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Reflections on research

Everything you always wanted to know but were afraid to ask….

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Knowledge Media Institute
The Open University
United Kingdom

Objectives for the day

- To share some of the experience gathered in 30+ years of research
- To reflect collaboratively on some of the issues that typically arise when carrying out PhD research
- To offer some practical advice on how to address typical research challenges – epistemological, political, social, etc..
- To have a good discussion!

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Part 1: The epistemology of PhD research

How to construct a sound research narrative for your PhD

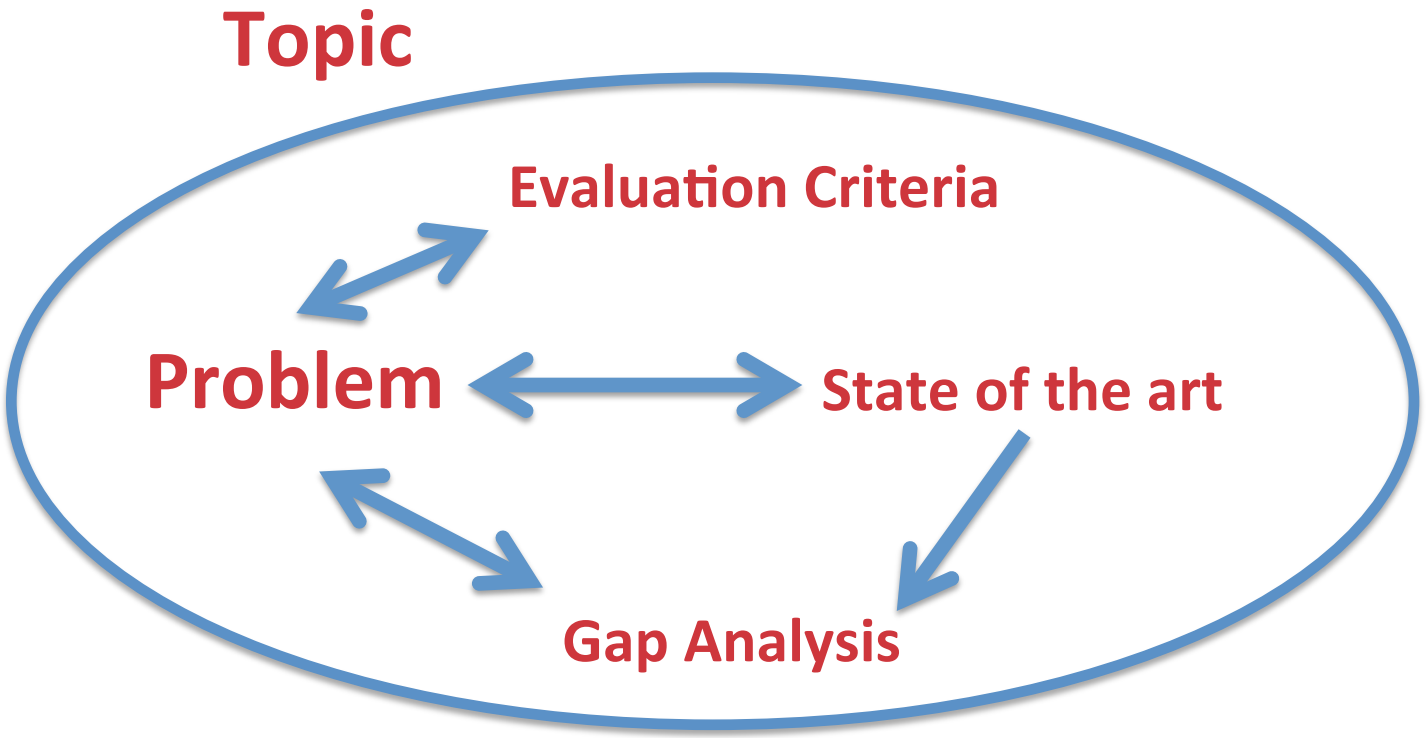
Components of a PhD: Topic

- What is it?
  - a generic research field where the PhD is situated
- Example
  - Semantic Web → Linked Data → Educational Linked Data
- Why is it useful?
  - It provides an overall context for the PhD, which is useful to determine the specific research issue to be tackled, to select events to attend, papers to read, colleagues to approach, etc…
  - In sum, it helps you to situate your PhD within an **academic community**
- What if I don't have it?
  - It depends… is it because you are exploring completely new fields or because you are a bit lost?…
  - No topic → risk increases and PhD may end up being a very lonely activity….missing out on peer interactions, role models, obvious publishing venues, etc…
    - Academic world tends to be rather compartmentalized……

Components of a PhD: Problem(s) to tackle

- What is it?
  - A specific research issue that has not been yet solved and that you attempt to address in your PhD
- Example
  - *Detecting new research trends (e.g., the emergence of new research areas) at a very early stage, before these areas have become established (with conferences, workshops, journals, etc…)*
- Why is it useful?
  - No problem, no PhD….where I come from, you get a PhD for advancing the state of the art in a particular research area…..
- What if I don't have it?
  - It depends…if you are at the beginning of a PhD, you still have time to select one…Otherwise you are in big trouble….unless you do your PhD in a country where a PhD thesis can simply be a collection of various pieces of work….which, let's face it, is rather boring…..

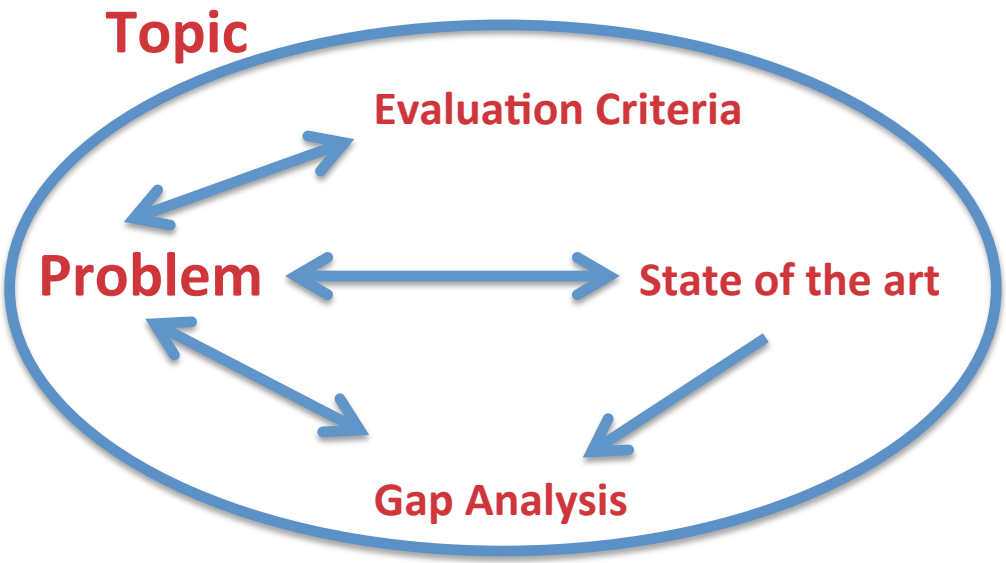
Defining and grounding a problem



Important: You can traverse this graph any way you want! Just traverse it!

I tend to start from the problem and not worry about the start of the art until it is necessary to do so…..but you can also start from the state of the art

Why are you tackling this particular problem?



