

**AMLaP 2020**



# Mind your models!

Distributional semantic models for the analysis of verbal fluency tasks in  
Schizophrenia Spectrum Disorders

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People with SSDs exhibit poor performance to Verbal Fluency tasks → executive functions and semantic store



Promising studies using manual scoring to identify semantic clusters and switching BUT heterogeneous results.



***How about automating the scoring process using computational semantic models?***



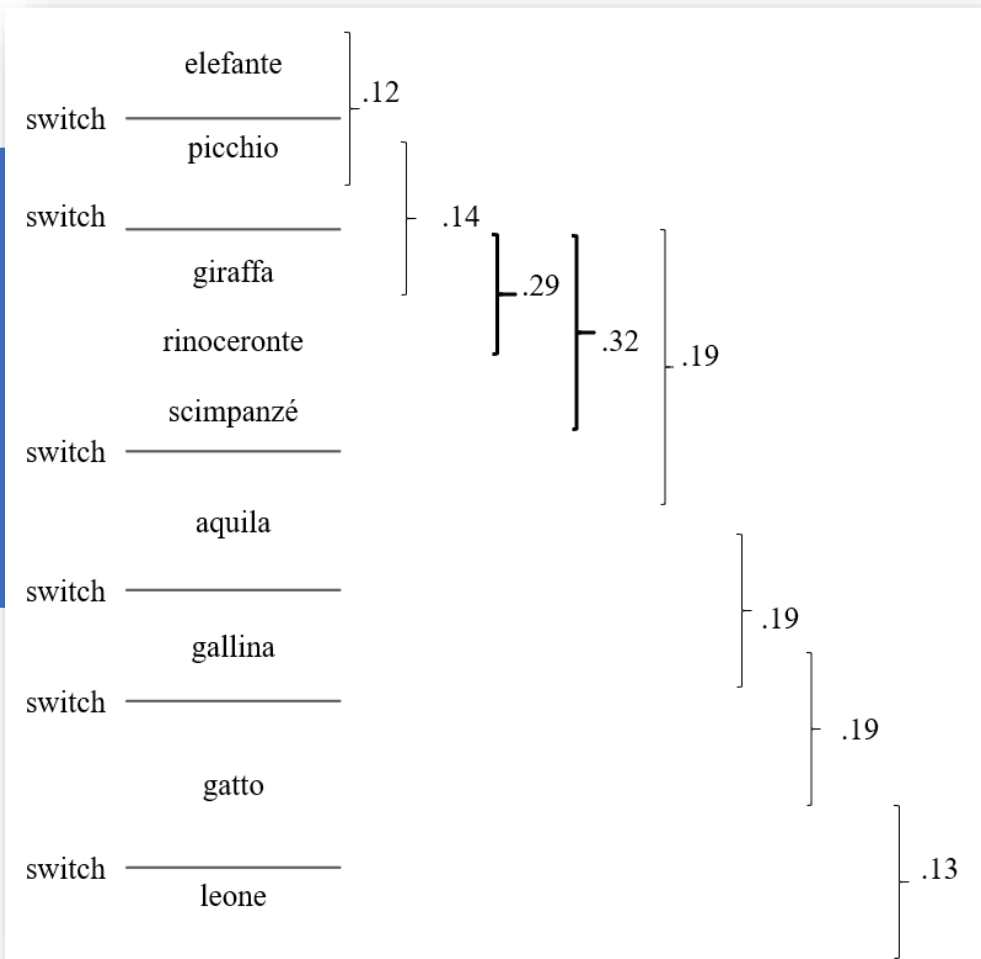
AIM: classification performance of VF semantic measures derived from different computational architectures vs manual annotation

60sec  
«Animals»



120sec  
«Free  
associations»

- 37 people with SSD + matched HP
- VF tasks: one SVF and one GAN
- Variables:
  - size of semantic clusters,
  - number of switches between clusters,
  - Coherence between responses
- Computed:
  - manually following Troyer et al.'s procedure (1997)
  - algorithms relying on semantic representations from:
    - Word2vec
      - WEISS1 (9-word windows, 400 dimensions)
      - WEISS2 (4-word windows, 200 dimensions)
    - LSA
      - Ad-hoc, matched vocabulary, 300 dimensions, PPMI + SVD
- Classifiers: logistic regressions models
  - NS \* SC + coherence ~ group membership
  - AUC from ROCs compared to identify the best performing classifier

