



Readers: Evaluation And DEvelopment of Reading Systems

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Content

1. Scientific background
2. Challenges
3. Partners and their value to the consortium
4. Outputs
5. Valorisation

Scientific Background

- Learning by Reading (DARPA 2005)
 - Pilot studies
 - Semantic representation of documents
 - Aligned to Knowledge Bases
 - Bottleneck: Knowledge Integration
- Machine Reading Program (DARPA 2009)
 - “Develop technology to enable formal processing over naturally occurring text”
 - Decouple Reading and Reasoning machines
 - Limitation of classic supervised Information Extraction
- Leverage redundancy: from local to global
 - Make Knowledge Bases grow on their own
 - Develop semi-supervised and unsupervised approaches
 - Macro-reading
 - Open Information Extraction

Scientific Background

Attached to a KB

- Micro-reading take advantage of the KB
 - Known instances and their categories
 - Subset /superset relations
 - Typed relations
 - Constraints
- Macro-reading populates the KB
 - Semi-supervised relation extraction + Entity Linking
 - Leverage redundancy
 - Beyond the sum of micro-readings (coupling information)
 - Self-growing Relational Knowledge Bases
- At the same time is continuously increasing its ability to map from text to KB
 - More seeds -> more patterns
 - More patterns -> more seeds

Scientific Background

- But imagine we are able to get all patterns...
- Would it be enough?
- A single message is never self-contained
- There is always implicit information

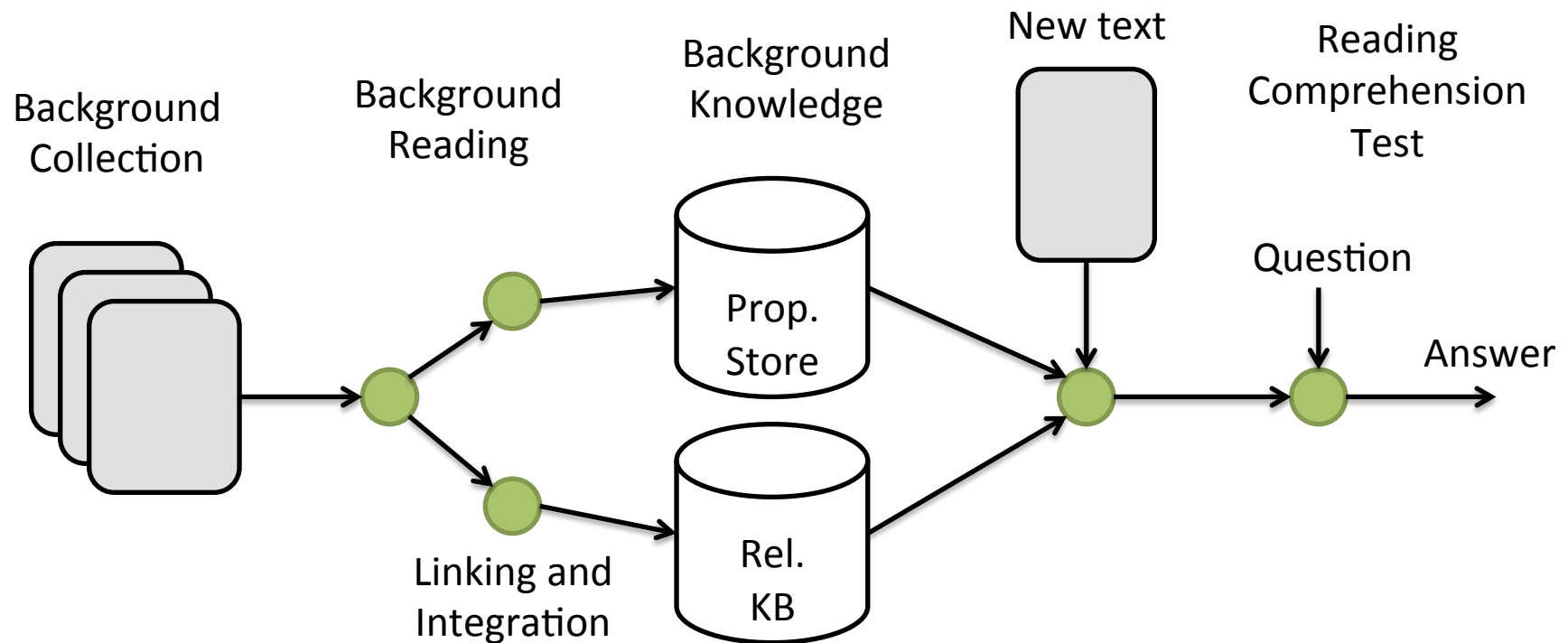
And what is missing...