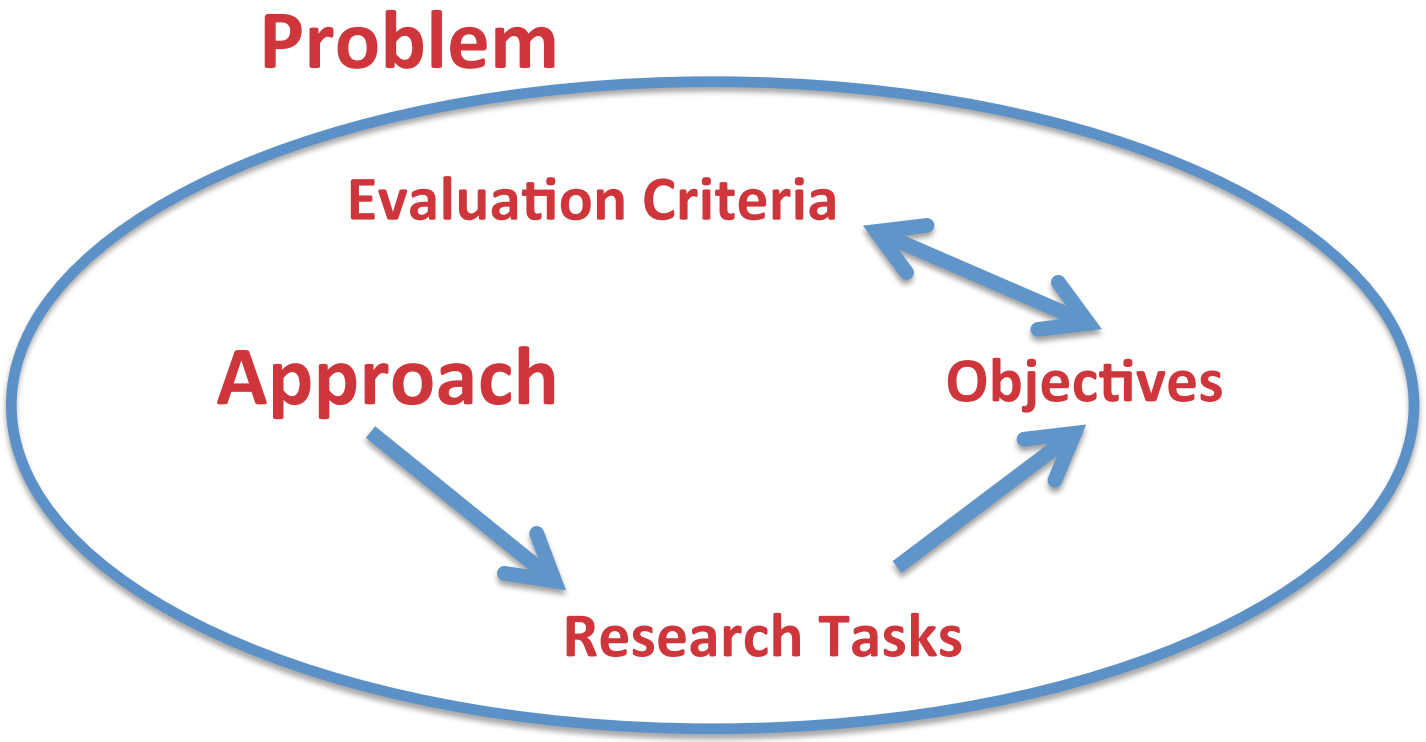
If you have been able to instantiate the topic/problem/approach framework, you are in very good shape….however

Make sure you know why you are tackling this problem!

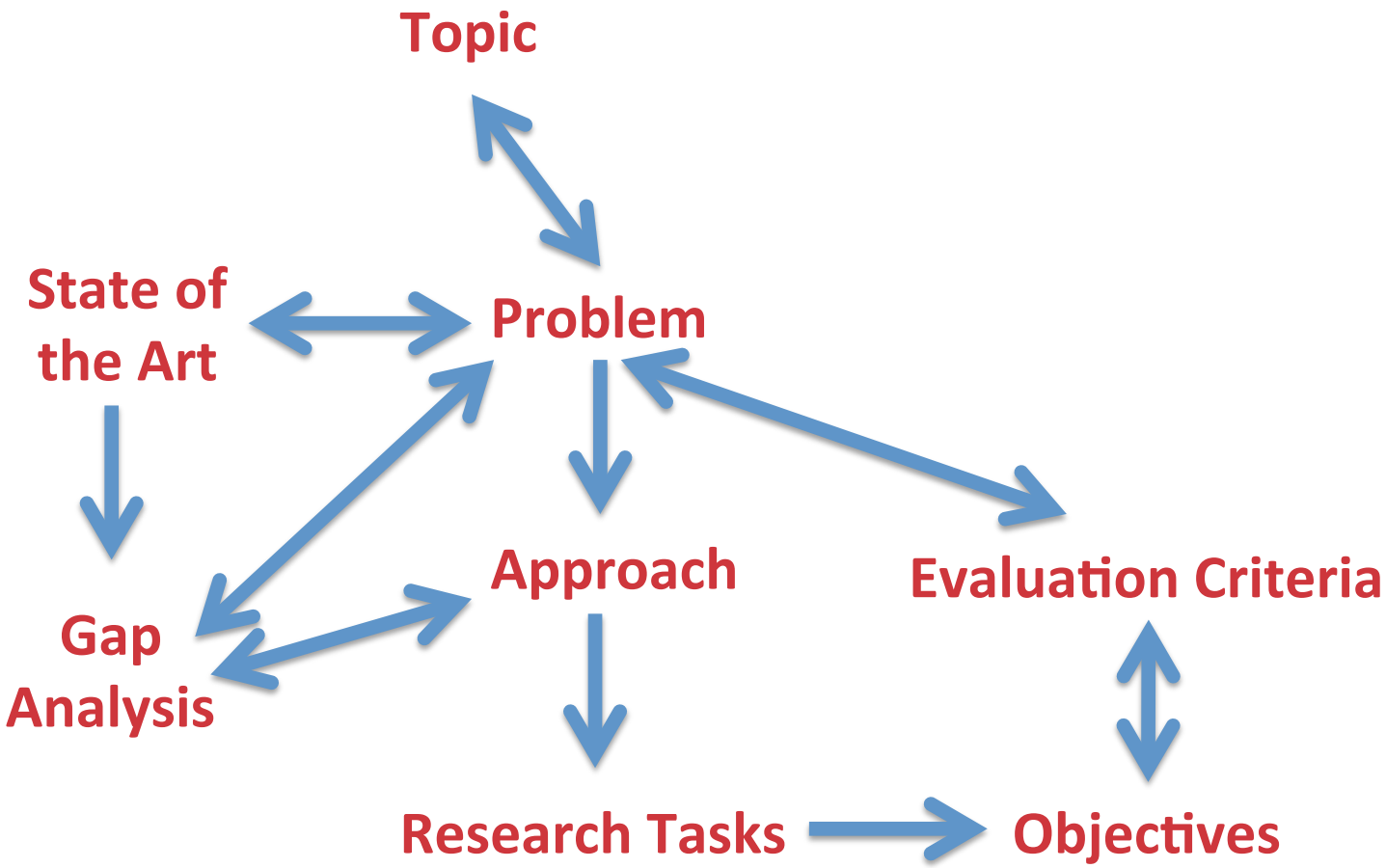
Is this really a significant research problem?

Does anybody care about it? Do you care? Does your supervisor care?...

