

How distinct are Syntactic and Semantic Representations in the Brain During Sentence Comprehension?

Subba Reddy Oota, Frédéric Alexandre, Xavier Hinaut

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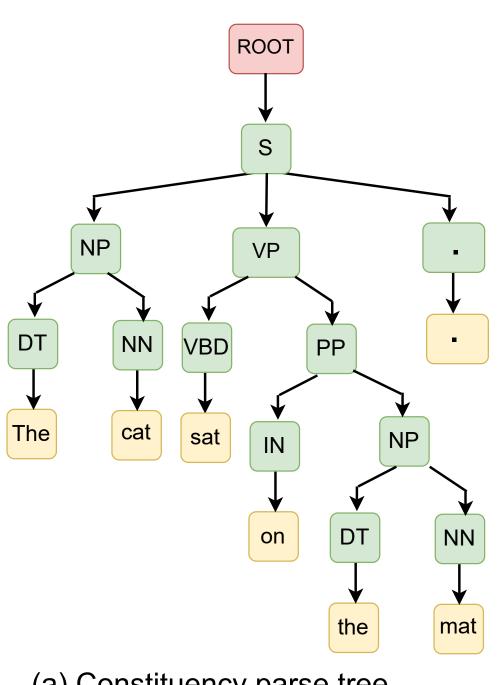
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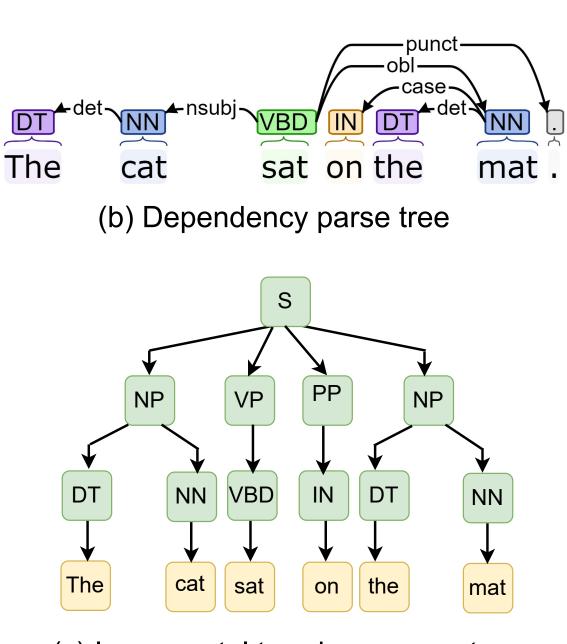
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Introduction

- Syntactic parsing is the task of assigning a syntactic structure to a sentence.
- 2 Recent works have used syntactic embeddings from constituency trees and other word syntactic features to understand how syntax structure is represented in the brain's language network.
- **3** However, the effectiveness of dependency parse trees or the relative predictive power of the three syntax parsers is yet unexplored.





(a) Constituency parse tree

(c) Incremental top-down parse tree

Figure 1: Example of syntactic parsing for three parsers

Questions

1 Do syntactic parser representations predict similar fMRI areas? • Which syntactic parsing method better predicts fMRI activity?

Main Contributions

• We explore syntactic structure embeddings obtained from three parsers and use them in an encoding model to predict brain responses.

• We use a GCN model (SynGCN embeddings) for the dependency parser that accurately encodes the global syntactic information.

