

Multinomial Processing Tree with JAGS

Joachim Vandekerckhove, Michael D. Lee

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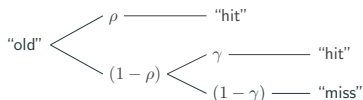
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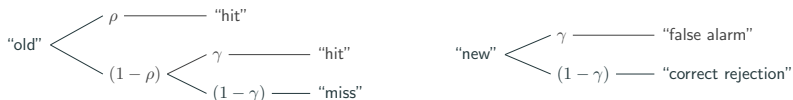
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The parameters ρ and γ together determine the hit rate θ^h and false alarm rate θ^f

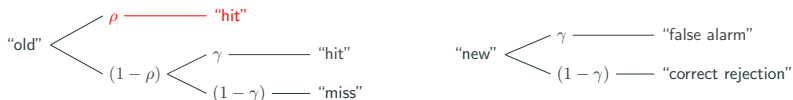
$$\begin{aligned}\theta^h &= \rho + (1 - \rho)\gamma \\ \theta^f &= \gamma\end{aligned}$$

See Matzke et al. (2018) for more like this!

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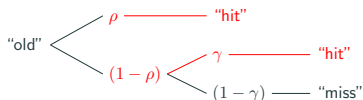
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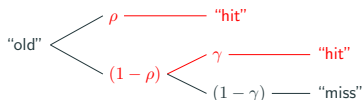
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One-High Threshold Model

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

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

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$\rho \sim \text{uniform}(0, 1)$	positive	8	4
$\gamma \sim \text{uniform}(0, 1)$	positive	9	4
$\theta^h = \rho + (1 - \rho) \gamma$	positive	14	0
$\theta^f = \gamma$	positive	14	1
$k^h \sim \text{binomial}(\theta^h, n_o)$	positive	13	2
$k^f \sim \text{binomial}(\theta^f, n_n)$

One-High Threshold Model

	AS	Hits	FA		AS	Hits	FA
	+	8	4		+	5	0
	+	9	4		+	6	3
	+	14	0		+	15	0
$\rho \sim \text{uniform}(0, 1)$	+	14	1		+	11	0
$\gamma \sim \text{uniform}(0, 1)$	+	13	2		+	14	1
$\theta^h = \rho + (1 - \rho) \gamma$	+	8	0		+	12	2
	+	13	3		+	12	1
$\theta^f = \gamma$	+	12	1		+	11	2
$k^h \sim \text{binomial}(\theta^h, n_o)$	+	11	3		+	1	0
	+	4	0		+	14	0
$k^f \sim \text{binomial}(\theta^f, n_n)$	+	8	0		+	13	0
	+	13	1		+	7	2
There were 33 participants. Each saw 15 old	+	15	0		+	11	1
and 15 new stimuli.	+	12	0		+	12	2
	+	11	0		+	8	0
	+	9	0		+	11	2
	+	5	1				

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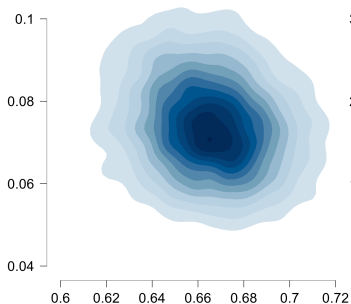
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“Convergence of the MCMC procedure was good, with all $\hat{R} < 1.01$.”

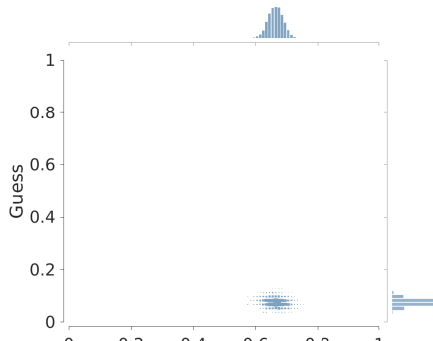
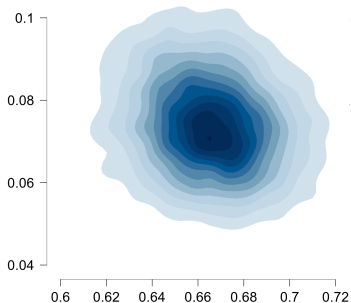
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References

Matzke, D., Boehm, U., & Vandekerckhove, J. (2018). Bayesian inference in psychology, part iii: Bayesian parameter estimation in nonstandard models. *Psychonomic Bulletin & Review*, 25, 77–101. doi: 10.3758/s13423-017-1394-5