Objectives, Approach, Evaluation



Components of a research narrative

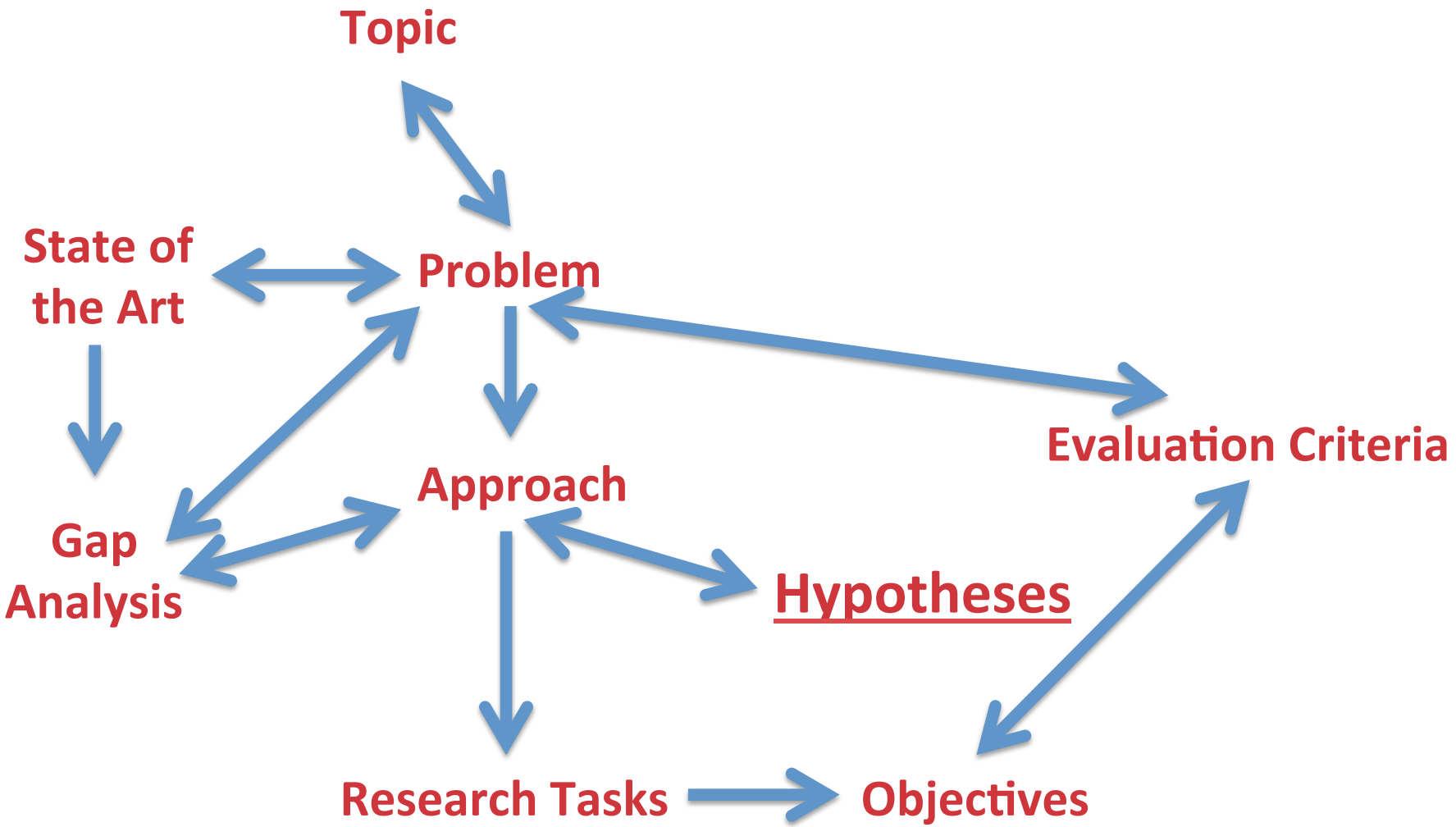


- This is not just sound epistemology, practically it reduces dramatically the risk associated with the PhD.
- Don't be obsessed with the 'big idea', just instantiate this schema.
- Once you build this schema, then PhD is just work.

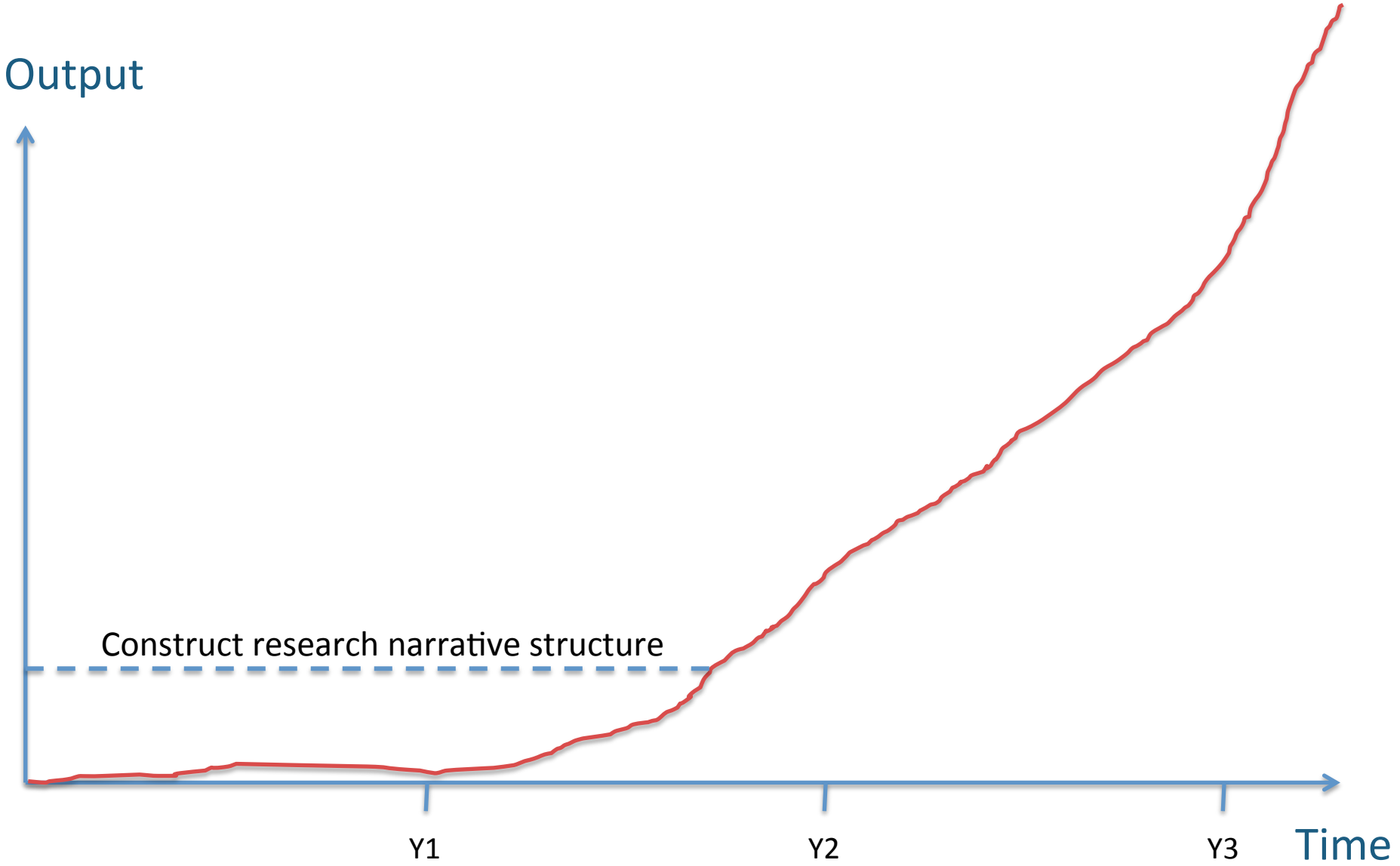
The role of hypotheses

- The PhD on “Early detection and forecasting of research trends” assumes that there are patterns in the way the dynamics of the research landscape evolves and that these patterns can be identified and used to predict the evolution of research
- This is a big, risky assumption
- At the same time, this assumption gives confidence that there is a sound research narrative at the basis of this PhD
- That is, an element of risk is important to provide significance to research, but then of course it is important that the approach is defined in such a way to try and minimise such risk

Components of a research narrative



PhD Graph


Output
Construct research narrative structure
Y1
Y2
Y3
Time

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Part 2: Pragmatics of a PhD

Passion and Ambition

- Doing a PhD requires a lot of hard work. It helps if you are passionate
- Tackle problems that you care about
- But also have ambition!

"No one should be astonished if …….. I bring up the noblest examples. Because, since men almost always walk in the paths beaten by others and ***carry on their affairs by imitating****….. a prudent man will always choose to take paths beaten by great men and to imitate those who have been especially admirable, in order that if his ability does not reach theirs, at least it may offer some suggestion of it; and he will act like prudent archers, who……****take an aim much higher than their mark****, not in order to reach with their arrows so great a height, but to be able, with the aid of so high an aim, to attain their purpose"*

The value of role models

B.J. Wielinga, W. Van de Velde, and A.T. Schreiber.

The Common KADS framework for knowledge modelling

7th Banff Knowledge Acquisition Workshop (Banff, Canada, 1992)

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The CommonKADS Framework for Knowledge Modelling*

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Abstract

In this article we present a framework for modelling reasoning processes in knowledge based systems. The aim of the framework is to integrate different lines of research and in particular, though not exclusively, the KADS approach and the Components of Expertise framework. We are especially concerned with enhanced facilities for domain modelling and with the notion of problem solving method. The resulting modelling framework, called the CommonKADS modelling framework, fits into a comprehensive methodology, called CommonKADS, that intends to cover all aspects of knowledge based applications. In this article we first present a set of principles on which our modelling framework in founded. We then describe the modelling framework itself, illustrating it with an example.

