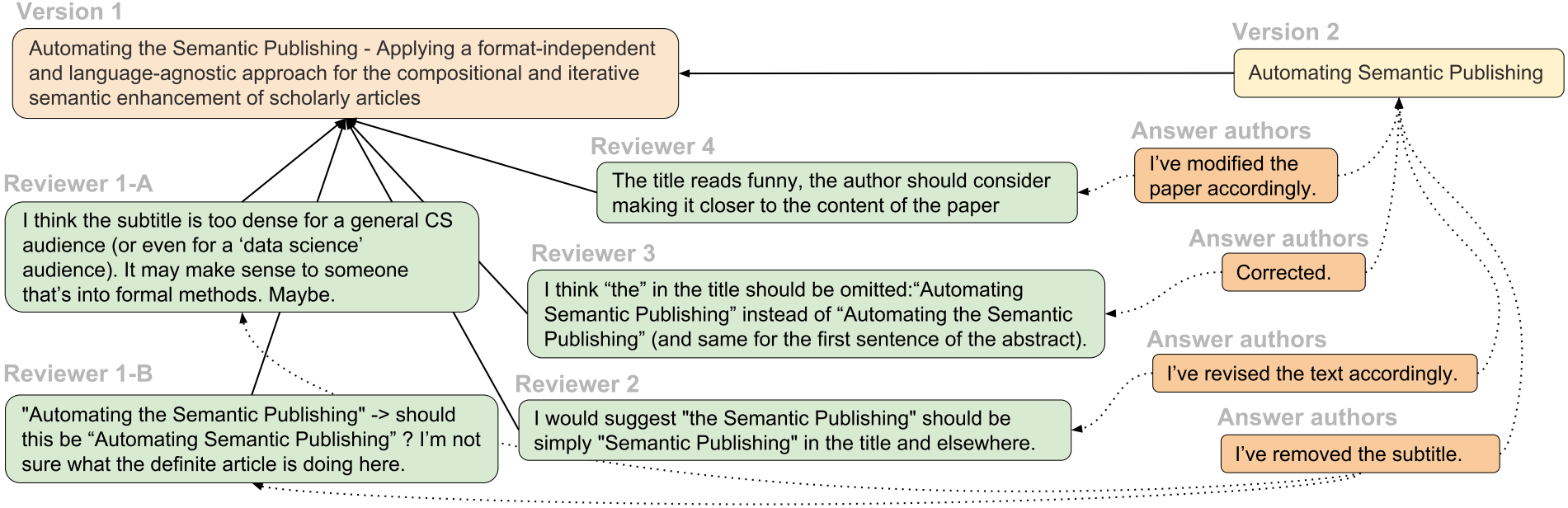
Death: 1866-03-29 (The Hague)

Floris Adriaan, Baron van Hall (15 May 1791 - 29 March 1866) was a prominent Dutch nobleman and statesman in the 19th century. He played an important role as representative of the Amsterdam trade and banking sector, and later as politician. He served as Prime Minister of the Netherlands from 1853 to 1856, and again from 1860 to 1861.

Niels Ockeloen, Victor de Boer, Tobias Kuhn, and Guus Schreiber. Data 2 Documents: Modular and Distributive Content Management in RDF. In *EKAW 2016*. Springer, 2016. Best paper award.

Linked Peer Reviewing Workflows

Based on Nanopublications

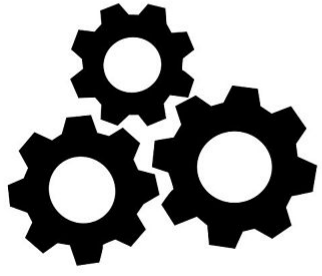


Supported with € 100 000 by industry partners: IOS Press and Sound&Vision

Cristina-Iulia Bucur. Linkflows: Enabling a Web of Linked Semantic Publishing Workflows. In *Proceedings of the PhD Symposion of ESWC 2018*. Springer, 2018.

