Intellectual property semantic search methods and visualization tools

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&
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Leiden, The Netherlands

This presentation was built around four main points:

- ✓ Show the potential of IP data for the innovation process.
- ✓ Present where the IP domain stands regarding data mining.
- ✓ Show that after some pre-processing IP data can be imported in most open-source visualization tools.
- ✓ Position and calibrate the existing solutions and the possibilities at hand vs. the users' "expectations".

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US008161049B2

(12) **United States Patent**
Williams

(10) **Patent No.: US 8,161,049 B2**
(45) **Date of Patent: *Apr. 17, 2012**

(54) **SYSTEM AND METHOD FOR PATENT EVALUATION USING ARTIFICIAL INTELLIGENCE**

(76) Inventor: **Allan Williams**, Ottawa (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 814 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/915,679**

(22) Filed: **Aug. 11, 2004**

(65) **Prior Publication Data**

US 2006/0036632 A1 Feb. 16, 2006

(51) **Int. Cl.**
G06F 7/00 (2006.01)

(52) **U.S. Cl.** **707/741**; 707/756; 707/930; 706/46; 706/933

(58) **Field of Classification Search** 707/705, 707/930

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,658,370	A *	4/1987	Erman et al.	706/60
5,052,043	A	9/1991	Gaborski	
5,138,377	A	8/1992	Smith	
5,170,443	A	12/1992	Todd	
5,398,300	A	3/1995	Levey	
5,721,910	A *	2/1998	Unger et al.	707/758
5,754,840	A *	5/1998	Rivette et al.	1/1
5,875,284	A *	2/1999	Watanabe et al.	706/2
5,991,751	A *	11/1999	Rivette et al.	707/1
5,999,907	A	12/1999	Donner	
6,029,195	A	2/2000	Harz	
6,038,561	A *	3/2000	Snyder et al.	1/1
6,175,824	B1 *	1/2001	Breitzman et al.	705/36 R
6,452,613	B1	9/2002	Lefebvre	
6,519,599	B1 *	2/2003	Chickering et al.	707/10
6,556,992	B1 *	4/2003	Barney et al.	707/6
6,564,198	B1	5/2003	Narayan	
6,665,656	B1	12/2003	Carter	
6,978,115	B2	12/2005	Whitehurst	

(Continued)

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WO	WO 00/75851	12/2000

OTHER PUBLICATIONS

Duane Hanselman and Bruce Littlefield "Mastering Matlab" Prentice-Hall Inc. 1996, p. 232-286 with cover and table of content.*

(Continued)

Primary Examiner — Vei-Chung Liang
(74) *Attorney, Agent, or Firm* — IP-MEX Inc.; Victoria Donnelly

(57) **ABSTRACT**

A system, method, computer program product, and a web site for evaluating a patent document by using an Artificial Intelligence (AI) have been provided. The patent document is characterized by patent indices arranged into a hierarchy, each index reflecting a different aspect of the patent document. The values of the patent indices are analyzed by an Artificial Intelligence (AI) system, which generates a verbal conclusion regarding the value of the patent document based on the performed analysis. A reason associated with the generated conclusion may also be generated. The AI system is a decision tree based AI system, which is implemented so as to be accessible via a network. The value of the patent document may be additionally visualized by using a color coding of the patent document based on values of its patent indices.

39 Claims, 29 Drawing Sheets

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5,999,907	A	12/1999	Donner	
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6,452,613	B1	9/2002	Lefebvre	
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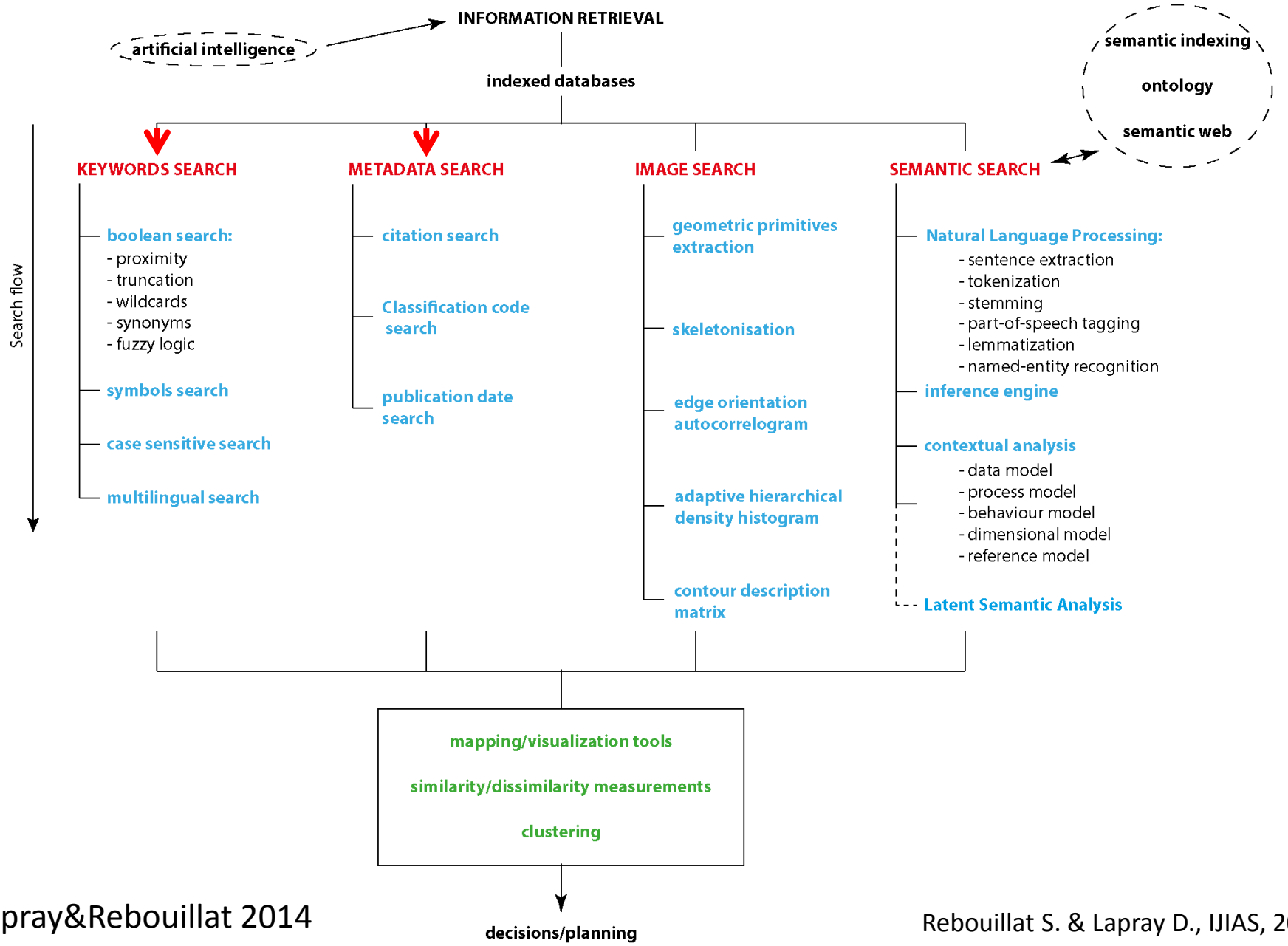
<u>Benefits of patents from a “non-legal standpoint”:</u>

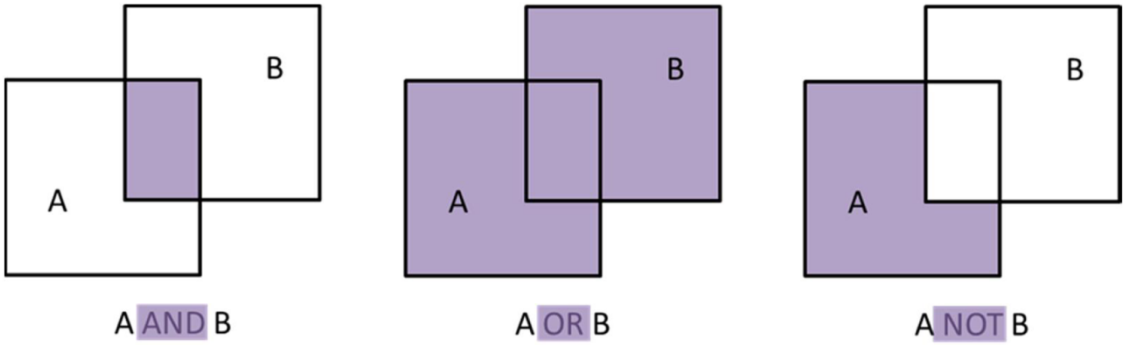
- They describe inventions to facilitate their reproduction in practice;
- They cover material genuinely new and not earlier available to the public;
- The matter of interest is categorized by a classification code, major and additional ones;
- The documentation access is free of charge;
- The patent document appears in a common format; and
- cross-referencing between documents is generally handy;

