Practical corpus analysis with multilingual semantic tagging using Wmatrix7

Master's Program in Advanced English Studies at the University of Alicante

Slides at https://ucrel.lancs.ac.uk/paul/

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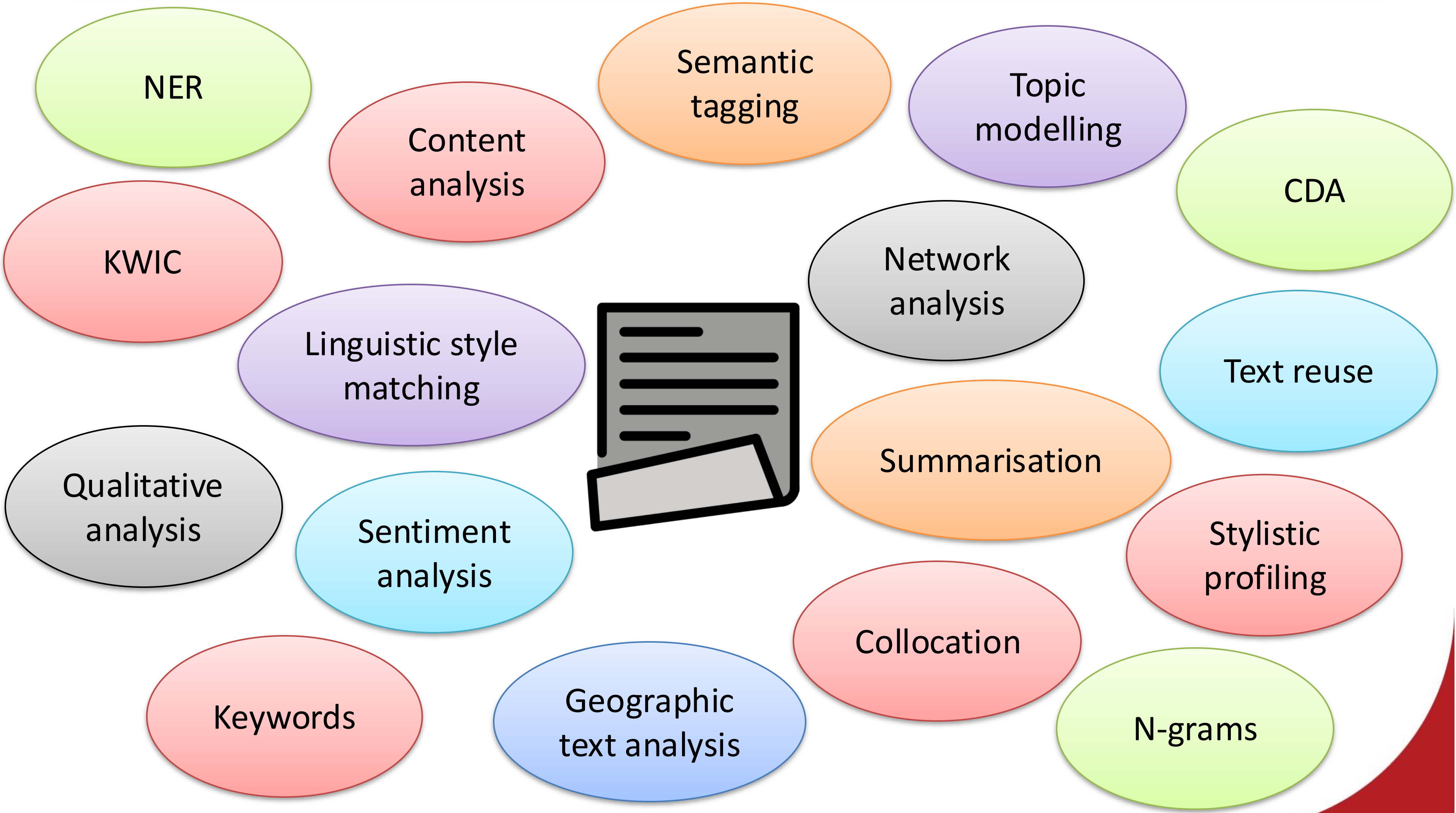
A myriad of NLP and CL methods …



NER

Content analysis

Semantic tagging

Topic modelling

CDA

KWIC

Network analysis

Linguistic style matching

Text reuse

Summarisation

Qualitative analysis

Sentiment analysis

Stylistic profiling

Collocation

Keywords

Geographic text analysis

N-grams

A myriad of NLP and CL tools ...

- Sketch Engine
- WordSmith
- PyMUSAS
- CQPweb
- spaCy
- CoreNLP
- AntConc
- KorAp
- BNCweb
- LIWC
- MALLET
- Wmatrix
- Voyant
- NLTK
- LancsBox
- ICEcup
- FreeTxt

Importance of open source and open access tools

Vital for reproducibility and replicability of corpus linguistics studies

Explainability of annotation c.f. generative AI / LLM methods, many of which do not declare their training materials

Extensibility and unrestricted free access to tools in the global south and low resource contexts

Recent releases

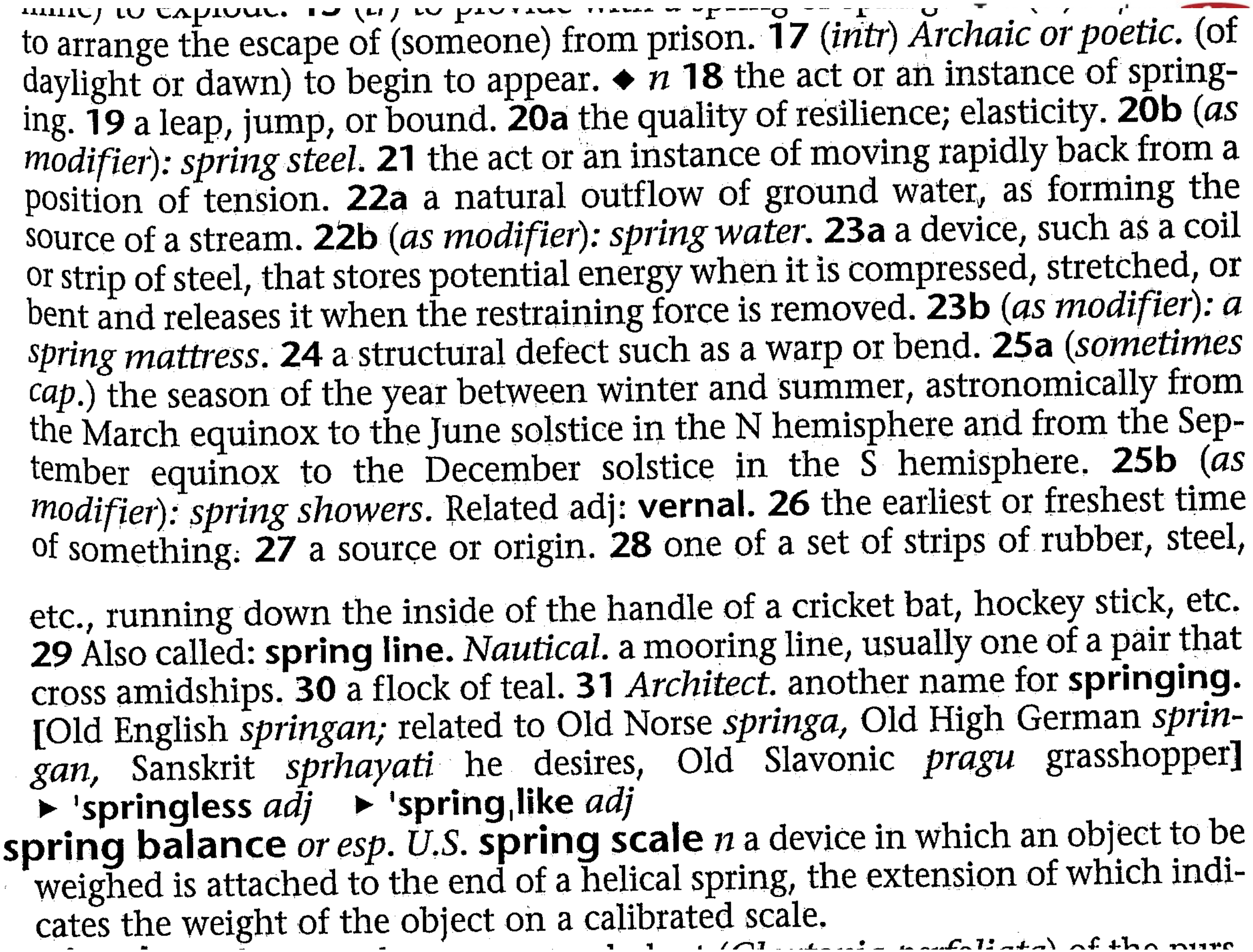
- All semantic lexicons are now open access (CC-BY-NC-SA-4.0)
  - https://github.com/UCREL/Multilingual-USAS
- Python reimplementation of semantic tagger, PyMUSAS is now open source (Apache 2.0)
  - https://pypi.org/project/pymusas/
- Wmatrix7, with PyMUSAS tagging for 8 languages, is now open access for researchers worldwide albeit with filestore limits, and a new indexing system built on SQLite (also open source)