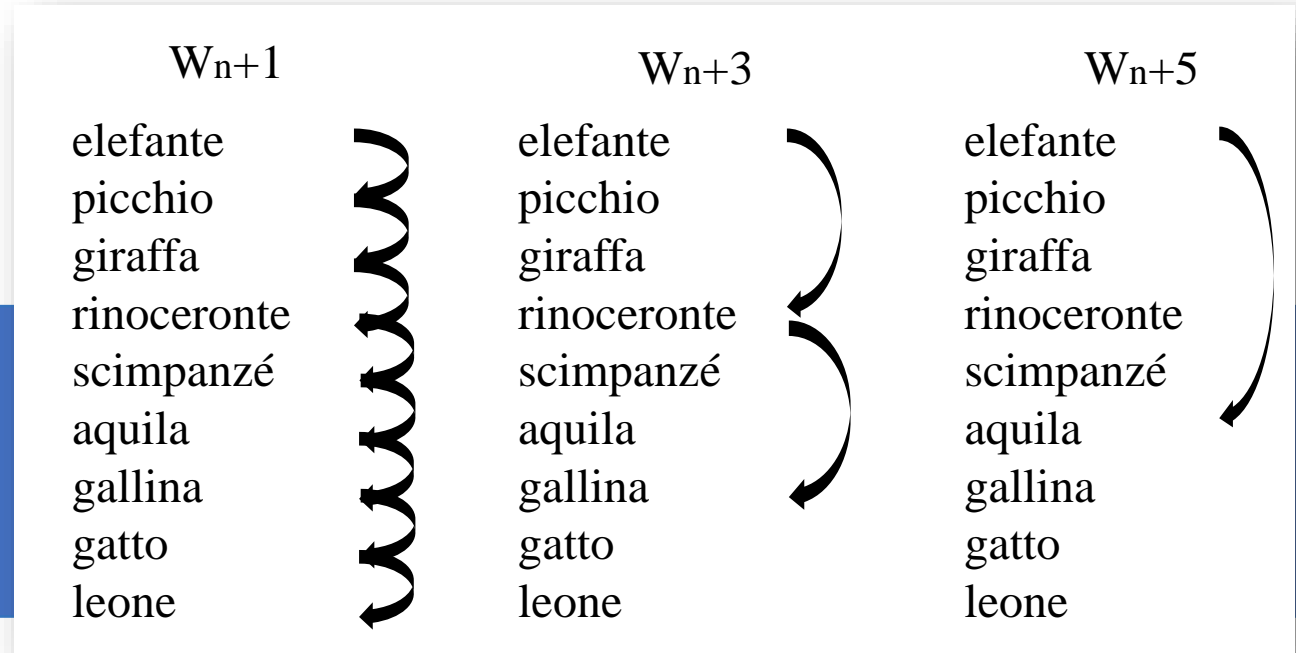


## Number of switches and size of clusters

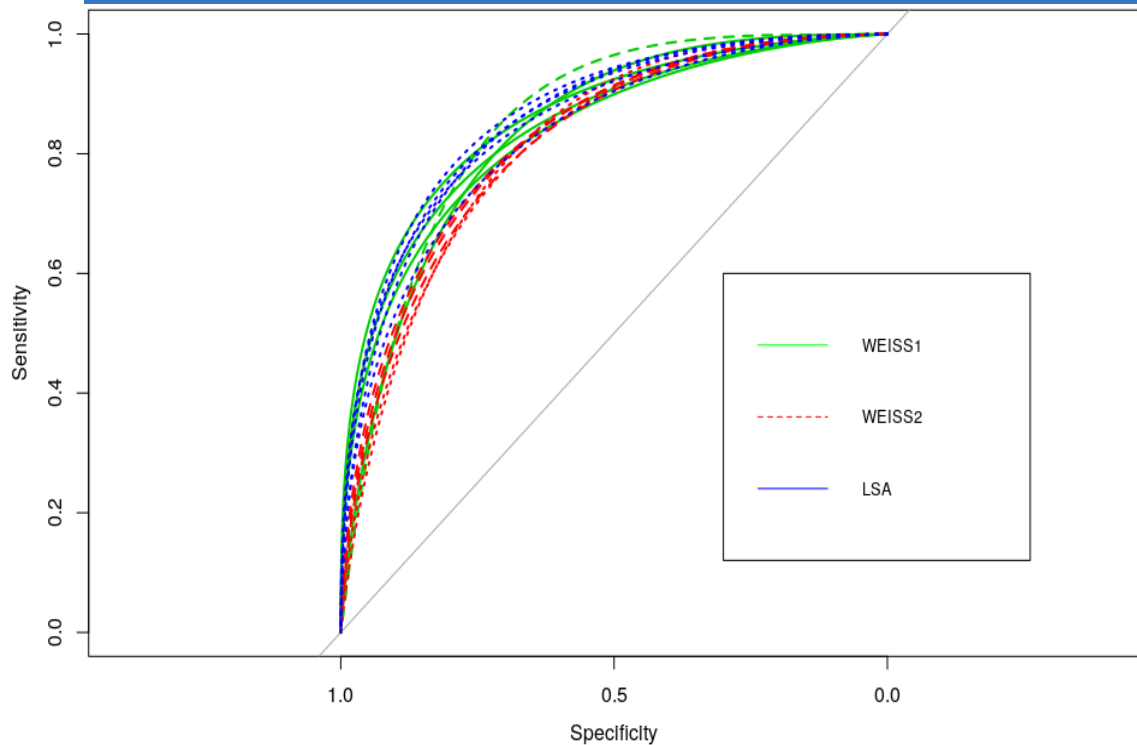
1. retrieves word vector from SS
2. computes cosine proximity with next word
3. compares value to threshold\*
4. if equal or above  $\rightarrow$  part of a cluster  $\rightarrow$  average vectors and loop a new vector
5. if not  $\rightarrow$  switch and restart

