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Semantic maps of causatives :
Data types and methods in contrast

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Liège June 27 2018

Introduction

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- This explains, at least partly, the success of semantic maps.
- But how do they help us to learn something new about language?
- This talk compares some popular and less well known **statistical** semantic maps based on different data types.

A typology of semantic maps

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Causative constructions

- Formal variation

- Semantic variation

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Formal variation

- Lexical, e.g. *kill*, *break*
- Morphological, e.g. Turkish *öldür*- “kill” from *öl*- “die”
- Syntactic, e.g. *cause X to die, make X disappear*

Causative constructions

- Formal variation

- Semantic variation

Control of the Causee

- Does the Causee have control over the caused event?

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  - Yes: The teacher had the students read *War and Peace*.
  - No: The sniper killed the terrorist.

Factitive or permissive

- Factitive (making):

  That which does not kill us, makes us stronger.

Factitive or permissive

- Factitive (making):

  That which does not kill us, makes us stronger.

- Permissive (letting):

  Let my people go!

Direct or indirect causation

- Direct:

  A Swedish football player broke Rudy's nose.

Direct or indirect causation

- Direct:

  A Swedish football player broke Rudy's nose.

- Indirect:

  The politician had a rival poisoned with Novichok.

Implicative or not

- Are we sure that the caused event happened?
  - Implicative:

    The secret service killed the Kremlin critic (*but he was alive).

  - Non-implicative:

    She asked him to leave (but he might have stayed).

Some more types

- Non-intentional:

  Oops, I've broken your Ming vase!

- Forceful:

  You can't force anyone to love you.

- Assistive:

  O God, help me to be pure, but not now! (St. Augustine)

- Involved/comitative:

  Load up your guns and bring your friends! (Nirvana)

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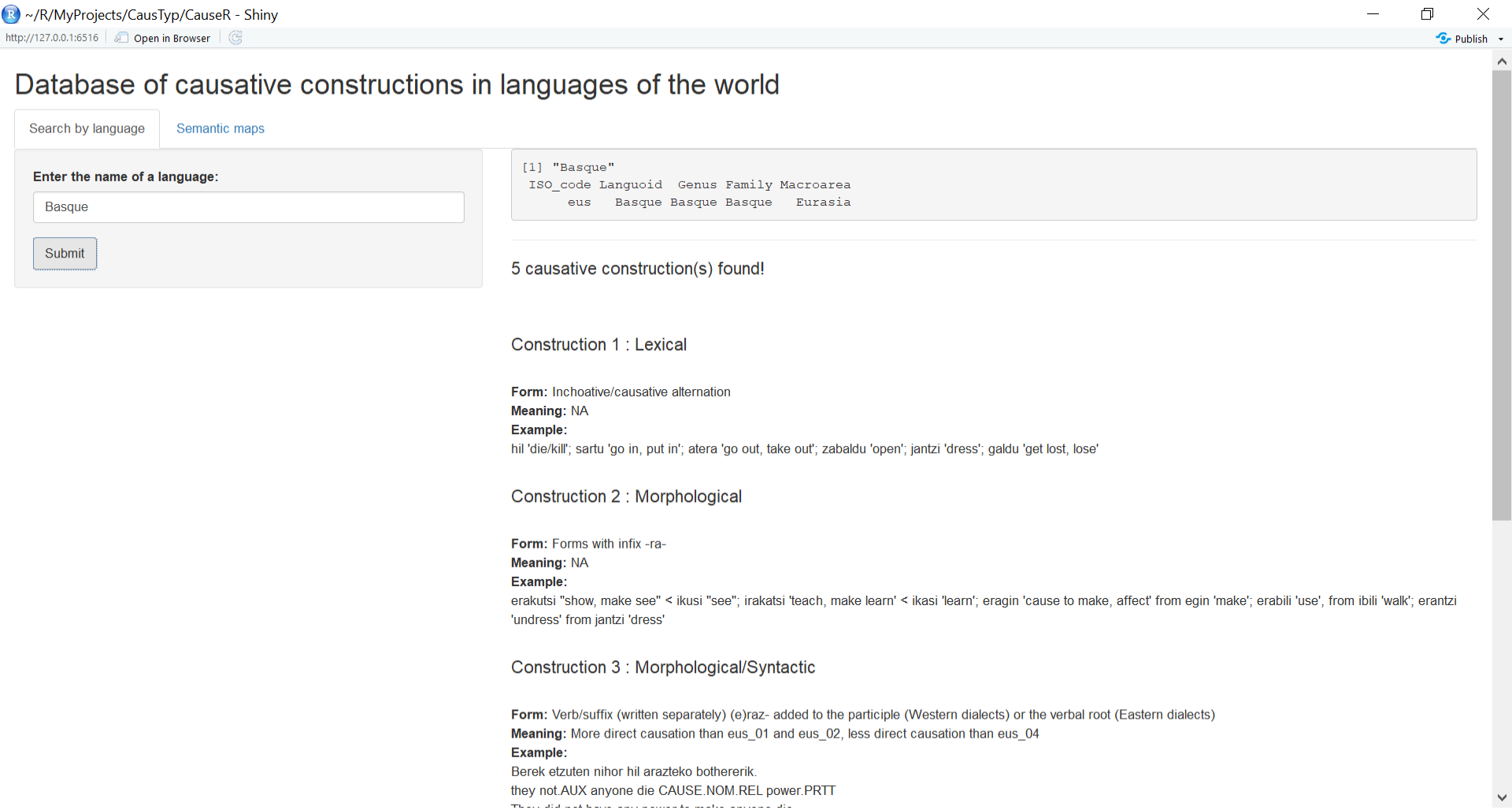
Database of causatives *TypoCaus*

- Levshina 2013 –
- Over 130 languages analyzed
- R Shiny User Interface
- Here: data from 50 families from all over the world