A workshop of three parts

1. Semantic annotation (tagging)
   – a little bit computational
2. Key semantic tags (key domains)
   – a little bit of statistics
3. Wmatrix and PyMUSAS software
   – Hands on practical
   – And your chance to provide feedback and influence future plans!

Lexical ambiguity

- Question:
  - How many senses does *spring* have?
- Answer:
  - A: 3
  - B: 4
  - C: 5
  - D: 31



to arrange the escape of (someone) from prison. **17** (*intr*) *Archaic or poetic.* (of daylight or dawn) to begin to appear. ◆ *n* **18** the act or an instance of springing. **19** a leap, jump, or bound. **20a** the quality of resilience; elasticity. **20b** (*as modifier*): *spring steel*. **21** the act or an instance of moving rapidly back from a position of tension. **22a** a natural outflow of ground water, as forming the source of a stream. **22b** (*as modifier*): *spring water*. **23a** a device, such as a coil or strip of steel, that stores potential energy when it is compressed, stretched, or bent and releases it when the restraining force is removed. **23b** (*as modifier*): *a spring mattress*. **24** a structural defect such as a warp or bend. **25a** (*sometimes cap.*) the season of the year between winter and summer, astronomically from the March equinox to the June solstice in the N hemisphere and from the September equinox to the December solstice in the S hemisphere. **25b** (*as modifier*): *spring showers*. Related adj: **vernal. 26** the earliest or freshest time of something. **27** a source or origin. **28** one of a set of strips of rubber, steel, etc., running down the inside of the handle of a cricket bat, hockey stick, etc. **29** Also called: **spring line.** *Nautical.* a mooring line, usually one of a pair that cross amidships. **30** a flock of teal. **31** *Architect.* another name for **springing.** [Old English *springan;* related to Old Norse *springa,* Old High German *springan,* Sanskrit *sprhayati* he desires, Old Slavonic *pragu* grasshopper] ▸ **'springless** *adj* ▸ **'spring,like** *adj*

spring balance *or esp. U.S.* **spring scale** *n* a device in which an object to be weighed is attached to the end of a helical spring, the extension of which indicates the weight of the object on a calibrated scale.

Definition of *spring* from Collins English Dictionary (21st Century Edition)

Spring (https://dictionary.cambridge.org)

- *spring* was found in the Cambridge Advanced Learner's Dictionary at the entries listed below.
  - spring (MOVE QUICKLY)
  - spring (APPEAR SUDDENLY)
  - spring (SEASON)
  - spring (CURVED METAL)
  - spring (WATER)
  - box spring
  - spring chicken
  - spring-clean
  - spring greens
  - spring onion
  - spring roll
  - spring from sth
  - spring sth on sb
  - be full of the joys of spring
  - spring to life
  - spring to mind
  - a spring in your step

What is Semantic Tagging?

- Semantic field annotation has applications for conceptual or topic tagging:
  - *Last_T1.1.1 year_T1.1.1* was_A3+ the_Z5 UK_Z2 's_Z5 second_N4 warmest_O4.6+++ *on_A11.2+ record_A11.2+* ,_PUNC *according_Z5 to_Z5* provisional_T1.3- data_X2.2 from_Z5 the_Z5 Met_S3.1 Office_I2.1/H1c ._PUNC This_Z8 *puts_X2.2-* it_Z8 just_A14 *behind_X2.2-* 2022_N1 ,_PUNC which_Z8 recorded_Q1.2 an_Z5 average_A6.2+ temperature_O4.6 of_Z5 only_A14 0.06C_Z99 higher_N3.7++ ._PUNC

- A3+ = being; A6.2 = comparing; A11.2 = importance; A14 = exclusivisers; H1 = architecture, buildings; I2.1 = business; N1 = numbers; N3.7 = measurement; N4 = linear order; O4.6 = temperature; Q1.2 = documents, writing; S3.1 = relationship; T1.1.1 = Time past; T1.3 = time period; X2.2 = knowledge; Z2 = geographical names; Z5 = grammatical bin; Z8 = pronouns etc; Z99 = unmatched

Multiword expressions: plain sailing?

- Phrasal verbs
  - *Stubbed out*
- Noun phrases
  - *Riding boots*
  - *Pony nuts*
- Proper names
  - *United States of America*
- *Named entities*
  - *23rd November 1963*
  - *British Broadcasting Corporation*
- Multiword prepositions
  - *In terms of*
  - *As soon as*
- Idiomatic expressions
  - *Spill the beans*
  - *A pain in the neck*

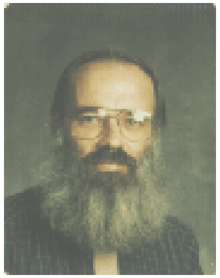
UCREL Semantic Analysis System (USAS)

- Full text tagging, not just selected words (c.f. Diction, LIWC, RID)
- Tagging the coarse-grained sense in context, not just the word
- Not task specific categories
- Flexible category set with hierarchical structure
- Words and multi-word expressions (MWE) e.g. phrasal verbs (stubbed out), noun phrases (riding boots), proper names (United States of America), true idioms (living the life of Riley)

- https://ucrel.lancs.ac.uk/usas/
- Lexicons available free for academic use:
  - https://github.com/UCREL/Multilingual-USAS

The work of many hands ... (in Lancaster)

- Joint research with
  - Geoffrey Leech
  - Roger Garside
  - Jenny Thomas
  - Andrew Wilson
  - Dawn Archer
  - Scott Piao
  - Tony McEnery
  - Sheryl Prentice
  - Andrew Moore
  - Daisy Lal
  - Ignatius Ezeani



The work of many hands … (and beyond)