IP mining: below expectations despite huge potential



Rebouillat S. & Lapray D., IJIAS, 2014

Keyword search: an illusion of simplicity and efficacy



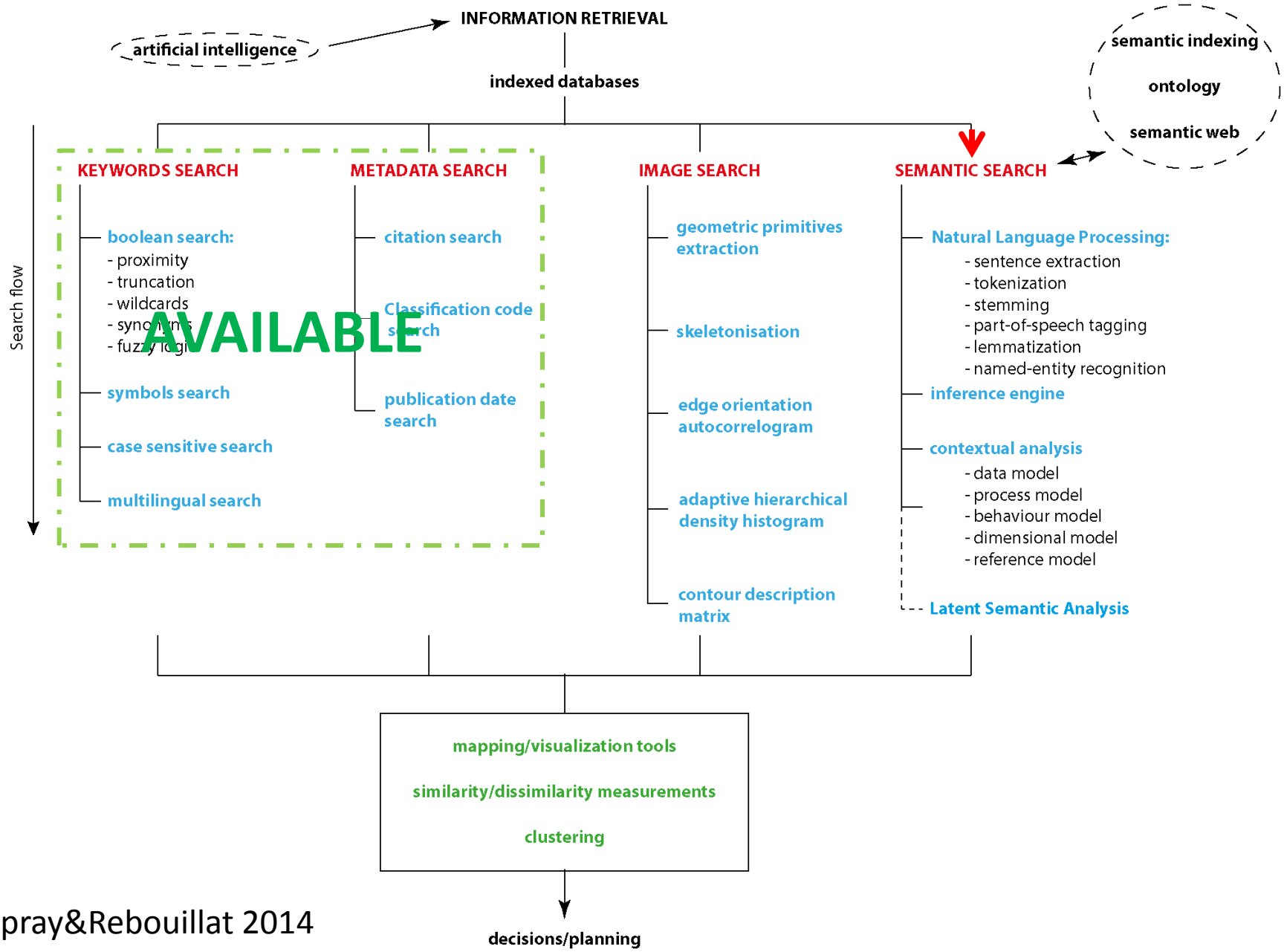
Rebouillat S. & Lapray D., IJIAS, 2014

Query to collect granted patents from the USPTO since 2000 about organic photovoltaic cells:

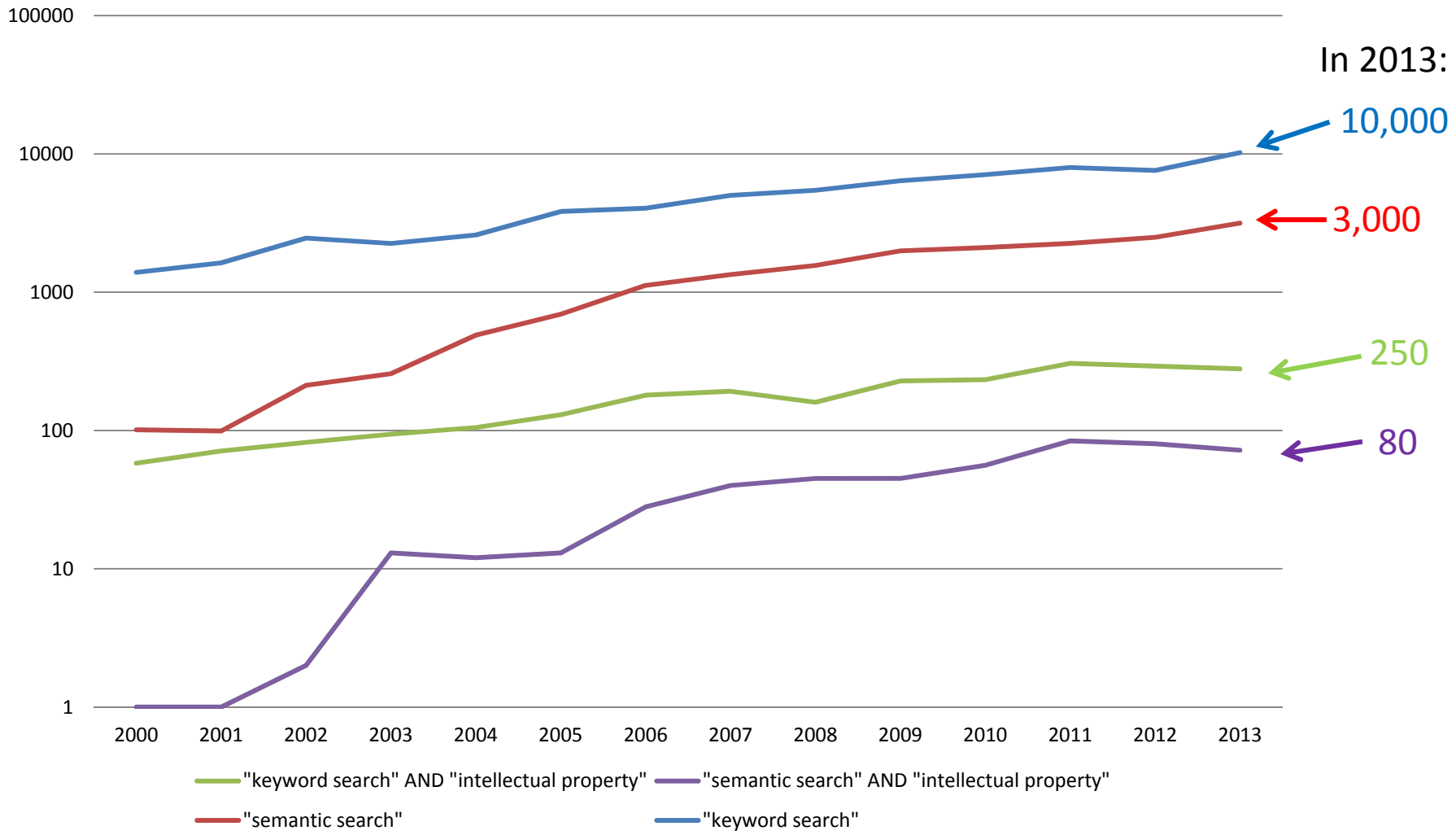
(((((photovoltaic* solar*) adj (cell* batter* device*)) and ((bulk* adjheterojunc*) ppv* phenylenevinylen* tandem* (dye*adj sensitiz*)fluoren* fulleren* PTCBI* PTCDA* PTCDI* H2PC* ZnPc* CuPc*TPyP* TFD* NPD* CBP* PCBM* (conjugat* adjpolymer*))) or(((organic* plastic* polymer* (dye* adj sensitiz*)) adj3 (photovoltaic*solar*) adj (cell* batter* device*))DSSC*))) and (B32B* C07* H01*H05B-033*).IPC.) AND @RD[=20000101\=20101231

