

# ECE511/PSY511 PSYCHOPHYSICS

A JOINT OFFERING BY THE SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

AND THE DEPARTMENT OF PSYCHOLOGICAL SCIENCES

PURDUE UNIVERSITY

FALL 2005

## STUDY GUIDE FOR FINAL EXAM

The final exam will be held from 3:00 to 5:00 p.m. on Friday, Dec. 16, 2005 in MSEE184.

Prof. Tan will hold office hour from 9:00 am to 12:00 noon on Thursday, Dec. 15, 2005 in her office (MSEE272).

### DISCLAIMER:

**THIS IS NOT AN EXHAUSTIVE LIST OF TOPICS THAT WILL BE INCLUDED IN THE FINAL.**

The final exam will cover the course materials presented after the mid-term exam. You are expected to be able to:

#### (Speed-accuracy Tradeoff)

- Discuss how the Speed-Accuracy Tradeoff (SAT) is different from the classical psychophysical methods or the Signal Detection Experiment.
- Describe how to set up an SAT experiment.
- Compare SATF with ROC. What are the similarities and differences in terms of experimental methods and data analyses?

#### (Adaptive Methods)

- Describe the simple and transformed up-down methods.
- Calculate the probability of convergence given the rules for increasing/decreasing stimulus levels.
- Describe how to estimate AL and DL using adaptive psychophysical methods.

#### (Perception as Inverse Problems)

- Define the forward and the inverse problem in visual, auditory or haptic perception.
- Provide two perceptual phenomena that can be adequately studied by treating the percept as a forward problem (Fechnerian psychophysics) or as an inverse problem, respectively. Discuss.
- Discuss the use of Bayesian rule in formulating a model of perceptual interpretation.
- Discuss the concept of a cost function in applying a regularization method to model perception.

#### (Information Theory and Absolute Identification Experiment)

- Calculate the uncertainty of a particular outcome. Calculate the average uncertainty of a set of events (when the events are equally likely, or when their *a priori* probabilities are known).
- Define the concept of information in terms of uncertainty.
- Describe the key steps in setting up an absolute identification (AI) experiment.
- Calculate IS, IR and IT given a confusion matrix.
- Know how to interpret IT results. The use of  $2^{IT}$ .
- Define and calculate cumulative  $d'$ . Describe the relationship between cumulative  $d'$  and IT for a given experiment.
- Review the practical issues in conducting an absolute identification experiment

#### (Multidimensional Scaling)

- Describe how to set up a Multidimensional Scaling experiment. Explain one method of obtaining dissimilarity scores.
- Explain how to select the dimensionality of an MDS space calculated by a statistics package.
- Interpret MDS solutions.
- Know the limitation of the MDS method.
- Describe at least one way to verify an MDS solution.