1 Introduction

There is little doubt about what expert systems do: they solve problems. However, what problem solving is, how we should describe it and whether there exists any systematicity in expert problem solving are questions that are still very much open. Finding the answers

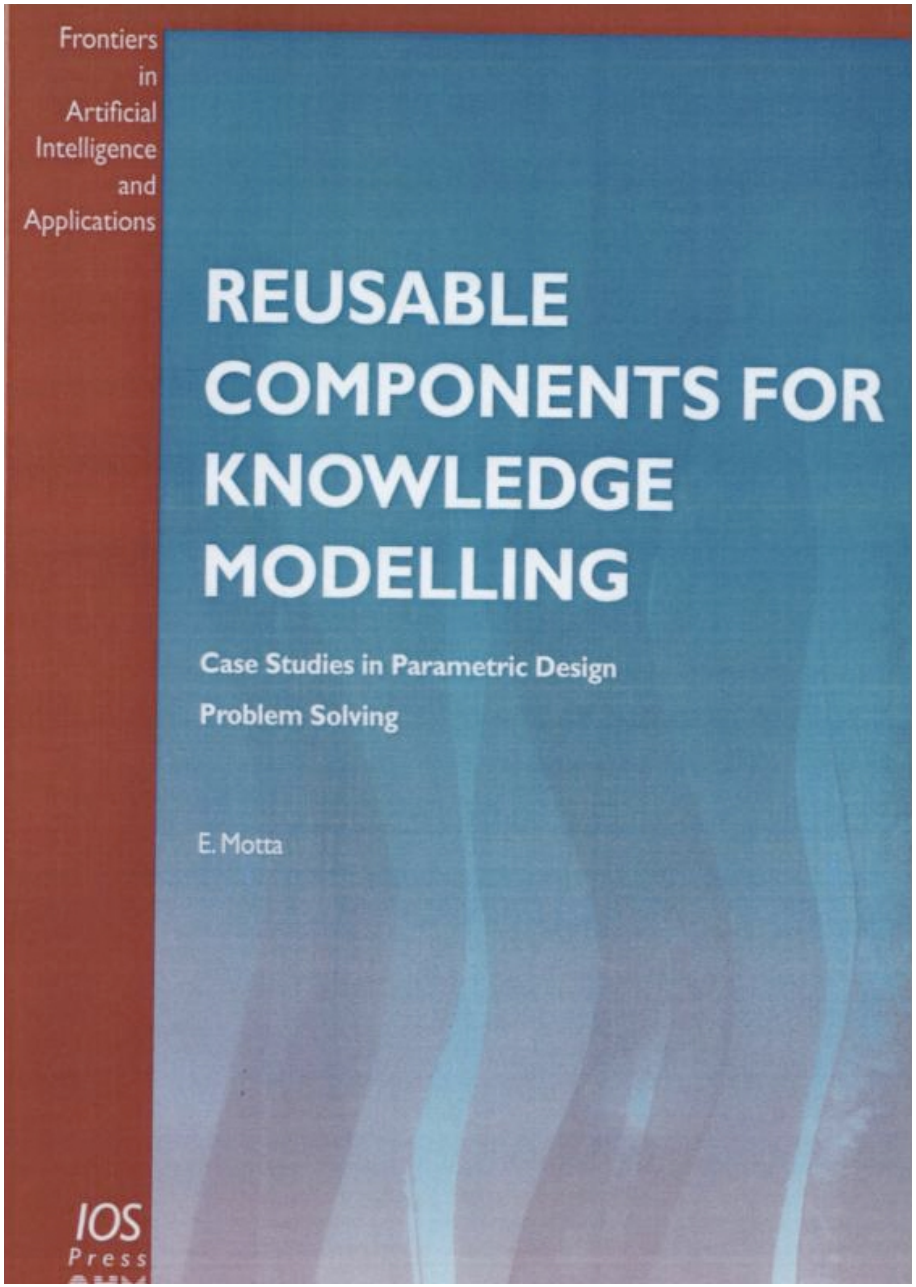
*The research reported here was carried out in the course of the KADS-II project. This project is partially funded by the ESPRIT Programme of the Commission of the European Communities as project number 5248. The partners in this project are Cap Gemini Innovation (F), Cap Gemini Logic (S), Netherlands Energy Research Foundation ECN (NL), ENTEL SA (ESP), IBM France (F), Lloyd's Register (UK), Swedisch Institute of Computer Science (S), Siemens AG (D), Touche Ross MC (UK), University of Amsterdam (NL) and Free University of Brussels (B).

This paper reflects the opinions of the authors and not necessarily those of the the consortium.

Enrico Motta

Reusable Components for Knowledge Modelling

IOS Press
1998



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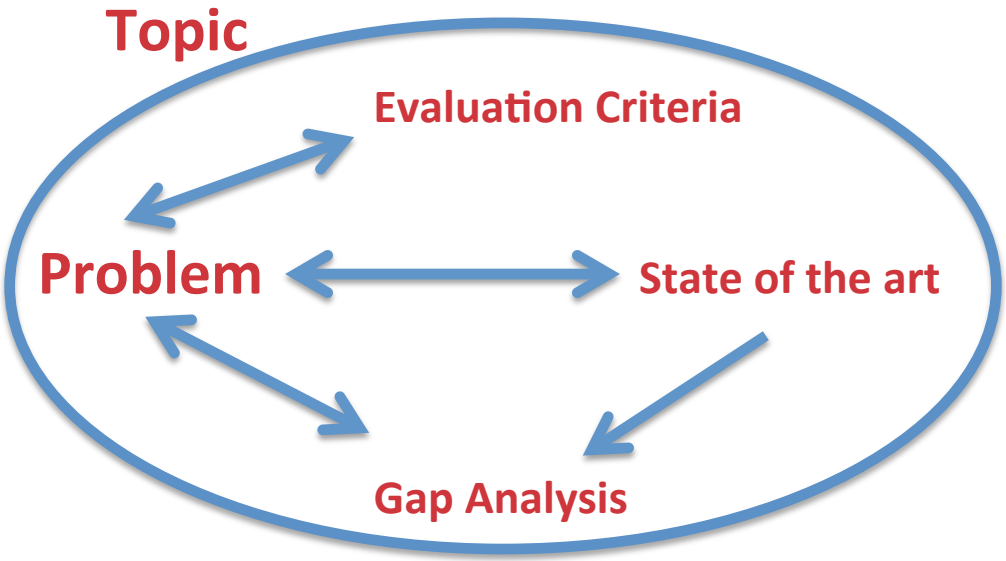
Self-belief is also crucial…



Earlier I emphasised the importance of being grounded in a research community, identify a problem and ground it in the state of the art…..This is all very important but…..

- **Do not spend your time worrying about what other people are doing!**
- **It is normal that you may not be the only one working on a particular issue. Do not ignore the literature but do not feel that you have to change trajectory because other people may get results before you. Each PhD is different!**

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    - bG - Semantic Web Technology
      - bG - Semantic Web Rule Language
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      - cT - Semantic Search
      - cT - Semantic Metadata
      - cT - Social Web
      - cT - Linked Open Data
    - bG - Semantic Web Service +
    - bG - Semantic Annotation -
      - bG - Semantic Metadata
      - bG - Semantic Wiki