Arabic	Mo El-Haj, Elvis de Souza, Nouran Khallaf, Nizar Habash
Chinese	Richard Xiao and Qian Yufang (Lancaster), Yan Yabo, Xiaobin Yang (Hubei)
Dutch	Carole Tiberius (INL, Netherlands)
Finnish	Laura Löfberg / Johanna Vuorinen (Tampere University)
French	Michael Gauthier (Université Lumière Lyon 2, France), Emilie L'Hôte (Paris Diderot University, France), Julien Perrez, Pauline Heyvaert (Université de Liège, Belgium), Min Reuchamps (Université catholique de Louvain, Belgium), and Verena Weiland (Heidelberg, Germany)
Indonesian	Prihantoro (Lancaster)
Irish	Tim Czerniak, Gearóid Ó Donnchadha and Elaine Uí Dhonnchadha (Trinity College, Dublin), Mícheál J. Ó Meachair (Dublin City University)
Italian	Dr Francesca Bianchi (Universita del Salento, Italy) and Elena Semino (Lancaster)
Portuguese	Carmen Dayrell (Lancaster)
Russian	Olga Mudraya (Lancaster), Serge Sharoff and Bogdan Babych (Leeds)
Spanish	Ricardo-María Jiménez (Universitat Internacional de Cataluña, Barcelona, Spain) and Hugo Sanjurjo González (University of Deusto, Spain) and Carlos Herrero Zorita (Autonomous University of Madrid)
Swedish	Lisa Sjösten, Maria Nääs, Anna Gustafsson and Johan Frid (Lund University, Sweden)
Urdu	Jawad Shafi (Lancaster)
Welsh	Dawn Knight (Cardiff)

Semantic fields

- AKA concepts, semantic domains
- ‘groups together word senses that are related by virtue of their being connected at some level of generality with the same mental concept’
- Not only synonymy and antonymy but also hypernymy and hyponymy
- E.g. EDUCATION: academic, coaching, coursework, deputy head, exams, PhD, playschool, revision notes, studious, swot, viva

A General and abstract terms	**B** The body and the individual	**C** Arts and crafts	**E** Emotion
F Food and farming	**G** Government and public	**H** Architecture, housing and the home	**I** Money and commerce in industry
K Entertainment, sports and games	**L** Life and living things	**M** Movement, location, travel and transport	**N** Numbers and measurement
O Substances, materials, objects and equipment	**P** Education	**Q** Language and communication	**S** Social actions, states and processes
T Time	**W** World and environment	**X** Psychological actions, states and processes	**Y** Science and technology
Z Names and grammar			

Lexical resources for English

- Lexicon of 56,316 items
  - presentation NN1   Q2.2 A8 S1.1.1 K4
- MWE list of 18,971 items
  - travel_NN1 card*_NN*   M3/Q1.2
- A small wildcard lexicon
  - *kg   NNU   N3.5
- Unknown words using WordNet synonym lookup

English Disambiguation methods (1)

- 1. POS tag

– *spring*	noun	[season sense] [coil sense]
– *spring*	verb	[jump sense]

- 2. General likelihood ranking for single-word and MWE tags
  - *green* referring to [colour] is generally more frequent than *green* meaning [inexperienced]
- 3. Overlapping MWE resolution
  - Heuristics applied: semantic MWEs override single word tagging, length and span of MWE also significant

English Disambiguation methods (2)

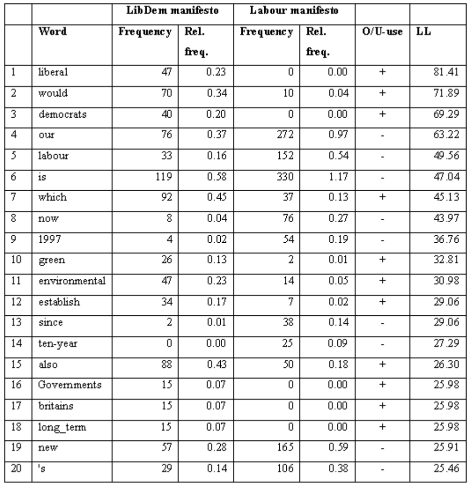
- 4. Domain of discourse
  - adjective *battered*
    - [Violence] (e.g. battered person)
    - [Judgement of Appearance] (e.g. battered car)
    - [Food] (e.g. battered cod)
- 5. Text-based disambiguation
  - one sense per text
- 6. Template rules
  - *Auxiliary verbs (be/do/have)*
  - *account* of NP [narrative]
  - balance of xxx *account* [financial]

Evaluation (English data)

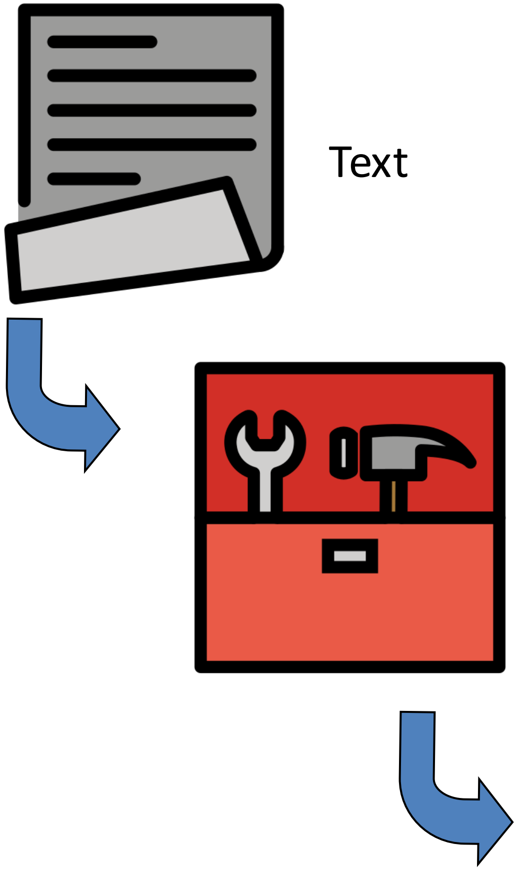
- Hand tagged test corpus of 124,839 words
- Error rate of 8.95%
- Ambiguity ratio 47.73%
- Reduced to 17.06% by disambiguation
- Not all ambiguity is resolved, but 1st choice tag selection gives 91% accuracy.

