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

Topic: Information Theory

(1) For the stimulus-response confusion matrix shown below, compute *IS*, *IR* and IT_{est}. You can compute them by hand, or by writing your own software.

	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). You can either prove this through derivation, or transpose the matrix and calculate the new $IT_{est.}$

(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?