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Semantic Web

- Publications: 22 143
- Citations: 120 704

- Plot authors and publications
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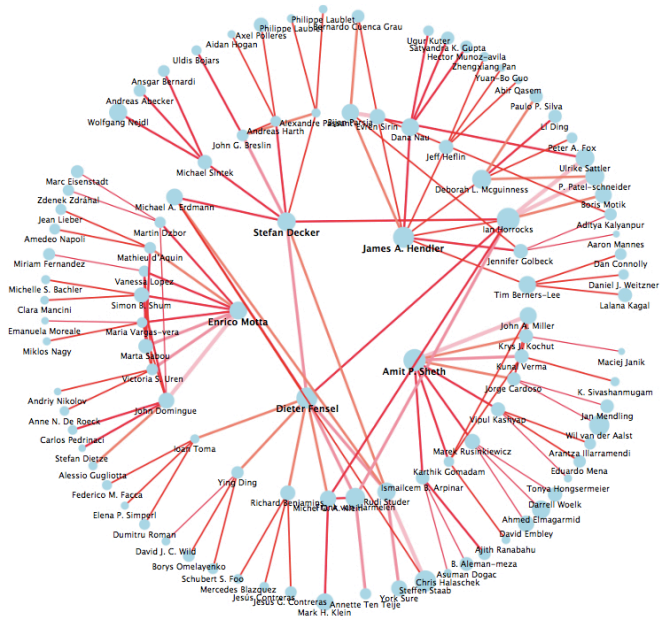
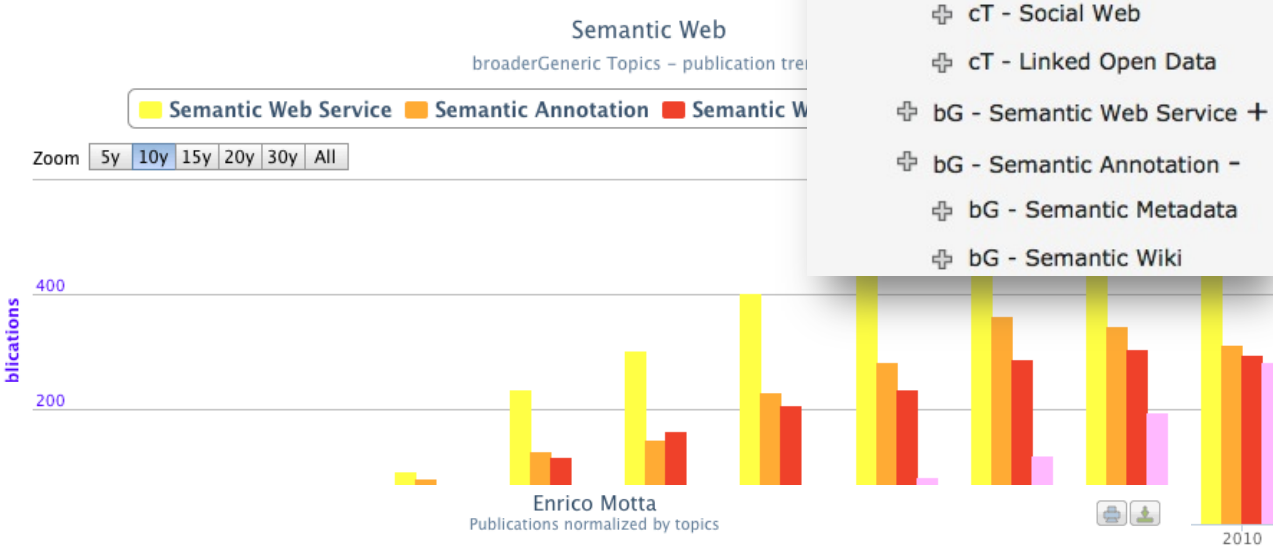
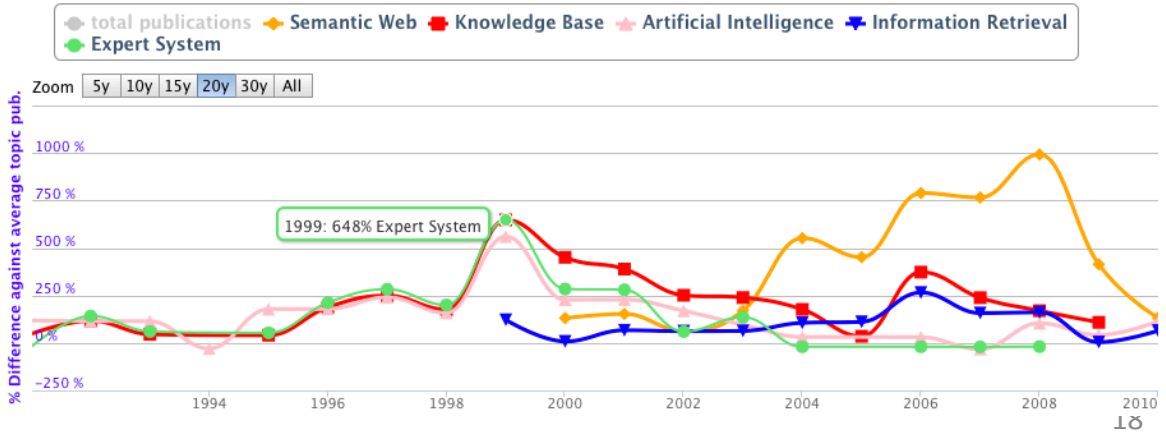
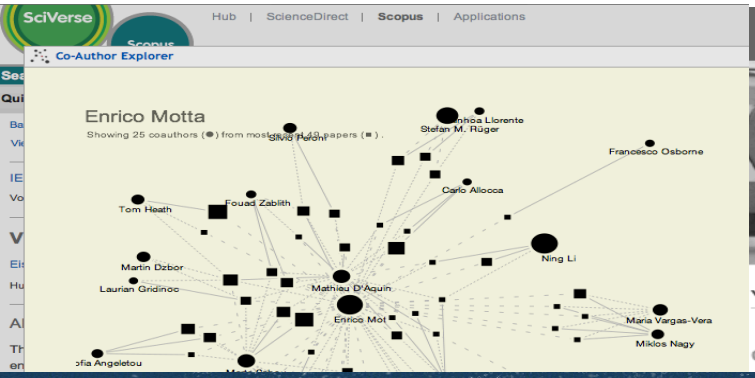
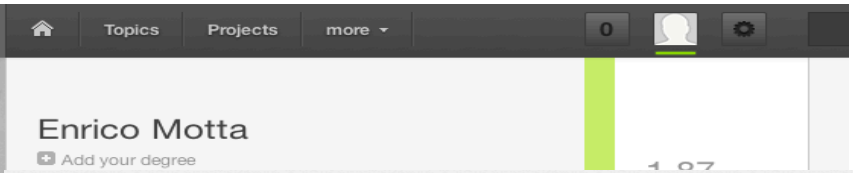


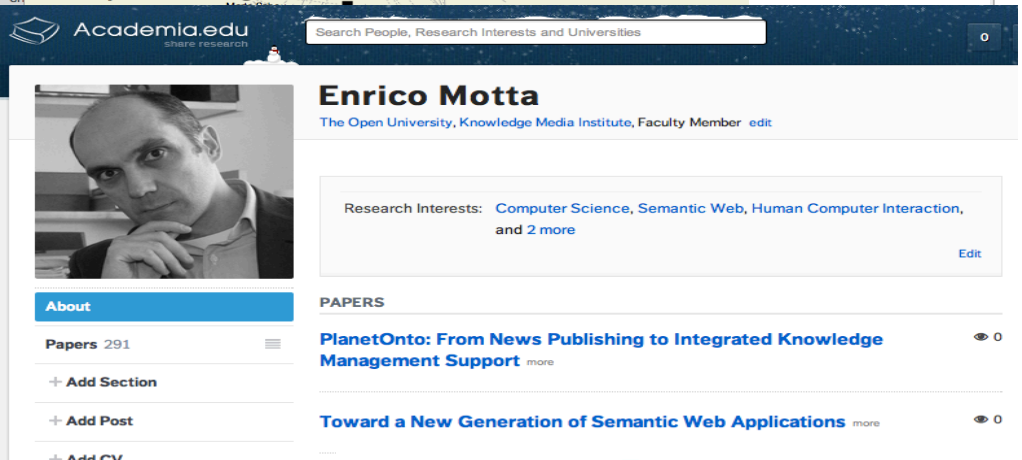


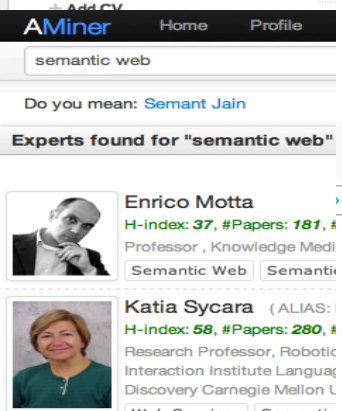


Exploring scholarly data: a variety of options….









