Categorization Model Comparison/Selection

GCM:

$$d_{ij} = |x_i - x_j|.$$

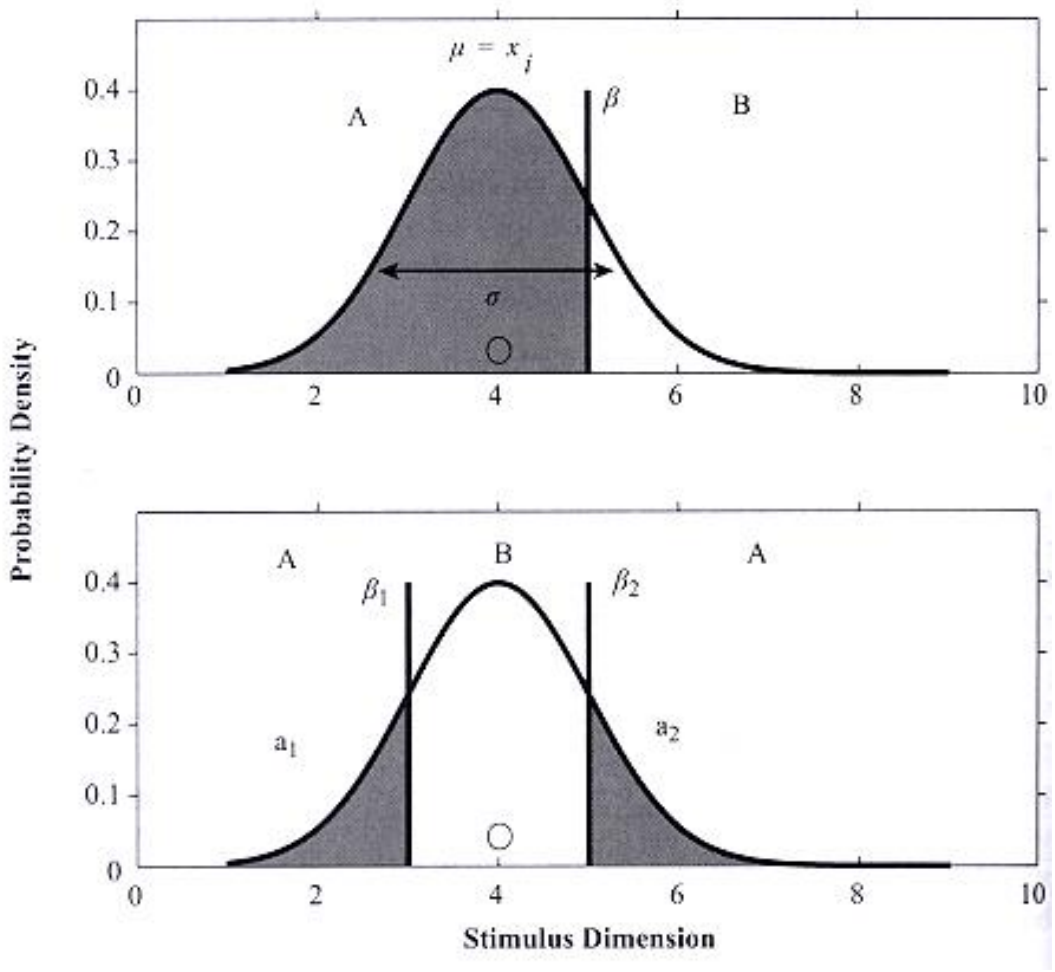
$$s_{ij} = exp(-c \cdot d_{ij}).$$

$$P(R_i = A|i) = \frac{\left(\sum_{j \in A} s_{ij}\right)}{\left(\sum_{j \in A} s_{ij}\right) + \left(\sum_{j \in B} s_{ij}\right)}$$

DEM: (Modified Luce decision rule)

$$P(R_i = A|i) = \frac{\left(\sum_{j \in A} s_{ij}\right)^{\gamma}}{\left(\sum_{j \in A} s_{ij}\right)^{\gamma} + \left(\sum_{j \in B} s_{ij}\right)^{\gamma}}$$

