Exploring the syntax-semantic interface using neurolinguistic decoding

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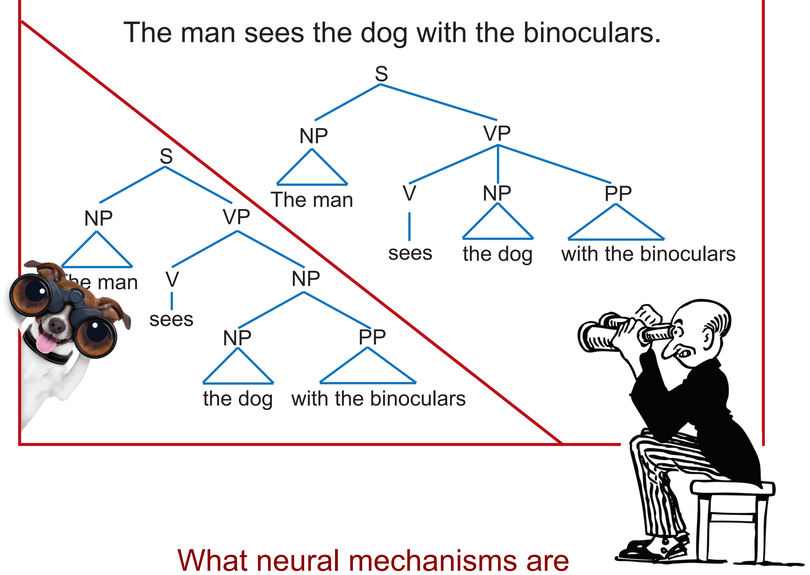
INTRODUCTION

Compositionality:
The meaning of an expression is a function of the meaning of its parts and the rules to combine them.

We interpret structurally ambiguous sentences on the basis of semantics.



What neural mechanisms are at play when semantic information interacts with syntactic combinatorics during sentence reading?

DESIGN

MATERIAL

100 German sentence pairs. Two sentences share the prepositional phrase, but differ in either main verb (Type 1) or noun order (Type 2).

Example	Attachment	Type
The acrobat **beats** the clown with the rubbery hammer	Verb	1
The acrobat **sees** the clown with the rubbery hammer	Noun	1
The **man** sees the **bird** with the big binoculars	Verb	2
The **bird** sees the **man** with the big binoculars	Noun	2

All sentences are pre-tested for attachment and plausibility by 20 native German speakers.

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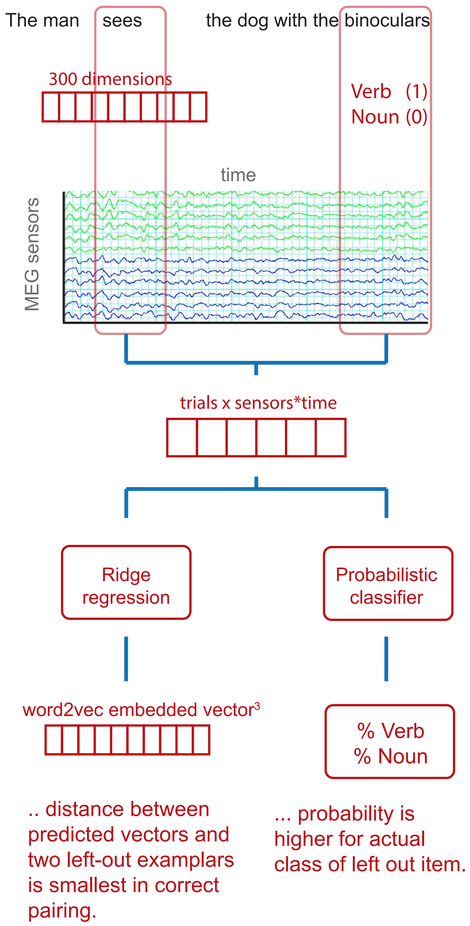
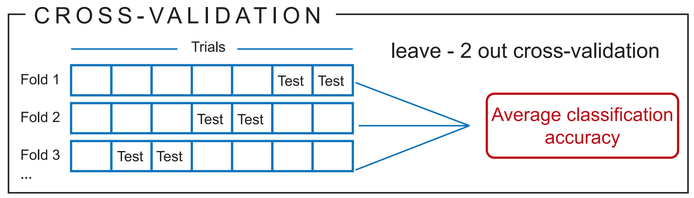
ANALYSIS

SUPERVISED LEARNING

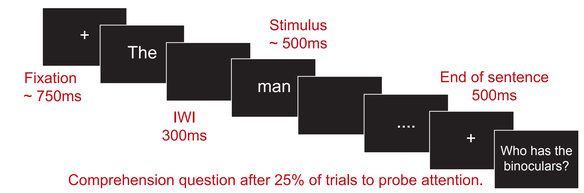


CROSS-VALIDATION



MEG PARADIGM

Rapid visual word by word presentation



EXPECTED OUTCOME

BINARY ATTACHMENT CLASSIFICATION

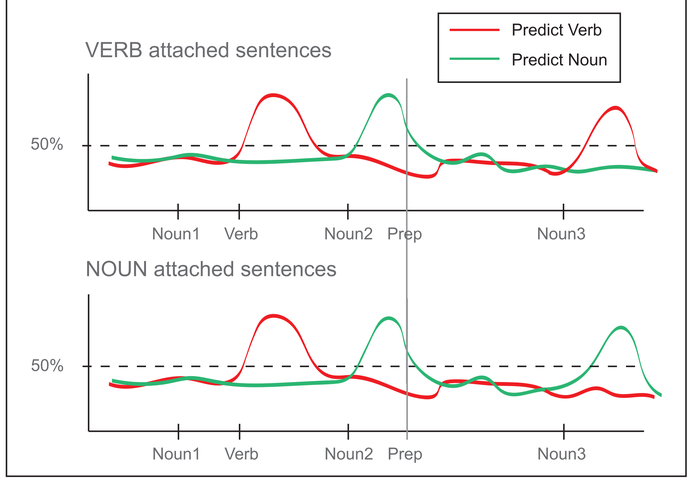
1. Above-chance accuracy in assiging the correct label (Verb or Noun attached) only after disambiguating last noun phrase.

2. Successful classification driven mostly by “channel” features located in superior temporal and inferior frontal sites[4].

SEMANTIC VECTOR PREDICTION

1. Train regression model only on time window of verb presentation.

2. Test predictions across entire sentence time window (temporal generalization[1,2])



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