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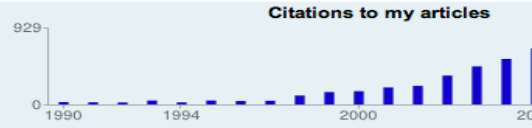

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Reusable components for knowledge modelling: Case studies in parametric design problem solving

E Motta

Lack of a semantic treatment of research topics

- Current tools do not treat research topics as ‘first class citizens’.
  - E.g., a tool may support a keyword search for papers on Ontology Matching, but by and large tools do not ‘understand’ that Ontology Matching is actually a research area

- Crucially, understanding what is a research area also means understanding what is not a research area
  - E.g., “case study” is often used as a tag for papers, but it is not actually a research area

Microsoft Academic Search Beta

Advanced Search

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Co-authors (217)

John Domingue
Victoria S. Uren
Marta Sabou
Mathieu d'Aquin
Vanessa Lopez

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ESWS
K-CAP
ASWC

Journals (39)

IJMMS
Journal of Web Semantics
EXPERT
PROC INST CIVIL ENG-GEOTECH E
KER

Keywords (433)

Case Study Information Extraction **Knowledge Acquisition** **Knowledge Base** Knowledge Based System Knowledge Engineering Knowledge Management **Large Scale** Natural Language Ontology

Enrico Motta

Open University UK

Publications: 324 | Citations: 4193

Fields: Artificial Intelligence, World Wide Web, Databases

Collaborated with 217 co-authors from 1985 to 2011 | Cited by 4550 authors

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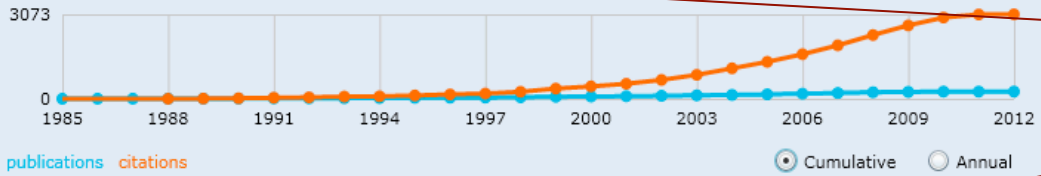


Publications (324)

Export

Sort by: Year

Watson, more than a Semantic Web search engine (Citations: 2)

Mathieu d'Aquin, **Enrico Motta**

Published in 2011.

Ontology augmentation combining semantic web and text resources

Miriam Fernandez, Ziqi Zhang, Vanessa Lopez, Victoria Uren, **Enrico Motta**

Conference: International Conference on Knowledge Capture - K-CAP, pp. 9-16, 2011

Extracting relevant questions to an RDF dataset using formal concept analysis

Mathieu d'Aquin, **Enrico Motta**

Published in 2011.

Data Linking: Capturing and Utilising Implicit Schema-level Relations (Citations: 3) View...

Andriy Nikolov, **Enrico Motta**

Published in 2010.

Reflections on five years of evaluating semantic search systems (Citations: 3)

Victoria S. Uren, Marta Sabou, **Enrico Motta**, Miriam Fernández, Vanessa Lopez, Yuangui Lei

Journal: International Journal of Metadata, Semantics and Ontologies - IJMSO, vol. 5, no. 2, pp. 87-98, 2010

Very high level research fields

Only co-autorship is provided

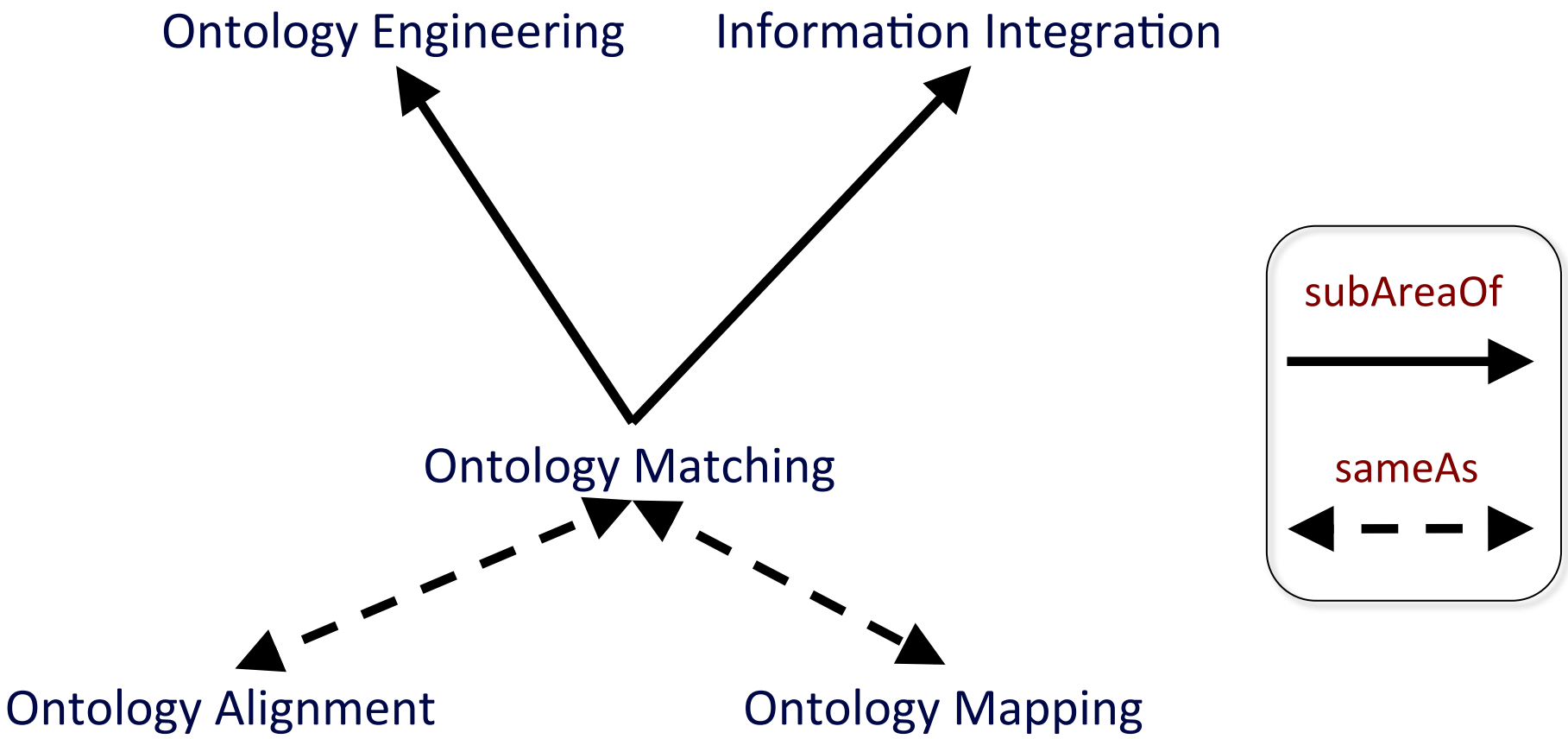
Old name for IJHCS (changed long ago!)