... can't be used by a pattern to extract information

- We need to explore additional alternatives
 - Not attached to predefined relational KBs
 - Unsupervised algorithms
 - With generative power

Project Overview

● Reading Technology (READERS)



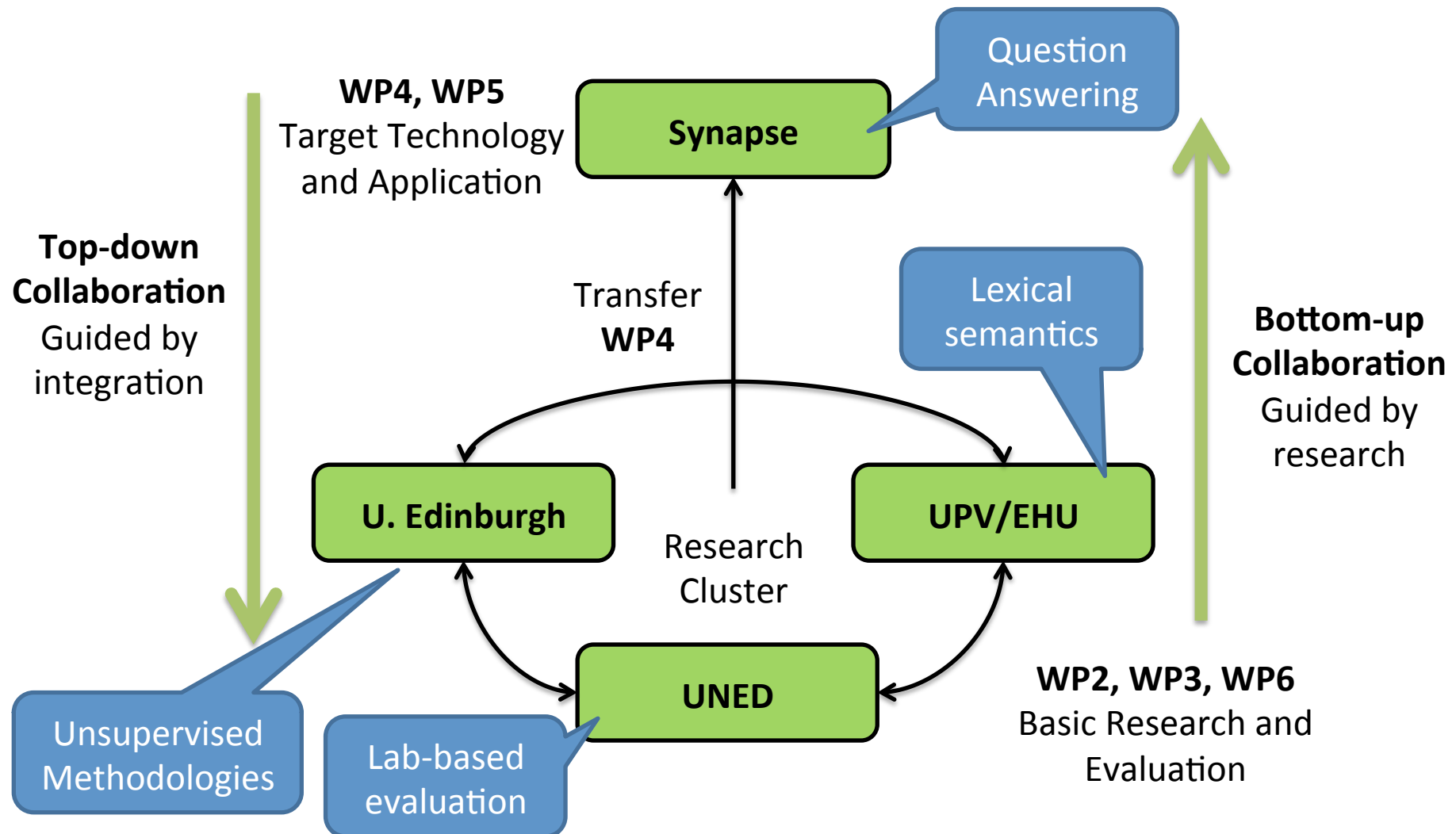
Challenges

- Background Reading
 - Induction of semantic roles
 - Build propositional background knowledge bases
- Knowledge Linking and Integration
 - To acquired background knowledge
 - To existing Knowledge Bases
- Read a single document
 - Bringing the background knowledge
 - Required to answer questions about the doc.
- Develop methodologies for Machine Reading evaluation