## Coherence

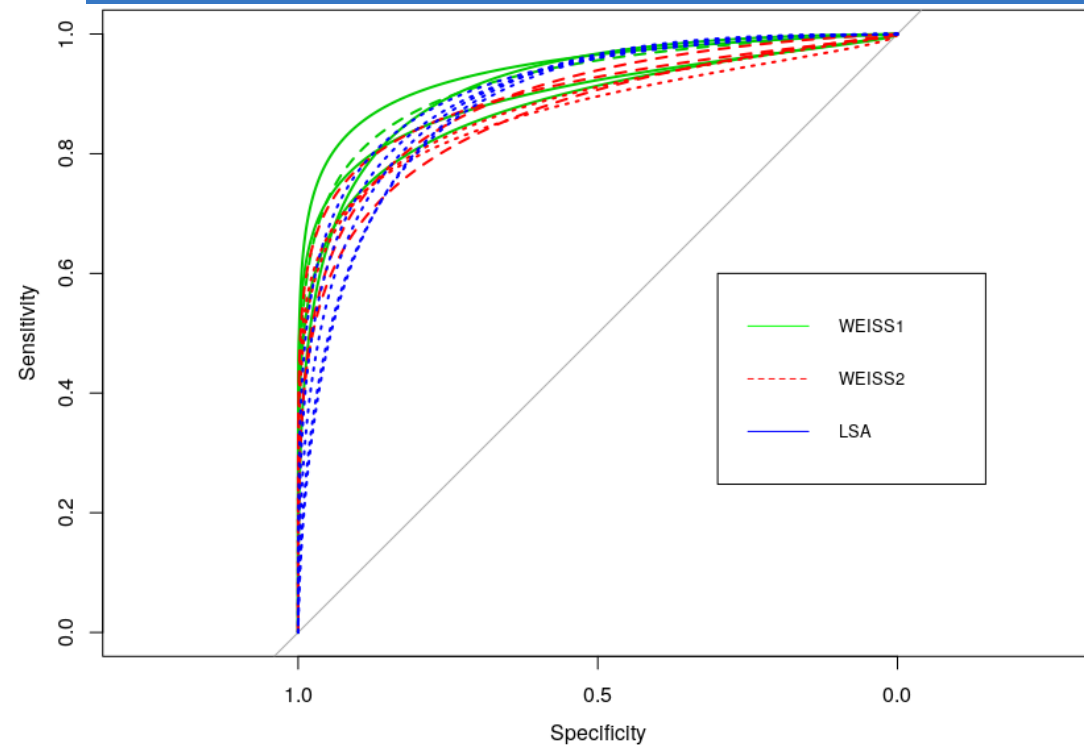
R function: computes mean cosine distance between words at different distances ( $w_{n+1}$ ,  $w_{n+3}$ ,  $w_{n+5}$ ,  $w_{n+7}$ ).



## SVF



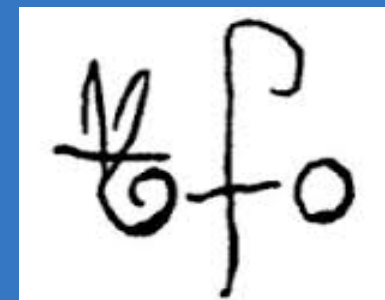
## GAN



AUC values	SVF	GAN
MANUAL	0.76	0.82
WEISS1	0.86	<b>0.94</b>
WEISS2	0.84	0.91
LSA	<b>0.87</b>	0.92

## ...IN A NUTSHELL

- Consider the type of semantic relations prompted by a VF when choosing the semantic representation to employ.
- Classifiers based on VF measures derived from semantic models always outperformed classifiers informed by manual scoring.



Thanks!

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