

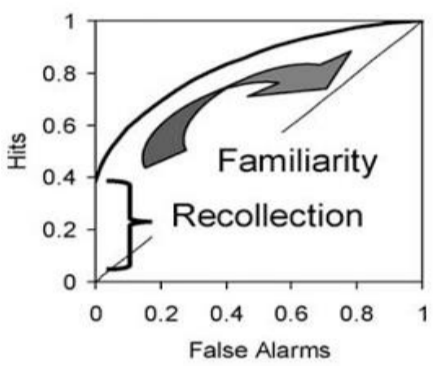
# A multi-component model of recognition memory: The interplay of input statistics, memory, and decision making

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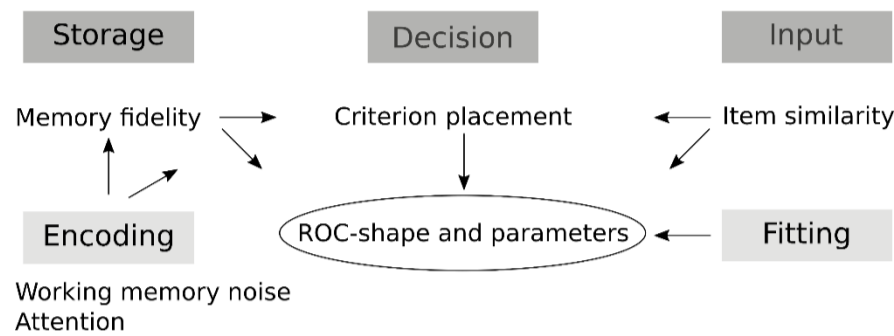
## Introduction

**Recognition memory** is the ability to judge whether an item or event has been encountered. Although recognition judgments rely on mnemonic, perceptual and decision making processes, the experimental outcomes largely ignore the latter two. In our computational model, we systematically study how each of these factors influence the ROC-curves, a common measure to quantify recognition performance.