Database in R Shiny



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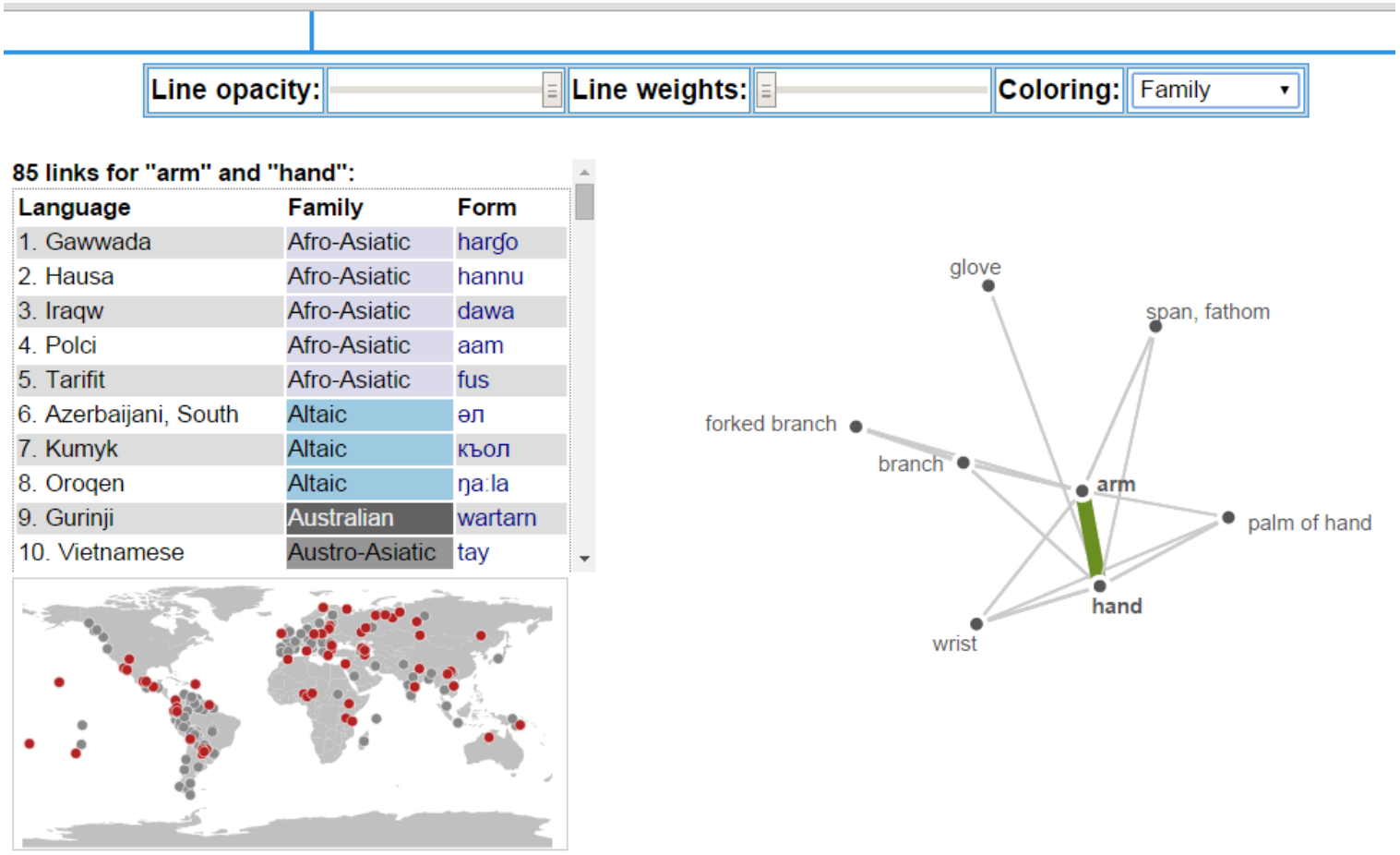
Networks: Previous work

