Stevens Institute of Technology
Department of Electrical and Computer Engineering
Course Outline

EE616A Signal Detection and Estimation for Communications

Text: Materials distributed in class.
S.M. Kay, *Fundamentals of Statistical Signal Processing: Detection Theory*, Prentice Hall, 1998 (ISBN:0-13-504135-X)
S.M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*, Prentice Hall, 1993 (ISBN: 0-13-345711-7)

References: H.V. Poor, *An Introduction to Signal Detection and Estimation*, 2nd edition, Springer, 1994.
M.D. Srinath, P.K. Rajasekaran and R. Viswanathan, *Introduction Statistical Signal Processing with Applications*, Prentice Hall, 1996
H.L. Van Trees, *Detection, Estimation and Modulation Theory*, Wiley, 1968.
J.G. Proakis, Digital Communications, 4th edition, McGraw-Hill, 2001.

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Lecture Hours: 12 – 2:30 pm Mondays

Meeting Place: B213

Office Hours: 4 – 5 pm Mondays, and by appointment

Prerequisites: An undergraduate course in probability and statistics

Contents: Review: linear algebra, probability, and random variables. Signal detection: Bayes principle, minimax rule, Neyman-Pearson rule; randomized decision; compound hypothesis testing; locally and universally most powerful tests, generalized likelihood-ratio test; Chernoff bound, asymptotic relative efficiency; sequential detection; nonparametric detection, sign test, rank test. Parameter estimation: Bayesian estimation, minimum variance unbiased estimation; sufficient statistics, minimum statistics; maximum a posteriori estimation, maximum likelihood estimation, invariance principle; estimation efficiency, Cramer-Rao lower bound, Fisher information matrix; least squares, weighted least squares, best linear unbiased estimation. Applications of detection and estimation in communications.

Grading: Homework (20%); mini-projects (40%); final project and presentation (40%)

Holidays: No class on February 16 (make-up on February 18) and March 16 (Spring Break).

Miscellaneous: Homework and Matlab projects will be assigned and collected on a regular basis; certain of these problems will be graded and/or discussed. You are responsible for all assignments, changes of assignments, announcements of exam dates, and other course-related events that occur in class. **No late work will be accepted**.