

DS 768: Forecasting Analytics

General Information

Instructor: Christopher D. Glynn
Course Title: Forecasting Analytics (DS 768)
Semester: Spring 2019
Meeting Room: PCBE 165
Meeting Times: Mondays 5:10 PM – 8:00 PM
Office: 360M
Office Hours: By appointment

Course Objectives

This course will explore the elements of statistical forecasting with applications in business decision making. The course will focus on the following four objectives:

- Explore time series data with appropriate numerical summaries and visualizations;
- Provide students with a broad understanding of linear regression;
- Utilize dynamic linear models for time series analysis;
- Develop basic software skills for data analysis using the R programming language.

Text (Recommended)

Data Science: A Gentle Introduction

James G. Scott

https://jgscott.github.io/STA371H_Spring2018/files/DataScience.pdf

Dynamic Linear Models with R

Giovanni Petris, Sonia Petrone, Patrizia Campagnoli

http://people.bordeaux.inria.fr/pierre.delmoral/dynamics-linear-models.petris_et_al.pdf

Software

[R programming environment](#) (free for all operating systems)

Communication

Canvas. Canvas will be used as the primary communication platform. Please routinely check Canvas for class announcements, assignments, and materials. Announcements may include changes in the course schedule, changes to exams, assignments, and other things that are critical for your successful completion of the course.

Email. The instructor will respond to emails within 24 hours from Monday through Friday. Emails sent late Friday afternoon or anytime on Saturday or Sunday will be replied to the following Monday. Please plan communications accordingly.

If you would like the instructor to respond to your email, it must be structured as follows: The subject line of the email **MUST** include the course number and section. Emails, like all correspondence, must be written in a professional manner. Be sure to sign all email messages with your **FIRST** and **LAST** name. Here is an example of a correctly structured email.

Subject: DS 768 Spring 2019 – Absent on 3/5

Message:

Professor Glynn,

Because of an illness, I will not be able to attend class on Tuesday March 5. Attached is a note from the urgent care provider.

Sincerely,
Jane Smith

Please note that if you do not structure your email in this manner, it will not get a response.

In all digital and personal communications, you are expected to call the instructor either Professor Glynn or Dr. Glynn.

Assessments

Individual Assessments: You will be required to complete graded homework assignments based on exercises from the course notes or those designed by the instructor.

Midterm Exam 1: On Tuesday 3/5/2019, you will be assigned a take home midterm exam. The midterm will be due Friday **3/8/2019 by 5:00 PM**. The take home midterm is to be completed individually without consultation of peers. Any communication with peers regarding the midterm will be treated as a violation of UNH's academic honesty policy.

Midterm Exam 2: On Tuesday 4/9/2019, you will be assigned a take home midterm exam. The midterm will be due Friday **4/12/2019 by 5:00 PM**. The take home midterm is to be completed individually without consultation of peers. Any communication with peers regarding the midterm will be treated as a violation of UNH's academic honesty policy.

Final Project: An applied forecasting project is an essential part of the learning experience. You will work in groups of 3-4 people.

- You are expected to form your groups and find the data set you want to work with – following the guidelines.
- An in-class presentation about your data set, goals of your forecasting project, and an exploratory data analysis will happen on **Tuesday 3/19/2019**
- Each group will present their project and results in class on **Tuesday April 30, 2019** (last class).
- The hard copy of the project will be due on **May 13, 2019 by 5:00 PM**.
- There will be a peer review score for each group member for the project. The peer review rubric is available on Canvas and at the end of this syllabus. Peer reviews are due on **May 13, 2019 by 5:00 PM**.
- **No late projects will be accepted.**

Grades

Below is a table that shows the grade breakdown for coursework.

Assessment Type	Available points
Homework	20%
Midterm 1	25%
Midterm 2	25%
Final Project	30%
Total	100%

Make-up Policy: In general, no make-ups of missed work are accepted (including exams, and homework assignments). When legitimate excuses arise due to severe illness (with a doctor's note), a family death, etc., you are expected to contact the instructor as soon as possible to develop a plan for completing the assessment, and legitimate proof is required.

Assignment submission and late work: All homework assignments must be submitted on Canvas by midnight of the due date. No late work is accepted.

The letter grades associated with each range of points is shown below. Please note that an 89.99% is NOT an "A-". It is a "B+". Similarly, a 93.99 is an "A-" and not an "A". **Grades will not be rounded.** Remember, the instructor does not GIVE you grades by deducting from 100%. You EARN grades by accumulating points from 0%. On the first day of class, your course grade is a 0%. Over the course of the semester, you will earn points. The instructor objectively evaluates your work and reports your grade to you. The UNH grading scale is that an "A = Excellent", "B = Superior", "C = Satisfactory", "D = Marginal", and "F = Failing". The following information will help you understand how your final grade for this course will be calculated.