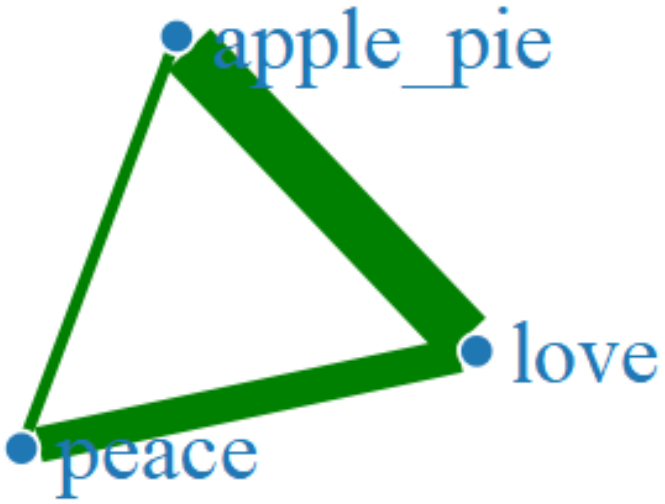


http://clics.lingpy.org/

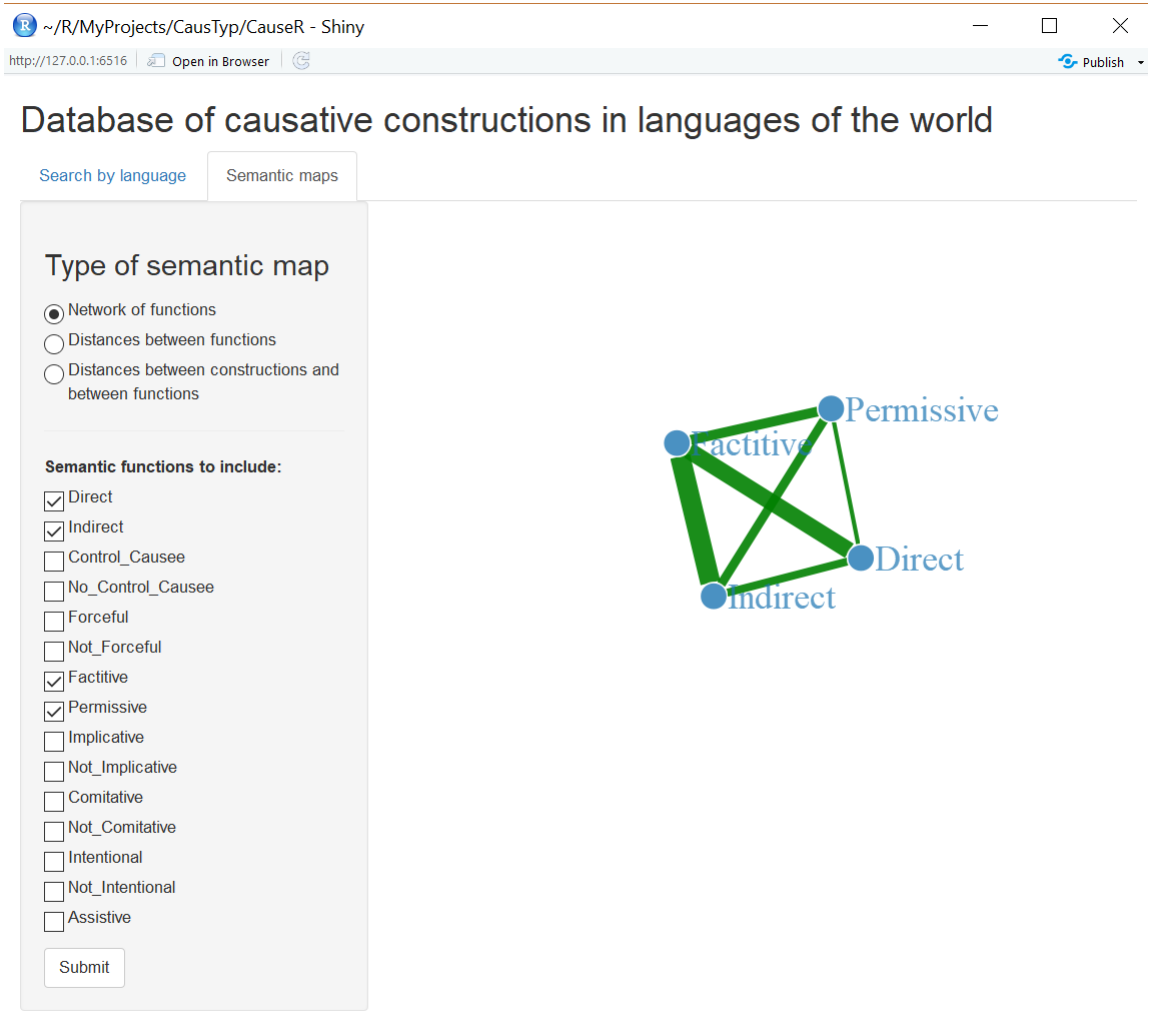
Networks: co-expression data

SENSE 1	SENSE 2	Frequency of co-expression by one form
LOVE	PEACE	3
LOVE	APPLE PIE	5
APPLE PIE	PEACE	1

Networks: visualization



Networks of causative senses



Networks of functions: evaluation

Advantages

- One can investigate the relationships between individual semantic functions
- No loss of information

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- No loss of information

Disadvantages

- Very confusing when the number of nodes is large
- No common dimensions of variation

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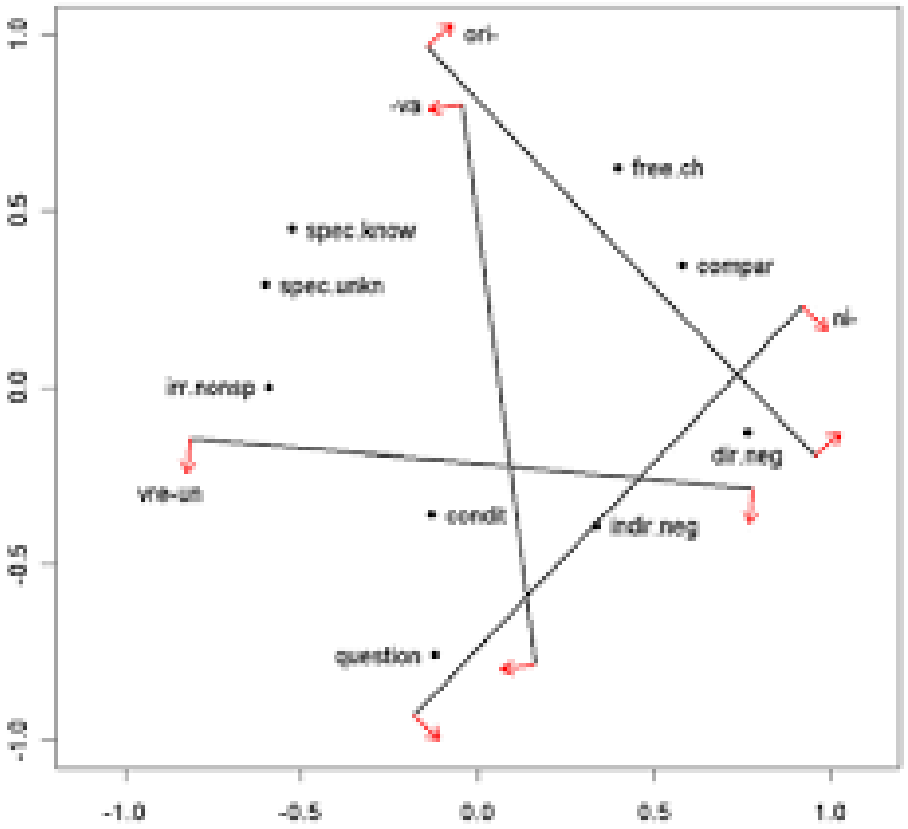
Previous work