KEY SEMANTIC DOMAINS AND FURTHER APPLICATIONS

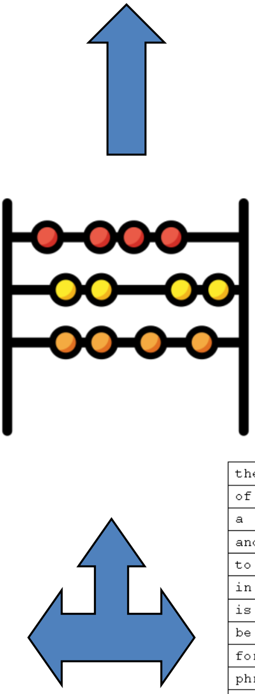
Keywords

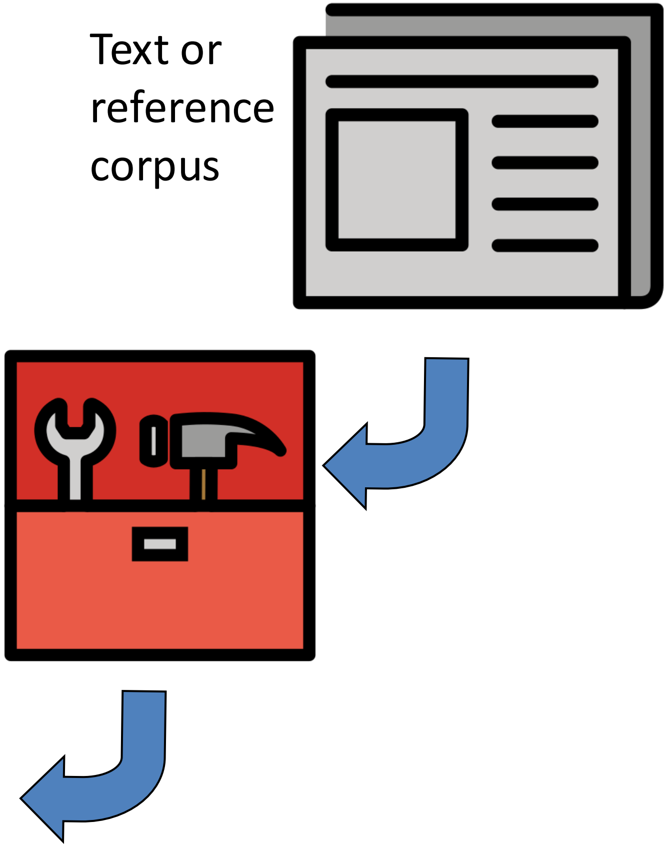


		LibDem manifesto		Labour manifesto			
	Word	Frequency	Rel. freq.	Frequency	Rel. freq.	O/U-use	LL
1	liberal	47	0.23	0	0.00	+	81.41
2	would	70	0.34	10	0.04	+	71.89
3	democrats	40	0.20	0	0.00	+	69.29
4	our	76	0.37	272	0.97	-	63.22
5	labour	33	0.16	152	0.54	-	49.56
6	is	119	0.58	330	1.17	-	47.04
7	which	92	0.45	37	0.13	+	45.13
8	now	8	0.04	76	0.27	-	43.97
9	1997	4	0.02	54	0.19	-	36.76
10	green	26	0.13	2	0.01	+	32.81
11	environmental	47	0.23	14	0.05	+	30.98
12	establish	34	0.17	7	0.02	+	29.06
13	since	2	0.01	38	0.14	-	29.06
14	ten-year	0	0.00	25	0.09	-	27.29
15	also	88	0.43	50	0.18	+	26.30
16	Governments	15	0.07	0	0.00	+	25.98
17	britains	15	0.07	0	0.00	+	25.98
18	long_term	15	0.07	0	0.00	+	25.98
19	new	57	0.28	165	0.59	-	25.91
20	's	29	0.14	106	0.38	-	25.46

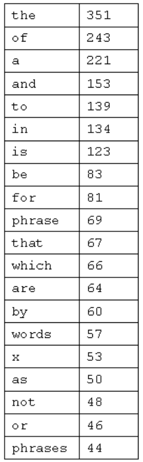


Text



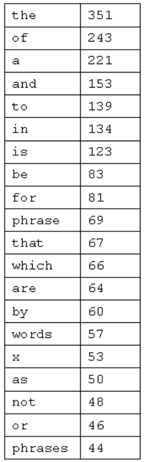


Text or reference corpus



the	351
of	243
a	221
and	153
to	139
in	134
is	123
be	83
for	81
phrase	69
that	67
which	66
are	64
by	60
words	57
x	53
as	50
not	48
or	46
phrases	44

Word frequency list



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Word frequency list

Significance and effect size

- Log-likelihood (LL) Wizard online at:
  - https://ucrel.lancs.ac.uk/llwizard.html

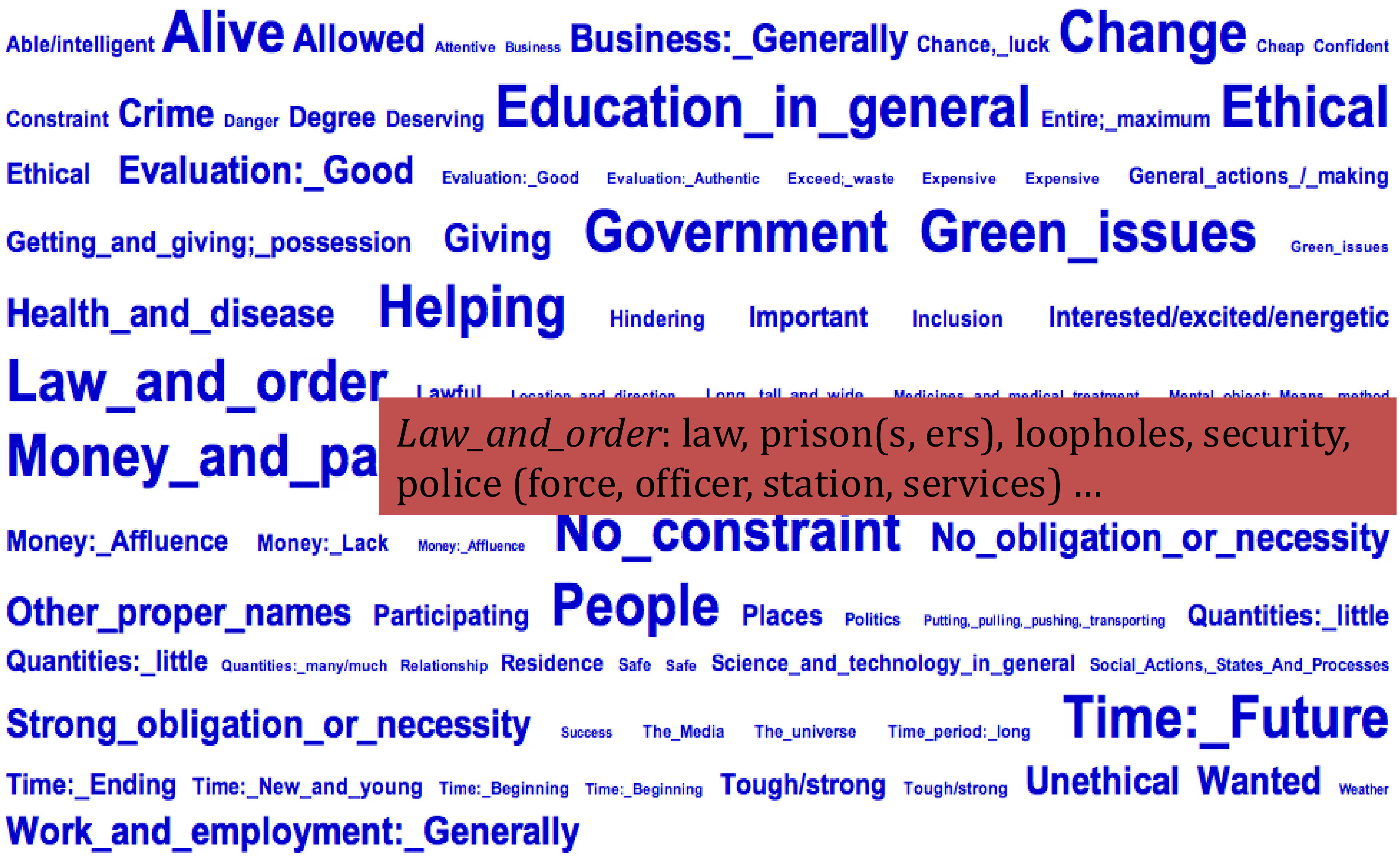
- Spreadsheet and code also available for download
  - https://github.com/UCREL/SigEff