Findable Accessible Interoperable Reusable

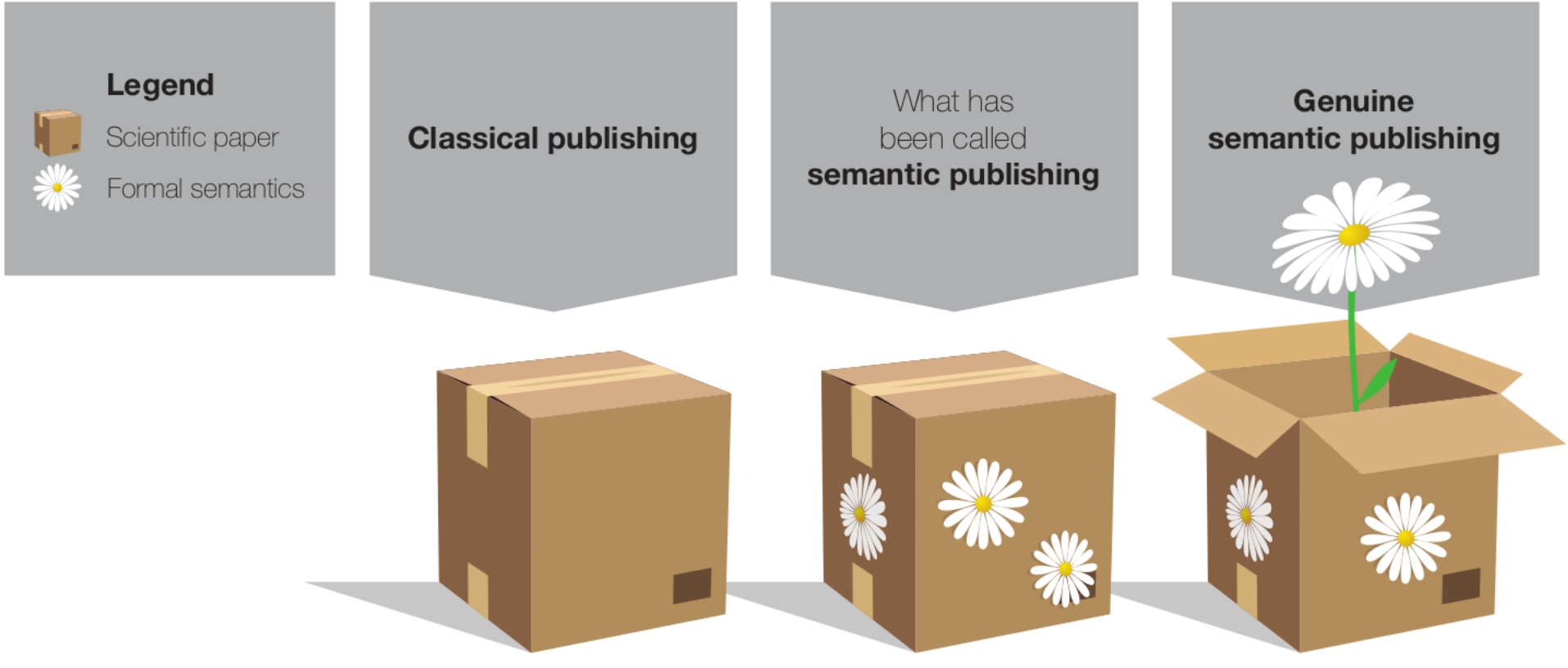




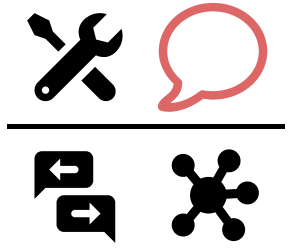

- Adoption by major funders and publishers
- Slogan for my work: FAIR, FAIRer, Nanopublications
- Ongoing work: Applying FAIR to entire scientific workflow

Mark Wilkinson, Michel Dumontier, ..., Tobias Kuhn, ..., Barend Mons. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, 3:16001, 2016. 1094 citations.

Vision for Future Work:
Genuine Semantic Publishing



Tobias Kuhn and Michel Dumontier. Genuine semantic publishing. *Data Science*, 1(1-2), 2017.



