SYLLABUS

Instructor
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Office Hours: W 1pm-2:30pm @ Bren Hall 2241

Time and Days
Lecture: TuTh 12:30-1:50p DBH 1423
Discussion: Fri 12:00-12:50p DBH 1427 (see schedule)

COURSE WEBSITE: http://www.micheleguindani.info/teaching/stats245
CANVAS WEB SPACE: https://canvas.eee.uci.edu/courses/3478

COURSE DESCRIPTION:
The course will provide a basic introduction to modern time series analysis. We will cover time series regression and exploratory data analysis, ARMA/ARIMA models, model identification/estimation/linear operators, Fourier analysis, spectral estimation, and state space models. The analyses will be performed using the freely available package astsa, which accompanies the book. Both R and RStudio will be required for this class.

OBJECTIVES:
Learn basic analysis of time series data; learn basic concepts in time series regression; learn auto-regressive and model averaging models; learn basic concepts of spectral analysis and space-time models; utilize R for computation, visualization, and analysis of time series data.

REQUIREMENTS:
Corequisite: STATS 200C.
Prerequisite: STATS 201 or STATS 210.


ADDITIONAL REFERENCES:
Brockwell & Davis (2016) Introduction to Time Series and Forecasting, 3rd edition, Springer
GRADING POLICY:
Homeworks (30%)
Take Home Exam (30%)
Final Project (40%)

HOMEWORK POLICY:
- Homework is due by 5pm on the due date.
- Homeworks need to be submitted in the EEE Dropbox on the CANVAS website, preferably as a PDF format or Rmd (R markdown) file.
  The timestamp recorded by the system for the upload of the file on the EEE Dropbox or the reception of the email will validate the submission of the homework at the required time.

(VERY) TENTATIVE COURSE SCHEDULE

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<tbody>
<tr>
<td>Lecture</td>
<td>Characteristics of Time Series Data</td>
<td>Stationarity</td>
<td>Detrending and De-seasonalizing</td>
<td>ACF and PACF</td>
<td>Estimation &amp; Forecasting - 2</td>
<td>Basics of ARIMA models</td>
<td>Intro to Spectral Analysis - 1</td>
<td>The Periodogram</td>
<td>Filtering and Smoothing in DLMs</td>
<td>MLE for DLMs</td>
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<td>Disc: 1/8:</td>
<td>Intro to R and reproducibility</td>
<td>Time Series regression</td>
<td>Smoothing</td>
<td>Estimation &amp; Forecasting - 1</td>
<td>Estimation &amp; Forecasting - 3</td>
<td>Basics of GARCH models</td>
<td>Intro to Spectral Analysis - 2</td>
<td>Dynamic Linear Models</td>
<td>Forecasting in DLMs</td>
<td>Conjugate Bayesian Inference</td>
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ACADEMIC DISHONESTY POLICY
Students are responsible for adhering to the UCI Academic Honesty standards. Students are encouraged to talk to each other, the teaching assistants or the instructor about any homework assignment. However, this assistance is limited to the general and broad conceptual discussion of the problem. Any work turned in must be the original and independent work of each student. **Academic honesty is a requirement for passing this class. Any student who compromises the academic integrity of this course is subject to a failing grade.** The work you submit must be your own. Academic dishonesty includes, but is not limited to copying answers from another student, allowing another student to copy your answers, communicating exam answers to other students during an exam, attempting to use notes or other aids during an exam, or tampering with an exam after it has been corrected and then returning it for more credit. If you do so, you will be in violation of the UCI Policies on Academic Honesty [see https://aisc.uci.edu/]. **It is your responsibility to read and understand these policies. Note that any instance of academic dishonesty will be reported to the Academic Integrity Administrative Office for disciplinary action and is cause for a failing grade in the course.**
FINAL PROJECT  

Proposal (3-4 pages, double spaced)  Due by 2/16

You are required to select your own data. The proposal should include the following: (1) description of the dataset; (2) the scientific goals, specific hypotheses; (3) data exploratory analysis including preliminary plots and summary tables; (4) plan for future analysis and modeling.

The written final report (12-15 pages including figures, double spaced)  is due by 03/22.

Reports have to be complete but brief.

DATA ANALYTIC STRATEGIES:

- Perform adequate exploratory analysis of the data and provide a complete, yet succinct, presentation of the results.
- Clearly state the statistical model used when presenting model estimates.
- Clearly state the model building/selection/validation criteria used to address the scientific question(s) of interest.
- Perform adequate model diagnostics.
- Provide precise interpretations of the parameters in your model (or your estimates of those parameters) in the context of the scientific problem.

GENERAL GUIDELINES ON THE REPORT

Your final analysis should be presented in the form of a brief report between 10-12 double-spaced pages including relevant tables and figures. Your report should be structured as follows:

- Abstract - A brief summary of your basic findings
- Introduction - A brief introduction/motivation to the problem at hand, relevant details about the data, additional relevant scientific information from searching the web, for example, and what is to be addressed
- Statistical Methods - A discussion and justification of the methods you have used to analyze the data and how you went about analyzing the data. Don’t forget to describe in some detail how and why the particular model was selected.
- Results - A presentation of the results of your analysis. Interpretations should include a discussion of statistical versus practical import of the results.
- Discussion - A synopsis of your findings and any limitations your study may suffer from. Present final conclusions in terms that non-statisticians will understand. Quantitative and qualitative aspects should be discussed.

Your report should be succinct and to the point! It should be written in a language that is understandable to the scientific community.