Yoon et al., 2012

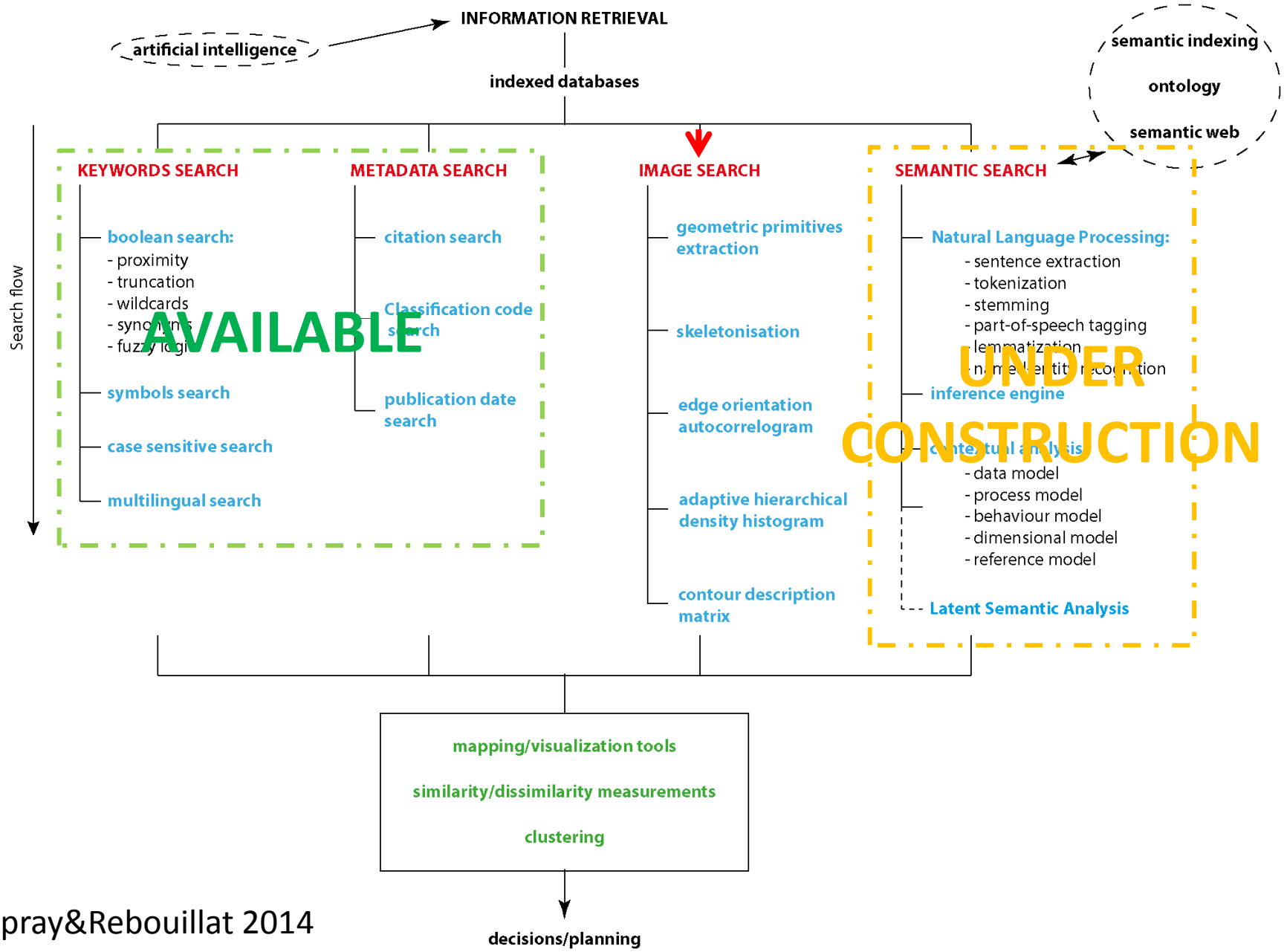
IP mining: below expectations despite huge potential

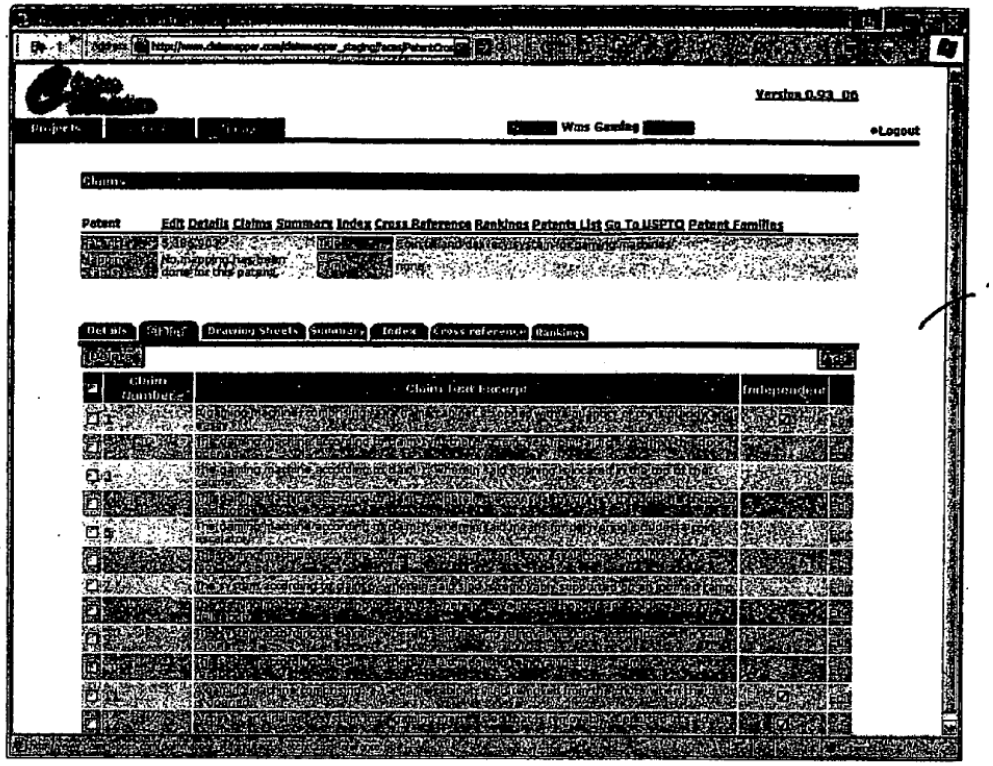


Google Scholar approximate number of publications (excluding patents, Log10 scale)