### Typical interpretation



### Our hypothesis



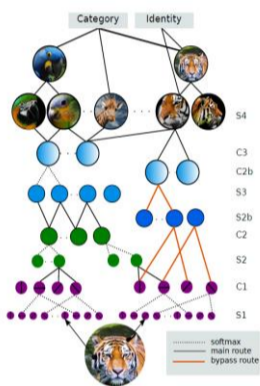
## Method

### Sensory processing

Naturalistic images

HMAX model

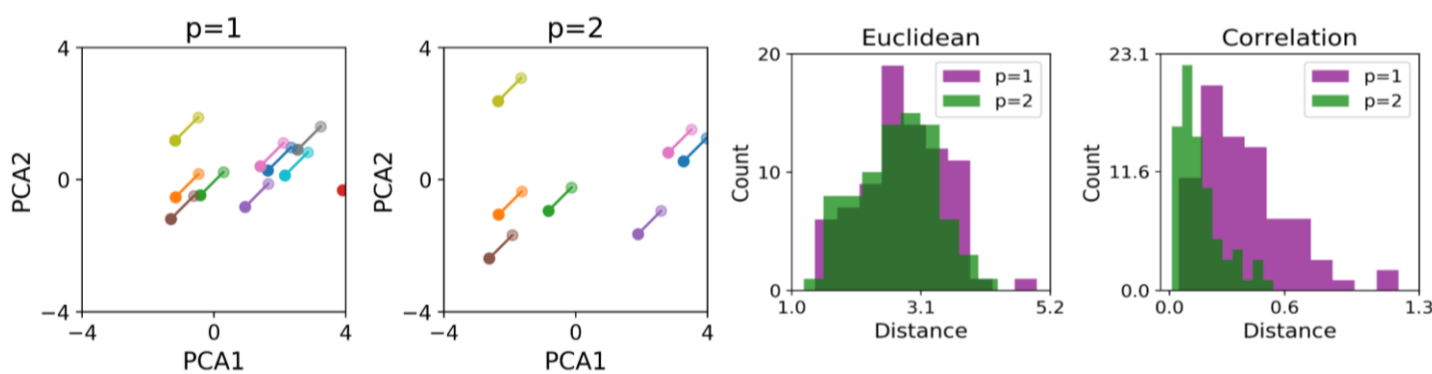
PCA analysis



6D patterns

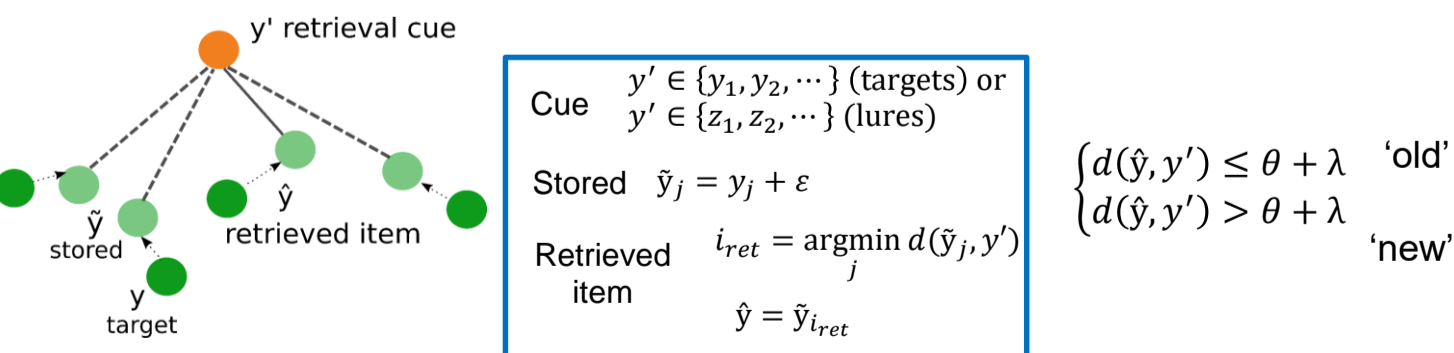
### Memory storage

The memory system scales the input representations before memory noise is added. Scaling increases the inter-item distance and results in better correlations between the original and noisy patterns.



### Memory retrieval and recognition decision

At retrieval targets (studied items) and lures (new items) are used as retrieval cues. Each of these cues is compared to all the stored items and the one with the smallest distance is retrieved. If that distance is smaller than a given threshold, the item is considered old.  $\lambda$  is the overall liberal bias.



## References

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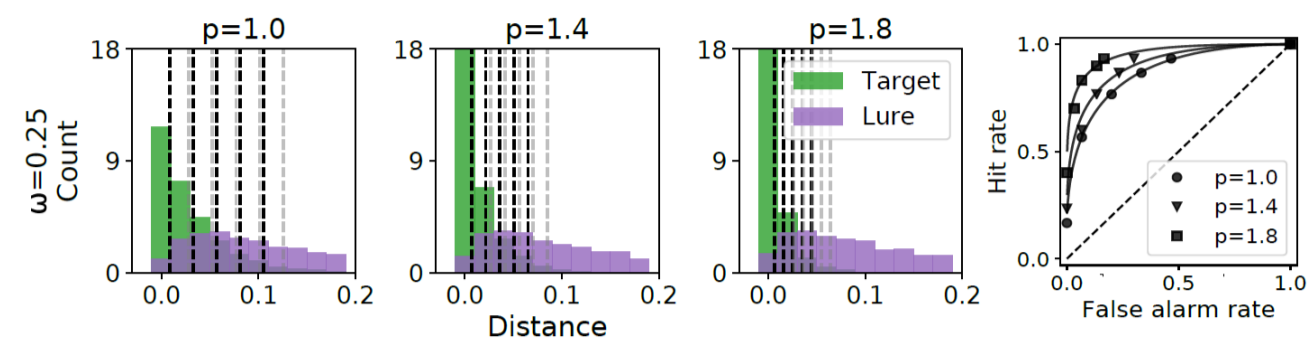
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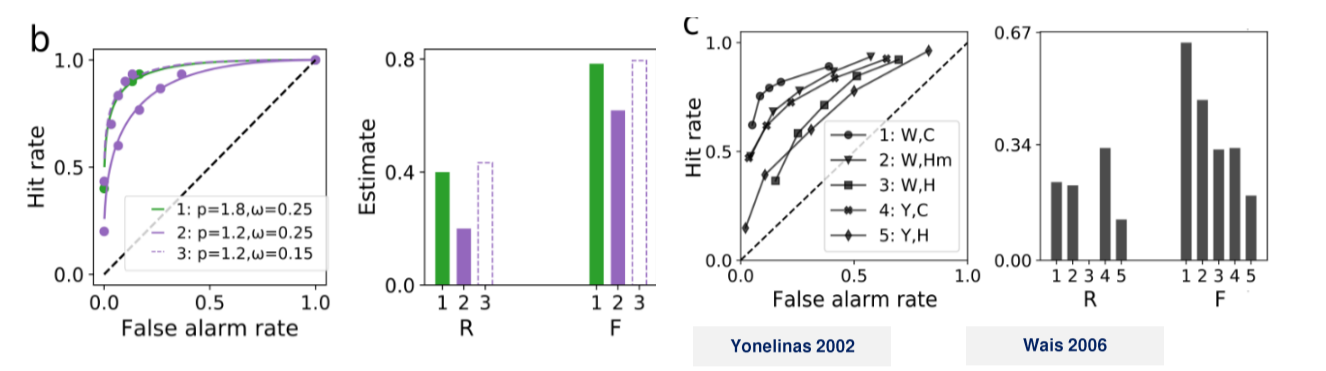
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## Results