- Very important to consider dispersion and effect size measures (depending on your corpus) – included in Wmatrix frequency lists and keyness measures
  - See the work of Hardie, Gabrielatos, Brezina and others
  - Rayson and Potts (2021)

Figure 1: keywords in LibDem 2010 manifesto

2020 2050 affordable allow banking banks believe better Britain budget businesses
carbon change child climate create crime cut deficit democrats developing_countries
economy education emissions energy ensure environment establish EU
every fair fairness finances financial for funding future give global government
health help homes improve increase infrastructure insulate introduce jobs justice liberal
local local_authorities long-term manifesto money mutuals need NHS our over_time paid pay
people politics polluting power protect public reduce reducing reform reforming
renewable replace restore review savings schools scrap seek services
so_that spending state_pension such_as support sustainability
sustainable system target targets tax taxes to UK UN unfair we will

Figure 2: key domains (semantic fields) in LibDem 2010 manifesto



Able/intelligent Alive Allowed Attentive Business Business:_Generally Chance,_luck Change Cheap Confident Constraint Crime Danger Degree Deserving Education_in_general Entire;_maximum Ethical Ethical Evaluation:_Good Evaluation:_Good Evaluation:_Authentic Exceed;_waste Expensive Expensive General_actions_/_making Getting_and_giving;_possession Giving Government Green_issues Green_issues Health_and_disease Helping Hindering Important Inclusion Interested/excited/energetic Law_and_order Lawful Location_and_direction Long,_tall_and_wide Medicines_and_medical_treatment Mental_object:_Means,_method Money_and_pa

No_constraint Money:_Affluence Money:_Lack Money:_Affluence No_obligation_or_necessity Other_proper_names Participating People Places Politics Putting,_pulling,_pushing,_transporting Quantities:_little Quantities:_little Quantities:_many/much Relationship Residence Safe Safe Science_and_technology_in_general Social_Actions,_States_And_Processes Strong_obligation_or_necessity Success The_Media The_universe Time_period:_long Time:_Future Time:_Ending Time:_New_and_young Time:_Beginning Time:_Beginning Tough/strong Tough/strong Unethical Wanted Weather Work_and_employment:_Generally

Law_and_order: law, prison(s, ers), loopholes, security, police (force, officer, station, services) …

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Applications of semantic analysis

100+ papers listed at https://ucrel.lancs.ac.uk/wmatrix/

- Analysis of market research interview transcripts
- Intelligent dictionaries
- Assistance for human translators
- Software Engineering domain understanding
- Language profiling for online child protection
- Actionability
- Corpus stylistics
- Prediction of real-world events from social media
- Metaphor and end-of-life care
- Pattern analysis of the language of psychopaths
- Political discourse analysis
- Describing the language of extremism and counter-extremism
- UK General Election Manifestos (Rayson 2008)

BRITISH NATIONAL CORPUS

ParlaMint

BNC
BRITISH
NATIONAL
CORPUS
2014

CorCenCC
Corpws Cenedlaethol Cymraeg Cyfoes
National Corpus of Contemporary Welsh

Metaphor, cancer and end of life care (MELC)

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- Analysis of metaphorical language used to talk about cancer, dying and death: people ‘fight’ their cancer, ‘win’ or ‘lose’ their ‘battle’ against it, hope for a positive end to their cancer ‘journey’, and so on.
- 1.5M word corpus of interviews and online forum posts from patients, carers and healthcare professionals
- Methods: Manual analysis (MIP) and Wmatrix (Semantic analysis & concordancing)
- http://wp.lancs.ac.uk/melc/

G3 Warfare (e.g. *fight* as a verb, *battle*)
A1.1.1 General actions, making (e.g. *blast*, *confront*)
A1.1.2 Damaging and destroying (e.g. *destroy*, *shatter*)
E3– Violent/angry (e.g. *hit*, *attack*)
S8+ Helping (e.g. *defend*, *protect*)
S8– Hindering (e.g. *fight* as a noun)
X8+ Trying hard (e.g. *struggle*)

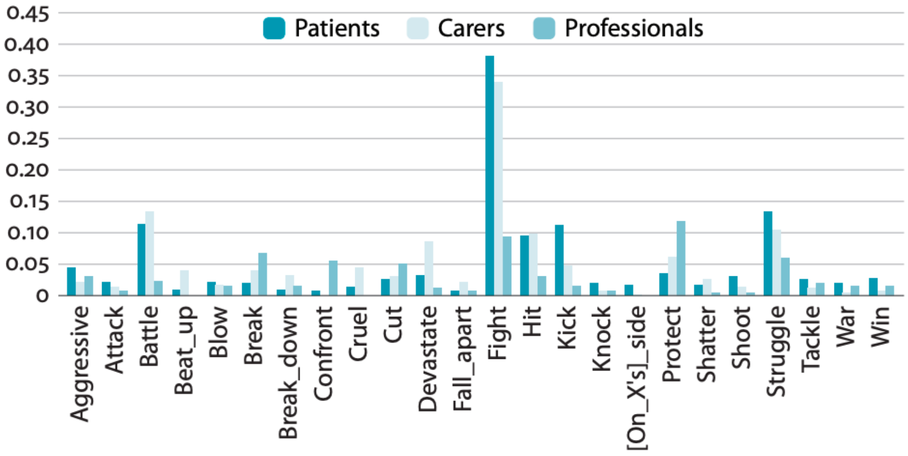

Figure 3. Relative use of most frequent Violence metaphors by each stakeholder group (per 1,000 tokens): Online forum posts

Qualitative survey analysis: FreeTxt/TestunRhydd project (2022-3)