- Croft & Poole 2008

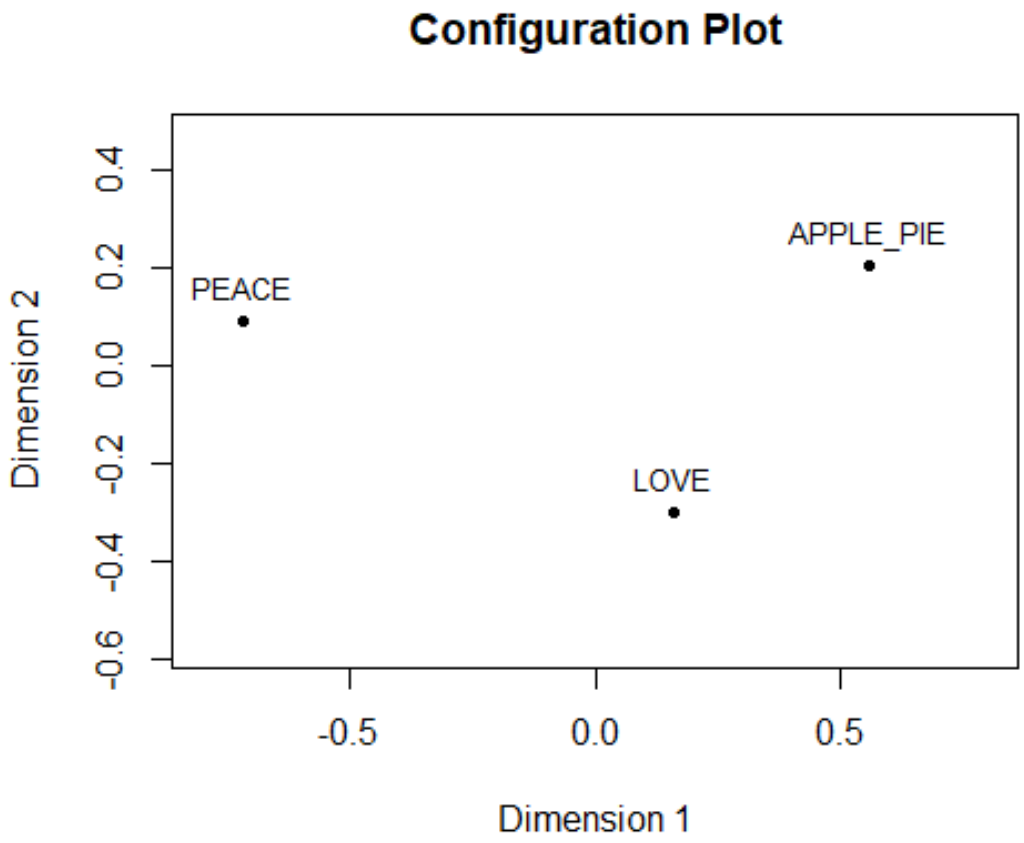


Multidimensional Scaling: computing the distances

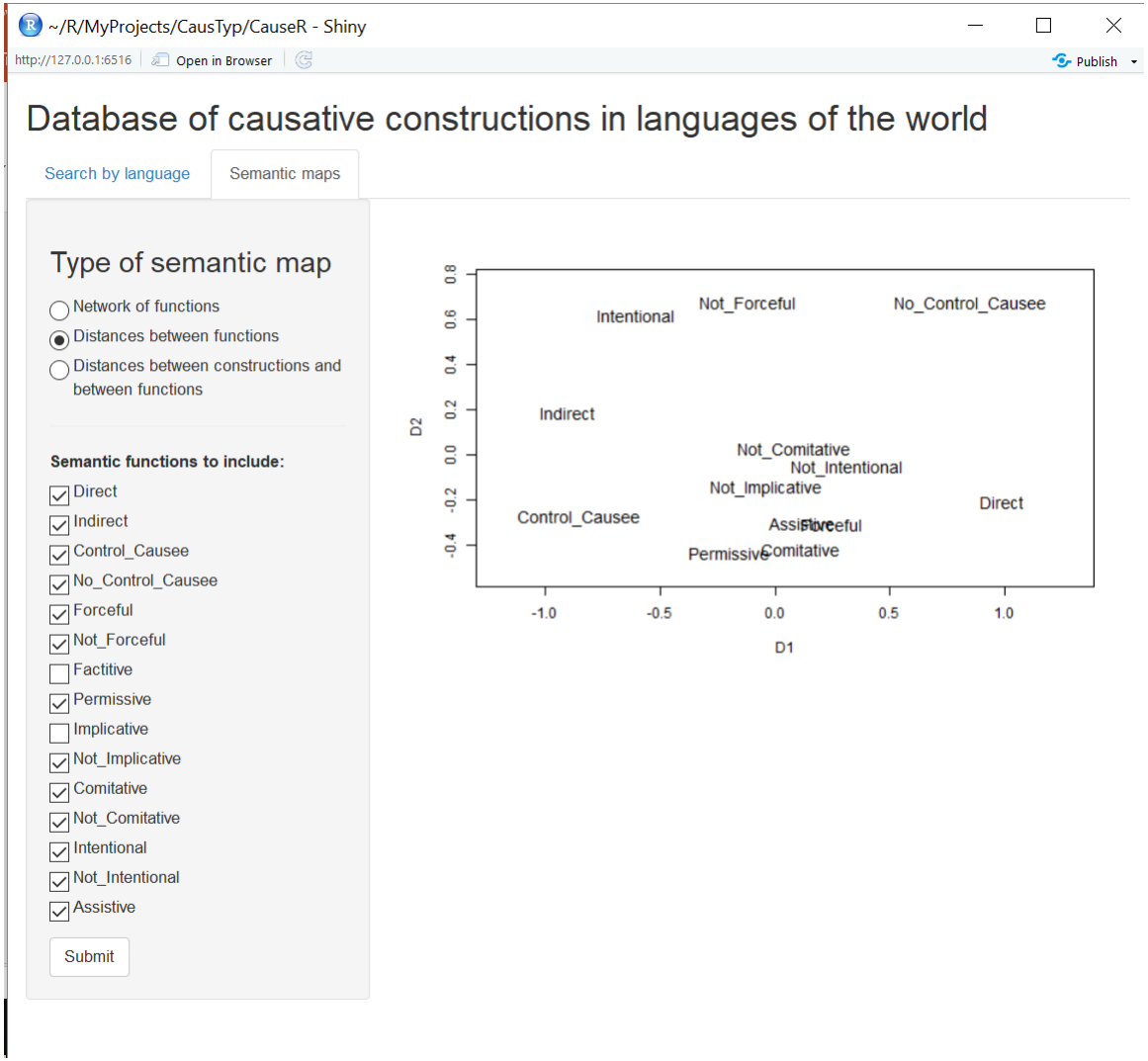
Sense	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Form 9
LOVE	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
APPLE PIE	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes
PEACE	No	Yes	No	Yes	No	Yes	Yes	No	No