IP mining: below expectations despite huge potential

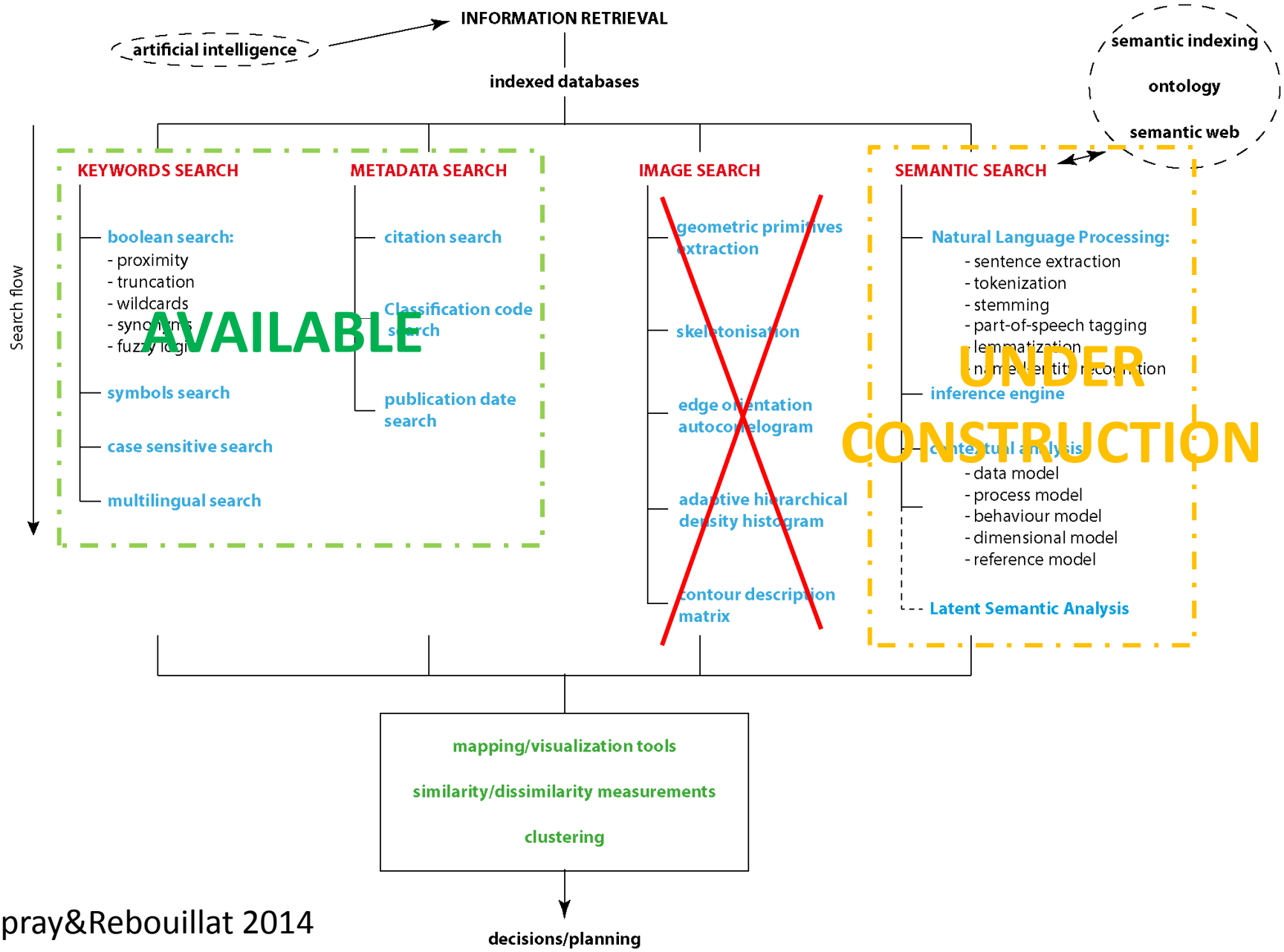




US 2007/0198578 A1

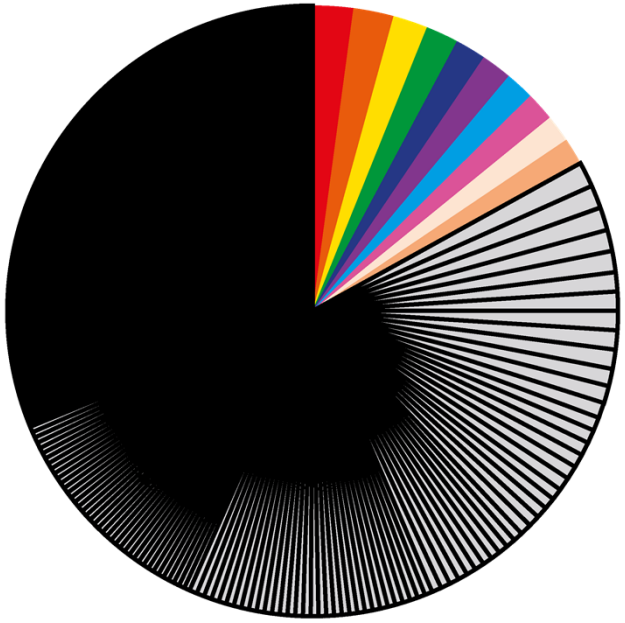
Patents' images issues: very poor overall quality and absence of colours

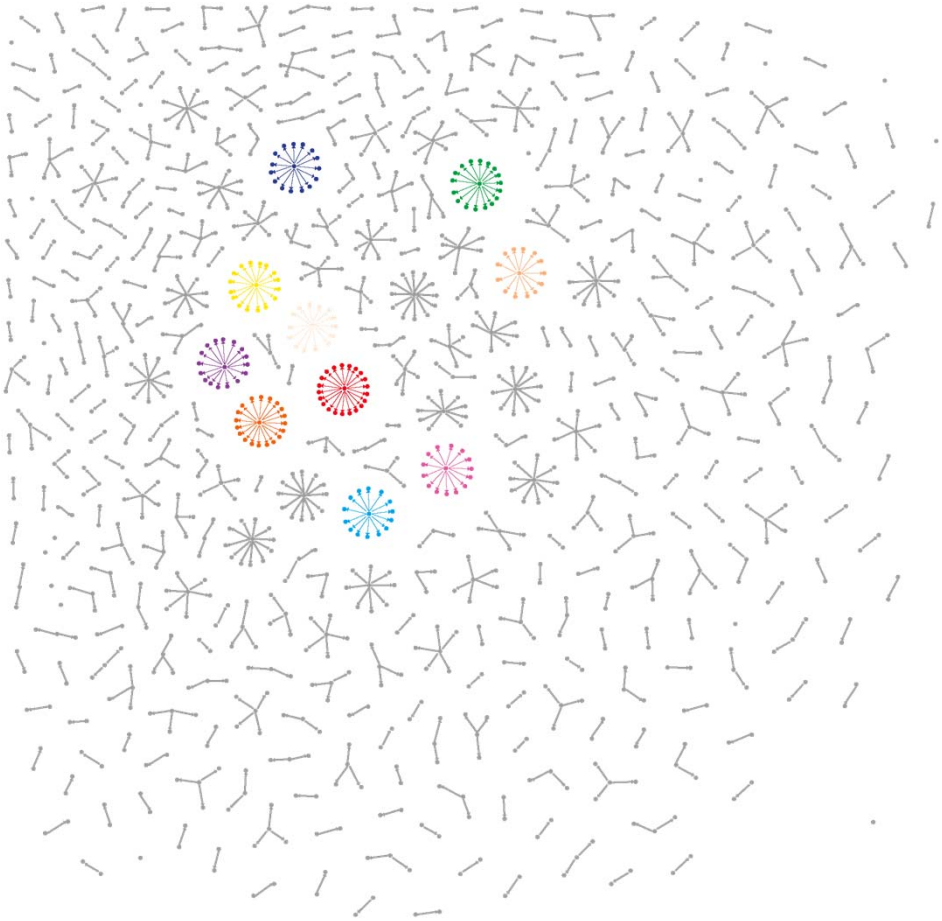
IP mining: below expectations despite huge potential



Visualization tools: combining the best of human-machine cooperation

- Tufts University (21)
- University of Virginia (21)
- Allergan, Inc. (18)
- Cordis Corporation (17)
- University of Texas (16)
- Osteotech, Inc. (16)
- CNRS (15)
- University of Drexel (15)
- Applied NanoStructured Solutions, LLC (14)
- Rice University (14)





Plotted using GUESS from Sci^2 tool

Lapray D. & Rebouillat S., *in press*

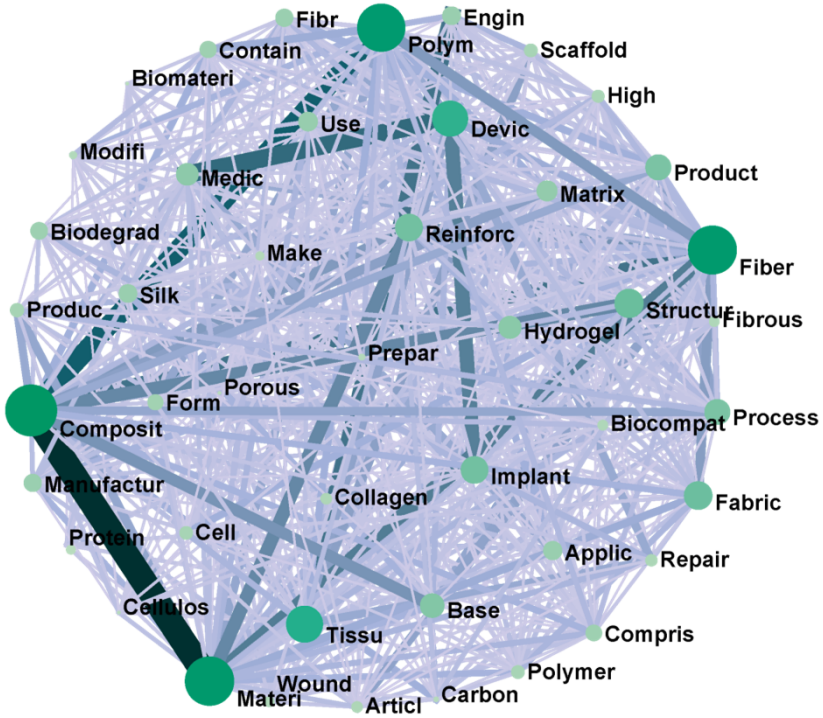
Assignees/number of patents correlation in the field of natural polymers