This journal has nothing to do with my research areas

Case Study is not a research area

KB and KBS are the same research area

Relations between research areas



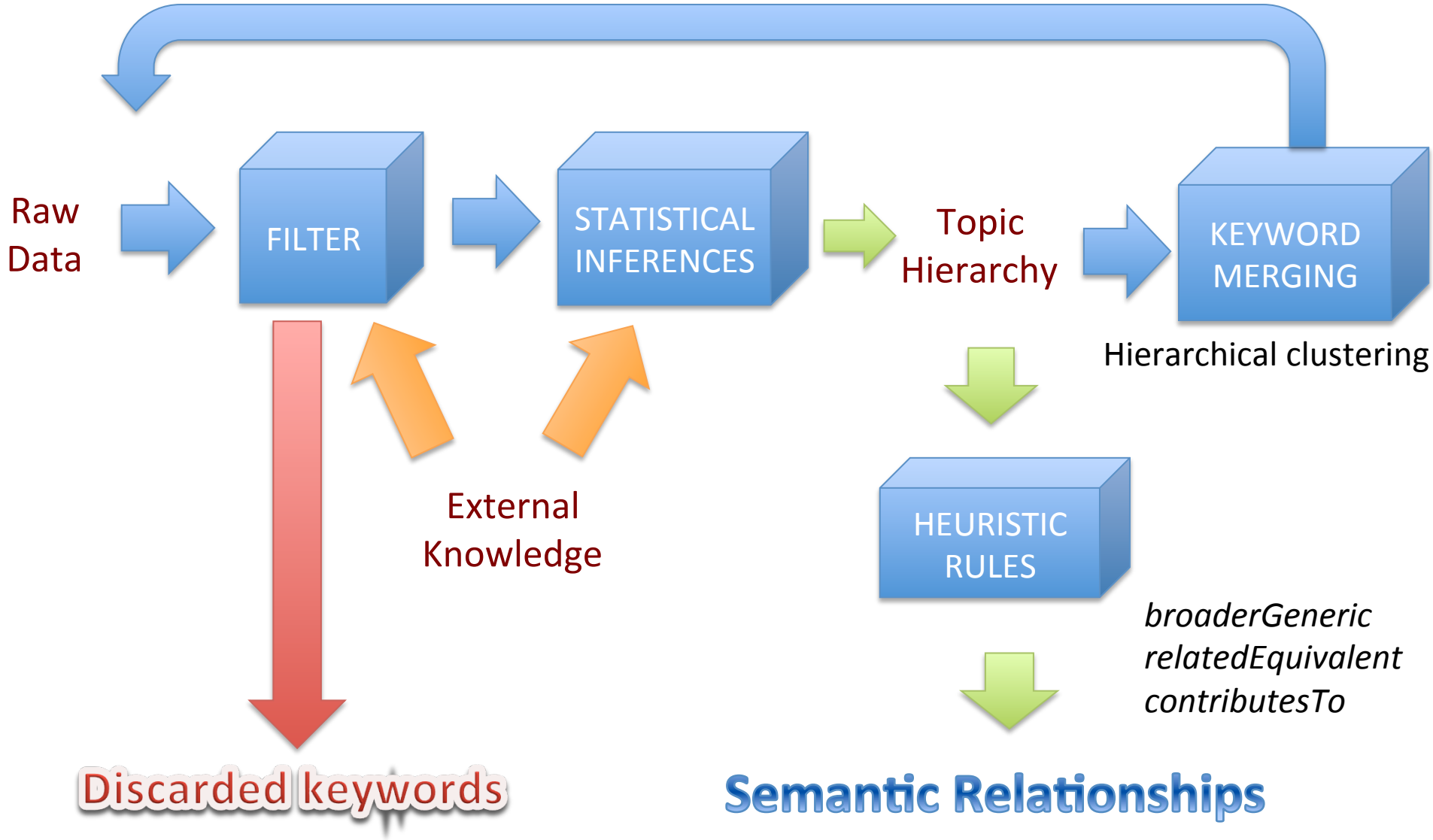
ACM and other similar classifications

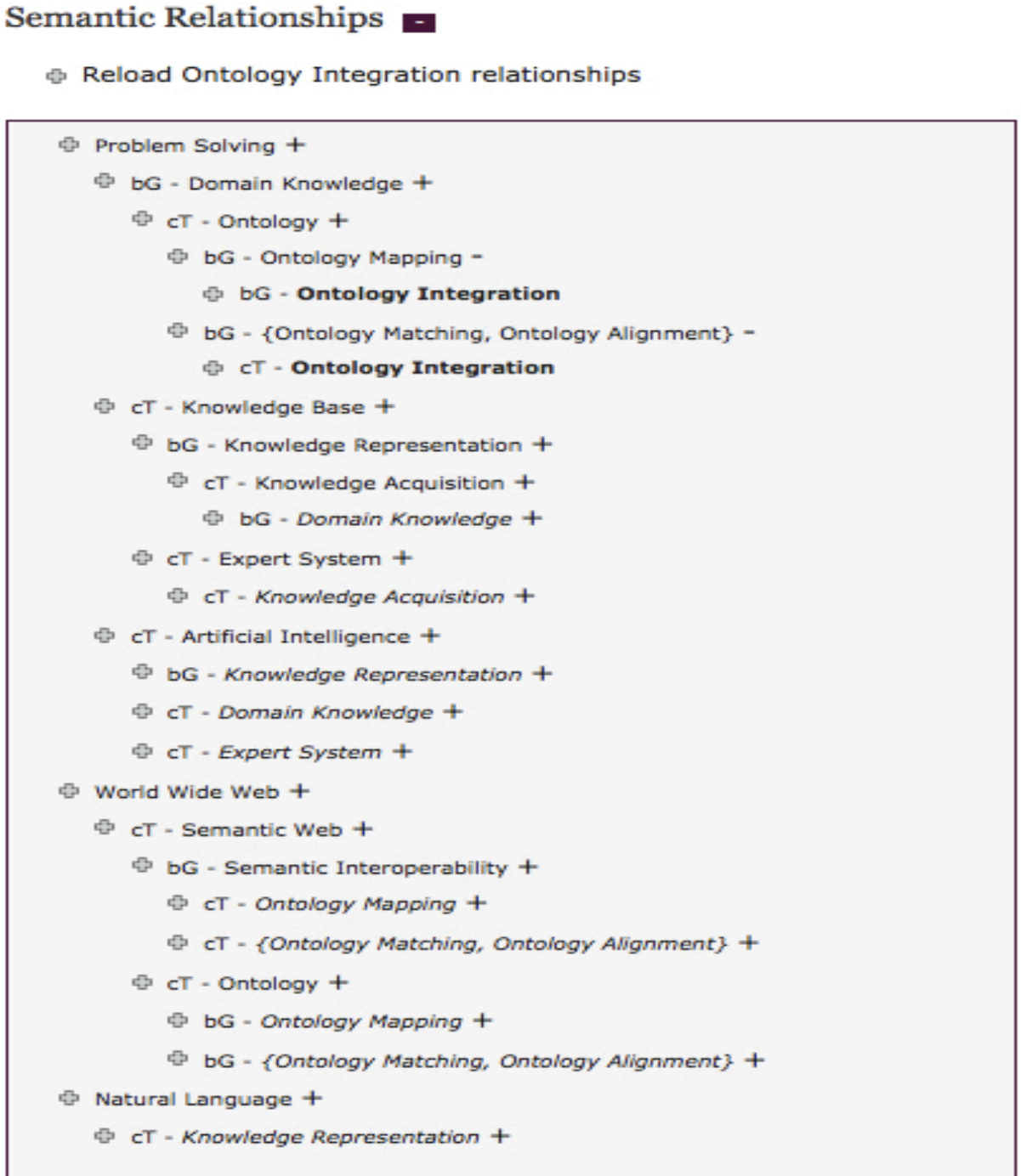
XII. Intelligent Web Services and Semantic Web

I. Intelligent Web service languages
II. Internet reasoning services
III. Ontology design
IV. Ontology languages

- The relations between entries are unclear
  - They are meant to be sub-areas, but for many of them it can be argued that they are not really sub-areas
- The different types of relationships are not distinguished
- Rather shallow
  - Most areas we know about are not listed – e.g., only 4 topics are classified under Semantic Web
- Static, manually defined, hence they get obsolete very quickly

Klink


Raw Data
FILTER
STATISTICAL INFERENCES
Topic Hierarchy
KEYWORD MERGING
Hierarchical clustering
External Knowledge
HEURISTIC RULES
broaderGeneric
relatedEquivalent
contributesTo
Discarded keywords
Semantic Relationships