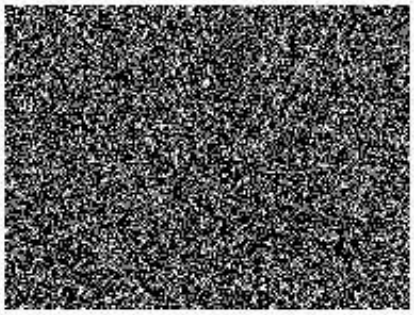
GRT:


$\mu = x_i$
A
β
B
σ
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
A
B
A
β_1
β_2
a_1
a_2
Probability Density
Stimulus Dimension

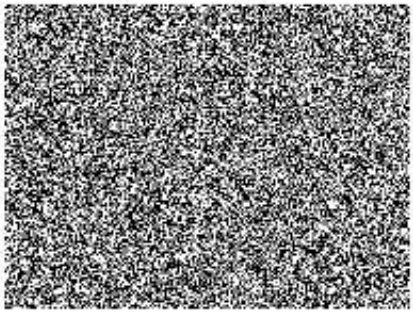
Rouder & Ratcliff (2004)

Probabilistic Feedback Training / Uncovering the Mechanisms of Category Perception

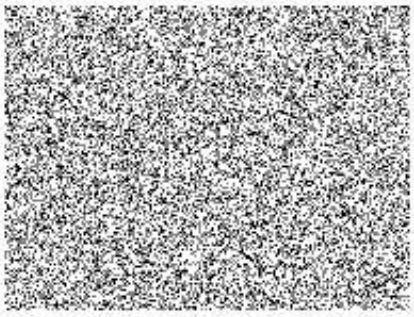
Low Space-averaged Luminance Image

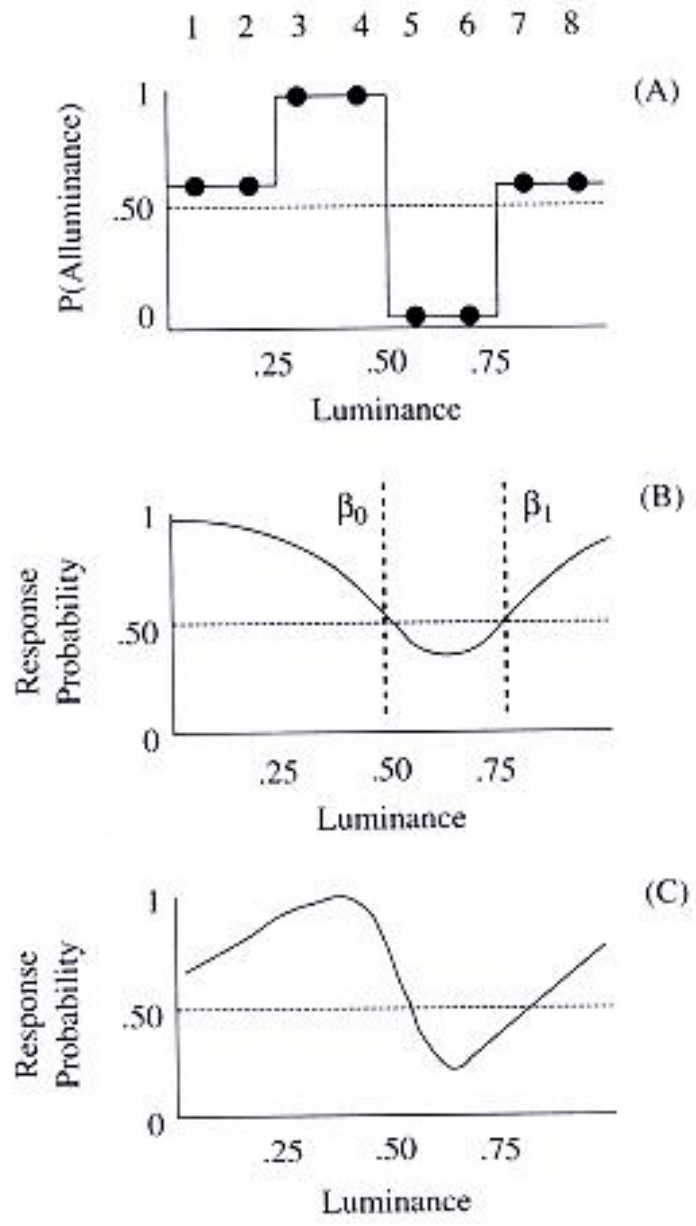


Moderate Space-averaged Luminance



High Space-averaged Luminance Image





(A) P(A) feedback schedule

(B) GRT Model Predictions

(C) DEM Predictions

Luminance Levels =	**.06**	**.18**	**.31**	**.43**	**.56**	**.68**	**.81**	**.94**
Probability(A) fback	**.60**	**.60**	**1.0**	**1.0**	**0.0**	**0.0**	**.60**	**.60**