Visualization tools: combining the best of human-machine cooperation

Patent titles

1	New fibre containing active elements, process for the preparation thereof and their uses, in particular in packaging
2	Fiber-assembled tissue constructs
3	Hybrid nanofibril matrices for use as tissue engineering devices
4	Immunoneutral silk-fiber-based medical devices
	…
999	PVA hydrogel
1000	Methods of bonding or modifying hydrogels using irradiation
1001	Methods of modifying hydrogels using irradiation

Plotted using wordle.net



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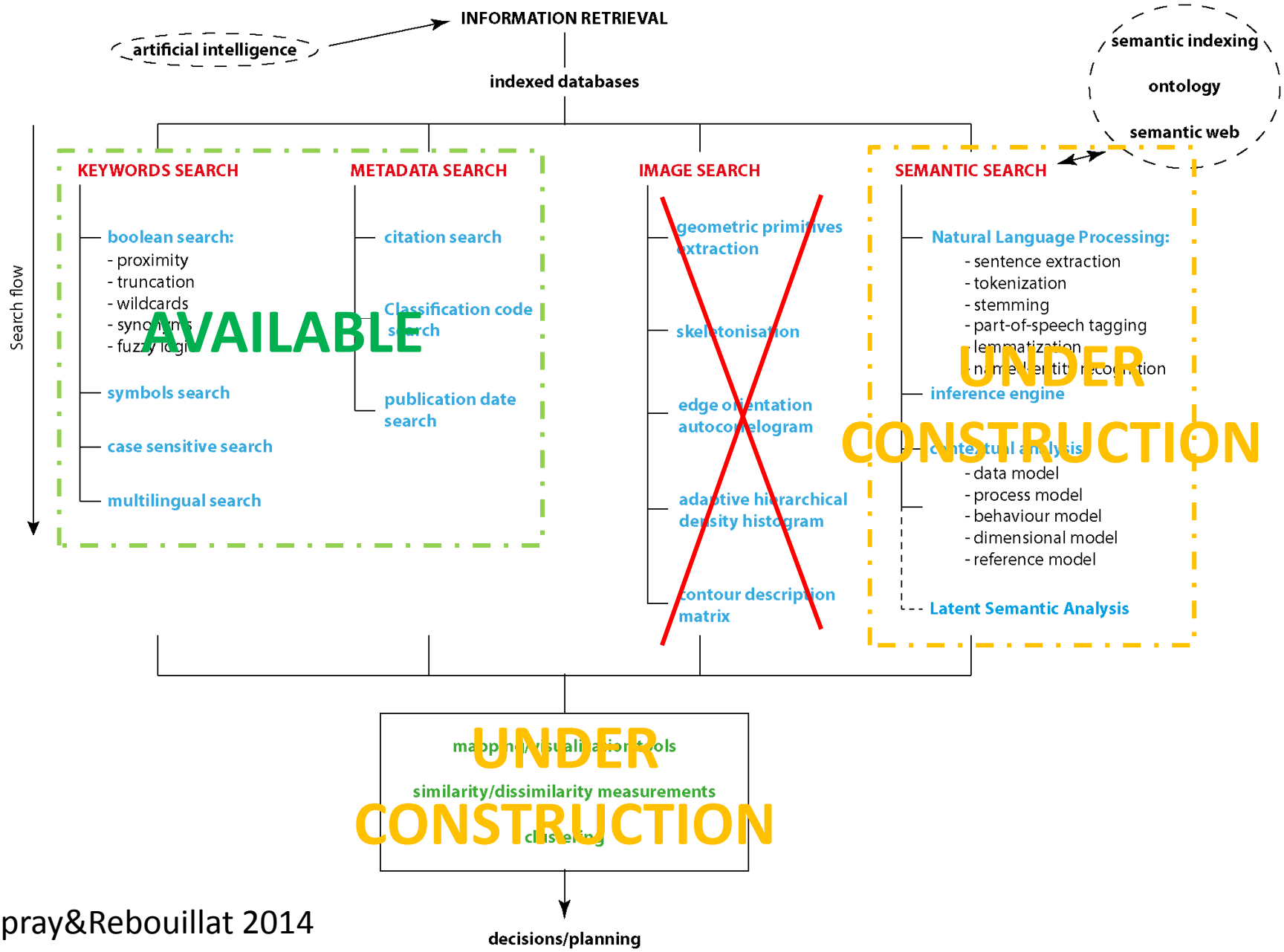
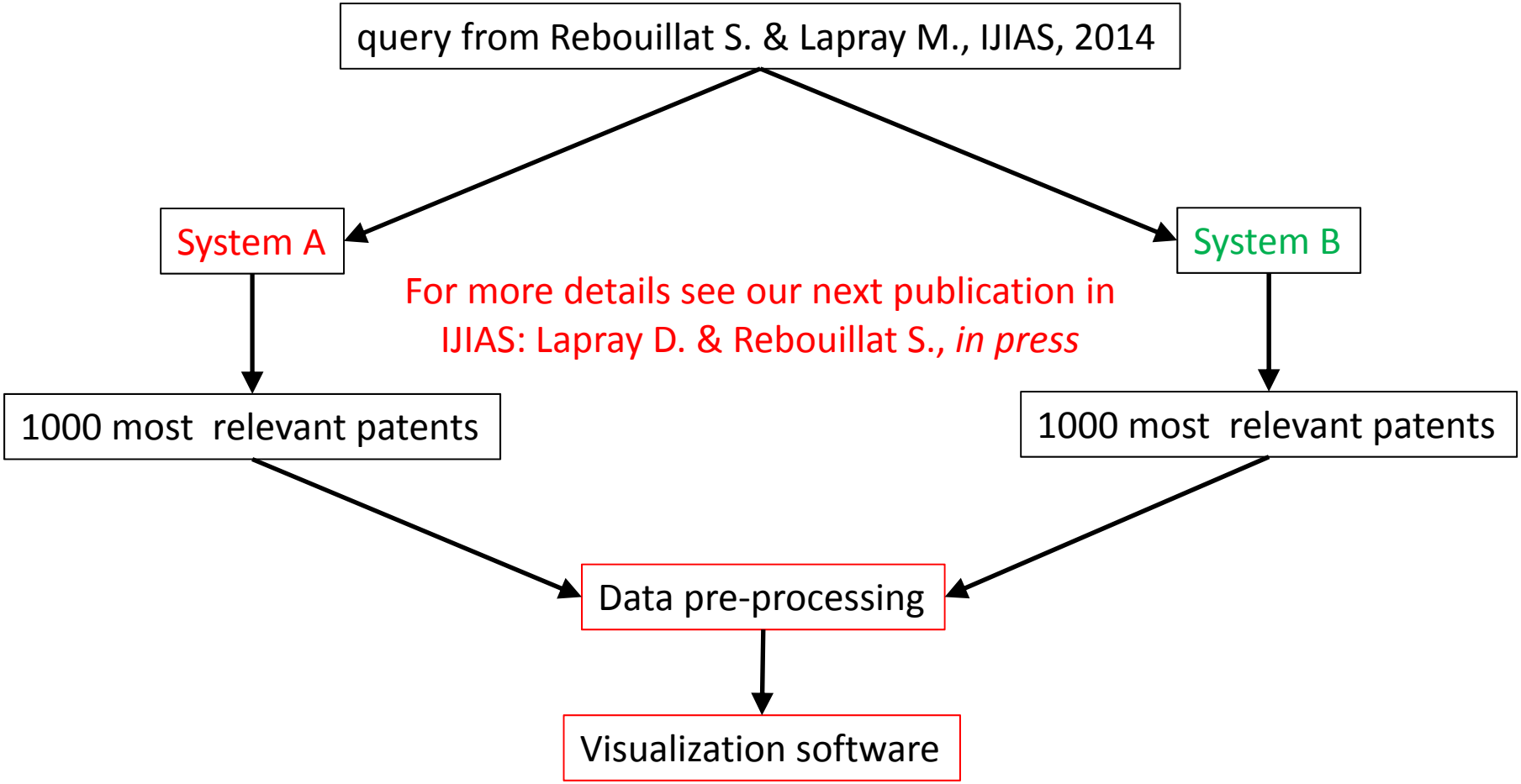
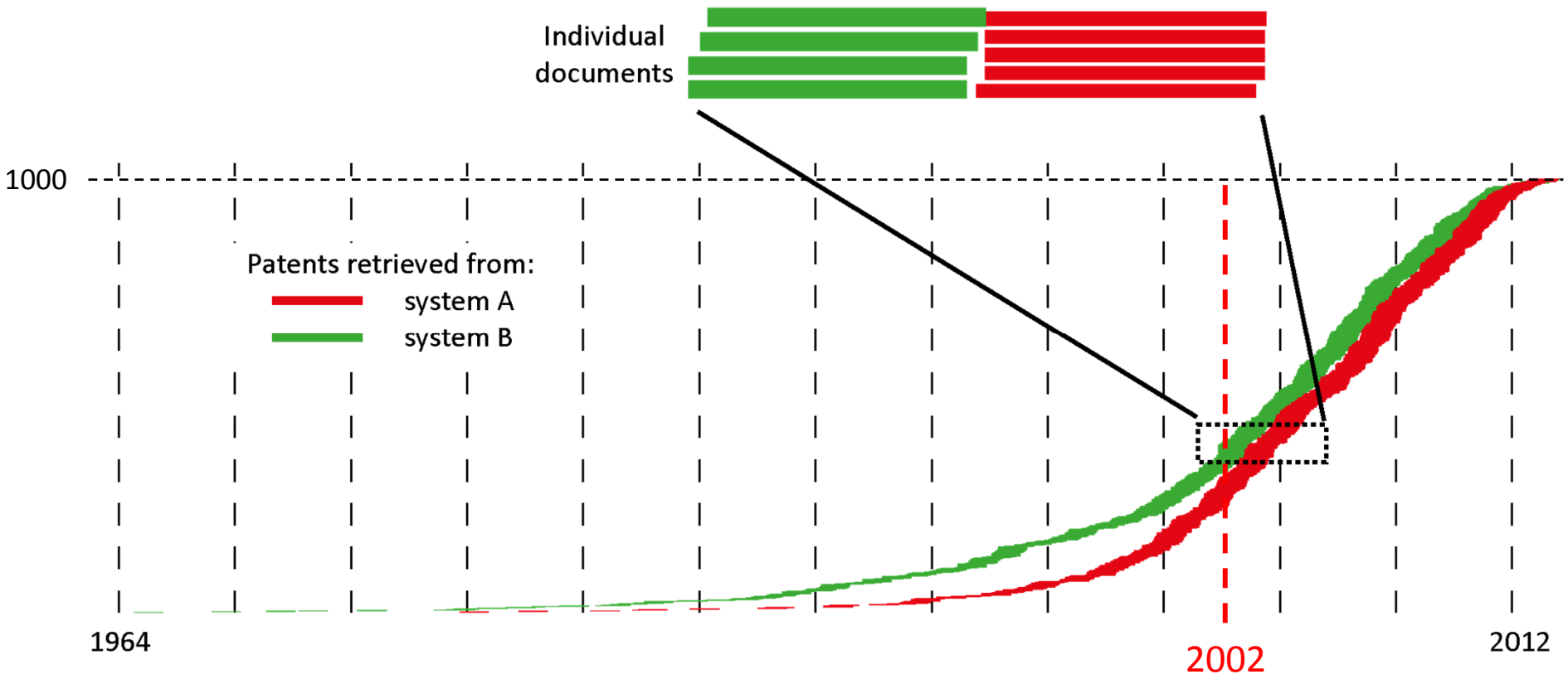


