Acronyms:

Dictionary Construction & Disambiguation

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PARSEME Working Group 1: Lexicon-Grammar Interface

Abstract

- Automatically build **acronym dictionary**
  - Apply to Hebrew
  - Rank multiple expansions by context match
  - Include local acronyms (unaccompanied by expansions)
- Improve **acronym disambiguation**
- Acronym expansions are usually **MWEs**

"Oh, it's an acronym for 'It Doesn't Stand For Anything.'"

Why We Care

- Most acronym expansions are multi-word expressions (MWEs).
- Acronyms affect NLP applications like search and machine translation.
- Hand-crafted dictionaries incomplete and require constant updating.

Previous Work

- Prior acronym dictionary-building techniques rely on ***local acronyms*** (acronyms adjacent to their expansions, often in parentheses).

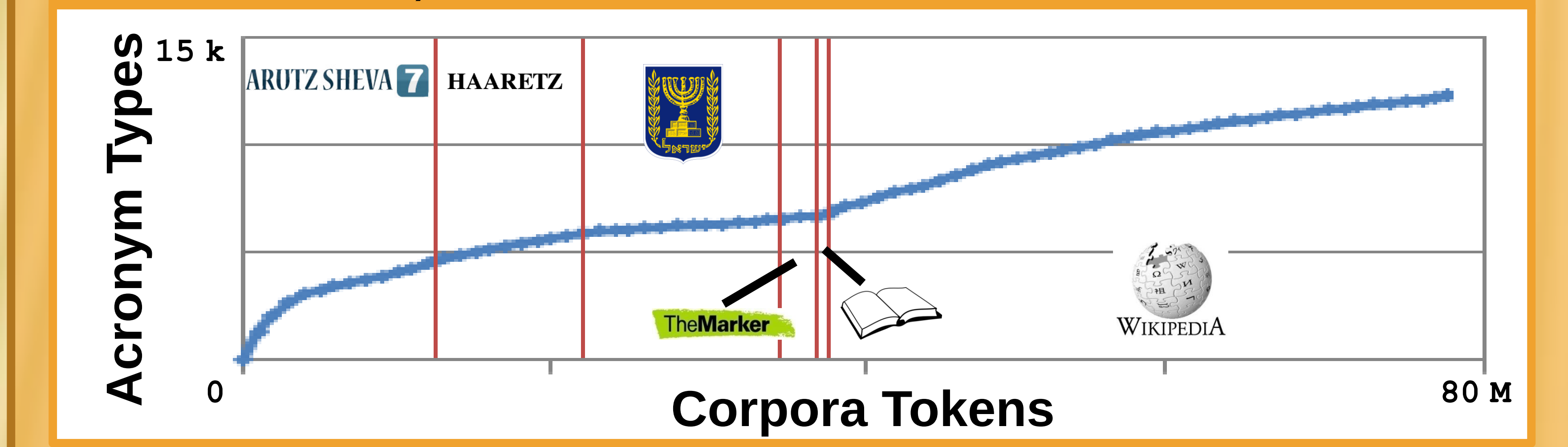
```
"The CIA (Central Intelligence Agency) released its budget."
"She works at the Culinary Institute of America (CIA)."
"Alumni of the Cleveland Institute of Art support the CIA."
```

- Only computational work on Hebrew acronyms: HaCohen-Kerner [04,08,10,13].
  - Disambiguation of Hebrew/Aramaic acronyms in Jewish law domain.
  - Assumes a pre-existing, hand-crafted acronym dictionary.

Hebrew Acronyms

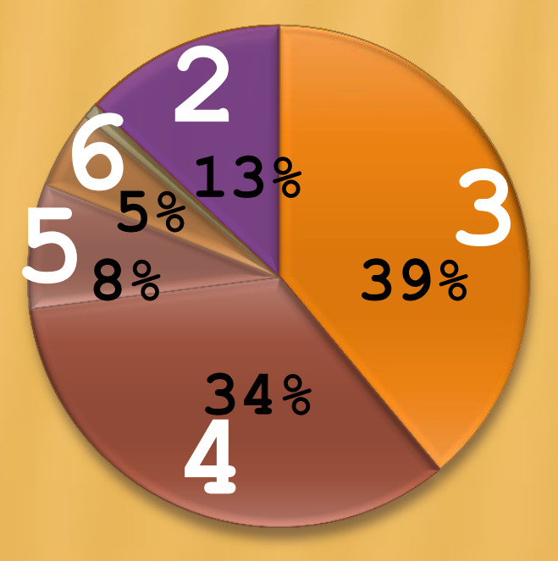
- In Hebrew corpus, acronyms **1% of word tokens** and **3% of types.**
- More common in news and encyclopedia genres than in literature.
- Challenges from Hebrew's complex morphology and orthography.