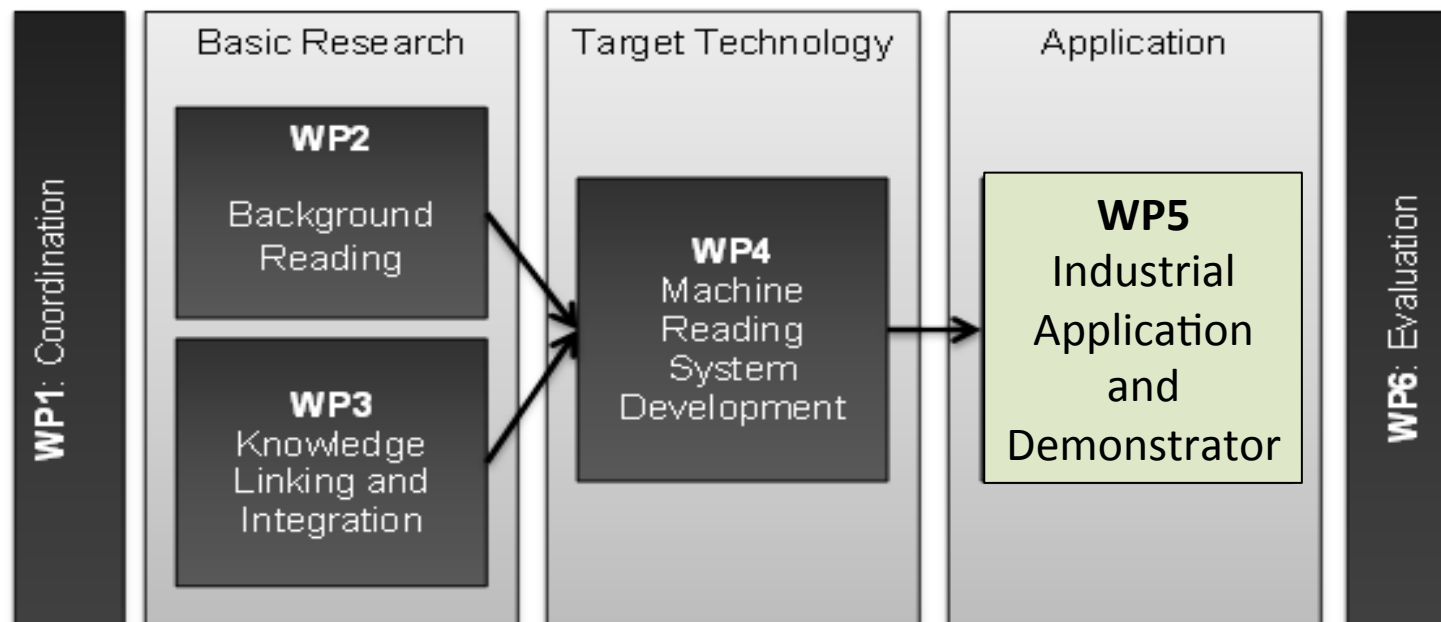
Consortium

Country	Institution/Department	Principal Investigator	Co-investigators
Spain	UNED (coordination)	Anselmo Peñas	Henry Anaya Bernardo Cabaleiro
United Kingdom	U. Edinburgh	Maria Mirella Lapata	Kristian Woodsend
France	Synapse Développement	Patrick Séguéla	Camille Pradel Dominique Laurent Baptiste Chardon
Spain	UPV/EHU	Eneko Agirre	German Rigau Oier Lopez Ander Barrena Aitor Soroa

Consortium background



Workplan and Milestones



No of Milestone	Delivery month	WP involved	Title
✓ M1	M12	WP2	Initial Proposition Store
✓ M2	M24	WP2, WP4	Semantic Role Labelling Software release
✓ M3	M36	WP3, WP4, WP6	Machine Reading system
✓ M4	M36	WP4, WP5	Industrial demonstrator release

Deliverables

Deliverable	Month of delivery	Title of deliverable
✓ D1.1	M12	1 st annual report
✓ D1.2	M24	2 nd annual report
✓ D1.3	M36	Final report
✓ D2.1	M12	Initial Proposition Store
✓ D2.2	M24	Semantic Role Labelling component
✓ D2.3	M36	Open IE and knowledge base construction
✓ D3.1	M6	Design of knowledge linking and integration
✓ D3.2	M30	Results of knowledge linking and integration
✓ D4.1	M12	Storing format in Knowledge Base
✓ D4.2	M24	Multilingual platform with beta-version
✓ D4.3	M24	SRL Software release
✓ D4.4	M36	Multilingual platform with final version
✓ D4.5	M36	Taxonomy induction software release
✓ D5.0	M6	New definition of WP5
✓ D5.1	M12	Report on building comprehensive business case
✓ D5.2	M24	Report on the design of the demonstrator and the use case
✓ D5.3	M32	Demonstrator Release
✓ D6.1	M12	1 st Report on the lab-based evaluation
