LSCDiscovery: A shared task on semantic change discovery and detection in Spanish

Frank D. Zamora-Reina [1] Felipe Bravo-Marquez [1] Dominik Schlechtweg [2]

[1]Department of Computer Science, University of Chile, IMFD & CENIA

[2]Institute for Natural Language Processing, University of Stuttgart

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LSCDiscovery: Phases

1. Graded Change Discovery,
2. Binary Change Detection

Graded Change Discovery

Given a diachronic corpus pair $C1$ and $C2$, rank the intersection of their (content-word) vocabularies according to their degree of change between $C1$ and $C2$.

Binary Change Detection

Given a target word w and two sets of its usages $U1$ and $U2$, decide whether w lost or gained senses from $U1$ to $U2$, or not.

LSCDiscovery: discovery

- *discovery* introduces additional difficulties for models
  - a large number of predictions is required
  - target word are not preselected, balanced or cleaned

LSCDiscovery: Optional Tasks

- Graded Change Detection
- Sense Gain Detection
- Loss Gain Detection
- COMPARE

LSCDiscovery: Optional Tasks

Graded Change Detection

- similar to Graded Discovery
- the only difference was the public target words corresponded exactly to the hidden words on which we evaluated

LSCDiscovery: Optional Tasks

Sense Gain Detection

- similar to Binary Change Detection
- only words which gained (not lost) senses receive label 1.

LSCDiscovery: Optional Tasks

Sense Loss Detection

- similar to Binary Change
- only words which lost (not gained) senses received label 1.

LSCDiscovery: Optional Tasks

COMPARE

- average of human semantic proximity judgments of usage pairs
- approximation of JSD (Graded Change)

LSCDiscovery: Corpora

Corpus	Time period	Tokens
Old corpus ($C1$)	1810–1906	$\sim 13M$
Modern corpus ($C2$)	1994–2020	$\sim 22M$

Table: Sizes of both corpora.

LSCDiscovery: Previous Shared Tasks

- SemEval 2020 Task 1
- DIACR-Ita
- RuShiftEval

LSCDiscovery: Previous Shared Tasks

Shared Task	**Target words (dev/testing)**	**Task**
SemEval 2020 Task 1	0/156	Binary Change/Graded Change
DIACR-Ita	0/18	Binary Change Detection
RuShiftEval	12/99	COMPARE

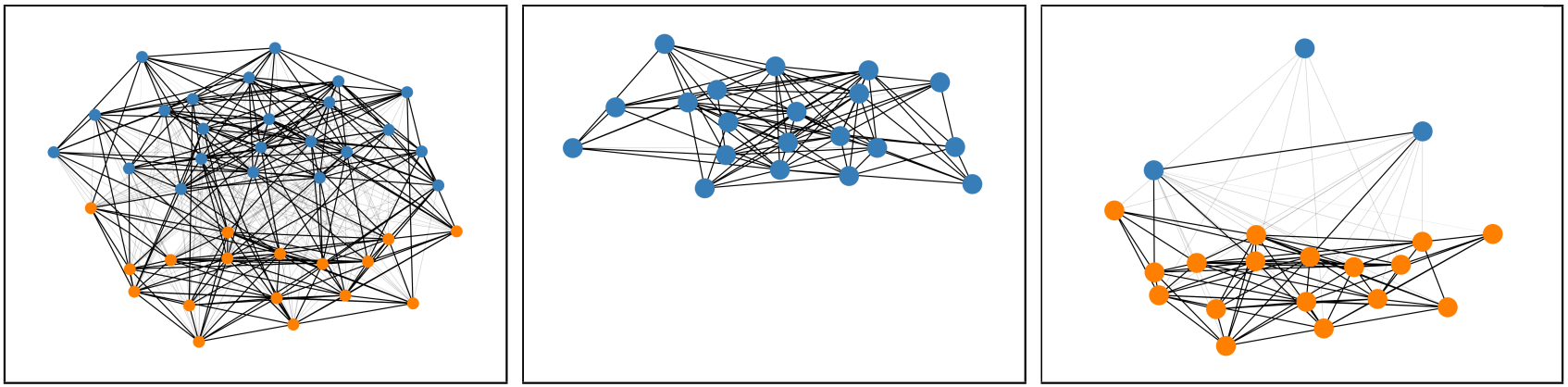
LSCDiscovery: Target words

- public target words $\rightarrow$ 4385 (only evaluation phase 1)
- hidden target words $\rightarrow$ 80
  - development set $\rightarrow$ 20
  - evaluation set $\rightarrow$ 60
- exact annotated target word usages were provided

LSCDiscovery: Annotations

- 12 annotators
- each target word was sampled $|U_1| = |U_2| = 20$ usages (sentences) per subcorpus (C_1, C_2).
- ~62K judgments
  - 12k judgments for development
  - 38k judgments for evaluation
  - 12k judgments for discarded (due to the low agreement)

LSCDiscovery: Annotations



$G, D = (23, 17)$ $G_1, D_1 = (20, 0)$ $G_2, D_2 = (3, 17)$

Figure: Word Usage Graph of Spanish *servidor*.

