Postgraduate Course
Statistical Signal Processing (MSc)

Instructor Information

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Course Information

Course Description
This course carries out a review of random variables and processes to then expose the basic elements of theory of statistical parameter estimation and hypothesis testing, both covering the classical and Bayesian approaches. Also detailed explanations of the applications of this theory are presented like spectral estimation, adaptive filtering and signal detection in noise.

Prerequisites
Basic knowledge of probability, random variables and random processes as in [4], linear algebra and digital signal processing. In addition, a working knowledge of MATLAB is required.

Syllabus
1. Random Variables and Random Processes.
   1.1. Random Variables Characterization.
   1.5. Spectral Analysis of Random Processes.
   1.6. Linear Transformations.

2. Parameter Estimation.
   2.1. Introduction.
   2.2. Fisher Information and Cramér-Rao Bound.
   2.3. Maximum Likelihood Estimation.
   2.4. Linear Estimation of Parameters.
   Assignment: development of Matlab computer programs related with Parameter estimation

3. Bayesian Estimation.
   3.1. Introduction.
   3.2. Random Variables Estimation.
3.3. Linear Mean-Square Estimation of Random Processes. Wiener Filters.
3.4. Applications.
Assignment: development of Matlab computer programs related with Bayesian estimation

4.1. Introduction.
4.3. Bayesian Approach.
4.4. Applications
Assignment: development of Matlab computer programs related with Hypothesis Testing

Textbooks
This course has not an only one required or recommended textbook. Instead, course notes have been prepared for this course. However, there are recommended reading material that can be used as a supplement to the course notes.

Recommended Reading material

Student Assessment Criteria
Final Exam: 90%
Computer simulations: 10%