DATA130013: Time Series and Spatial Statistics

Spring 2019

Instructor:	Nan Zhang	**Class:**	Wed 15:25–18:00, H6107
Email:	zhangnan@fudan.edu.cn	**Office:**	N210, Zibin Building

Teaching Assistant: Jichen Yang, 18210980017@fudan.edu.cn

Course Websites:

1. https://zhangnanfudan.github.io/teaching/
2. Wiki: shjkx.wang (username/password: guest.fudan/shanghai)

Office Hours: Friday 9am-11am, or by appointment.

Textbook:

- Robert Shumway and David Stoffer (2011) *Time Series Analysis and Its Applications: with R Examples*, Springer, 4th edition. pdf
- Noel Cressie and Christopher Wikle (2011). Statistics for Spatio-temporal Data, Wiley

Main References: There are various interesting and useful books related to this course. You can consult them occasionally.

- Peter Brockwell and Richard Davis (2016). *Introduction to Time Series and Forecasting*, Springer, 4th edition. link
- Hadley Wickham and Garrett Grolemund (2017). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*, O'Reilly Media. link
- Norman Matloff (2011). *The Art of R Programming: A Tour of Statistical Software Design*, No Starch Press

Objectives: This course is designed for advanced undergraduates majoring in mathematics, statistics, and data science. It covers modern topics in time series and spatial statistics and emphasizes their applications to real data sets with statistical programming language R.

Prerequisites: Introductory courses on probability and statistics is assumed. Knowledge of regression analysis is preferred. Programming experience with R is recommended.

Tentative Outline:

- Introduction to time series: examples and concepts
- Regression methods and exploratory data analysis
- Models for stationary time series: ARMA model
- Models for non-stationary time series: ARIMA model
- Spectral analysis

- Introduction to spatial statistics, data visualization
- Spatial random process, spatial correlation, variogram
- Covariance function modeling
- Prediction and Kriging

Grading Policy:

Homework	(10%)
Wiki contribution	(5%)
Project	(5%)
Quiz	(20%)
Midterm	(30%)
Final	(30%)

Homework: Problems will be assigned on course website after class meetings and will be due in class on the following Thursday. No late homework will be accepted. Missed homework will receive a grade of zero. Each assignment carries equal weight. You are encouraged to work with other students on the homework problems, however, verbatim copying of homework is absolutely forbidden. Therefore each student must ultimately produce his or her own homework to be handed in and graded. It is encouraged to type your homework solution using LaTeX.

Wiki contribution: Wiki page is designed as a comprehensive resource for this course. Everyone can make contribution. Homework questions and extra exercises will be listed on it and students are assigned to edit solutions or submit R code. Instructor and teaching assistant will help improve and evaluate each student's work.

Quiz: Two in-class quizzes will be arranged accordingly. Questions are conceptual or related to previous homework.

Project: A project on real data analysis is arranged for each student along the semester. Students are encouraged to look for and analyze one data set of their interest. The progress report should be regularly updated on a personal wiki page and checked by teaching assistant. At the end of this semester, a final report is submitted for evaluation.

Midterm: Midterm exam is also in-class. It is required and there will be no make-up exam.

Final: Final exam is scheduled on the afternoon of June 19, 2019. It will cover all topics along the semester.

Quizzes and exams are closed-book.

Class Policy:

- Regular attendance is recommended.
- Academic honesty: no plagiarism is tolerated.