Meteorology 5323
Time Series Analysis
Fall Semester 2008
MWF 11:00 – 11:50 am
Room 5930 NWC

Course Objective

    The objective of this course is to develop an understanding of selected methods for analyzing one-dimensional data ordered in time or space. We will do this by deriving and interpreting certain equations that are useful in explaining the structure of data and then applying them, using computer programs, to a variety of data sets. TSA is primarily an introductory course in the application of statistics to the analysis of time series. At the same time we want to use time series analyses to gain insight into the physical processes that generate the data.

    The topics covered should be relevant to anyone in any science where events are observed in time and/or space. By the end of the course you should have acquired sufficient understanding of time series terminology and methodology to better deal with more advanced spectrum analysis, for example, that found in radar and atmospheric turbulence measurements, analysis, and theory. Also, you should be able to confidently read many journal articles that employ time and/or space series analyses.

Course Outline

  I. Univariate Fourier Analysis
    A. Purpose, formulas and examples
    B. Statistical properties of the periodogram
    C. Working with the periodogram

  II. Measurement Systems
    A. Linear systems and convolution
    B. Input-output relationships

  III. Filtering Data
    A. Definitions
    B. Filter design considerations
    C. Examples

  IV. Autocorrelation in Data
    A. Autocovariance (acvf) and autocorrelation (acf) functions
    B. Acfs for selected processes
    C. Effect of autocorrelation on statistical properties

  V. Lagged-product Spectrum Analysis
    A. Relationship between the acvf and the spectrum
    B. Spectrum smoothing

Prerequisites

  Calculus and an upper-division course in statistics. Familiarity with complex variables will be advantageous. A working knowledge of a scientific programming language is necessary.

Text

  In general, the text and supplementary materials will be made available as pdfs or handouts. Reference texts will be cited as needed.

Computer needs

  Everyone should have a computer account on an appropriate machine.

Problem Sets

  There will be 5 to 7 problem sets.

Exams

  I plan to have a 6-week exam, a 12 week exam, and a final exam.

Office hours

  Usually after class and always by appointment.

Instructor

  C. E. Duchon   Email: cduchon@ou.edu
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Note to students: If you have a disability that might prevent you from fully demonstrating your abilities, please contact me as soon as possible so we can discuss accommodations necessary to ensure your full participation and to facilitate your educational opportunities.

23 July 2008