Numeric grade range	Letter grade
Greater than or equal to 94% and less than or equal to 100%	A
Greater than or equal to 90% and less than 94%	A-
Greater than or equal to 87% and less than 90%	B+
Greater than or equal to 84% and less than 87%	B
Greater than or equal to 80% and less than 84%	B-
Greater than or equal to 77% and less than 80%	C+
Greater than or equal to 74% and less than 77%	C
Greater than or equal to 70% and less than 74%	C-
Greater than or equal to 67% and less than 70%	D+
Greater than or equal to 64% and less than 67%	D
Greater than or equal to 60% and less than 64%	D-
Greater than or equal to 0% and less than 60%	F

Once grades are posted on Canvas, you have three days to inform the instructor if you believe that a mistake has been made in your grade. If you fail to contact the instructor within the three-day period, the grade for the test or assignment, even if incorrect, will be final. If you ask for an assignment to be regraded, the entire assignment will be regraded. Your grade may either go up or down.

Class Participation/Professionalism: You are expected to contribute to class discussions, respectfully ask questions, and share your knowledge. Class attendance is required and you are responsible for all material covered in class in addition to assigned readings and exercises outside of class. In respect to your classmates and the instructor, it is expected that you refrain from talking

to others, sleeping, playing videos games, browsing the internet, texting, posting to social media, and other disruptive activities. Such activities may result in you being asked to leave the lecture.

Academic Honesty: You are expected to strictly adhere to UNH’s Academic Honesty Policy. <https://www.unh.edu/student-life/academic-honesty-policy>. Any violations of the academic honesty policy, such as working together on individual take home exams, will result in an automatic failure of the course.

Students with disabilities: According to the Americans with Disabilities Act (as amended, 2008), each student with a disability has the right to request services from UNH to accommodate his/her disability. If you are a student with a documented disability or believe you may have a disability that requires accommodations, please contact Student Accessibility Services (SAS) at 201 Smith Hall. Accommodation letters are created by SAS with the student. Please follow-up with your instructor as soon as possible to ensure timely implementation of the identified accommodations in the letter. Faculty have an obligation to respond once they receive official notice of accommodations from SAS, but are under no obligation to provide retroactive accommodations. For more information refer to www.unh.edu/studentaccessibility or contact SAS at 603.862.2607, 711 (Relay NH) or sas.office@unh.edu.

Emotional health and wellness: Your academic success in this course is important. If, during the semester, you find emotional or mental health issues are affecting that success, please contact Psychological and Counseling Services (PACS) (3rd fl, Smith Hall; 603 862- 2090/TTY: 7-1-1) which provides counseling appointments and other mental health services.

Tentative Class Schedule

Date	Class #	Module	Topic
1/22/19	1	Regression analysis	Intro: Motivation, Stats Review, Intro to Time Series
1/29/19	2	Regression analysis	Linear Regression: Normal Distribution, Least Squares;
2/5/19	3	Regression analysis	Model Diagnostics: R squared, Residuals, normality, autocorrelation, Predictive error.
2/12/19	4	Regression analysis	Categorical Data: dummy variables, ANOVA, seasonality
2/19/19	5	Regression analysis	Multiple Linear Regression: Systems of equations, design matrices, comparing two means
2/26/19	6	Regression analysis	Model Building: Stepwise selection, Occam’s Razor, marginal likelihood; Exponential Smoothing
3/5/19	7	Regression analysis	Bayes Rule: Prior + Data = Posterior
3/12/19		Spring Break	
3/19/19	8	Dynamic modeling	Random walk models; Group EDA presentations
3/26/19	9	Dynamic modeling	Dynamic regression via Dynamic Linear Models: Observation, State, Inference, Prediction
4/2/19	10	Dynamic modeling	Autoregressive models

4/9/19	11	Dynamic modeling	Moving average Models
4/16/19	12	Dynamic modeling	ARIMA models
4/23/19	13	Dynamic modeling	Seasonal models; Nonlinear forecasting models
4/30/19	14	Dynamic modeling	Final Project Presentations

Peer Review Rubric

	Criteria	Filled out by:			
		Member 2	Member 3	Member 4	Self
	Peer name:				
1	Quality of Technical Work: Work is correct, complete, and relevant to the problem. Graphs, codes, and notes are clear and intelligible.				
2	Commitment to Team / Project: Attends all meetings. Arrives on time or early. Prepared. Ready to work. Dependable and reliable.				
3	Leadership: Takes initiative, makes suggestions, provides focus.				
4	Responsibility: Gladly accepts work and gets it done. Spirit of excellence.				
5	Communicates clearly and understands the team's direction				
	Average Grade				

Grading scale: 5 – Always; 4 – Most of the time; 3 – Sometimes; 2 – Rarely; 1 – Never.