✓ D6.2	M24	2 nd Report on the lab-based evaluation
✓ D6.3	M36	3 rd Report on the lab-based evaluation

Dissemination

- 2 PhD Thesis and 45 Scientific papers
 - 14 Publications with multiple partners and third-parties
 - NAACL-HLT 2015, COLING 2014, CICLING 2014, *SEM, CLEF, SemEval, ...
 - 6 publications in Journals by single partners
 - JAIR, TACL, IEEE-TKDE, ...
 - 25 publications in Conferences
 - AAAI 2016, NAACL-HLT 2015, EMNLP 2015, EMNLP 2014, ACL 2013, TAC, CLEF, ...
- Press release
 - http://www.synapse-developpement.fr/presse/CP_Entrance_Exams.pdf
 - 2 articles published so far:
 - <http://www.info-utiles.fr/modules/news/article.php?storyid=11009>
 - http://www.decideo.fr/Synapse-Developpement-franchit-une-etape-decisive-dans-la-comprehension-d-un-texte-ecrit-par-un-ordinateur_a7413.html
- READERS presentation at the French exhibition “Salon de l’Innovation en Traitement Automatique des Langues” in TALN 2014

Outputs on Background Reading

Semantic Role Labeling

1. A novel deterministic algorithm for implicit Semantic Role Labeling (ACL 2013)
2. A method to employ distributional word representations gathered from unlabelled data in Semantic Role Labeling (EMNLP 2014)
3. Use of embeddings to represent a predicate, its arguments and their interdependence, improving Unsupervised Semantic Role Labeling (EMNLP 2015)

Knowledge Bases

4. Predicate Matrix, a new lexical resource resulting from the integration of FrameNet, VerbNet, PropBank and WordNet (GWC 2014) (LREC 2014)
5. Semantic Parsing and Querying over Large Linked Knowledge Bases (TACL 2014)