Graded Change Discovery

- Spearman correlation

LSCDiscovery: Metrics

COMPARE

- Spearman correlation

Binary Change Detection

- F1 (main metric)
- Precision
- Recall

Sense Gain Detection

- F1
- Precision
- Recall

LSCDiscovery: Metrics

Sense Loss Detection

- F1
- Precision
- Recall

Baselines

- **baseline1**: SGNS+OP+CD
- **baseline2**: Normalized Log-Transformed Frequency Difference
- **baseline3**: Grammatical Profiling
- **baseline4**: Minority class
- **baseline5**: Random baseline

LSCDiscovery: Winning systems in phase 1

- GlossReader (token-based system)
  - fine-tuned the XLM-R multilingual as part of a gloss-based Word Sense Disambiguation (WSD) system language model
- DeepMistake (token-based system)
  - WiC model, initially trained by fine-tuning the XLM-R model
- HSE (token-based system)
  - fine-tuning BERT, and then clustering using K-means

LSCDiscovery: Winning systems in phase 2

- GlossReader (token-based system)
- UAlberta (token-based and type-based system)
  - SGNS + XLM-R + APD
- Rombek (token-based system)
  - WSI task

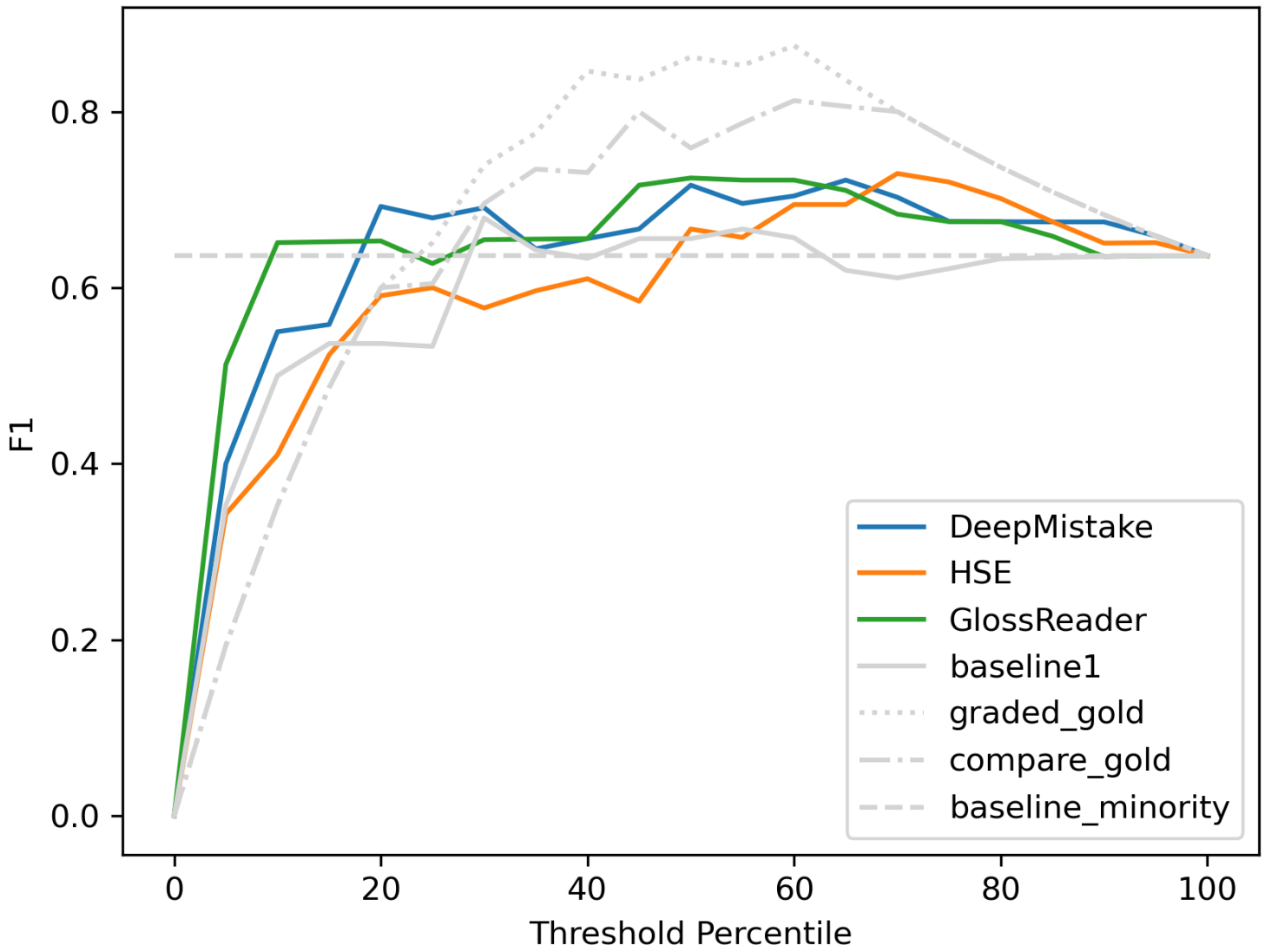
LSCDiscovery

- the winning system for phase 1 and 2 actually models the COMPARE score with APD
- for phase 2 it uses thresholding on the graded scores

LSCDiscovery: Discussion

- performance for **graded change** comparable to previous shared tasks
  - but obtained under harder conditions (Discovery)
  - → applicable to solve real-world historical semantics/lexicography problems
- performance for **binary change** lower, but still above baseline
  - more relevant to historical semantics/lexicography
  - → future challenge
- both tasks dominated by token-based models
  - → confirms tendency observed in RuShiftEval
- clustering methods amongst the best-performing systems for the first time
  - important, because current systems exploit correlations between change measures and do not model annotation procedure
    - → **upper performance bound**

LSCDiscovery: Thresholding



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