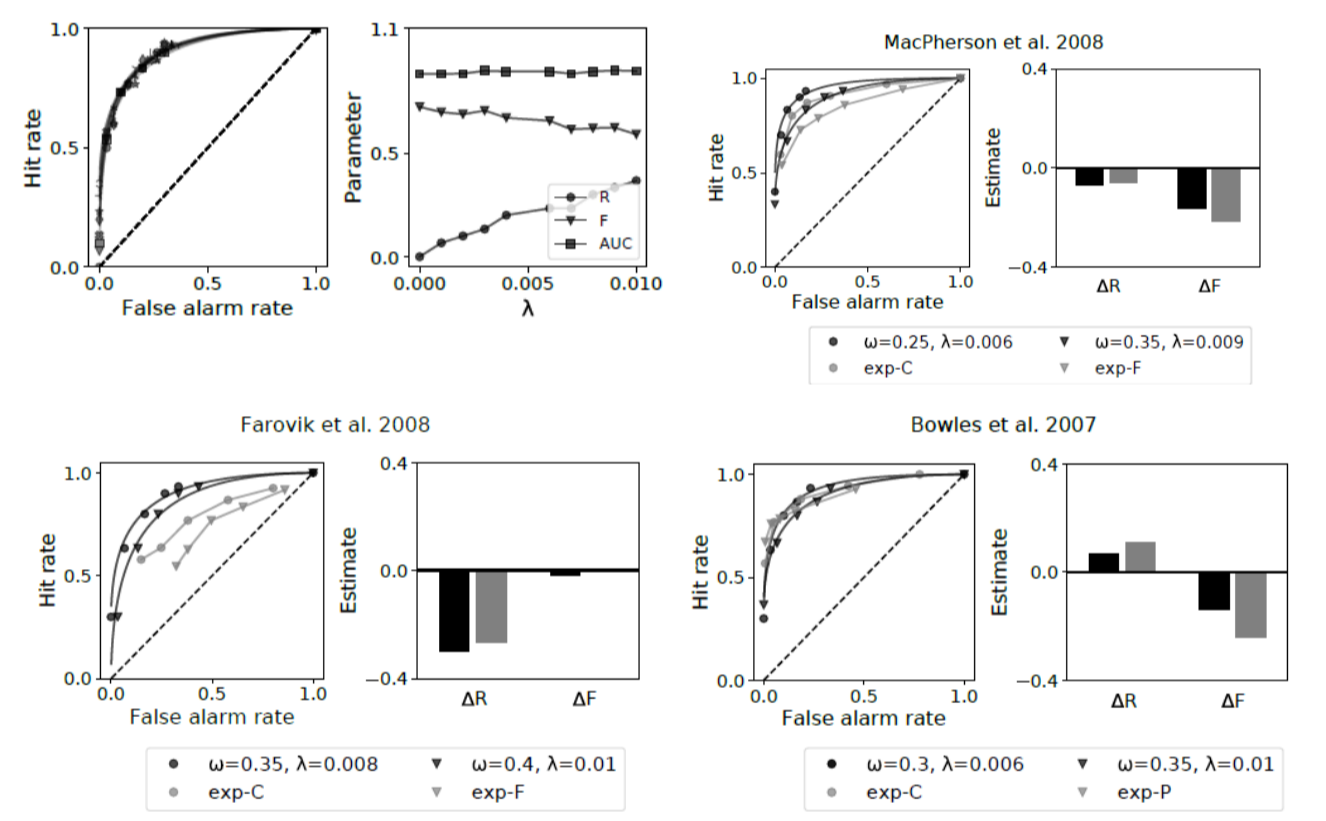
### Memory noise and pattern separation lead to a limited dissociation of the ROC-parameters