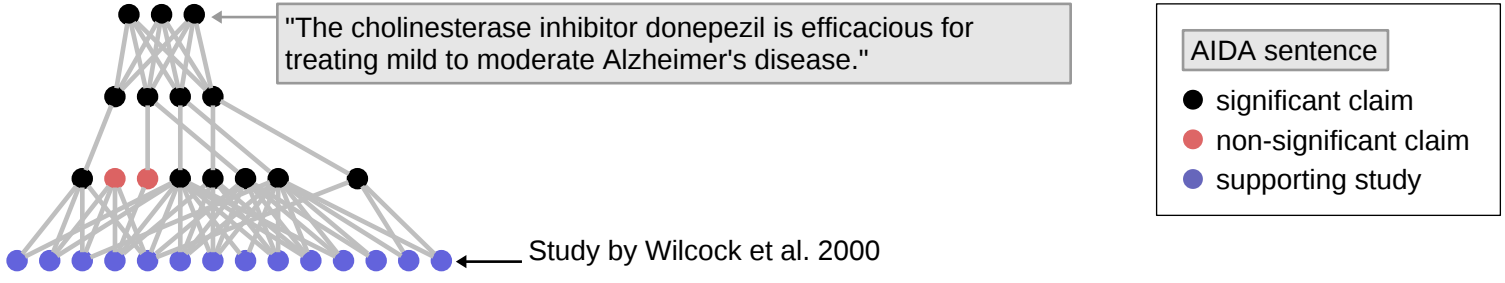
Research Highlights:

Expressive Controlled Natural Languages

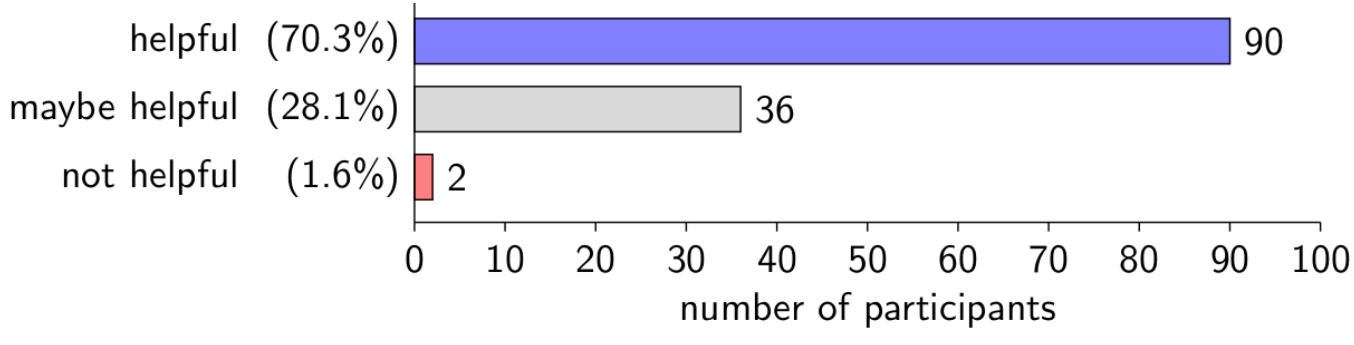
Intuitive languages to communicate complex issues:

- AIDA
- Thing Explainer

AIDA Sentences: Atomic, Independent, Declarative, Absolute



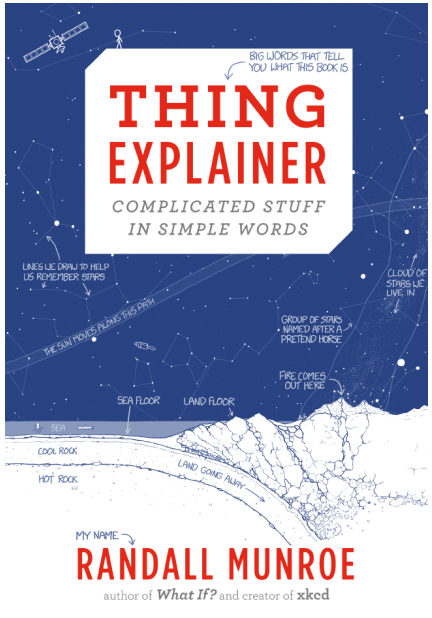
Students found AIDA sentences for papers helpful:

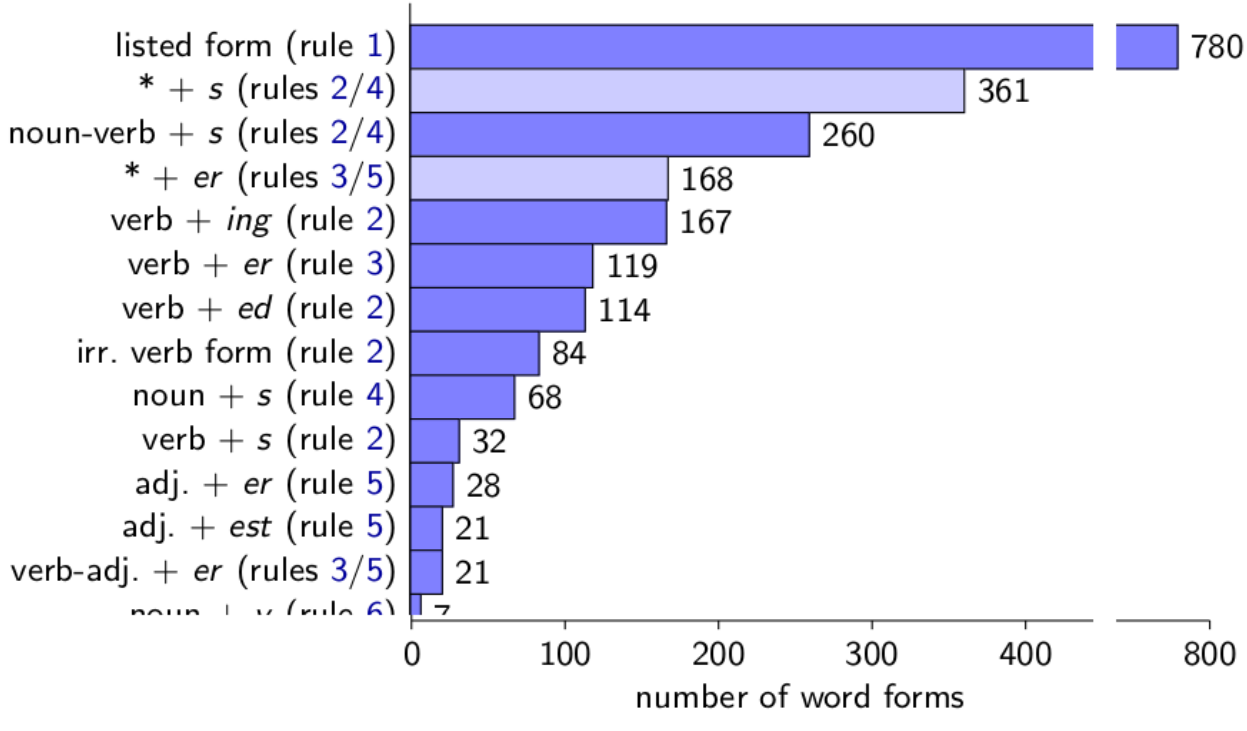


Tobias Kuhn. Using the AIDA Language to Formally Organize Scientific Claims. In *Proceedings of CNL 2018*. IOS Press, 2018. Best paper candidate.

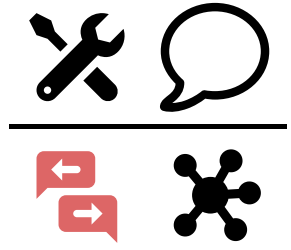
Thing Explainer: Use Only 1000 Most Used English Words

Not quite as simple as advocated:





Tobias Kuhn. The Controlled Natural Language of Randall Munroe's Thing Explainer. In *Proceedings CNL 2016*. Springer, 2016.



Research Highlights:

Controversy and Bias

Analyzing the forces that can disrupt communication:

- CAPOTE Controversy Model
- Bias in International Video News

CAPOTE Controversy Model

$$\text{Controversy} \sim \text{Actors} + \text{Polarization} + \text{Openness} + \text{Time-persistence} + \text{Emotions}$$