Comparison of two semantic retrieval systems using visualization tools



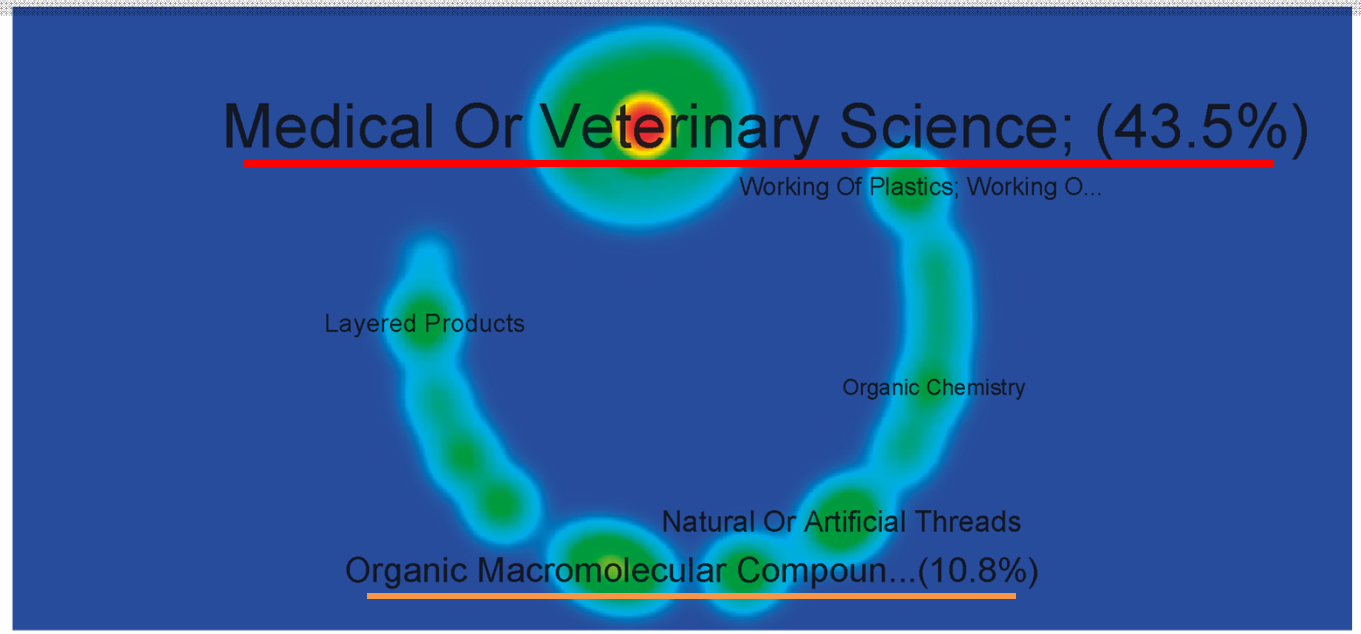


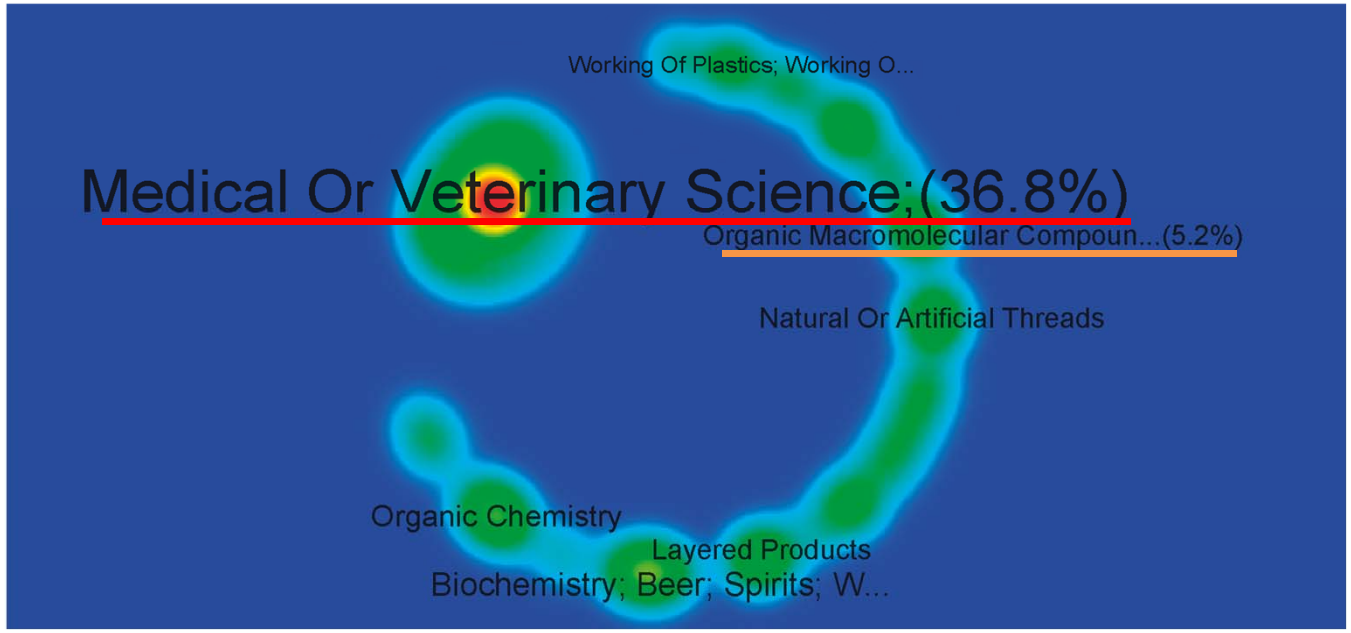
Plotted using Sci² tool

Lapray D. & Rebouillat S., *in press*

Retrieved patents temporal distribution (cumulative graph)