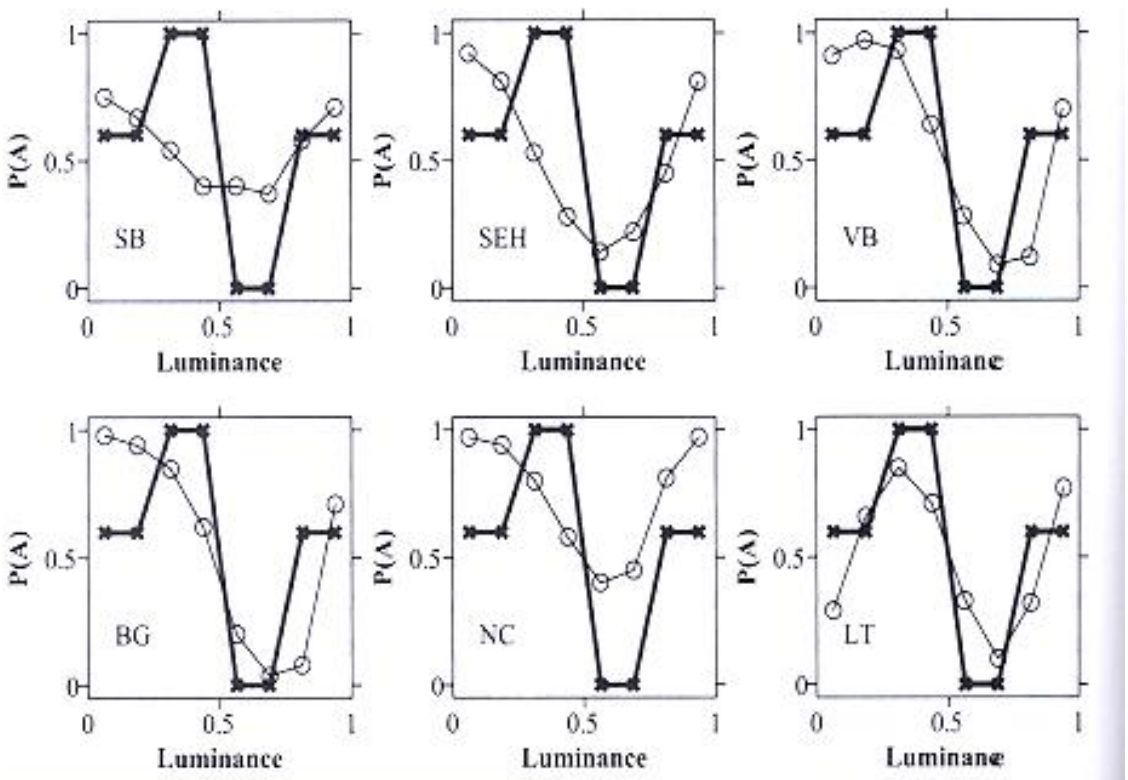
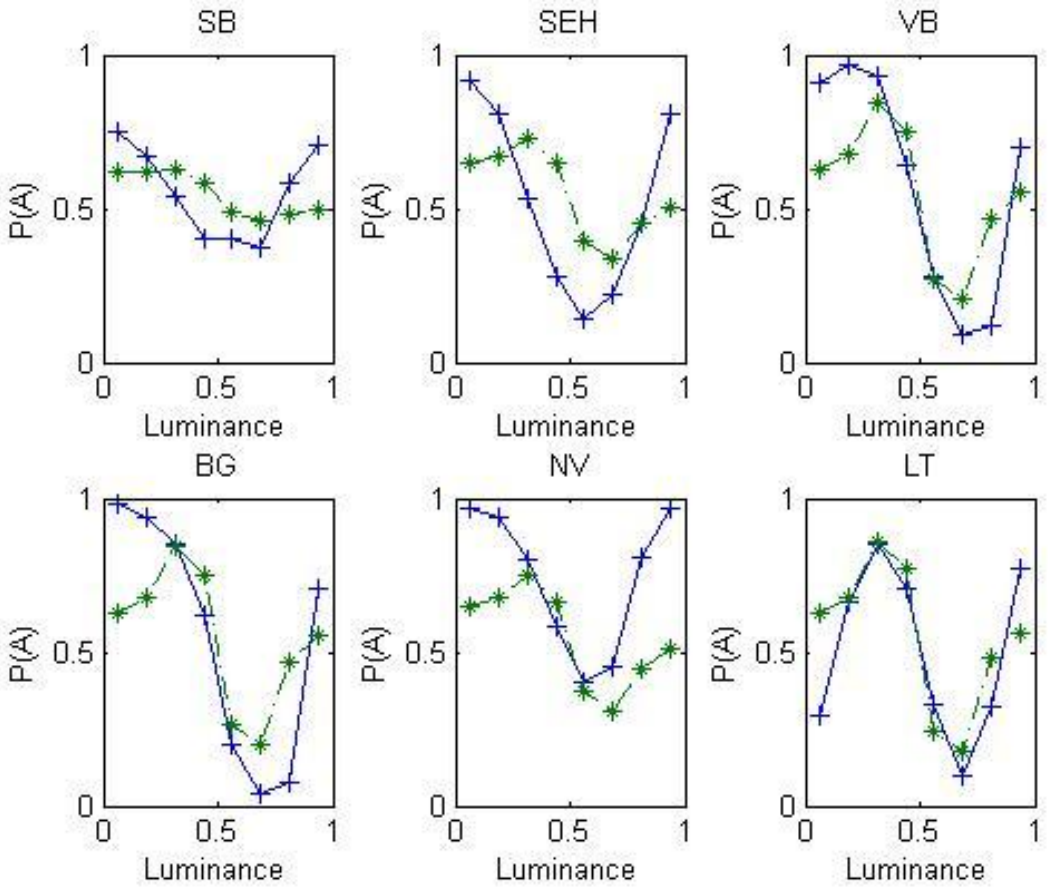