The model accounts for the effect of hippocampal lesions, which lead to higher decrease of the y-offset (R) compared to the curvilinearity (F). Different memory processes are not required.

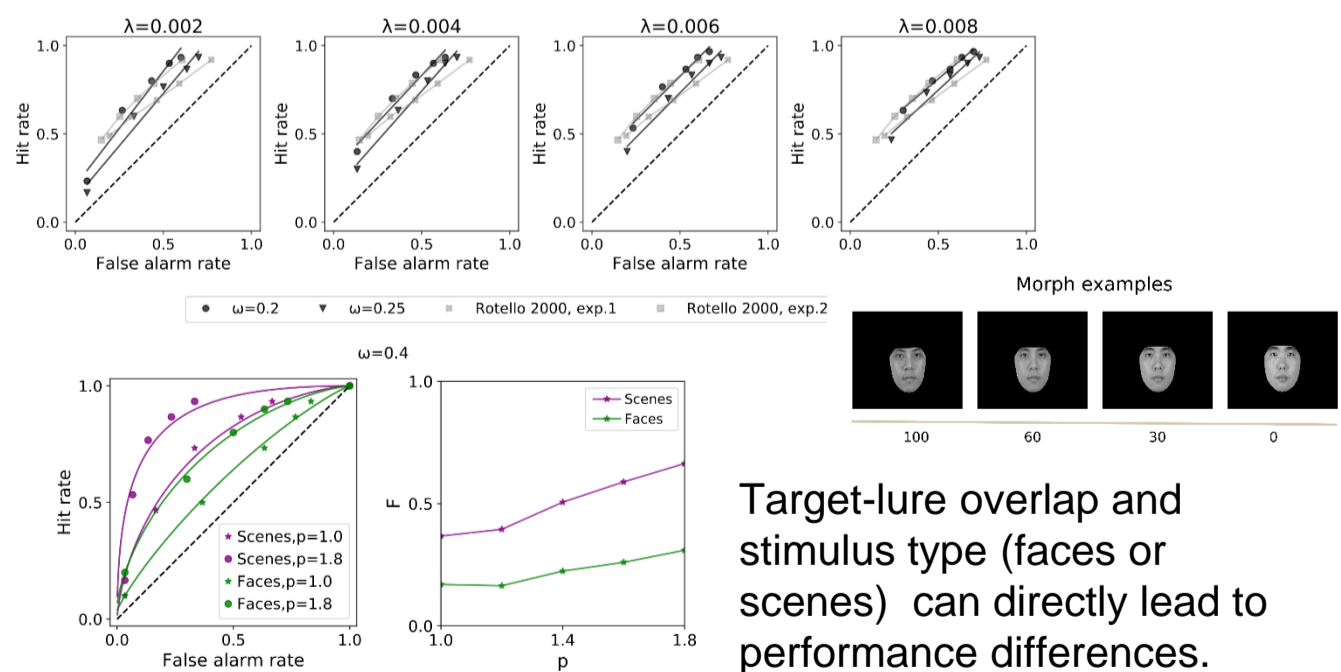


### Changes in criterion placement result in drastic alterations of the ROC-parameters



Increased liberal bias ( $\lambda$ ) in some conditions could explain performance differences in conditions such as frontal lesions or case studies.

### Input statistics affect the performance



Target-lure overlap and stimulus type (faces or scenes) can directly lead to performance differences.

## Conclusions

The features of the recognition ROC-curves reflect a complex relationship between perceptual, mnemonic and decision making processes rather than the simplified notion of familiarity and recollection.

Caution should be exercised when interpreting ROC-findings since the aforementioned factors are often not considered, resulting in controversies.