A never-ending story for unique acronyms:
new acronyms continue to be found as more text is read

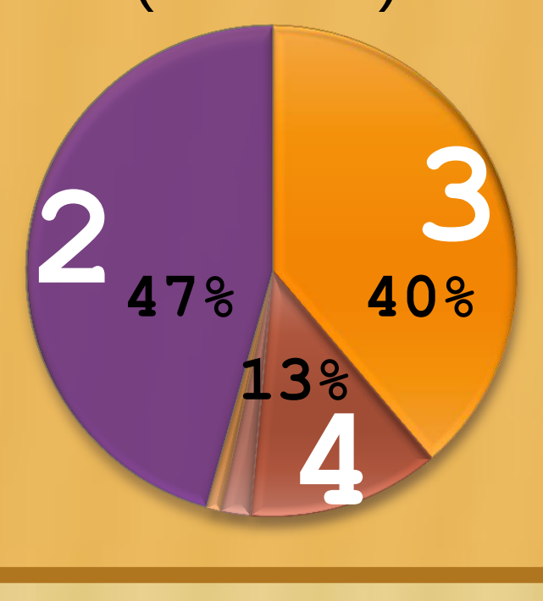


- Study **gold dictionary**: 1,000 hand-crafted acronym-expansion pairs.

Acronym Lengths
(# letters)



Expansion Lengths
(# words)



Letters	%	Formation Rule	Example
2	98%	■□□ ■□□	ש"ח = שקל חדש (*shekel new*, "New Israeli Shekel")
3	48%	■□□ ■□□ ■□□	אא"כ = אלא אם כן (*but if thus*, "unless")
	18%	■■□ ■□□	בי"ח = בית חולים (*house-of sick-people*, "hospital")
	18%	■□□ ■■□	מו"מ = משא ומתן (*take and+give*, "negotiation")
4	21%	■□□ ■□□ ■□□ ■□□	אעפ"כ = אף על פי כן (yet on as thus, "nevertheless")
	18%	■■□ ■■□	דו"אל = דואר אלקטרוני (mail electronic, "e-mail")
	13%	■■■□ ■□□	מוצ"ש = מוצאי שבת (exits-of Sabbath, "Saturday night")

Building a Dictionary

1 Identify acronyms

- **Easy in Hebrew:** unambiguous orthographic marking (internal " mark).
  - יו"ר = יושב ראש (*sitter head*, "chairperson")
- **Difficult in English:** capitalization and punctuation vary widely:
  - **M.S.** / **MS** / **M.Sc.** / **MSc** / **MSC** = **M**aster of **Sc**ience
  - **au** = **a**tomic **u**nit

2 Identify potential expansions

- Collect corpus *n*-grams ($2 \le n \le 5$).
- Discard *n*-grams that are infrequent or end with a preposition or quantifier.

Example: `Public relations is easy.`

n	*n*-grams	Freq.
2	public relations relations is ✗ is easy	1092 152 5224
3	public relations is ✗ relations is easy	102 23
4	public relations is easy	1 ✗

3 Pair acronyms and expansions

- For each *n*-gram, generate all possible frequent acronyms via common formation rules.
- Tag with contextual info from LDA topic model.

Example: `public relations`

Rule	Acronym	Freq.
■□□ ■□□	**P.R.**	5293
■□□ ■■□	**P.R.E.**	2 ✗
■■□ ■■□	**P.U.R.E.**	53

4 Classify acronym-expansion pairs

- Train SVM to recognize matches.
- Training examples:
  - ⊕ Gold dictionary acronym paired with its gold expansion
  - ⊖ Gold dictionary acronym paired with a non-gold *n*-gram.

Example: `P.R.`

Acronym	*n*-gram	
P.R.	public relations	⊕
P.R.	prince reacted	
P.R.	positive result	
P.R.	past race	⊖

- **Linguistically-motivated classification features:**
  n-gram PMI ▪ acronym and *n*-gram document frequencies ▪ formation rule acronym and *n*-gram lengths ▪ LDA topic similarity score

Match-Recognition Approach	Precision	Recall	F-score
Baseline Guess acronym's most-frequent *n*-gram is correct expansion	55 %	3 %	5 %
Our classifier	**82 %**	**81 %**	**82 %**

Acronym Disambiguation

- Extrinsically evaluated dictionary on acronym disambiguation task.
- Given 200 acronyms and their contexts, how many of the *correct* expansions are in the top *r* dictionary results for the acronyms?

Dictionary	*r* = 1	*r* = 2	*r* = 3	*r* = ∞
Baseline #1: Dictionary of local parenthetical acronyms				52 %
Baseline #2: Gold dictionary	66 %	77 %	78 %	83 %
Our dictionary	**73 %**	**79 %**	**81 %**	**85 %**

Error Rate Reduction	*r* = 1	*r* = 2	*r* = 3	*r* = ∞
Our Dictionary *vs.* Baseline #1				**69 %**
Our Dictionary *vs.* Baseline #2	**18 %**	**8 %**	**14 %**	**14 %**

Future Work

- Exploit for identifying **multi-word expressions (MWEs)**.
- Apply to **other languages**
  - *Hebrew advantages:* Easy acronym identification, very widespread acronym use.
  - *Hebrew disadvantages:* Complex morphology/orthography, poor NLP resources.
- **Additional applications**: search, machine translation, named entities.