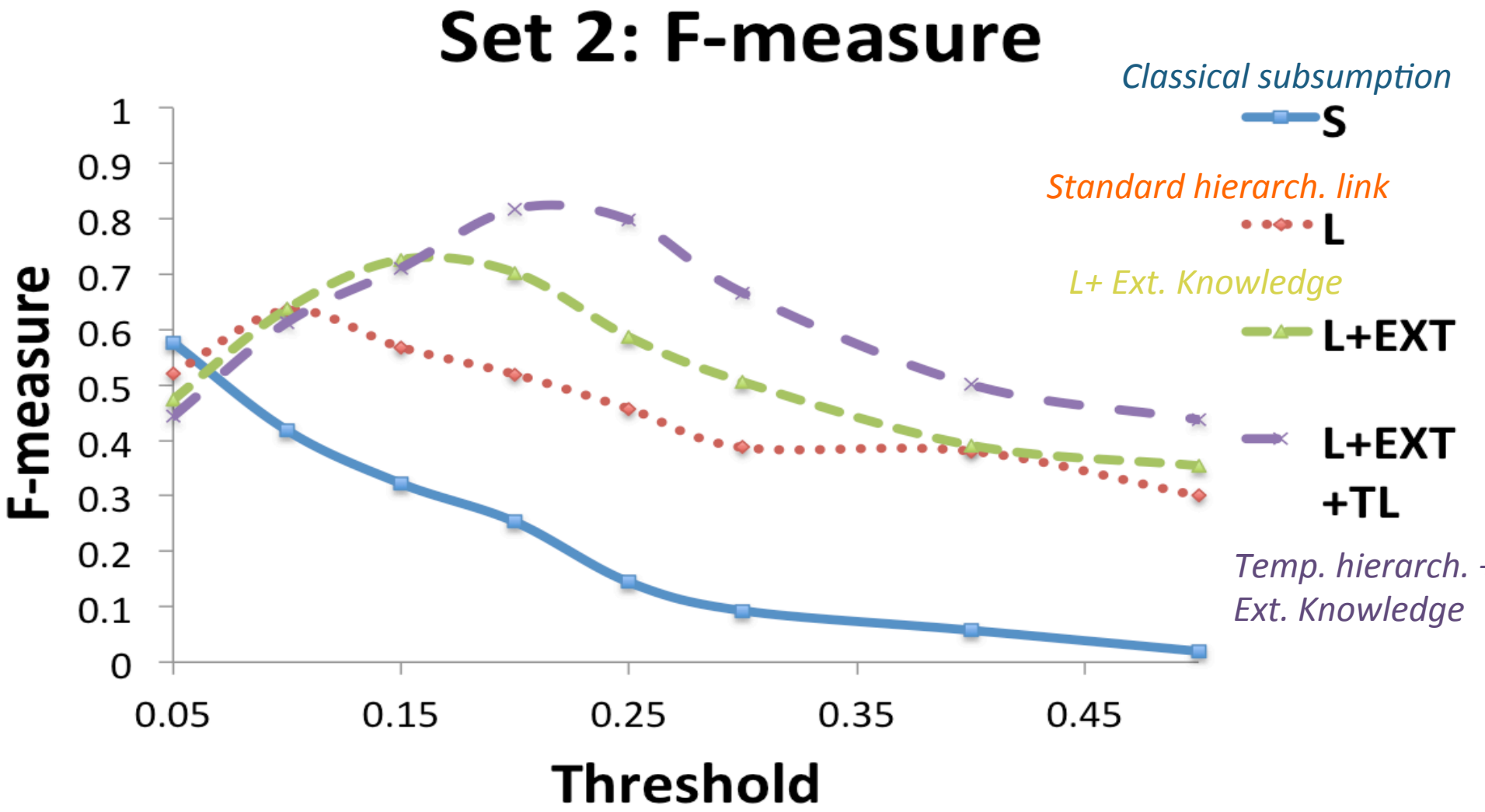


Microsoft Academic Search Beta

*From a corpus of **15M papers** accessed through the MAS API **Klink** identified about **1500 research topics** and structured them by means of almost **3000 semantic relationships***

F-Measure = 91%

Klink Evaluation



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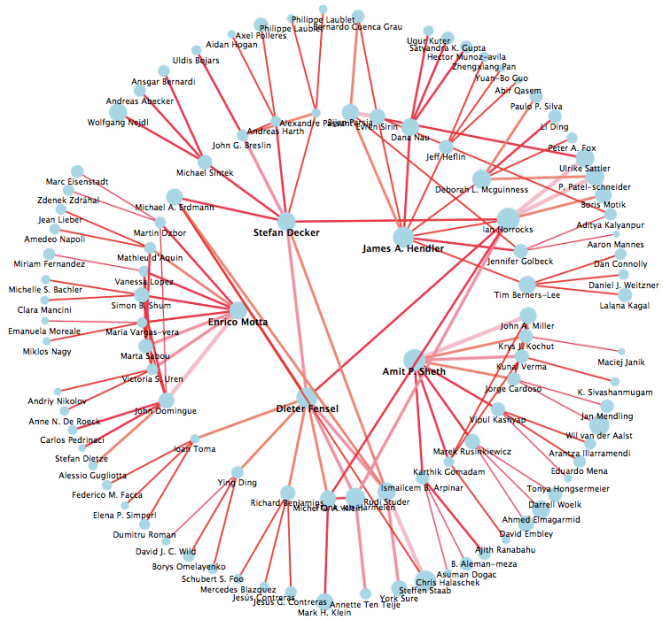

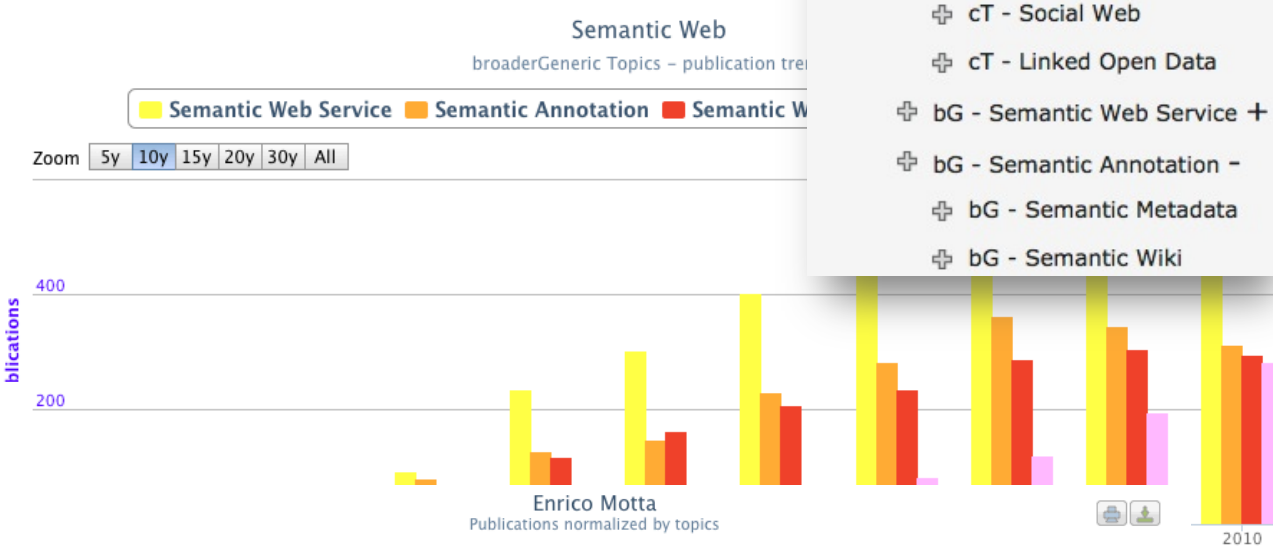

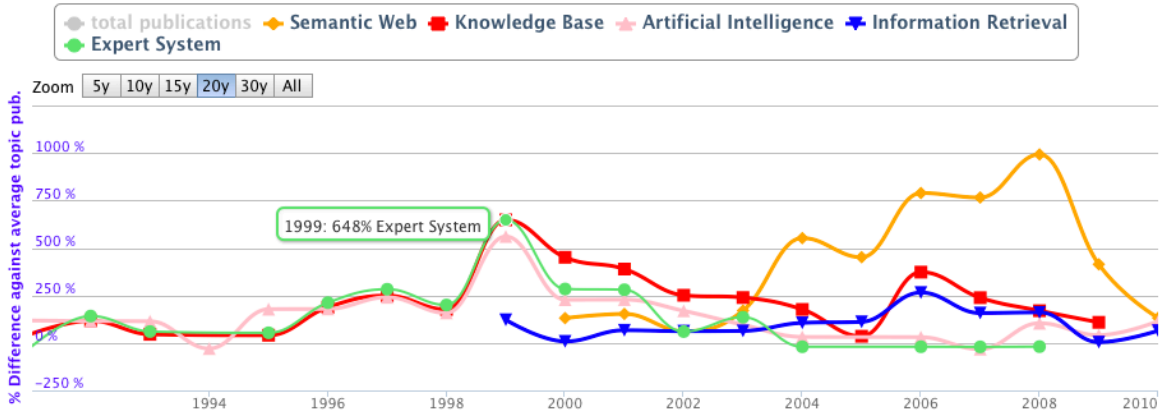

Managing Supervisors

- The relationship with your supervisor is very important, so ideally all the following axioms ought to be satisfied:
  - You have a good relationship with your supervisor
  - You and your supervisor share the same goals for the PhD
  - You and your supervisor agree on the approach you are following
  - Your supervisor is there when you need him/her
  - Your supervisor understands the area of your PhD well and provides excellent guidance
  - Your supervisor allows you to concentrate on your PhD and does not interrupt your research with all sorts of other tasks
  - You have regular meetings with your supervisor
  - Etc….

Summing up…..

- Be part of an academic community – create connections
- Tackle a problem that is research significant
- Define a sound research narrative
- Make explicit the hypotheses associated with your approach
- Do not worry about competition – but keep an eye on them
- Get guidance and support from supervisor, peers and other mentors

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