

## Semantic relatedness and cross-lingual passage retrieval

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# Introduction

- We participated in...
  - English-English monolingual (EN-EN)
  - Basque-English cross-lingual (EU-EN)
- Our focus:
  - Check IR only for passage retrieval (no question analysis or answer validation)
  - Check Machine Readable Dictionary (MRD) techniques for the EU-EN
  - Check WordNet-based semantic relatedness to expand the passages

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based on related concepts
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# Basque-English (EU-EN)

- No question analysis, but
  - Question pre-processing:
    - lemmatize, POS tagging, named entity recognition
  - Translation of query terms to English
- Passage retrieval:
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based on related concepts
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# Basque-English (EU-EN)

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# Translation of query terms

- From Basque to English
- No Basque version of document collection
- Strategy:
  - for each keyword take all the translation candidates from two Basque-English MRD
  - for out-of-vocabulary words
    - search for cognates in the target collection
  - ambiguous translations
    - translation selection: co-occurrence optimization (Monz&Dorr)

# Passage retrieval

- Split the documents into paragraphs
- Lemmatize and PoS tag passages
- Expand the documents based on semantic relatedness
  - UKB: publicly available graph-based WSD and lexical relatedness engine (Agirre et al. 2009)
  - Given a passage, UKB returns a vector of scores for concepts in WordNet, with most related at top
  - Expand the highest-scoring 100 concepts to all their variants



# Passage retrieval

- Index the passages using MG4J
  - one index for the original words and one for the expanded words
  - porter stemmer
- BM25 ranking function
  - we did not tune the  $k_1$  and  $b$  parameters
- Return just the 1st passage

# Results

submitted runs		#answered correctly	#answered incorrectly	c@1
English-English	run1	211	289	0.42
	run2	240	260	<b>0.48</b>
Basque-English	run1	78	422	0.16
	run2	90	409	<b>0.18</b>

- run1: not using expansion
- run2: using expansion
  - Semantic relatedness improves results in both tasks, but below baseline

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original passage:

*Whereas the Commission, having examined each of the objections raised in the light of Directive 90/220/EEC, the information submitted in the dossier and the opinion of the Scientific Committee on Plants, has reached the conclusion that there is no reason to believe that there will be any **adverse effects** on human health or the environment from the introduction into maize of the gene coding for phosphinotricine-acetyl-transferase and the truncated gene coding for beta-lactamase;*

# Example of a document expansion

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## original passage:

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## some expanded words:

*cistron factor gene coding cryptography ... acetyl acetyl\_group acetyl\_radical ethanoyl\_group ethanoyl\_radical beta\_lactamase penicillinase common\_market ec eec eu europe european\_community european\_economic\_community european\_union ... directive directing directional guiding citizens\_committee committee environment surround surroundings corn indian\_corn maize zea\_mays health wellness health adverse contrary homo human human\_being man adverse inauspicious untoward lemon lemon\_yellow ... unfavorable **unfavourable** ... set\_up expostulation objection remonstrance remonstrating dissent protest believe light lightly belief feeling impression notion opinion ... reason reason\_out argue jurisprudence law **consequence** effect event issue outcome result ...*

# Analysis

- Performance drops in the Basque-English task
  - 38% of monolingual, when same technique achieves 74% in other settings
- Basque has no reference document collection or reference terminology for this domain
  - “Official Journal of the Community”
- Many query/answer pairs in the other languages were literal
- Unfortunately, no other cross-lingual participant

# Example

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- EN: ***How will judges be appointed by the Council?***
- *<answer\_english\_string e\_doc\_id="jrc32005D0150-en" e\_p\_id="32">The **judges will be appointed by the Council** acting unanimously, after consulting the committee of seven persons chosen from among former members of the Court of Justice and the Court of First Instance and lawyers of recognised competence. The committee will give its opinion on the candidates' suitability to perform the duties of judge at the Civil Service Tribunal ...</answer\_english\_string>*

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- EU: *Nola izendatuko ditu Kontseiluak epaileak?*
- EN: *How will judges be appointed by the Council?*
- EU keywords: *izendatu kontseilu epaile*
- Translation to EN: ***designate** council judge*
- *<answer\_english\_string e\_doc\_id="jrc32005D0150-en" e\_p\_id="32">The **judges will be appointed by the Council** acting unanimously, after consulting the committee of seven persons chosen from among former members of the Court of Justice and the Court of First Instance and lawyers of recognised competence. The committee will give its opinion on the candidates' suitability to perform the duties of judge at the Civil Service Tribunal ...</answer\_english\_string>*

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# Conclusions and future work

- Good results can be achieved without question analysis and answer validation
- Results improve applying semantic relatedness
- Optimize parameters to beat baseline
- Gather comparable corpora to improve cross-lingual results (Talvensaari, 2008)