Feature Representations

1 Constituency Tree-based Embeddings 2 Dependency Tree-based Embeddings using GCN (SynGCN) 3 Incremental Top-Down Parser Embeddings **4** Basic Syntactic Features **5** BERT Features

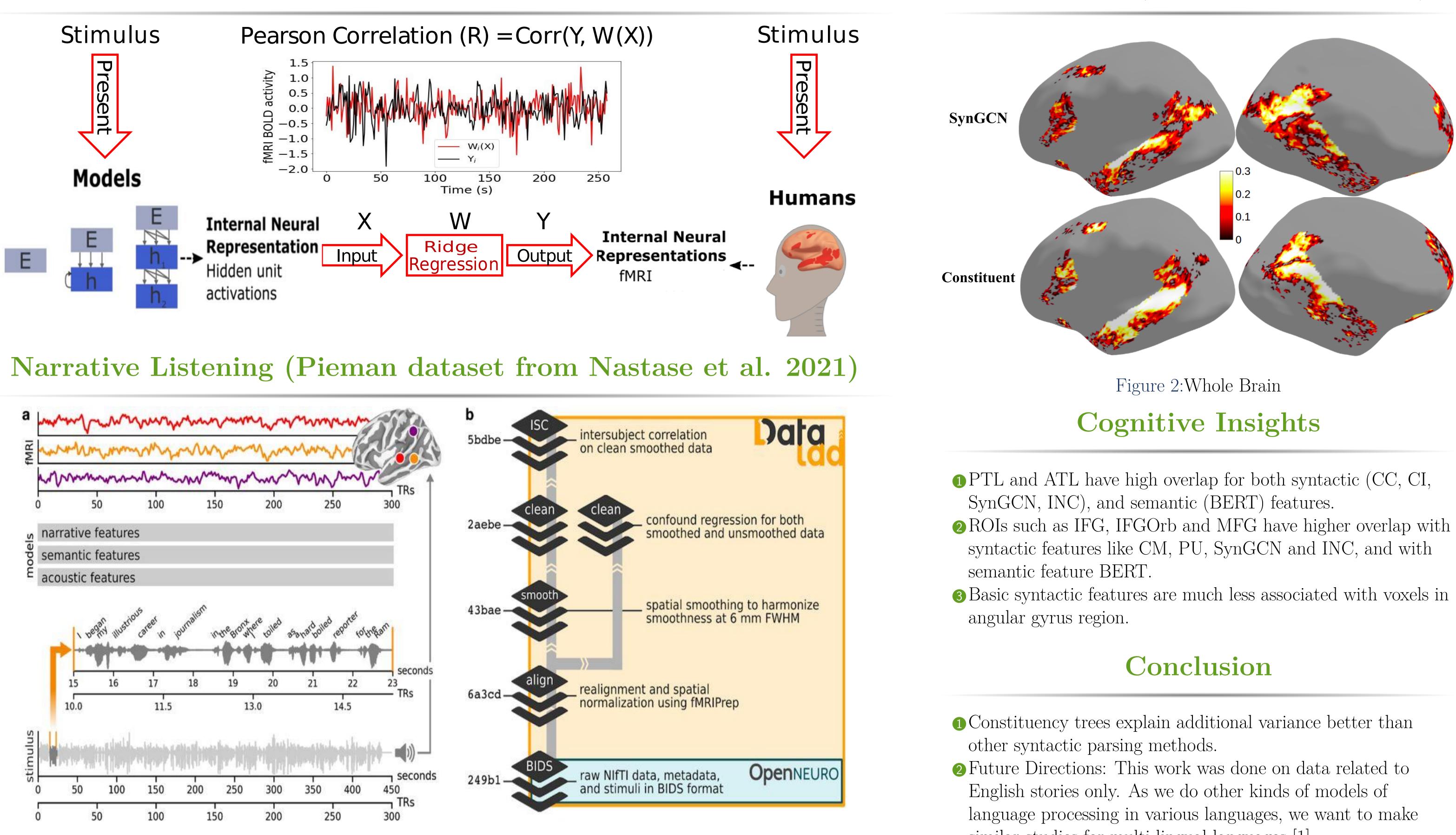
Evaluation Metrics

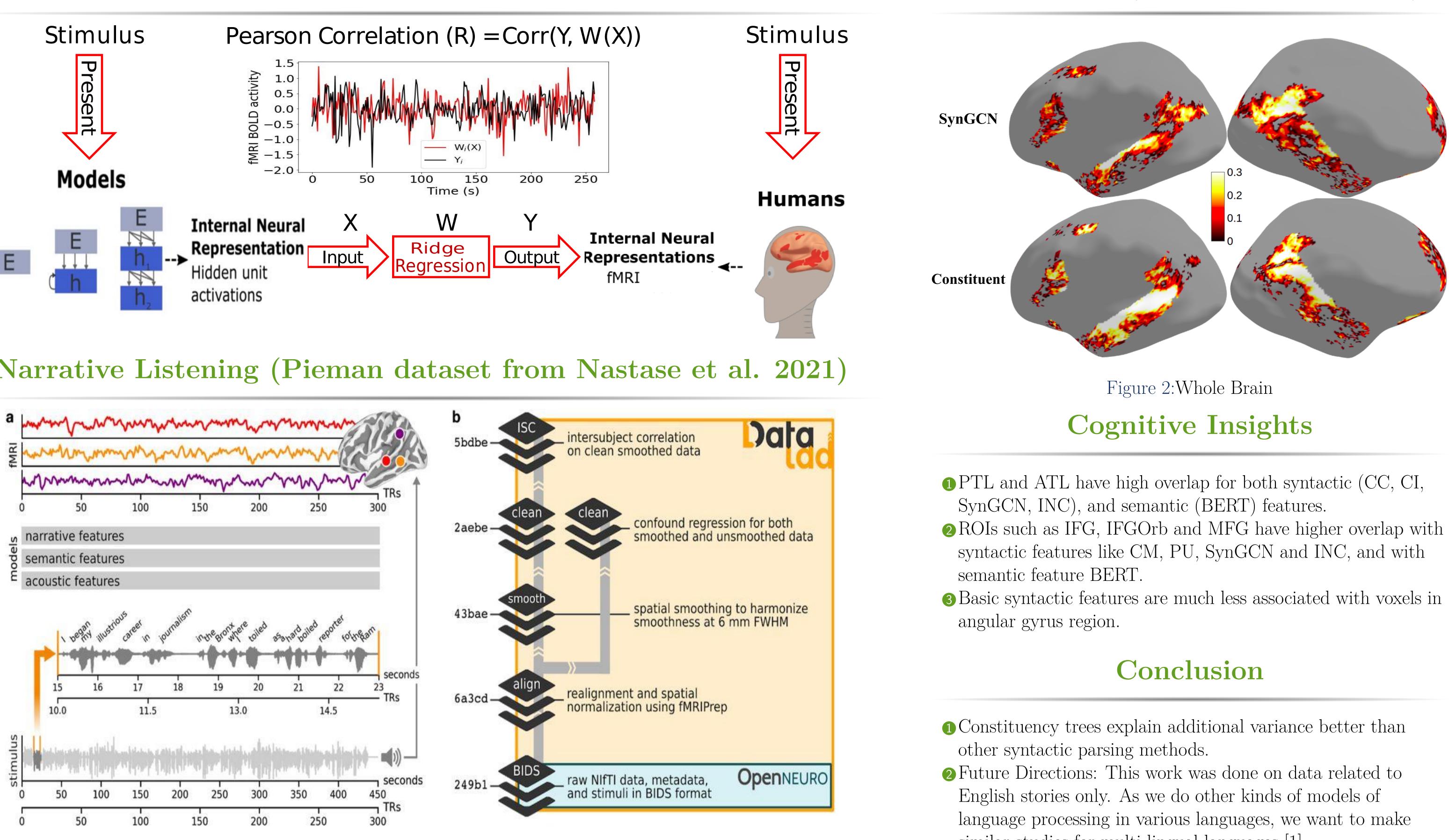
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¹INRIA Bordeaux