Distance between LOVE and APPLE PIE: 1 – (5/9) = 0.44
Distance between LOVE and PEACE: 1 – (3/9) = 0.67
Distance between APPLE PIE and PEACE: 1 – (1/9) = 0.89

Multidimensional Scaling: visualization of distances



MDS of causative senses



Type-based MDS maps: evaluation

Advantages

- Help to identify dimensions of semantic variation

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Advantages

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Disadvantages

- More difficult to evaluate pairwise relationships
- Loss of information

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The main idea behind CA

- CA is based on comparison of row profiles and column profiles, e.g.

	M1	M2	M3	Total
Cx1	20	30	50	100
Cx2	10	70	20	100
Total	30	100	70	200

row profiles

	M1	M2	M3	Total
Cx1	0.2	0.3	0.5	1
Cx2	0.1	0.7	0.2	1

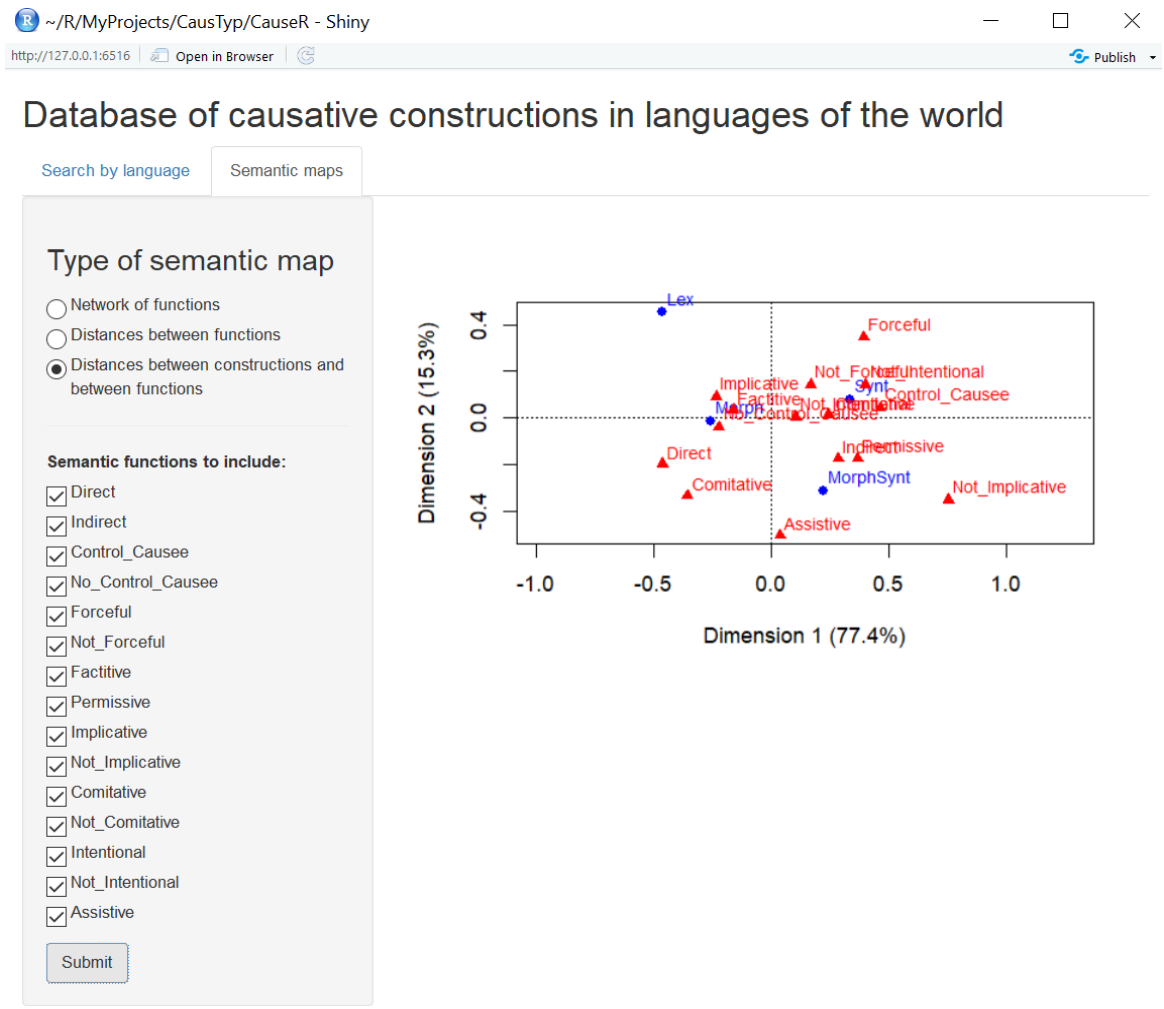
column profiles

	M1	M2	M3
Cx1	0.67	0.3	0.71
Cx2	0.33	0.7	0.29
Total	1	1	1

The main idea behind CA

- If two row or column profiles are similar, their labels will be closely located in a semantic map.
- If two row or column profiles are dissimilar, their labels will be located far from each other.

