AAE 59000 Aerospace Eng Probability and Est.

Random variables and estimation theory for aerospace engineering

Abstract

This course presents an introduction to probability, random variables with a particular emphasis on estimation theory and problems arising in engineering.

Prerequisite: Calculus and linear algebra. 3 credits, 500 level.

Topics

- Probability measure, conditional probability and Bayes' theorem.

- The Google PageRank search algorithm and stochastic matrices.

- Random variables, distribution and density functions. Binomial, Poisson, uniform, exponential, Gaussian, Raleigh and Cauchy distributions. Functions of a random variable.

- Joint probability densities and distribution. Independent random variables. The sum of independent random variables.

- The expectation, mean, variance and standard deviation of random variables.

- An introduction to Hilbert space, the projection theorem and abstract least squares problems.

- Random vectors and covariance matrices.

- The conditional expectation and its relation to the projection theorem.

- Gaussian random vectors, conditional expectation and the orthogonal projection. Estimation theory and Regression analysis by using the projection theorem. Some white noise problems.

- The characteristic function, central limit theorem and the law of large numbers.