ECE511/PSY511 PSYCHOPHYSICS
A Joint Offering by the School of Electrical and Computer Engineering
And the Department of Psychological Sciences
Purdue University
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HW #5 (Assigned: 11/03/05; Due: *before lecture* on 11/15/05)

Topic: Information Theory

(1) For the stimulus-response confusion matrix shown below, compute *IS*, *IR* and IT_{est}. Please explain your steps (whether you compute them by hand, or by using a software package).

	R_1	R_2	R_3	R_4	R_5
S_1	15	2	2	0	1
S_2	1	14	3	2	0
S_3	2	3	12	2	1
S_4	1	0	3	15	1
S_5	2	1	4	0	13

(2) For the stimulus-response confusion matrix shown in (1), demonstrate that

(i) IT_{est} remains the same if the role of stimuli and responses were reversed (i.e., by transposing the confusion matrix), and

(ii) IT_{est} remains the same if rows or columns were switched around (e.g., by exchanging column R_2 with column R_5, etc.).

Please do so by both reasoning (mathematical proof or essay) and by numerical examples.

(3) What is the interpretation of the quantity 2^{IT}? In what ways are *IT* and 2^{IT} different in representing the outcome of an AI experiment?

(4) Explain the issues involved in selecting *k*, the number of alternatives in a stimulus set, when designing an absolute identification experiment to measure channel capacity. Discuss what happens if *k* was too small or too large. After the completion of an AI experiment, how would you determine whether the value of *k* has been appropriately selected?