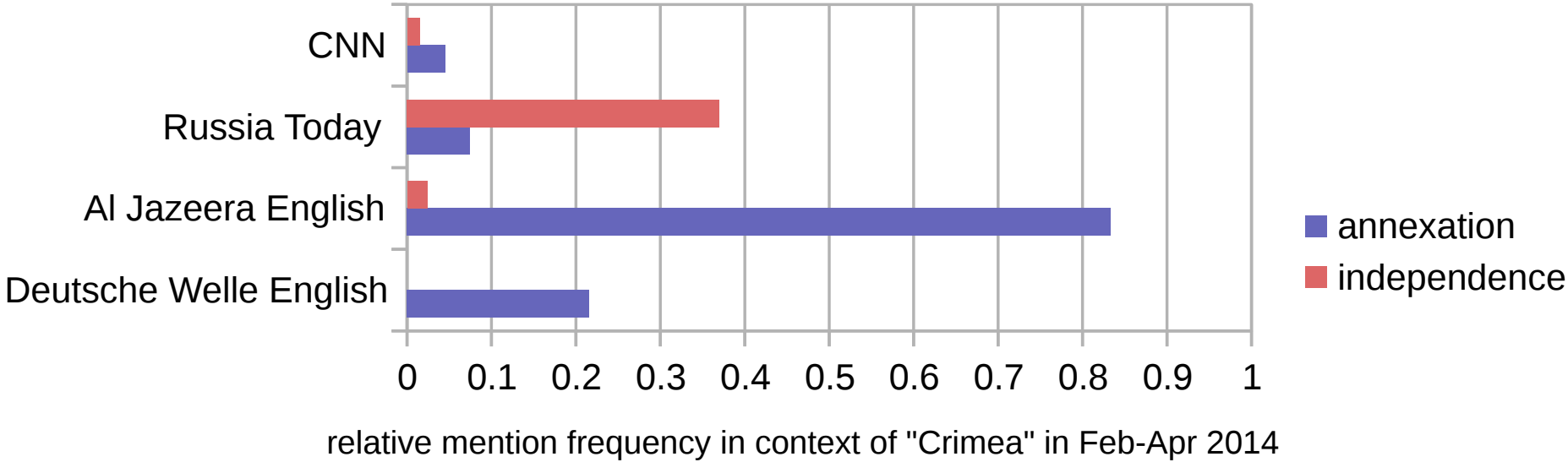
Validated by crowdsourced regression analysis:

ALL 5	(intercept)	Actors	Polarity	Openness	Time	Emotions
coefficient	-0.15386	0.00787	0.30629	0.10345	0.21832	0.47036
p-value	$< 10^{-15}$	0.64	$< 10^{-15}$	$3.1 \cdot 10^{-10}$	$< 10^{-15}$	$< 10^{-15}$
significant	*		*	*	*	*
adjusted R^2	0.5885					

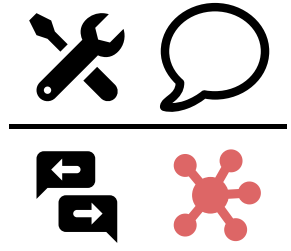
Benjamin Timmermans, Tobias Kuhn, Kaspar Beelen, Lora Aroyo. Computational Controversy. In *Proceedings of Socinfo2017*. Springer, 2017.

Bias in International Video News

Preliminary results:



With Alessandro Bozzon, Antoaneta Dimitrova, Alec Badenoch, Johan Oomen, Jesse de Vos, Honorata Mazepus, Markus de Jong, Panagiotis Mavridis, and Lora Aroyo.
https://capturebias.wordpress.com