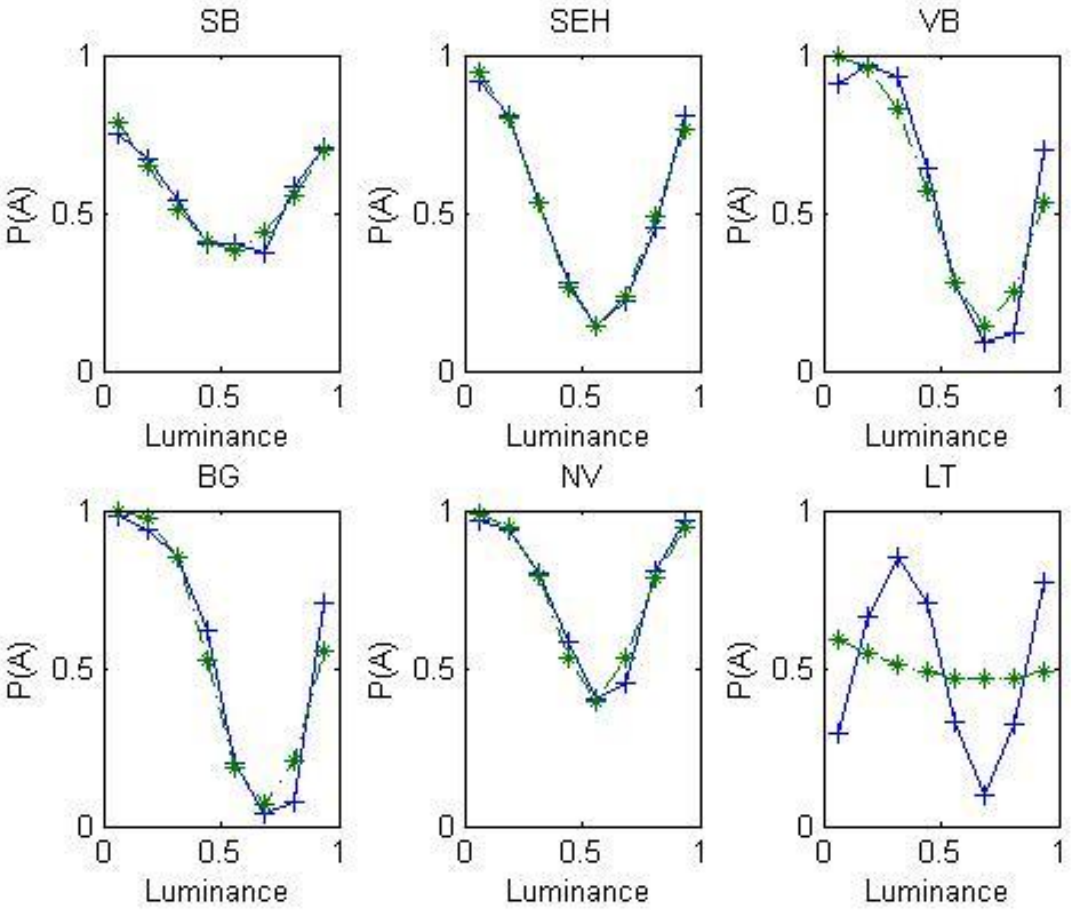
Figure 7.9 Proportion of trials on which stimuli were categorized as belonging to Category A, for six participants (separate panels). Feedback probabilities from the training session are shown in gray. Figure adapted from Rouder, J. N., & Ratcliff, R. (2004). Comparing categorization models. *Journal of Experimental Psychology: General, 133*, 63–82. Published by the American Psychological Association; reprinted with permission.