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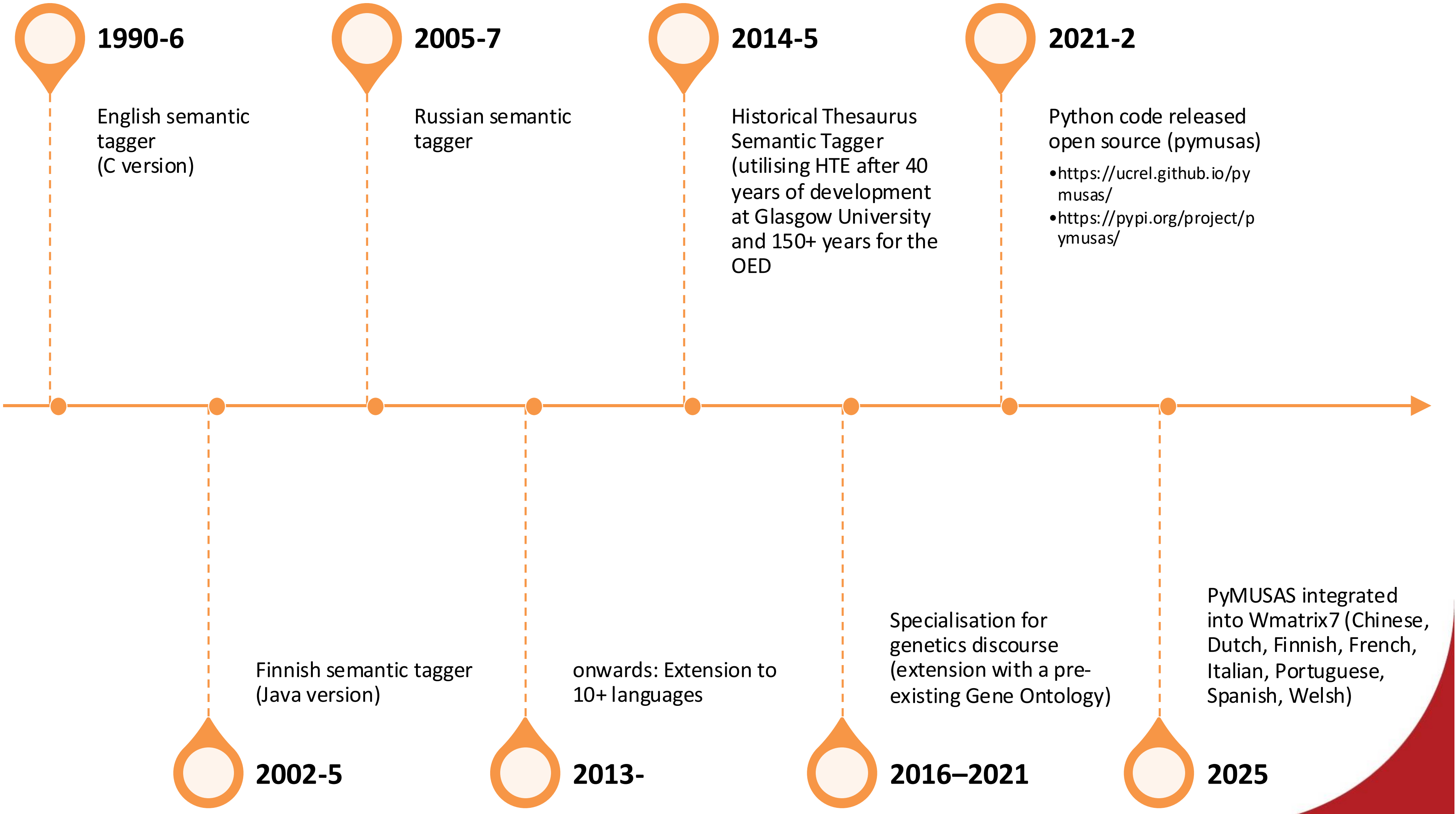
- Surveys are widely used in many areas of professional practice, e.g. staff development, professional training, product design, testing as well as for many types of hotel, movie and product reviews
- Very little support for bilingual free-text survey and questionnaire data analysis in English and Welsh
- Follow on funding impact project building on CorCenCC project (National Corpus of Contemporary Welsh), we will develop an open access user friendly online interface
- Partners: National Trust Wales, Cadw and National Museum Wales
- https://ucrel.lancs.ac.uk/freetxt/



1990-6

English semantic tagger (C version)

2002-5

Finnish semantic tagger (Java version)

2005-7

Russian semantic tagger

2013-

onwards: Extension to 10+ languages

2014-5

Historical Thesaurus Semantic Tagger (utilising HTE after 40 years of development at Glasgow University and 150+ years for the OED

2016–2021

Specialisation for genetics discourse (extension with a pre-existing Gene Ontology)

2021-2

Python code released open source (pymusas)

- https://ucrel.github.io/pymusas/
- https://pypi.org/project/pymusas/

2025

PyMUSAS integrated into Wmatrix7 (Chinese, Dutch, Finnish, French, Italian, Portuguese, Spanish, Welsh)

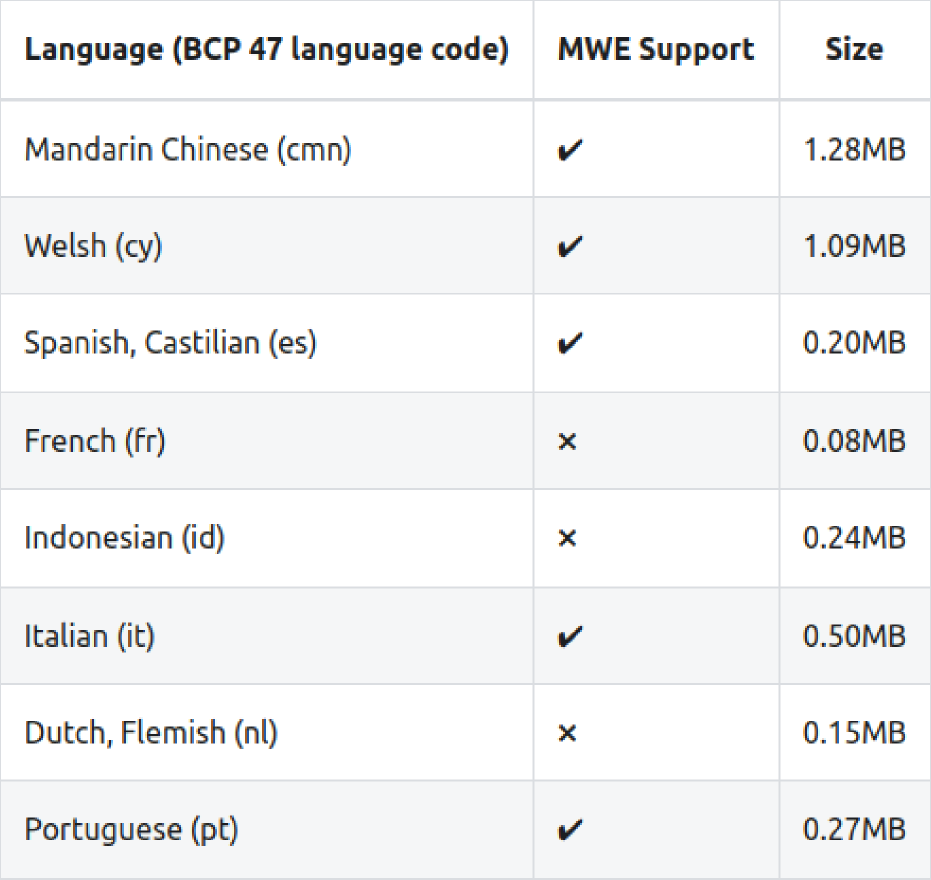
Recipe for creating a tagger in a new language

1. re-evaluate USAS semantic tagset for new language context
2. find freely available (open source if possible) POS tagger & lemmatiser
3. integrate these into USAS Multilingual software framework (PyMUSAS)
   a. consider whether other new components are needed e.g. tokeniser or compound tool
4. develop single-word semantic lexicon and MWE dictionary
   a. bilingual dictionary
   b. parallel aligned corpus (Moses / Giza)
   c. machine translation / translation memory
   d. crowdsourcing by non-experts
   e. named entity recognition and gazetteers
   f. vector-based approaches
   g. multi-task & deep learning
   h. manual checking and editing by experts
5. extend disambiguation routines e.g. with deep learning methods
6. release lexicons with CC-BY-NC-SA licence
7. release software as REST API and/or open-source licence

PyMUSAS

https://pypi.org/project/pymusas/

- Open source – Apache License Version 2.0
- Open resources – Creative Commons licence version 4
- Rule based tagger
- Identify and tag Multi Word Expressions (MWE)
- Supports multiple languages through downloadable spaCy pipelines
- Supports Indonesian and Welsh via other POS taggers (TreeTagger for Indonesian and CyTag for Welsh)