CA of causative formal types and senses



CA maps: evaluation

Advantages

- Easy to investigate form-meaning mapping
- One can explore the semantic dimensions

CA maps: evaluation

Advantages

- Easy to investigate form-meaning mapping
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Disadvantages

- One cannot interpret the distances between forms and functions directly.
- Loss of information
- The distances are non-Euclidean (chi-squared)
- Outliers are dangerous!

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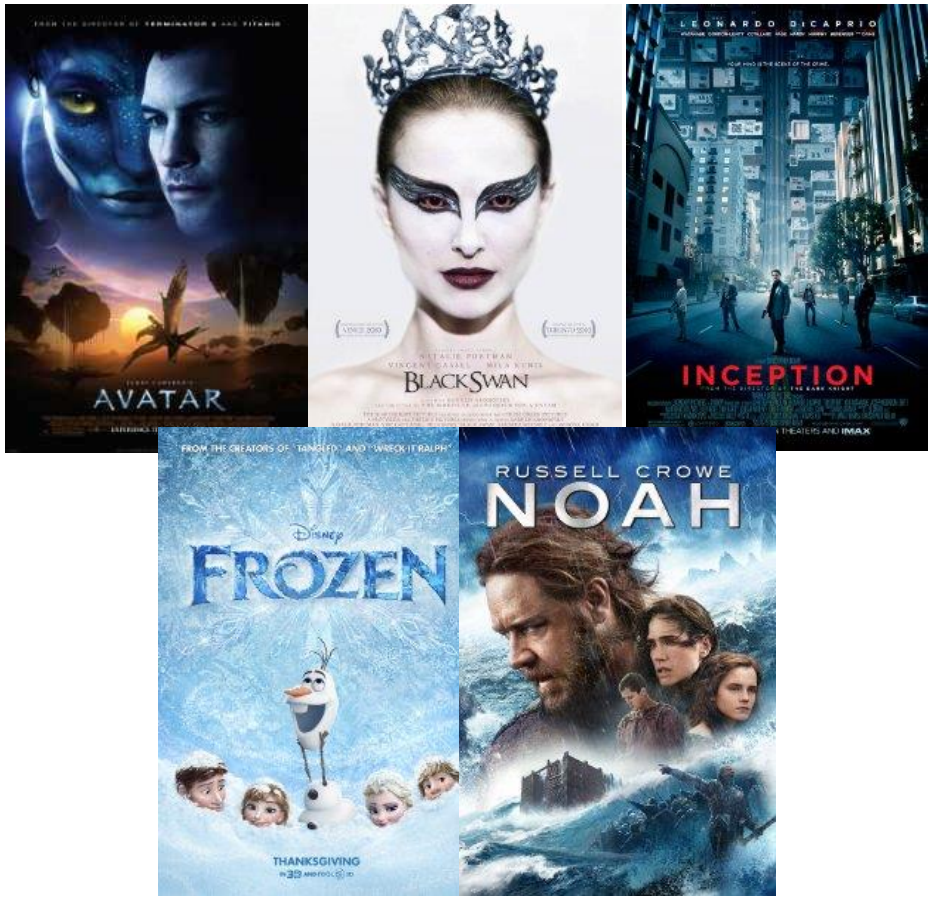
Languages

Language	Genus	Family
Chinese	Chinese	Sino-Tibetan
Finnish	Finnic	Uralic
French	Romance	Indo-European
Hebrew	Semitic	Afro-Asiatic
Indonesian	Malayo-Sumbawan	Austronesian
Japanese	Japanese	Japanese
Russian	Slavic	Indo-European
Thai	Kam-Tai	Tai-Kadai
Turkish	Turkic	Altaic
Vietnamese	Viet-Muong	Austro-Asiatic

Subtitles used in the case studies

Films



TED talks

- Ken Robinson: *Do schools kill creativity?*
- Elizabeth Gilbert: *Your elusive creative genius*
- Amy Cuddy: *Your body language shapes who you are*
- Leslie Morgan Steiner: *Why domestic violence victims don't leave*
- Dan Gilbert: *The psychology of your future self*
- Simon Sinek: *Why good leaders make you feel safe*

Data set

- 344 causative situations found in the English segment of the ParTy corpus*
- Translations in the 10 languages are found and coded into 3 types of constructions (Syntactic, Morphological or Lexical)

*http://www.natalialevshina.com/corpus.html

Example from *Avatar*

Original

- ENG: *Don't shoot, you'll piss him off.*

Translations

- FRA: *Ne tirez pas. Vous allez l'énerver*. (Lexical)
- TUR: *Ateş etme. Ateş etme. Onu kızdıracaksın*. (Morphological, from *kızmek* 'become angry').
- VIE: *Đừng bắn. Cậu sẽ làm nó nổi điên đó.* (Syntactic)

Examples of constructions

	Lexical	Morphological	Syntactic
Chinese	shā sǐ “kill”	-	ràng “let, make“ + Pred
Finnish	tappaa “kill”	odotu-tt-aa “make wait”	antaa “give” + V1
French	tuer “kill”	-	faire + Vinf
Hebrew	harag “kill” *pa’al*	hotsi “take out” *hiph’il*	natan “give” + le-Vinf
Indonesian	mem-bunuh “kill”	meng-ingat-kan “remind”	membuat “make” + Pred
Japanese	korosu “kill”	ikar-ase-ru “make angry”	V_te + morau “get”
Russian	ubit’ “kill”	-	zastavit’ + Vinf
Thai	kaa “kill	-	tham hai “do give” + Pred
Turkish	açmak "open"	öl-dür- “kill”	V_mA_DAT + izin ver- “allow”
Vietnamese	giết hại “kill”	-	làm “do” + Pred