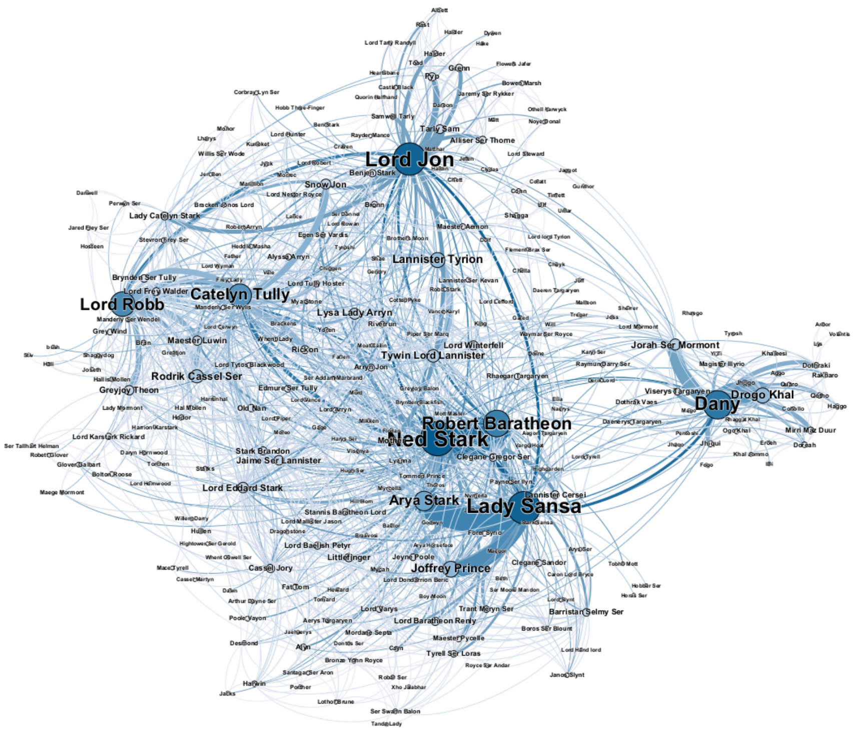


Research Highlights:
Knowledge Networks

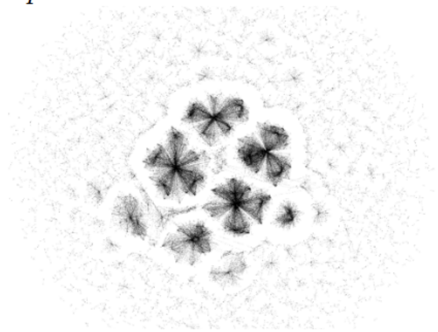
Analyzing the structure of our knowledge:

- Social Networks from Novels
- Linked Open Data Networks

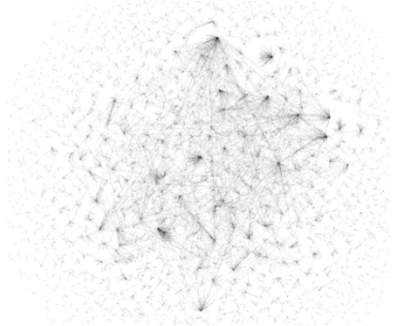
Knowledge Networks: High Diversity but Poor Completeness



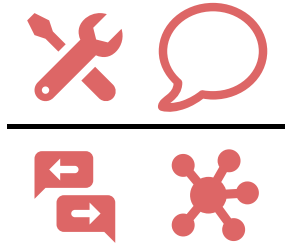
osspr:within



gn:parentCountry



Dekker et al. Evaluating social network extraction .... PeerJ, to appear. Noteworthy article invited for press release by publisher. / Mangaladevi et al. Understanding Knowledge Networks. In *LD4IE 2017*.



Research Summary 2015–now

- 1816 citations
- 18 peer-reviewed articles (8 as first author)
  - 5 journal articles
  - 5 papers at conferences with acceptance rates <35%
  - Leading the collaborations with co-authors from 14 institutions in 7 countries
- best paper award at conference
- "noteworthy article" at journal

Personal Research Grant Proposals (unsuccessful)

NWO (A+/A/B/UF/U scale):

- Vidi 2016: A+, A+, A
- Top Grant (module 2) 2017: A, A
- Vidi 2017: A+, A, A
- Top Grant (module 2) 2018: A+, A, UF

ERC Starting Grant 2016: Very Good (5), Excellent (6), Outstanding (1)

More Research Grants

Successful:

- NWO JEDS: FAIR Workflows (co-PI), with Maastricht and eScience Center, € 437 000
- VU Innovatie AIO: Linkflows (main PI), with IOS Press and Sound&Vision, € 200 000

Unsuccessful (H2020):