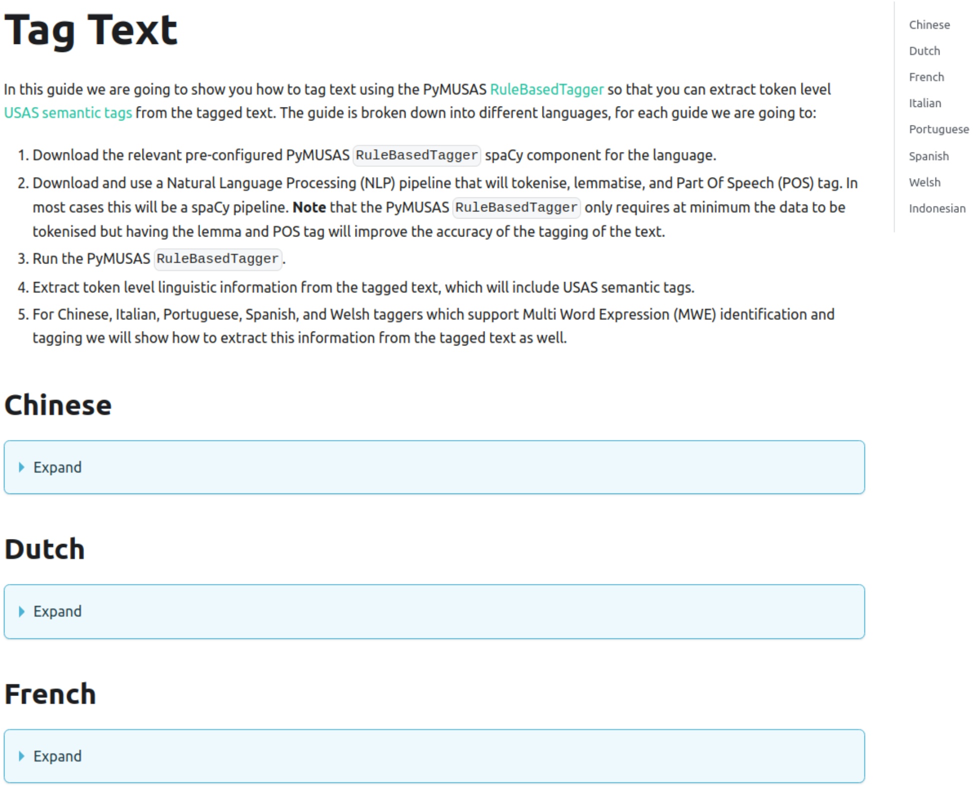


Language (BCP 47 language code)	MWE Support	Size
Mandarin Chinese (cmn)	✔	1.28MB
Welsh (cy)	✔	1.09MB
Spanish, Castilian (es)	✔	0.20MB
French (fr)	×	0.08MB
Indonesian (id)	×	0.24MB
Italian (it)	✔	0.50MB
Dutch, Flemish (nl)	×	0.15MB
Portuguese (pt)	✔	0.27MB

PyMUSAS – Language Support

Each language that we support has a guide on how to semantically tag text for that language:

https://ucrel.github.io/pymusas/usage/how_to/tag_text



Tag Text

In this guide we are going to show you how to tag text using the PyMUSAS RuleBasedTagger so that you can extract token level USAS semantic tags from the tagged text. The guide is broken down into different languages, for each guide we are going to:

1. Download the relevant pre-configured PyMUSAS `RuleBasedTagger` spaCy component for the language.
2. Download and use a Natural Language Processing (NLP) pipeline that will tokenise, lemmatise, and Part Of Speech (POS) tag. In most cases this will be a spaCy pipeline. **Note** that the PyMUSAS `RuleBasedTagger` only requires at minimum the data to be tokenised but having the lemma and POS tag will improve the accuracy of the tagging of the text.
3. Run the PyMUSAS `RuleBasedTagger`.
4. Extract token level linguistic information from the tagged text, which will include USAS semantic tags.
5. For Chinese, Italian, Portuguese, Spanish, and Welsh taggers which support Multi Word Expression (MWE) identification and tagging we will show how to extract this information from the tagged text as well.

Chinese

Dutch

French

Try this Python Notebook during the hands on session:
https://github.com/UCREL/pymusas_notebook

Recent developments in new languages

- Used the IgboAPI dataset (33 distinct Igbo dialects, 5,095 Igbo words with 17,979 unique dialectal word variations, complemented by 27,816 example parallel sentences) to bootstrap a lexicon for the Igbo semantic tagger
  - https://aclanthology.org/2024.lrec-main.1384/
- Creation of high quality linguistic resources (MWE lexicon) via LLMs to retrieve MWE definitions facilitating accurate translation from English to Danish lexicons, coverage evaluation and manual annotation for metaphor analysis in 4D Picture project
  - Puts et al. (2025) Pushing the boundaries: creating a Danish semantic tagger for metaphor analysis of cancer narratives. Corpus Linguistics 2025, Birmingham, UK.

A Universal Semantic Tagger?

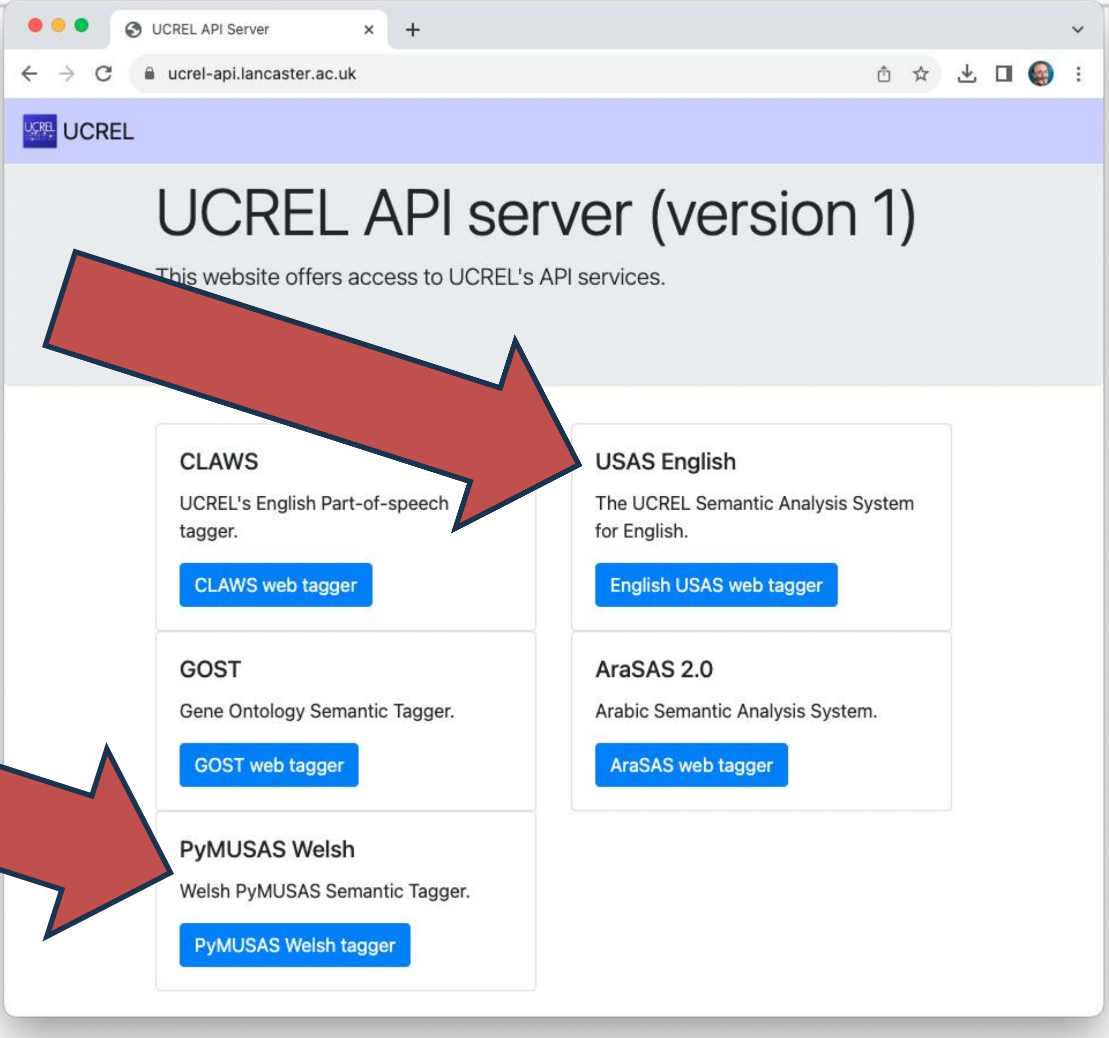
- Appropriateness of USAS semantic taxonomy
- Availability of core resources and tools e.g. tokenizer, lemmatiser, POS tagger
- Cross-lingual (embedding) methods
- Increasingly important for the analysis of social media and other online varieties where code switching is more frequent
- Two main options
  - A truly universal semantic tagger
  - Language ID and multiple separate semantic taggers