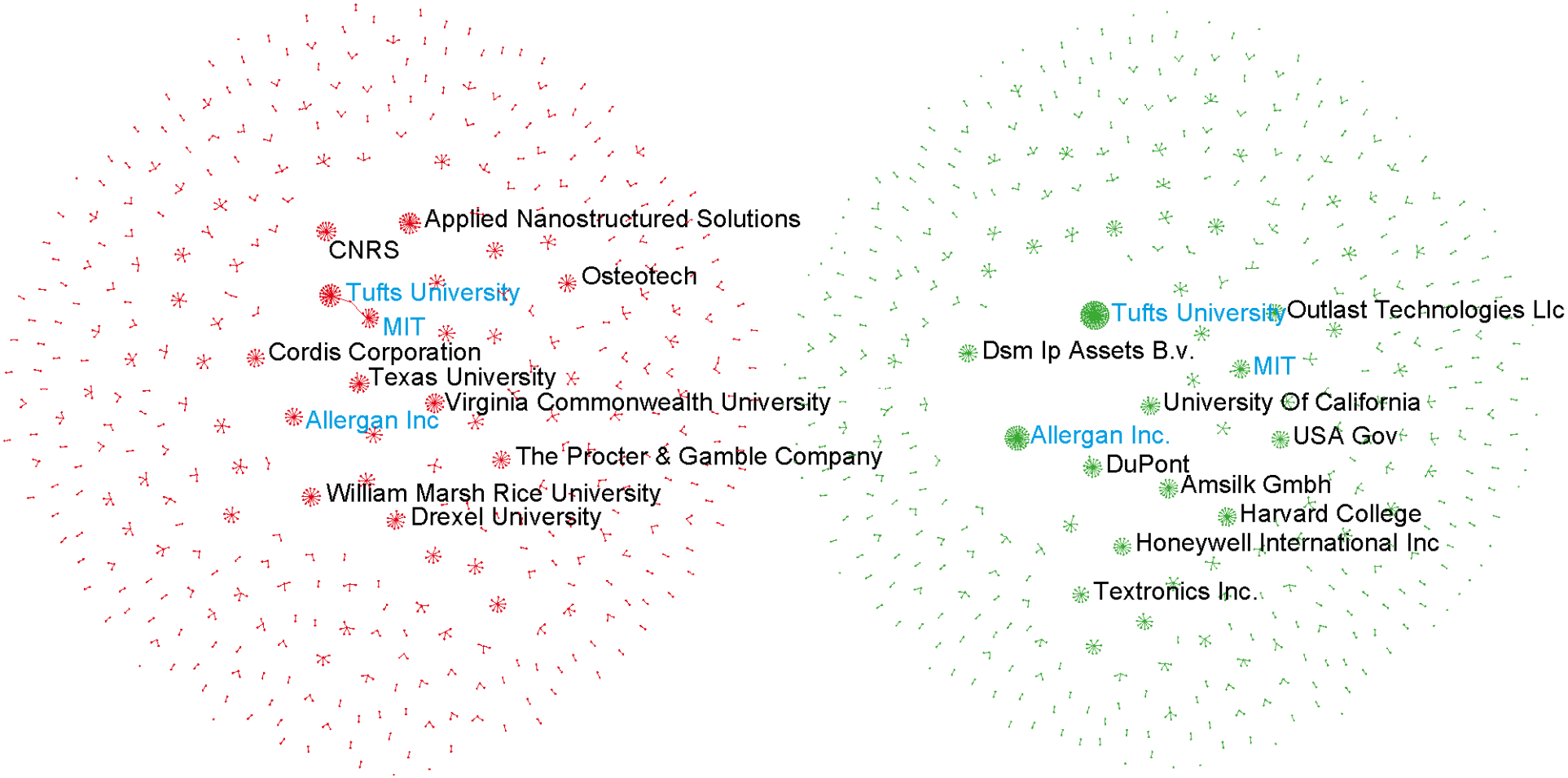
Case studies: Natural polymers (IPC) (inspired by Leydesdorff et al, 2012)





Plotted using Pajek and VOSviewer tool

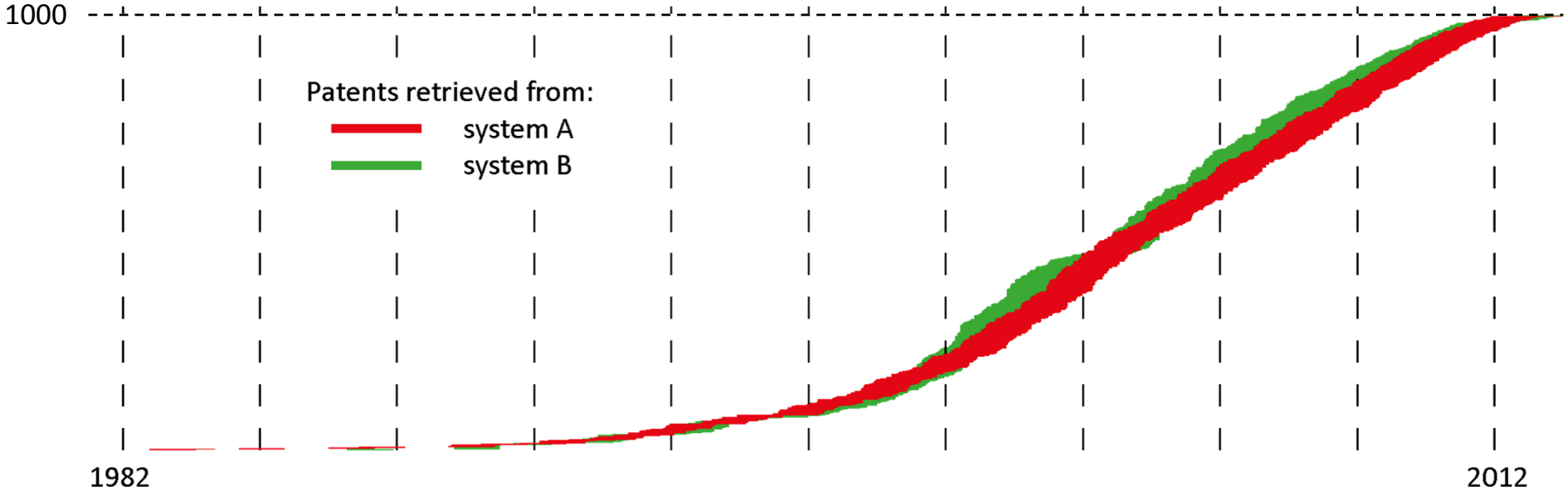
Case studies: Natural polymers (assignees)



Plotted using GUESS from Sci^2 tool

Lapray D. & Rebouillat S., *in press*

Case studies: Pharma (temporal distribution)