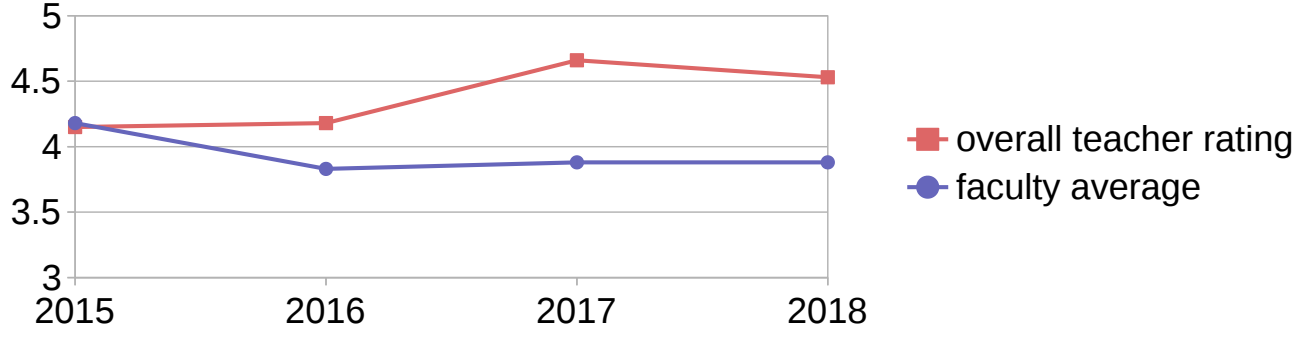
- EINFRA-9-2015: PharmaVRE. Score: 13.0/15.0
- EINFRA-22-2016: NANO. Score: 12.5/15.0
- ICT29-2018: DACORA. Score: 12.5/15.0 (on reserve list)

Education Highlights

- Master course Knowledge and Media
- Bachelor course Information Retrieval
- Master/Bachelor project supervisor of 30 students

