Time Series Analysis and Classification

1 Instructor Information

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2 Course Information

2.1 Textbooks

Main textbook:
Time Series Analysis with Applications in R (2nd Edition), by J.D. Cryer and K. Chan, Springer, 2008.
Optional textbook:
Time Series: A Data Analysis Approach, by R.H. Shumway and D.S. Stoffer, 2019.
Available at: https://www.stat.pitt.edu/stoffer/tsda/

2.2 Topics Covered

- Part 1: Time Series Analysis
  - Introduction
  - Time Series Models
  - Spectral Analysis
  - Time-Frequency Representation
  - Multivariate Time Series
- Part 2: Time Series Classification
  - Pattern Recognition and Detection
  - Feature Extraction and Selection
  - Models and Representation Learning
  - Data Enhancement and Preprocessings
  - Change-Point and Anomaly Detection

2.3 Learning Outcomes

By the end of the term successful students should be able to:

- Understand fundamental measures like mean, variance, autocovariance and autocorrelation for time series data
- Understand common time series analysis models and specify and validate appropriate models for real time series data
- Understand the concepts of Fourier time series representation for both univariate and multivariate data as well as wavelet representation.
- Gain some introductory insight into practical implimentations and issues faced when classifying time series data.

3 Assessment

- Attendance: 10%
- Homework: 10%
- Midterm: 20%
- Two Projects: 30%
- Final exam: 30%

4 Computing

The main computing language used for the course is R. All course codes and problem sheets will be illustrated with R. We will mainly use the TSA package available to download from the CRAN repositories.