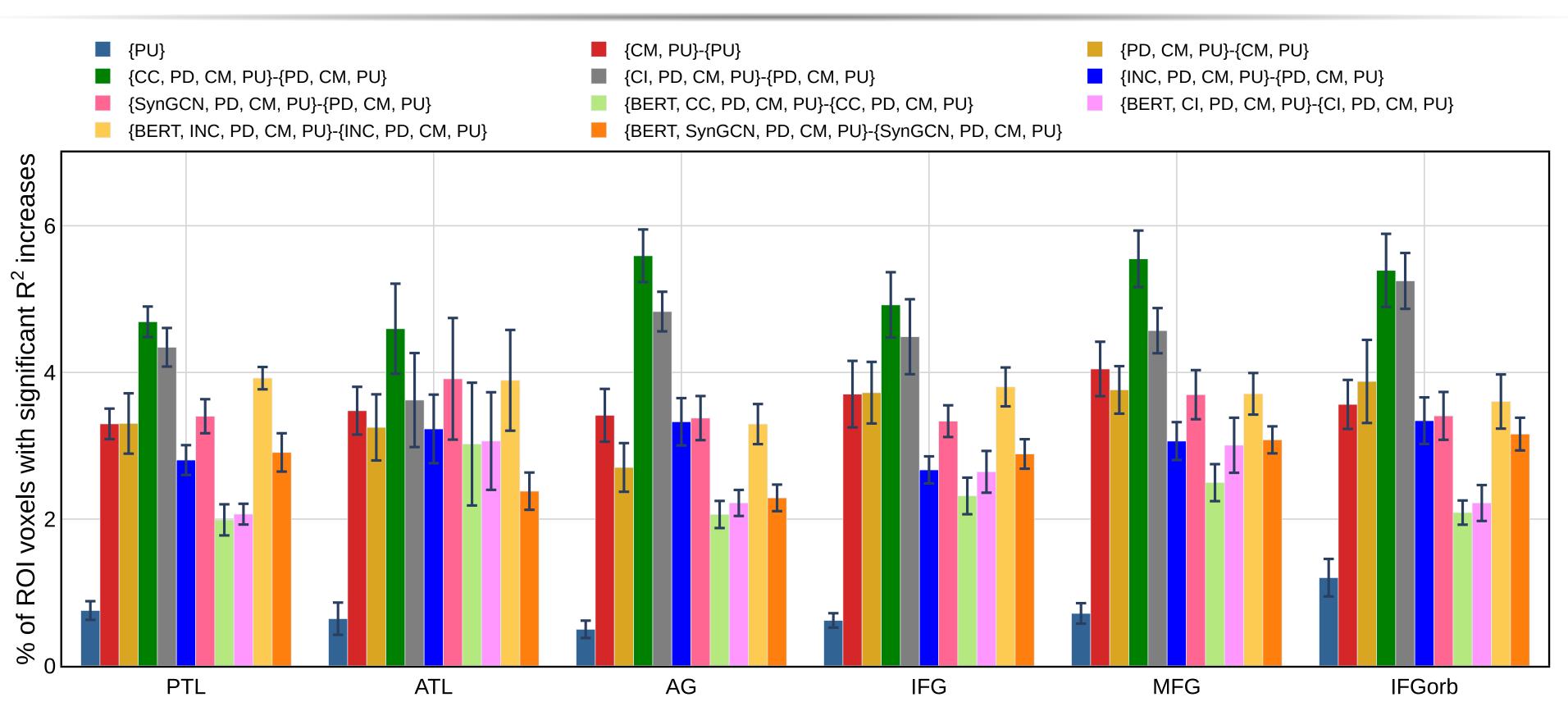
 2 LaBRI, UMR 5800

Brain Encoding





Encoding Performance of Various Feature Sets



Subba Reddy Oota^{1,2,3} Frédéric Alexandre^{1,2,3}, Xavier Hinaut^{1,2,3}

³IMN, UMR 5293, Universite de Bordeaux, France





BORDEAUX neurocampus

Brain Maps (Pearson Correlation)

similar studies for multi-lingual languages [1].

References

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brain?

project.

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Acknowledgements

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2 We thank Inria for the PhD funding and ANR DeepPool