

# Multinomial Processing Tree Models of Recognition Memory

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Joachim Vandekerckhove and Michael Lee

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  - e.g., discrete decisions rather than continuous response times
- MPTs make assumptions about how the different categories of behavior could be generated, in terms of probabilistic processes controlled by underlying psychological variables

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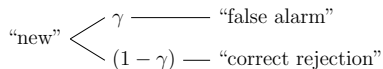
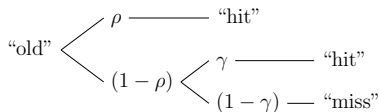
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- Behavior can be summarized in terms of four counts

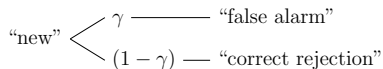
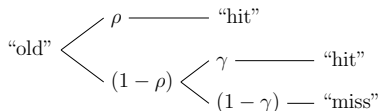
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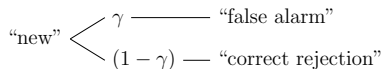
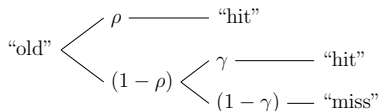
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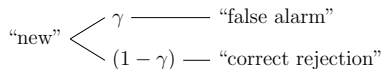
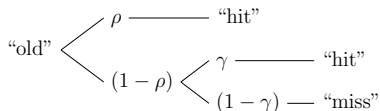
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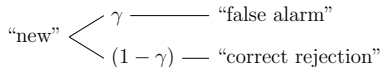
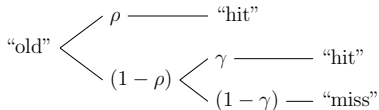
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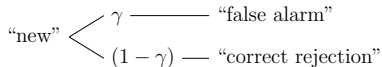
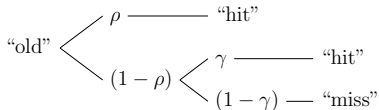
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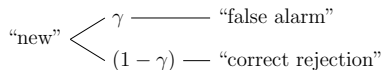
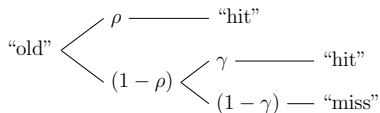
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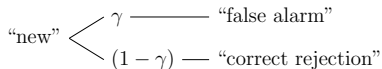
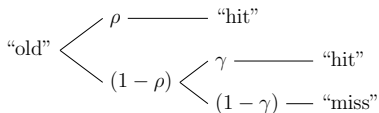


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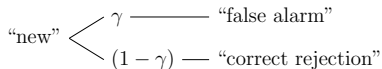
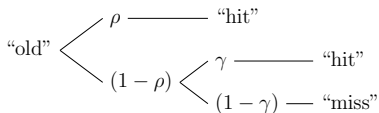
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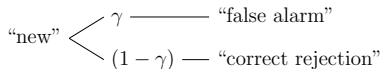
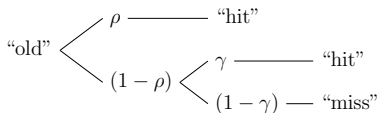
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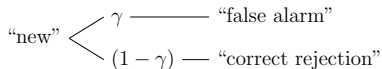
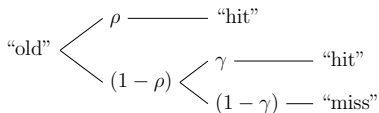
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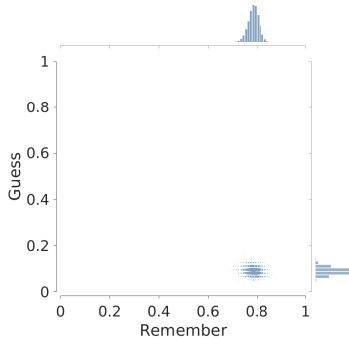
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  - amyloid positivity is thought to be a pre-symptomatic indicator of Alzheimer’s disease

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Amyloid Status	Hits	False Alarms
positive	8	4
negative	12	1
negative	14	0
positive	9	4
...	...	...

