Lecture 0

Course Information

MATH 8090 Time Series Analysis

Whitney Huang
Clemson University

About the Instructor

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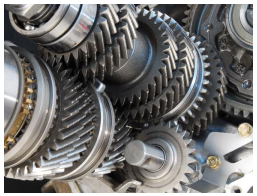
- Fifth-year Assistant Professor of Applied Statistics and Data Science
- Born in Laramie, WY, grew up in Taiwan

- Obtained a B.S. in Mechanical Engineering, switched to Statistics in graduate school



- Got a Ph.D. (Statistics) in 2017 at Purdue University.

How to Reach Me?

- **Email:** wkhuang@clemson.edu

  Please include [MATH 8090] in your email subject line

- **Office**: O-221 Martin Hall

- **Office Hours**: Tue. 9:15 am - 10 am, Wed. 2 pm - 3 pm, and Thurs 1:30 pm - 2:30 pm, and by appointment

Class Policies

Logistics

- There will some homework assignments:
  - To be uploaded to Canvas by 11:59 pm ET on the due dates
  - Worst grade will be dropped
- There will be one 60-min exam. The (tentative) date is: Oct. 5, Thursday
- There will be a final project. It could be a **data analysis**, a **simulation study**, **methodological or theoretical research**, or a **report on a research article** of interest to you. Topics for the project must be approved by me no later than Nov. 2 (Thursday).

Evaluation

Grades will be weighted as follows:

Homework	30%
Exam	20%
Final Project	50%

Final course grades will be assigned using the following grading scheme:

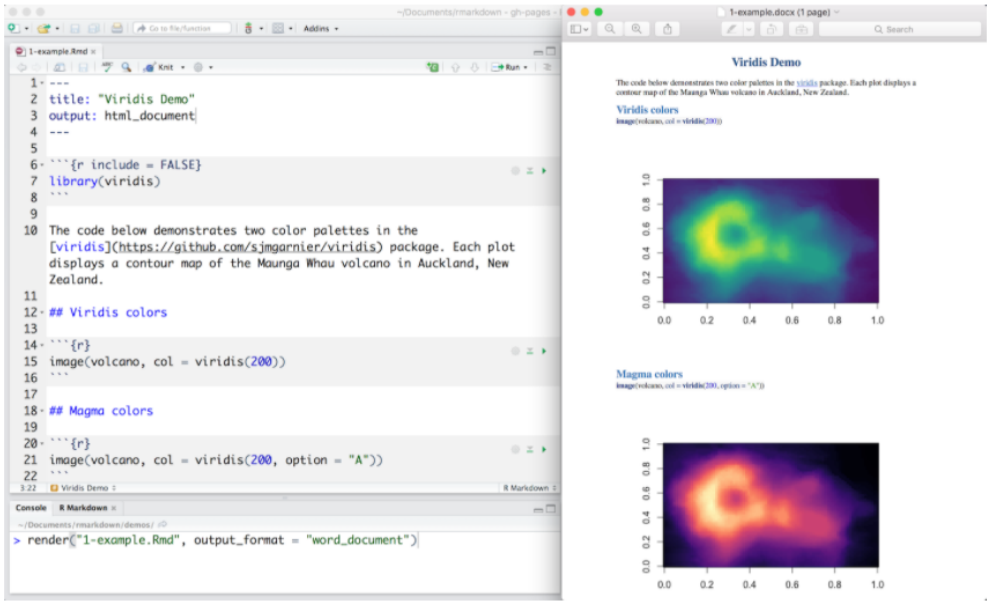
>= 90.00	A
88.00 ~ 89.99	A-
85.00 ~ 87.99	B+
80.00 ~ 84.99	B
78.00 ~ 79.99	B-
75.00 ~ 77.99	C+
70.00 ~ 74.99	C
68.00 ~ 69.99	C-
<= 67.99	F

Computing

We will use software to perform statistical analyses.

