

Multinomial Processing Tree with JAGS

Joachim Vandekerckhove, Michael D. Lee

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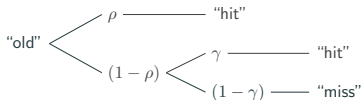
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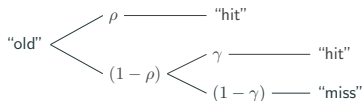
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The parameters ρ and γ together determine the hit rate θ^h and false alarm rate θ^f

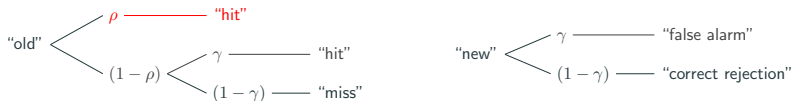
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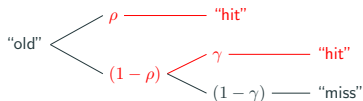
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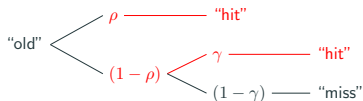
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One-High Threshold Model

The remembering parameter ρ and the old-guessing parameter γ can both take any value with equal likelihood:

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Those rates tell us how often old items lead to hits (the data are k^h hits out of n_o old items) and how often new items lead to false alarms (k^f false alarms out of n_n new items):

$$k^h \sim \text{binomial}(\theta^h, n_o)$$

$$k^f \sim \text{binomial}(\theta^f, n_n)$$

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One-High Threshold Model

		Amyloid Status	Hits	False Alarms
ρ	\sim uniform $(0, 1)$	negative	13	0
γ	\sim uniform $(0, 1)$	positive	8	4
θ^h	$= \rho + (1 - \rho) \gamma$	negative	12	1
θ^f	$= \gamma$	negative	14	0
k^h	\sim binomial (θ^h, n_o)	positive	9	4
k^f	\sim binomial (θ^f, n_n)

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$\theta^f = \gamma$	positive	14	1
$k^h \sim \text{binomial}(\theta^h, n_o)$	positive	13	2
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One-High Threshold Model

$\rho \sim \text{uniform}(0, 1)$	$\rho \sim \text{dunif}(0, 1)$
$\gamma \sim \text{uniform}(0, 1)$	$\gamma \sim \text{dunif}(0, 1)$
$\theta^h = \rho + (1 - \rho) \gamma$	$\theta^h = \rho + (1 - \rho) \gamma$
$\theta^f = \gamma$	$\theta^f = \gamma$
$\forall p \in (1, \dots, P)$	
$k_p^h \sim \text{binomial}(\theta^h, n_o)$	$k_p^h \sim \text{binomial}(\theta^h, n_o)$
$k_p^f \sim \text{binomial}(\theta^f, n_n)$	$k_p^f \sim \text{binomial}(\theta^f, n_n)$

```
model{
  rho ~ dunif(0, 1)
  gamma ~ dunif(0, 1)
  thetaHit = rho + (1-rho)*gamma
  thetaFA = gamma
  for (p in 1:nPeople){
    hit[p] ~ dbin(thetaHit, nOld)
    fa[p] ~ dbin(thetaFA , nNew)
  }
}
```

Amyloid Positive Inferences

Patients remember around 60-70% of the items, and guess “old” 5-10% of the time when they do not remember

Parameter	Posterior			95% Cred. Int.	
	Mean	Median	SD	Lower	Upper
gamma	0.075	0.074	0.012	0.053	0.100
rho	0.665	0.665	0.023	0.619	0.709

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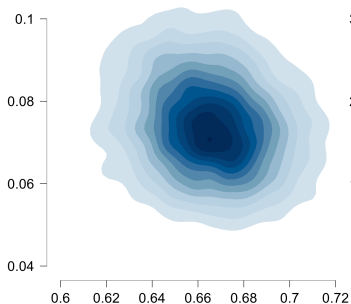
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“Convergence of the MCMC procedure was good, with all $\hat{R} < 1.01$.”

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