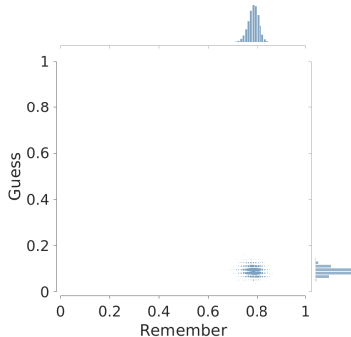


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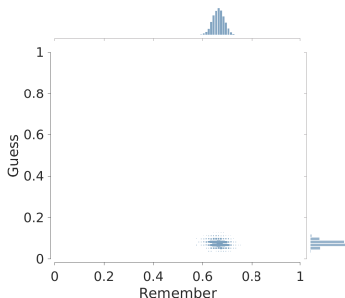
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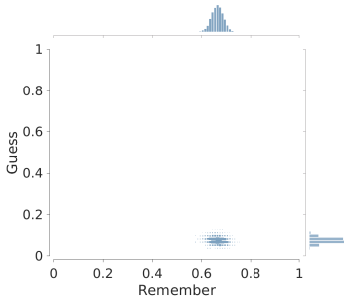
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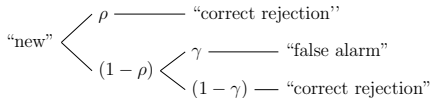
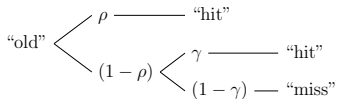
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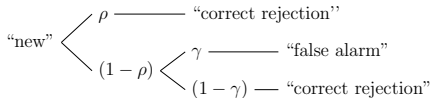
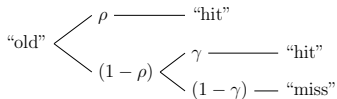
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- Very similar guessing behavior to amyloid negative group, but lower probability of remembering

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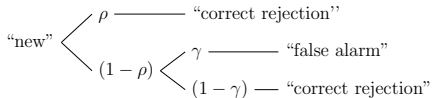
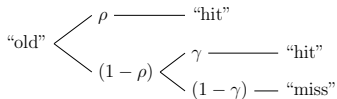
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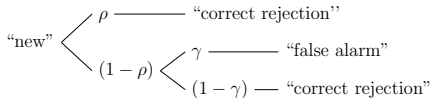
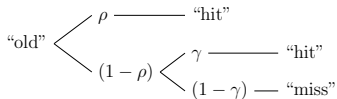
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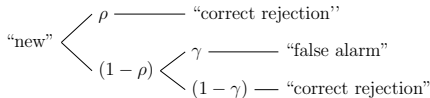
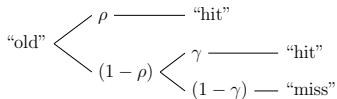
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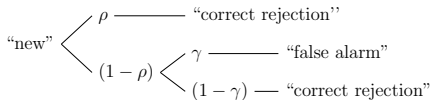
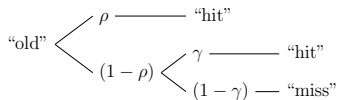


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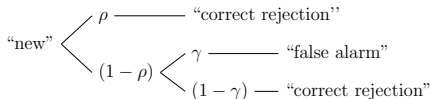
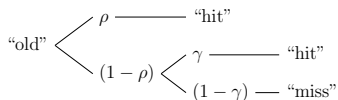
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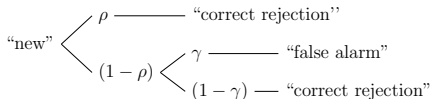
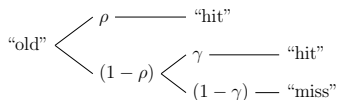
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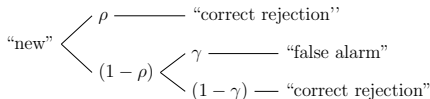
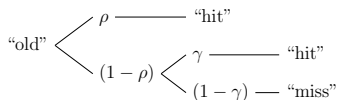
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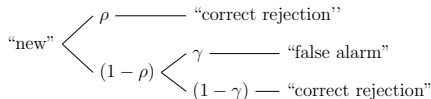
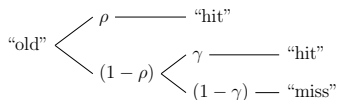
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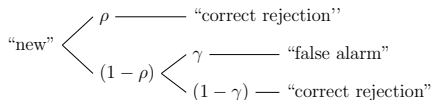
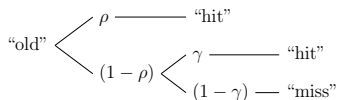
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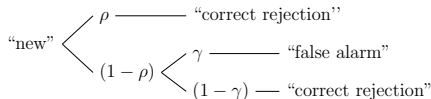
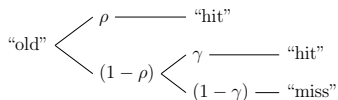
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- The hit rate  $\theta^h$  and the false alarm rate  $\theta^f$  are now
  - $\theta^h = \rho + (1 - \rho) \gamma$