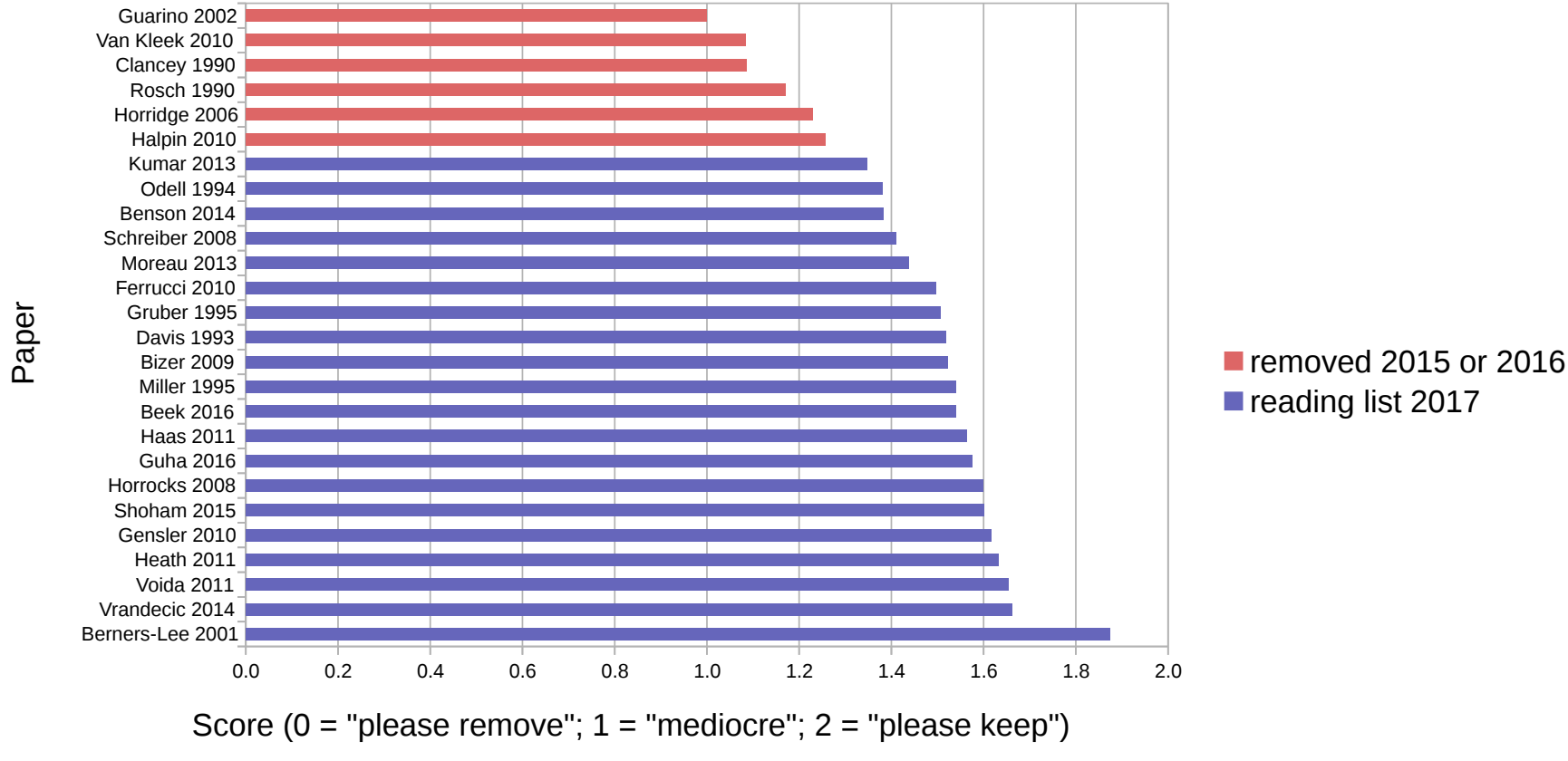
Master course Knowledge and Media

- Complete Redesign of Content and Structure
- Assessment: Flash Presentations, Posters, Overview and Focus Papers
- Good student evaluations



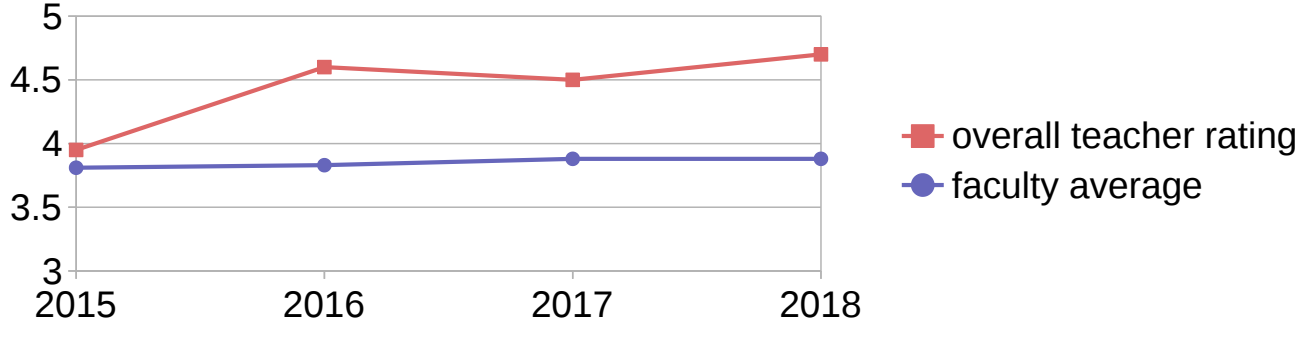
Course Improvement: Student Feedback

I ask students every year about their opinion of the papers on the reading list:



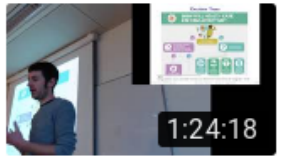
Bachelor Course Information Retrieval

- Based on Classic Textbook by Manning et al.
- Assessment: Six IPython Notebook Based Assignments and Multiple-Choice Exam
- Good student evaluations



Video Recordings: Never Again Without

I started to record all my lectures for both courses.

Video	Visibility	Date	Views
 Information Retrieval course, Lecture 12 Add description	Unlisted	Dec 5, 2018 Uploaded	115
 Information Retrieval course, Lecture 1, pa... Add description	Unlisted	Oct 29, 2018 Uploaded	112

"Were the video recordings helpful?":

- Knowledge and Media: 4.68 / 5.00
- Information Retrieval: 4.95 / 5.00

Master/Bachelor project supervision

- 30 Master/Bachelor students supervised
- All completed successfully
- No major delays (all finished in August the latest)

Management Highlights:
Projects and Group

- Main PI of Capturing Bias Project (NWO VWdata)
- Co-PI of FAIR Workflows Project (NWO JEDS)
- Supervisor of 3 Postdocs and 4 PhD Students
- Independently managed the UCDS group during the transition period in 2018, together with Victor de Boer

Management Highlights:
Department and External

- Master IS Project Coordinator
- Exam Committee Member
- Education Committee Member of BSc/MSc AI
- Editor-in-Chief of Journal Data Science at IOS Press

Thank you for Your Attention!

Questions?