Outputs on Background Reading

Proposition Stores and Open Information Extraction

6. Confirmation that “one sense per discourse” (OSPD) and “one sense per collocation” (OSPC) hypotheses hold for Named-Entity Disambiguation (COLING 2014)
7. A method that considers automatically gathered semantic information to correct appositive structures given by a parser (J KNOSYS 2015)
8. Unsupervised induction of semantic classes (IWCS 2015, CICLING 2015)
9. Use Proposition Stores to automatically unfold transfers of meaning in eventive propositions (CICLING 2014)
10. A method for textual enrichment using probabilistic topics of propositions (ADS 2015)
11. PhD Thesis: Discovering and describing coherent and meaningful topics from document collections (Henry Anaya)

Outputs on Knowledge Linking

1. Development of systems for Entity Linking, Slot Filling and Temporal Slot Filling for Knowledge Base Population (TAC KBP 2013) (ERD 2014) (TAC KBP 2014)
2. Algorithms for finding related words to a given a set of input words (CogALex 2014)
3. Methods for tweet filtering based on topic models (CLEF RepLab 2013)

Machine Reading technology

- Release of Semantic Role Labelling Software
 - <http://nlp.uned.es/readers-project/demos.html>
- Release of Taxonomy Induction Software
 - <http://homepages.inf.ed.ac.uk/mlap/resources/tree-taxonomy.tar.gz>
- Machine Reading system
 - based on a deep syntactic and semantic analysis with anaphora resolution
 - Representing the analysis into sophisticated structures based on Clause Descriptions
 - Efficient representation and storing of millions of documents linguistically analyzed
- Competitive evaluation
 - Participating with this Reading Machine in CLEF 2014-2015 Entrance Exams campaigns (CLEF QA track)
 - English and French languages
- Best results among all participants both in English and French in 2014 and 2015
 - In French, READERS system got 59% in 2014
 - Improved results for English in 2015 up to 58%
 - This accuracy shows that it can pass the entrance exams

Industrial application

- Demonstrator Release
 - Q&A interface to the Reading Machine to show the technology behind
- Building of comprehensive use cases
 - on top of Machine Reading technology
 - with added value for each customer workflow
- Promote its demonstrators through a real world example
 - Building a use case with the EADS Company (Airbus)
 - Iterative process where prototypes are proposed and illustrated through comprehensive mockups
- Use cases:
 - iFAQ, intelligent automatic building of FAQ
 - Q&A web sites
 - Knowledge bases for City Councils citizens questions
 - Management of aircraft maintenance documentation (“Aircraft on Ground”)

Outputs on Machine Reading evaluation

1. Methodology for evaluating validation technologies, measuring impact on Question Answering performance (J IEEE TKDE 2015)
2. General coordination of the Question Answering for Machine Reading (CLEF QA4MRE 2013) and CLEF QA Track 2014-2015
 - Three workshops have been organized:
 - QA4MRE 2013, CLEF 2013, Valencia
 - CLEF QA Track 2014, CLEF 2014, Sheffield
 - CLEF QA Track 2015, CLEF 2015, Toulouse
3. Organization of CLEF 2013, 2014, 2015 Entrance Exams exercises on Reading Comprehension
 - In collaboration with NTCIR and Todai Robot project (Japanese National Institute of Informatics)
4. Organization of *SEM 2013 and SemEval 2014-2015 task on Semantic Textual Similarity (STS)

Valorization

- Synapse developed the core technology for future demonstrators to its customers
 - iFAQ, Automatic building of Question & Answer web sites (aufeminin.com, Springer)
 - Synapse presented READERS to the Innovation Works dept. of EADS
 - READERS technology was evaluated for a core process of the company:
Management of the Eurocopter maintenance documentation ("Aircraft on Ground")
 - They were convinced that Machine Reading technology could improve the maintenance process
 - Including huge interaction flows between customers and company
- UPV/EHU delivers a disambiguation, similarity and expansion software
 - Continuously updated including result of READERS project activity (<http://ixa2.si.ehu.es/ukb>)
- New project proposals were presented to FET-Open 2014 and 2015 Calls



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Thanks!