EE 5369 : DISTRIBUTED ESTIMATION THEORY - Spring 2015

Time & Place : 2:00 pm -3:20 pm, Tuesday - Thursday, NH 203

Instructor :   Prof. Ioannis D. Schizas

Office :   NH 534 (e-mail : schizas@uta.edu)

Office Hours : 3:30pm-4:30pm Tuesday-Thursday, or by appointment

Textbook

-The first half of the class will rely on this book:
  S.M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*, Prentice-Hall, 1993.
-The second half will be based on recent research papers.

Prerequisites

EE 4541 and EE 5531 (or equivalent advanced undergraduate/first year graduate courses in Digital Signal Processing and Stochastic Processes). Basic knowledge of linear algebra, calculus, and probability theory are required.

Grading

Homework 10%

Midterm Exam 40% (March 5, 2015)

Project 50%   (A two-page project proposal will due on March 4th, 2015. The final project will be due on May 10th, 2015.)

Course Objective

The course presents major theoretical toolboxes for designing estimators and analyzing their performance. Specifically, the course will touch upon Cramer-Rao bound theory and present important estimators such as the maximum likelihood estimator, least-squares estimator and minimum mean-square error estimator to name a few. Tracking of time-varying processes and online estimation techniques will also be considered. After traditional theory is covered, the focus will move in distributed estimation with applications in sensor networks. Decentralized optimization tools such as the alternating direction method of multipliers will be studied and applied in deriving distributed estimators and tracking algorithms. Different modern distributed techniques will be considered and compared along with applications in sensing, data compression, data denoising and multi-target tracking. The goal of this course is to help graduate students acquire the necessary theoretical background to tackle estimation problems that appear in many engineering applications, especially in networks of sensors.

Topics

- Minimum variance unbiased estimators

- Cramer-Rao bound theory

- Best linear unbiased estimators

- Maximum likelihood estimation

- Least-squares estimation

- Sparse regression and compressive sampling

- Kalman and Particle Fltering

- Distributed Optimization Techniques

- Distributed Statistical Inference

- Applications in Networks of Sensors

Drop Policy

Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/ses/fao).

Grade Grievances

Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current graduate catalog:
http://www.uta.edu/gradcatalog/2012/general/regulations/#grades

Americans with Disabilities Act

The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the Americans with Disabilities Act (ADA). All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Dishonesty

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. (Regents Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22).

Student Support Services

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may contact the Maverick Resource Hotline by calling 817-272-6107, sending a message to resources@uta.edu, or visiting www.uta.edu/resources.

Electronic Communication

UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey

At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.

Final Review Week

A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located on your left hand side when exiting NH 110. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.