Specifically, we will be using `R/Rstudio`

- a **free/open-source** programming language for statistical analysis
- available at `https://www.r-project.org/` (`R`); `https://rstudio.com/` (`Rstudio`)
- I strongly encourage you to use **`R` Markdown** for homework assignments



Course Materials at CANVAS

- Course syllabus / Announcements
- Lecture slides/notes/videos
- R Codes
- Data sets

Course Website

CLEMSON UNIVERSITY

Link: https://whitneyhuang83.github.io/MATH8090/Schedule.html

MATH 8090 Time Series Analysis, Forecasting and Control

Contact Information

Instructor: Whitney Huang
Email: wkhuang@clemson.edu
Office Hours:Tue. 9:15 am - 10 am, Wed. 2 pm - 3 pm, and Thurs 1:30 pm - 2:30 pm, and by appointment (in person or via Zoom)
Syllabus:Link

Announcements

- Welcome to MATH 8090!

Schedule

Week	Date	Topic	Slides	Notes with R Code	Homework Assignments/Labs	Exam/Project
1	Aug. 24	Overview of the course	Course information; Slides 1	Notes 1		
2	Aug. 29 and Aug. 31	Estimating trend and seasonality	Slides 2	Notes 2		
3	Sep. 5 and Sep. 7	Stationary processes	Slides 3	Notes 3		
4	Sep. 12 and Sep. 14	ARMA models Part I	Slides 4	Notes 4		
5	Sep. 19 and Sep. 21	ARMA models Part II	Slides 5	Notes 5		
6	Sep. 26 and Sep. 28	ARMA models III	Slides 6	Notes 6		
7	Oct. 3 and Oct. 5	Nonstationary time series models	Slides 7	Notes 7		Exam: Oct. 5
8	Oct. 10 and Oct. 12	Seasonal time series models	Slides 8	Notes 8		
9	Oct. 19	Regression with time series errors	Slides 9	Notes 9		
10	Oct. 24 and Oct. 26	GARCH Models	Slides 10	Notes 10		
11	Oct. 31 and Nov. 2	Extreme Value Analysis	Slides 11	Notes 11		Final Project Proposal Due: Nov. 2
12	Nov. 7 and Nov. 9	Spectral Analysis of Time Series I	Slides 12	Notes 12		
13	Nov. 14 and Nov. 16	Spectral Analysis of Time Series II	Slides 13	Notes 13		
14	Nov. 21	State-Space Models I	Slides 14	Notes 14		
15	Nov. 28 and Nov. 30	State-Space Models II	Slides 15	Notes 15		
16	Dec. 5 - Dec. 7	Review	Slides 16			
17	Dec. 11-15	Final Project				Final Project Due

Reference Books

- *Introduction to Time Series and Forecasting,* 2_{nd} Edition, **Peter Brockwell and Richard Davis, 2013** [Link]
- *Time Series Analysis and Its Applications With* R *Examples,* 4_{th} Edition, **Robert Shumway and David Stoffer, 2017** [Link]
- *Time Series Analysis with Applications in* R*,* 2_{nd} Edition, **Jonathan Cryer and Kung-Sik Chan, 2008** [Link]
- *Time Series Analysis: Forecasting and Control,* 5_{th} Edition, **George Box, Gwilym Jenkins, Gregory Reinsel, Greta Ljung, 2015** [Link]
- *Analysis of Financial Time Series,* 3_{rd} Edition, **Ruey Tsay, 2010** [Link]
- *Climate Time Series Analysis: Classical Statistical and Bootstrap Methods,* 2_{nd} Edition, **Manfred Mudelsee, 2013** [Link]

Tentative Schedule

Week	Dates	Topic
1	8/24	Overview of the course
2	8/29-31	Estimating trend and seasonality
3	9/5-7	Stationary processes
4	9/12-14	ARMA models I
5	9/19-21	ARMA models II
6	9/26-28	ARMA models III
7	10/3-5	Nonstationary time series models
8	10/10-12	Seasonal time series models
9	10/19	Regression with time series errors
10	10/24-10/26	GARCH models
11	10/31-11/2	Extreme value analysis
12	11/7-9	Spectral analysis of time series I
13	11/14-16	Spectral analysis of time series II
14	11/21	State-space models I
15	11/28-30	State-space models II
16	12/5-7	Review