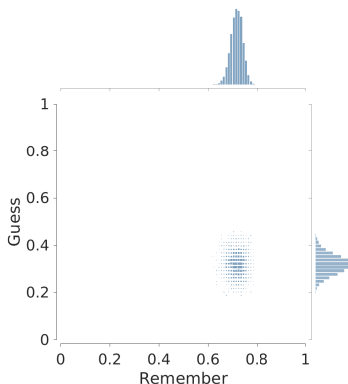
# Two-High Threshold Model



- The new assumptions do not change how hits are produced
  - Either by remembering the item or guessing "old"
- But they do change how false alarms are produced
  - By explicitly remembering the item was not on the list, or by guessing "old"
- The hit rate  $\theta^h$  and the false alarm rate  $\theta^f$  are now
  - $\theta^h = \rho + (1 - \rho) \gamma$
  - $\theta^f = (1 - \rho) \gamma$

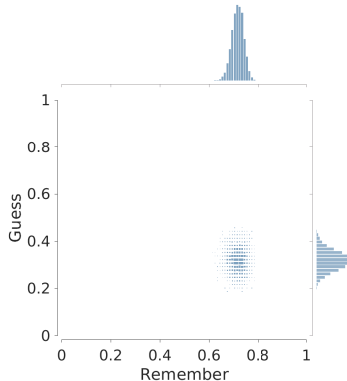


# Amyloid negative inferences



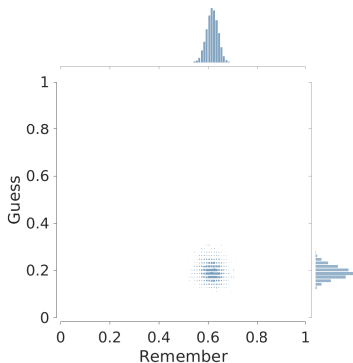
- The figure shows the joint and marginal posterior distributions for the remembering and guessing parameters

# Amyloid negative inferences



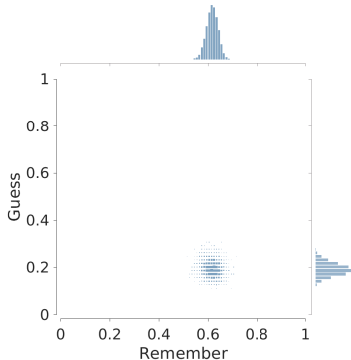
- The figure shows the joint and marginal posterior distributions for the remembering and guessing parameters
- Patients remember around 70-80% of the items, and guess “old” about 30% of the time when they do not remember

## Amyloid positive inferences



- Patients remember around 60% of the items, and guess “old” about 20% of the time when they do not remember

# Amyloid positive inferences



- Patients remember around 60% of the items, and guess “old” about 20% of the time when they do not remember
- The remembering rate is lower, and the guessing rate now also differs between the amyloid negative and positive groups

## Key points

- MPT models make assumptions about how categorical observed behavior can be decomposed into sequences of probabilistic events

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- MPT models make assumptions about how categorical observed behavior can be decomposed into sequences of probabilistic events
- The one-high threshold and two-high threshold models of recognition memory are widely-used MPT models
- The inferences for the amyloid positivity data showed meaningful differences between the clinical groups, but the exact nature of the differences in remembering and guessing depends on the model

## References

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