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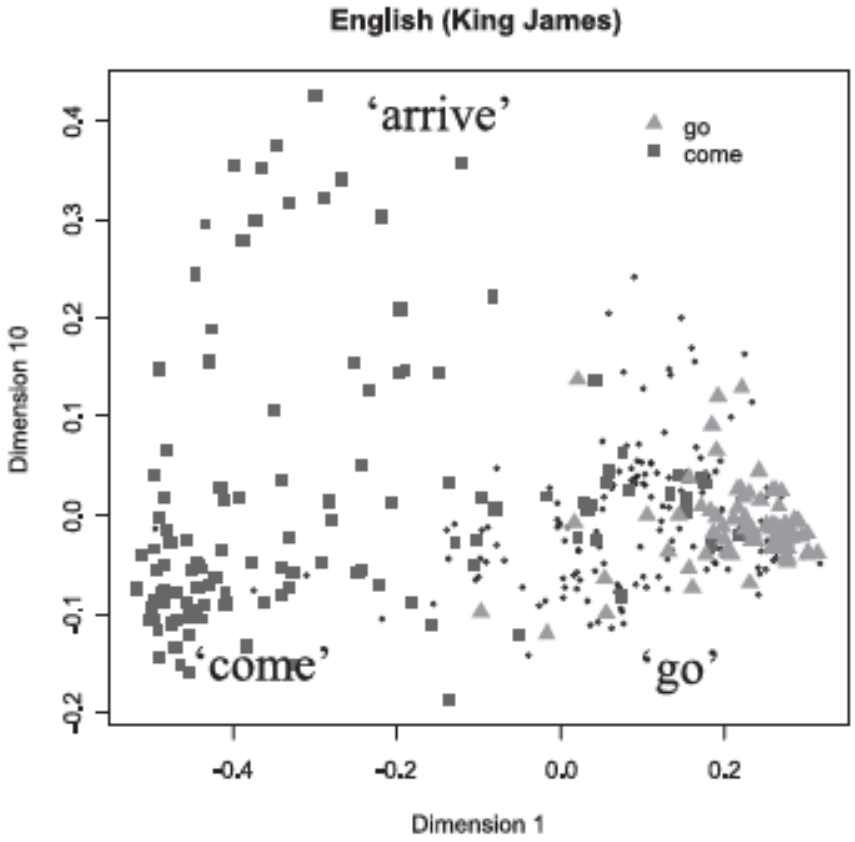
Previous work

- Wälchli & Cysouw (2012): verbs of motion in New Testament



Token-based MDS maps

1. Collect the data (fictitious example)

	Lang1	Lang2	Lang3	Lang4	Lang5
Situation 1	Lex	Morph	Synt	Morph	Lex
Situation 2	Lex	Morph	Synt	Synt	Morph
Situation 3	Morph	Morph	Lex	Morph	Synt

Token-based MDS maps

2. Compute the distances between the situations (rows)

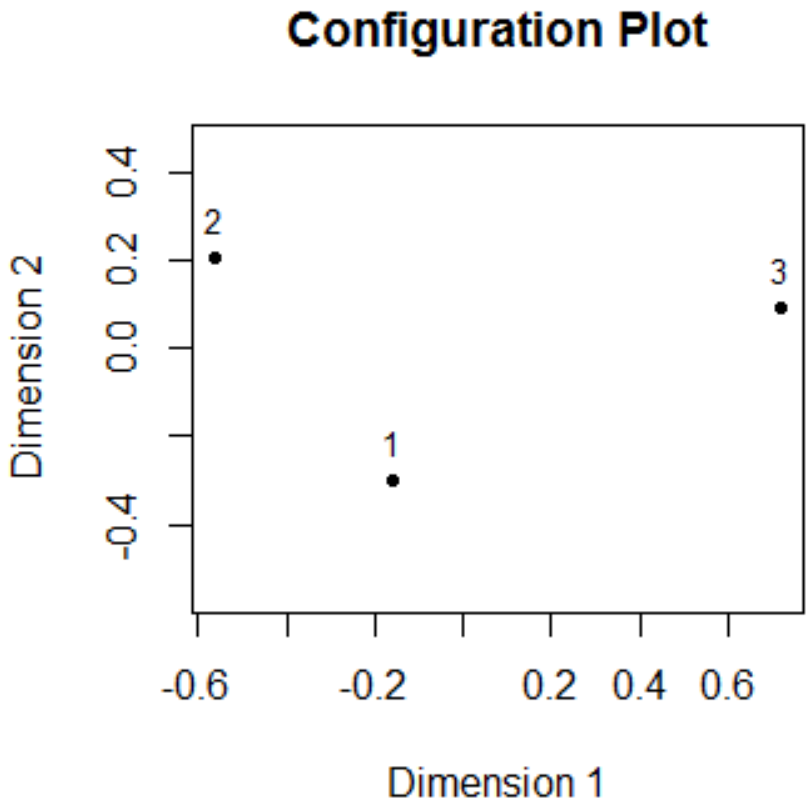
	Lang1	Lang2	Lang3	Lang4	Lang5
Situation 1	Lex	Morph	Synt	Morph	Lex
Situation 2	Lex	Morph	Synt	Synt	Morph
Situation 3	Morph	Morph	Lex	Morph	Synt

Overlap 1,2 = 3/5 = 0.6
Overlap 1,3 = 2/5 = 0.4
Overlap 2,3 = 1/5 = 0.2

Distance = 1 – overlap

Token-based MDS maps

3. Perform MDS (package smacof)



Interpretation of MDS distances

- The closer two points (i.e. causative situations), the more frequently they are expressed by the same constructions across the languages.