Data from 6 Participants

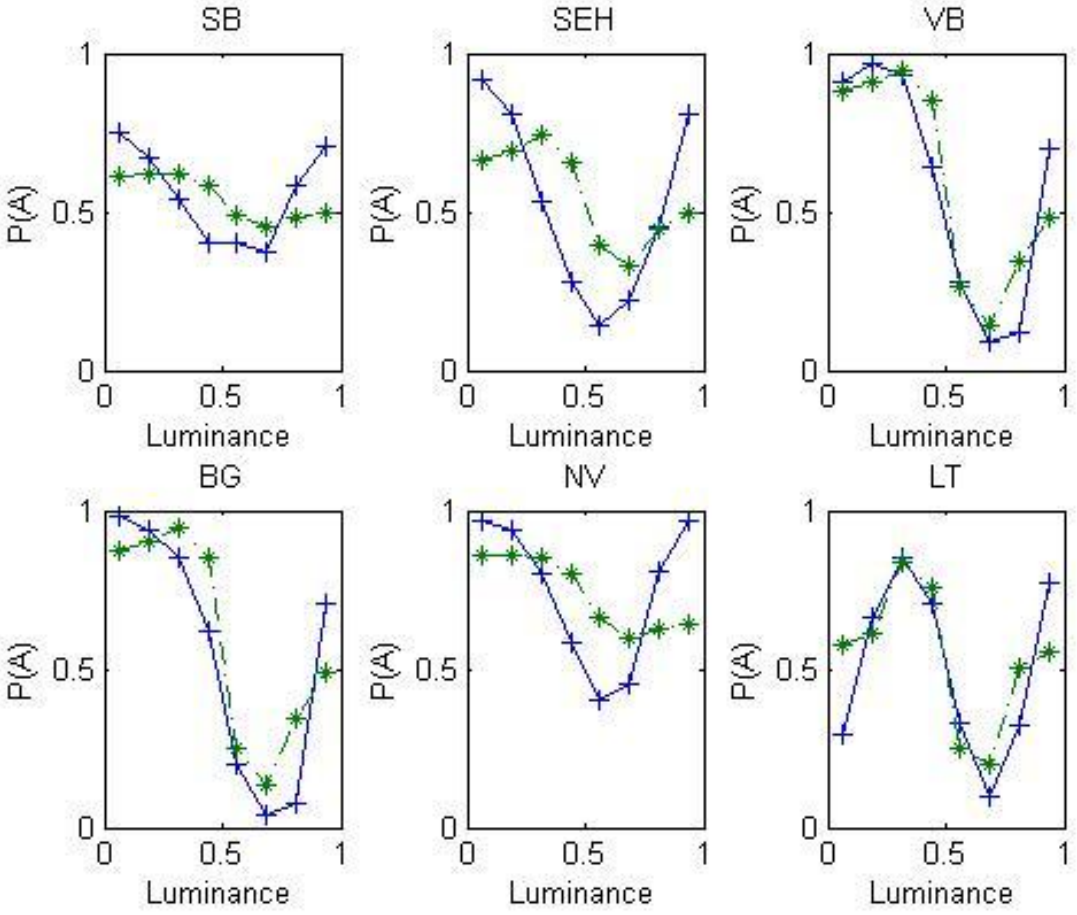
Generalized Context Model (GCM) Results



General Recognition Theory (GRT) Results



Deterministic Exemplar Model (DEM) Results



Maximum Likelihood Estimation Results

3 Models x 6 Participants

Table 7.4 ML Parameter Estimates and Associated Standard Errors for the GCM Fits to the Data in Figure 7.9

Participant	c	$SE(c)$
SB	2.29	0.36
SEH	5.29	0.32
VB	9.32	0.38
BG	9.43	0.38
NV	5.91	0.36
LT	10.28	0.41

Table 7.5 ML Parameter Estimates and Associated Standard Errors for the GRT Fits to the Data in Figure 7.9

Participant	β_1	$SE(\beta_1)$	β_2	$SE(\beta_2)$	σ	$SE(\sigma)$
SB	0.29	0.01	0.80	0.01	0.29	0.01
SEH	0.33	0.01	0.82	0.01	0.17	0.00
VB	0.92	0.01	0.46	0.01	0.16	0.00
BG	0.45	0.01	0.92	0.01	0.13	0.00
NV	0.43	0.01	0.69	0.01	0.15	0.00
LT	0.12	0.07	1.26	0.17	0.78	0.17

Table 7.6 ML Parameter Estimates and Associated Standard Errors for the DEM Fits to the Data in Figure 7.9

Participant	c	$SE(c)$	γ	$SE(\gamma)$
SB	2.44	0.90	0.95	0.26
SEH	4.89	0.43	1.13	0.11
VB	4.39	0.22	3.38	0.18
BG	4.65	0.21	3.24	0.16