Very recent developments …

- Moore et al. (under review) Creating a Hybrid Rule and Neural Network Based Semantic Tagger using Silver Standard Data: the PyMUSAS framework for Multilingual Semantic Annotation
  - largest semantic tagging evaluation of the rule based system that uses the lexical resources in the USAS framework covering five different languages (Chinese, English, Finnish, Welsh, Irish)
  - new silver labelled English corpus
  - trained and evaluated various mono and multilingual neural network models in both mono and cross-lingual evaluation setups with comparisons to their rule based counterparts, and show how a rule based system can be enhanced with a neural network model
- Updates to the Spanish lexicon (Hugo Sanjurjo, Deusto) and Danish lexicon (Sander Puts, Maastro) two weeks ago

https://ucrel-api.lancaster.ac.uk/

You can also test USAS without a login for Wmatrix



UCREL API Server

ucrel-api.lancaster.ac.uk

UCREL

UCREL API server (version 1)

This website offers access to UCREL's API services.

CLAWS

UCREL's English Part-of-speech tagger.

CLAWS web tagger

USAS English

The UCREL Semantic Analysis System for English.

English USAS web tagger

GOST

Gene Ontology Semantic Tagger.

GOST web tagger

AraSAS 2.0

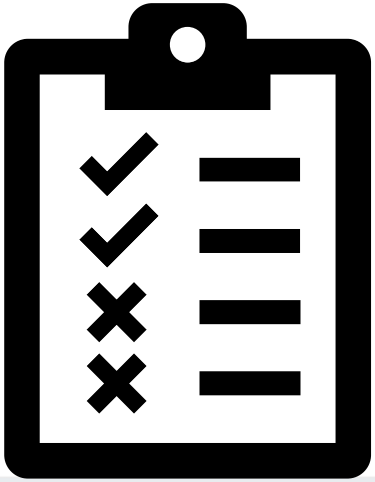
Arabic Semantic Analysis System.

AraSAS web tagger

PyMUSAS Welsh

Welsh PyMUSAS Semantic Tagger.

PyMUSAS Welsh tagger



WMATRIX VERSION 7

Key points

- Web-based (c.f. BNCweb, CQPweb, SketchEngine)
- Dedicated server, Secure HTTPS access
- You can load your own data (Multilingual in v7)
- Incorporates main methods in corpus linguistics toolbox
  - frequency lists, concordances, key words, collocations, n-grams
- Adds two levels of linguistic annotation (NLP methods)
  - POS tagging, Semantic field tagging
- Novelty
  - key domain analysis, semantic collocations

Hands on practical

- 2005 UK general election
  - Liberal Democrat party manifesto
  - Labour party manifesto
- 2010 UK general election
  - manifestos for all three main parties
- 2015, 2017, 2019 and 2024 UK general elections
  - manifestos for seven parties
- Aims:
  - To help you understand the basic Wmatrix features and key domains method
  - To give you some awareness of the semantic tagset

Version 7 compared to version 5

	Wmatrix5	Wmatrix7
Indexing system	Bespoke from 1990s	SQLite
Folders / Corpus	Single file, up to 1M words	Multiple files (zip), tested up to 30M words
Concordances	Corpus order	Various sort options
N-grams and collocations	NSP and Java code	SQLite
Language	USAS English, Spanish beta	PyMUSAS for Chinese, Dutch, Finnish, French, Italian, Portuguese, Spanish, and Welsh
MWEs	Tagged, displayed in frequency lists	Tagged but not yet displayed in frequency lists
Optional features	Domain and My Tag Wizard, Metaphor features, folder sharing	

Open two web-browser windows or tabs

- All URLs linked from Wmatrix home page:
  - https://ucrel.lancs.ac.uk/wmatrix/

1. Wmatrix tutorials
   - https://ucrel.lancs.ac.uk/wmatrix/tutorial7/

2. Wmatrix tool:
   - https://ucrel-wmatrix7.lancaster.ac.uk/
   - Apply for login now if you haven’t already got one

Your tasks!!

- https://ucrel.lancs.ac.uk/wmatrix/tutorial7/
- On your own or in small groups ...
  - **Do** tutorials A and B (you can either upload the manifesto documents yourself into Wmatrix, or use the ones I made earlier in the corpus library)
  - **Do** tutorial C (key words, key domains and concordances)

  - For the keen ones amongst you, move on to the other tutorials
  - You can use your own data if you wish
  - Ask questions any time!
  - Chance to provide feedback and influence future plans!

Thanks for listening!

- Questions and comments?

- PyMUSAS collaboration for existing and new languages welcome!!

- Contact:
  - Email: p.rayson@lancaster.ac.uk
  - 🦋 https://bsky.app/profile/perayson.bsky.social

- Icons from https://openmoji.org/

Key papers

- Rayson, P., Archer, D., Piao, S. L., McEnery, T. (2004). The UCREL semantic analysis system. In proceedings of the workshop on Beyond Named Entity Recognition Semantic labelling for NLP tasks in association with 4th International Conference on Language Resources and Evaluation (LREC 2004), 25th May 2004, Lisbon, Portugal, pp. 7-12.
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- El-Haj, M., Rayson, P., Piao, S., & Wattam, S. (2017). Creating and validating multilingual semantic representations for six languages: expert versus non-expert crowds. In Proceedings of the 1st Workshop on Sense, Concept and Entity Representations and their Applications: Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics. (pp. 61-71). Association for Computational Linguistics.
  - http://aclweb.org/anthology/W17-1908

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  - https://ucrel.lancs.ac.uk/claws/
  - https://ucrel.lancs.ac.uk/usas/
- Semantic lexicon expansion
  - Sheryl Prentice, Paul Rayson, Jo Knight, Mahmoud El-Haj, Solly Elstein (2021) A Domain Based Approach to Semantic Lexicon Expansion, International Journal of Lexicography. https://doi.org/10.1093/ijl/ecab028
- Useful background reading (keyness, annotation and MWE):
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- Ongoing maintenance of taggers (e.g. Linux porting work by Stephen Wattam), development of new components (e.g. L-gram developed by Eddie Bell, C-grams developed by Andrew Stone, Java taggers developed by Scott Piao, Python ‘pymusas’ developed by Andrew Moore) and dictionary updates (e.g. by Sheryl Prentice) are funded by user licence fees.
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