Interactive MDS maps with googleVis

- Exemplars:
  - http://www.natalialevshina.com/plots/bubblechart1.html
- Control of the Causee:
  - http://www.natalialevshina.com/plots/bubblechart2.html
- Intentionally acting Causer:
  - http://www.natalialevshina.com/plots/bubblechart3.html
- Mapping of the constructions: FRA, RUS, FIN, TUR

Token-based MDS maps: evaluation

Advantages

- No need for semantic coding
- Dimensions of semantic variation
- Information about the relative frequencies of meanings

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Disadvantages

- Often difficult to interpret linguistically
- Loss of information

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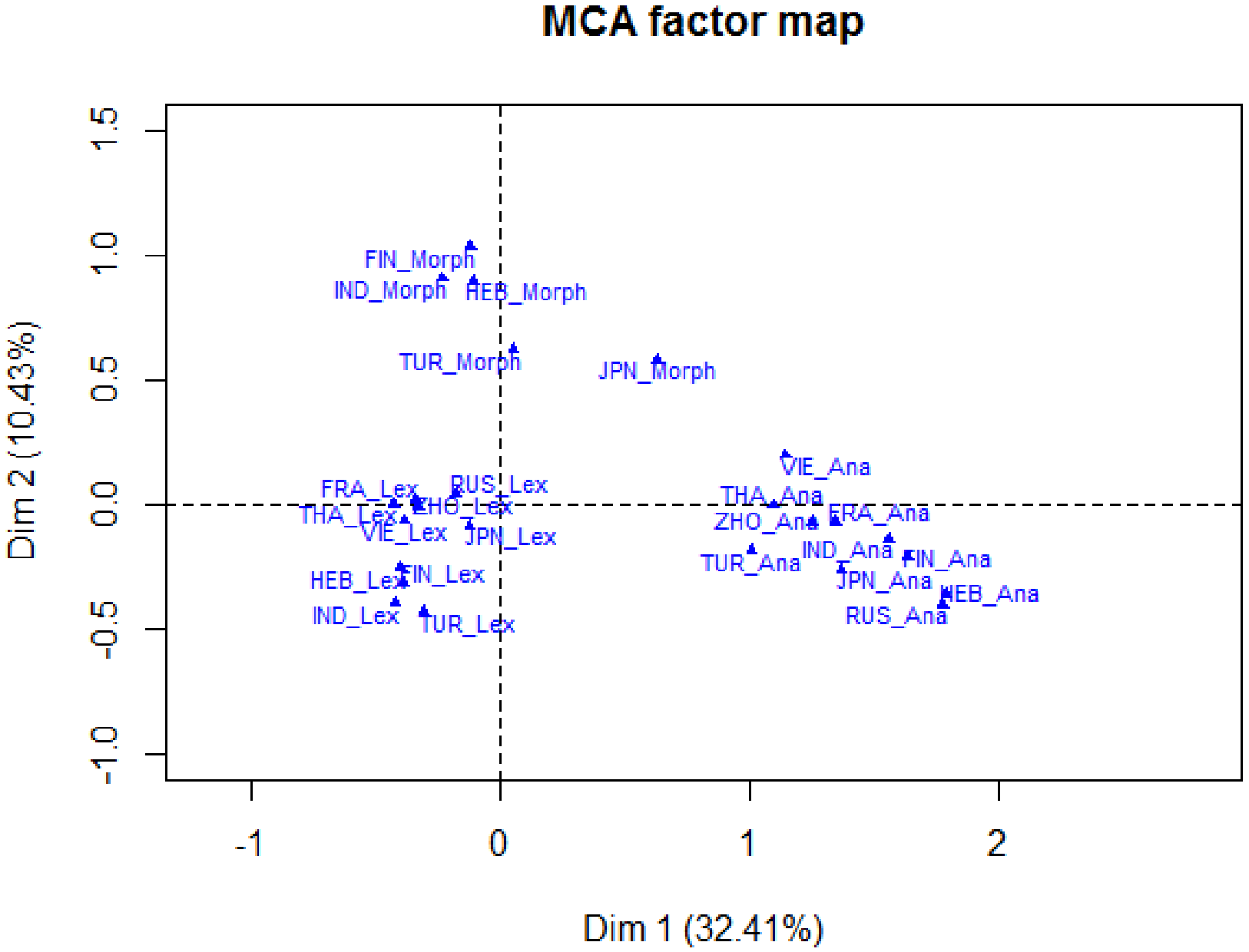
Multiple Correspondence Analysis

- Multiple Correspondence Analysis shows how different values of more than two categorical variables are associated.
  - e.g. if Finnish morphological causatives tend to be used in the same contexts as French analytic causatives, they will be located in the same region of the map.
- Package FactoMineR in R


MCA factor map
Dim 2 (10.43%)
Dim 1 (32.41%)
1.5
1.0
0.5
0.0
-0.5
-1.0
-1
0
1
2
FIN_Morph
IND_Morph
HEB_Morph
TUR_Morph
JPN_Morph
VIE_Ana
THA_Ana
FRA_Ana
ZHO_Ana
IND_Ana
FIN_Ana
TUR_Ana
JPN_Ana
HEB_Ana
RUS_Ana
FRA_Lex
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MCA maps of forms: evaluation

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Disadvantages

- Loss of information
- Outliers are dangerous!
- Only the average position (no exemplar information)
- What are the underlying semantic features?

(Note: This can be fixed with additional coding and supplementary points, see Levshina 2016)

Grammars vs. parallel corpora

Grammars

- More data for different languages are available, so one can control for genealogy and geography

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Parallel corpora

- More contextual information (e.g. films)
- More realistic picture of language use
- Translationese
- Fewer languages available (exception: NT)

Some considerations

- Statistical semantic maps are exploratory methods for generating theoretically interesting hypotheses, not the end goal.

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- If one formulates a cross-linguistic generalization on the basis of a semantic map, one also needs confirmatory methods, which can control for the genealogical and geographical relationships (e.g mixed-effects models).

Final message

- Semantic maps are almost as diverse as Belgian beers.

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- Semantic maps are almost as diverse as Belgian beers.
- Choose wisely, enjoy responsibly!

http://www.belgianbeerme.com/why-belgium/

- The database and the app will very soon be available at

https://github.com/levshina/TypoCaus

For questions and suggestions:

natalevs@gmail.com