Plotted using Sci^2 tool

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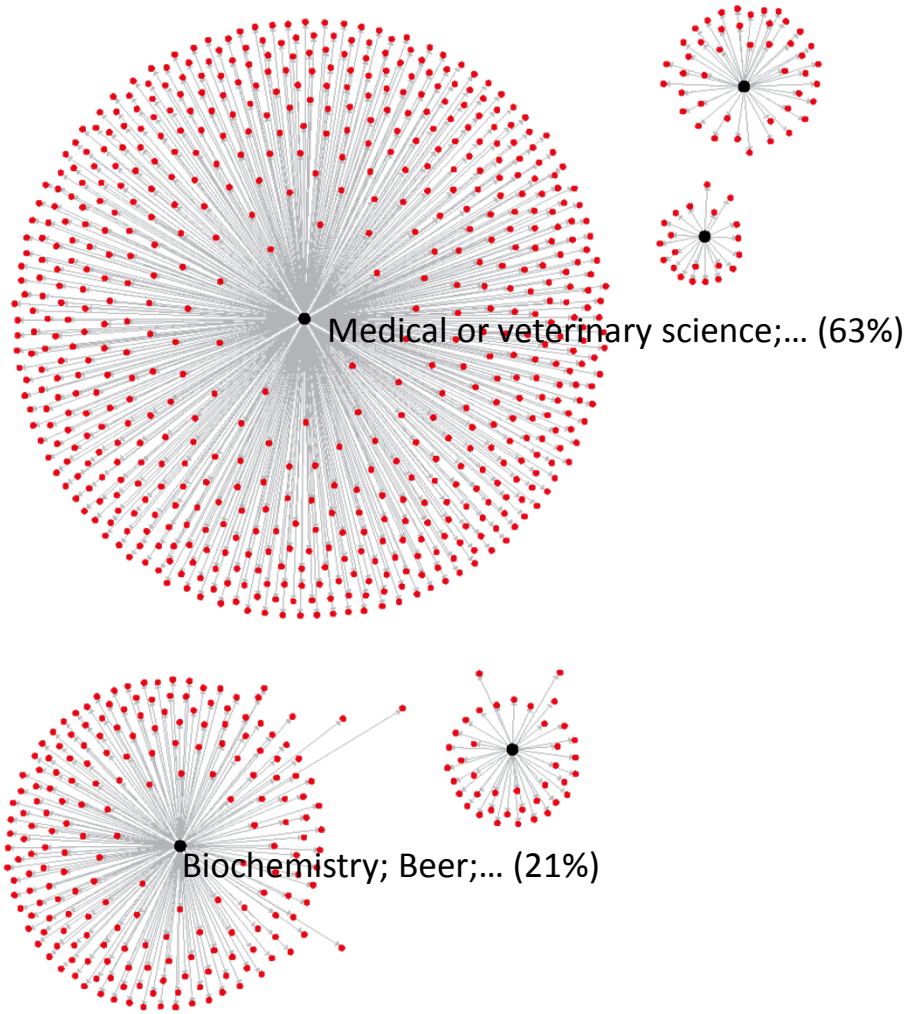
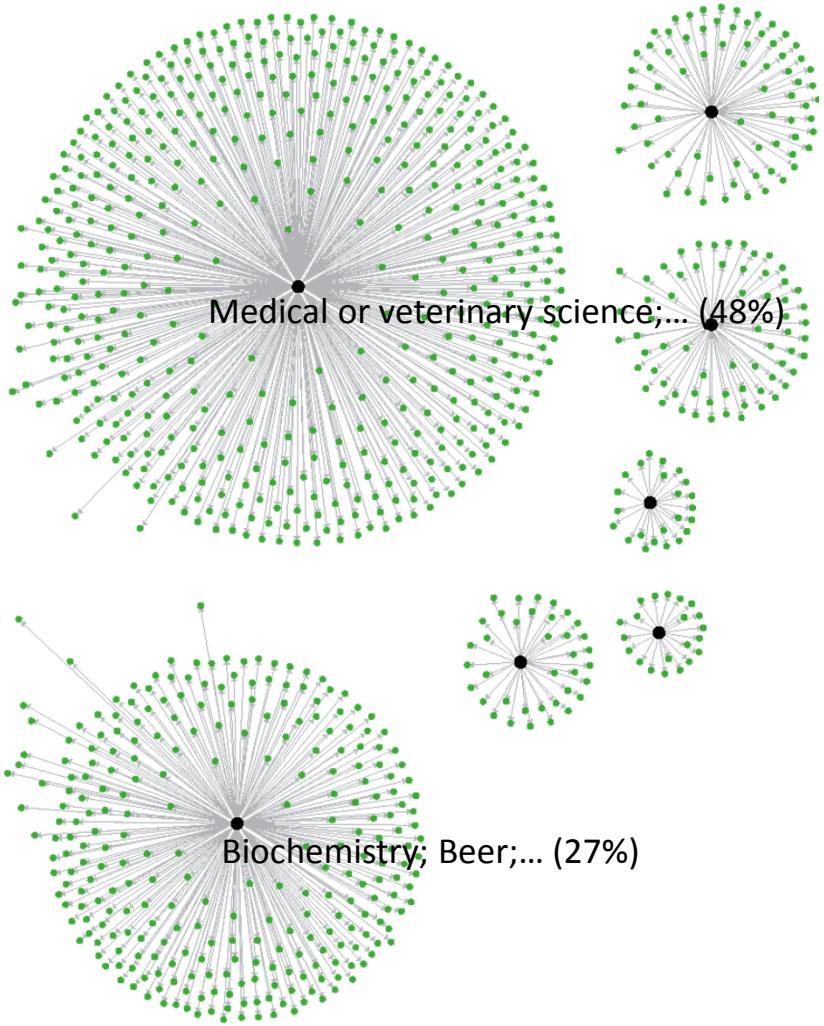
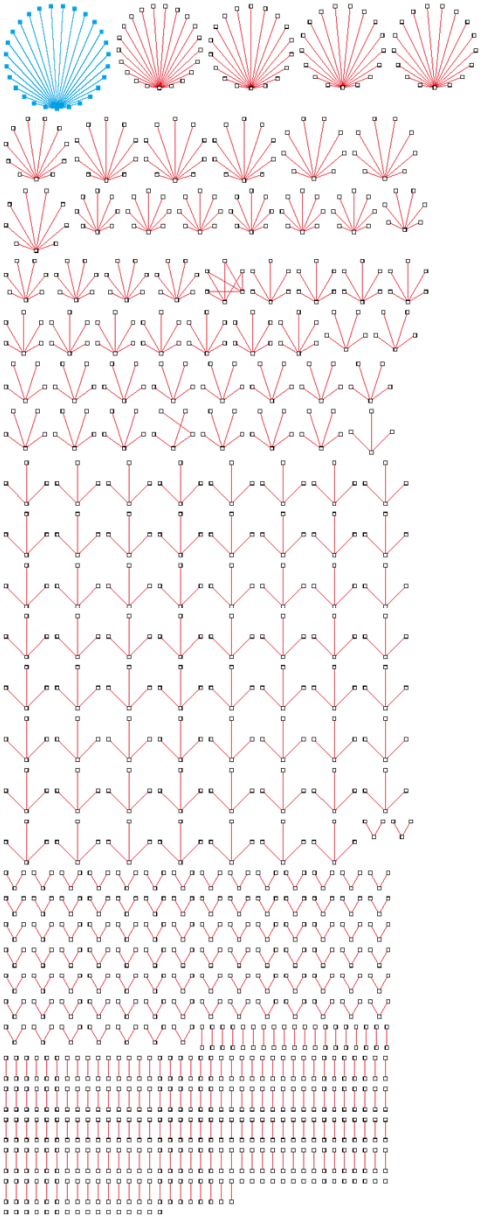
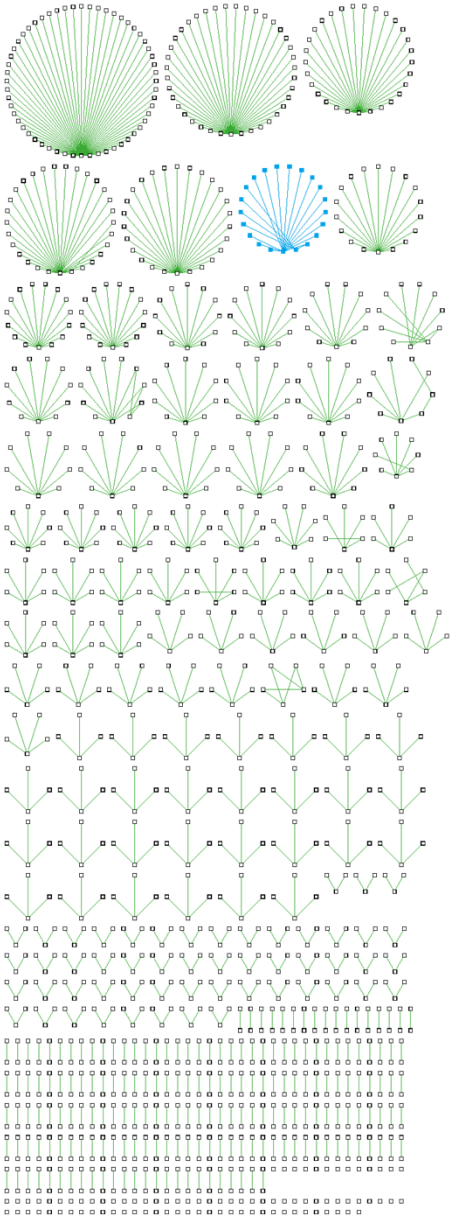




Plotted using Cytoscape

Case studies: Pharma (assignees)





Plotted using Cytoscape

Conclusions