NV	0.86	0.07	5.81	0.23
LT	13.51	1.19	0.69	0.07

Model Selection Analyses

3 Models x 6 Participants

Table 7.7 AIC and BIC Differences Between the Three Models GCM, GRT, and DEM

	ΔAIC			Δ BIC		
	GCM	GRT	DEM	GCM	GRT	DEM
SB	178.42	0.00	180.38	166.49	0.00	174.42
SEH	715.39	0.00	715.83	703.46	0.00	709.87
VB	413.26	0.00	43.53	401.33	0.00	37.57
BG	703.67	0.00	337.16	691.74	0.00	331.20
NV	990.71	0.00	581.08	978.78	0.00	575.12
LT	18.78	527.95	0.00	12.82	533.92	0.00
sum	3020.23	527.95	1857.99	2954.61	533.92	1828.16

Note. Differences are calculated for each participant individually, and summed differences are shown in the bottom row.

Table 7.8 AIC and BIC Weights for the Three Models GCM, GRT, and DEM

	ΔAIC			Δ BIC		
	GCM	GRT	DEM	GCM	GRT	DEM
SB	0.00	1.00	0.00	0.00	1.00	0.00
SEH	0.00	1.00	0.00	0.00	1.00	0.00
VB	0.00	1.00	0.00	0.00	1.00	0.00
BG	0.00	1.00	0.00	0.00	1.00	0.00
NV	0.00	1.00	0.00	0.00	1.00	0.00
LT	0.00	0.00	1.00	0.00	0.00	1.00
mean	0.00	0.83	0.17	0.00	0.83	0.17

Note. Model weights are calculated for each participant individually, and mean weights are shown in the bottom row.