DSBA/MBAD 6211 Advanced Business Analytics
Course Syllabus Summer 2024

Basic Information

Instructor: Ryan Wesslen, Ph.D.
Office: Virtual by appointment
Email: rwesslen@charlotte.edu

Classroom: The Dubois Center (Uptown) 1101
Class Hours: Tuesday 5:30 pm – 9:15 pm
Website: Canvas website

Course Description

This course is designed to help students apply business analytics techniques to explore and analyze various types of data, so they can find subtle and non-trivial relationships that are understandable, useful, and executable to business owners. Managers in various functional areas can exploit valuable insights gained via fact-based decision-making to achieve competitive advantages. This course uses a case approach and Python is the main analytical tool.

Specific topics covered in this course include

1. Predictive modeling (e.g., regression, gradient boosting, random forest),
2. Model Evaluation,
3. Dimension reduction and feature selection,
4. Text analytics and prompt engineering,
5. Time series analysis & forecasting,
6. Advanced statistical methods (clustering, Bayesian Statistics, survival analysis)

We will have a case-based approach throughout the semester. For the course, we'll explore three business use cases as three modules in the course:

1. Credit scorecard modeling
2. Text Mining for Customer Insights on Social Media
3. Marketing & Sales forecasting, marketing spend, and customer lifetime value (CLV)

The materials including presentations, cases, articles, and other readings will be uploaded to Canvas or shared in class by the instructor.

Learning Objectives

This course aims at business managers, information professionals, data analysts, as well as a general audience interested in applying data analytics techniques to discover non-trivial relationships and to summarize data in novel ways that are understandable, useful, and executable to business owners.

This course will examine principles, ideas, and data analytics tools underlying the current practice of data mining. Specifically, students will understand the basics of predictive modeling, experimentation, survival analyses, text mining, forecasting, and social network analytics. By understanding business analytics at the practical and non-highly-mathematical levels, students will be able to translate information into decisions and convert information about past performance into reliable forecasts.

This course will develop an understanding of the practical applicability of analytics methods in a variety of business scenarios. This course will not just describe/explain the end results, but also discuss the process of formulating/refining business objectives, data selection, data preparation, model selection, and evaluation that lead to the results. The students will learn how to formulate analytic tasks in support of business objectives, how to define successful projects, and how to evaluate the utility of existing and potential applications of discussed technologies in practice.

This course includes lectures, seminar-style discussions, and lab work. This course will use the statistical software Python for hands-on experimentation with various analytics techniques.

Course Materials

Handouts, Slides, assignments, and additional helpful resources will be posted on Canvas.
Software: Python/Jupyter Notebook/Google Colab Notebooks

Recommended Python Bootcamp course provided by SDS: Introduction to Python For Data Science

Grading

Component	Percentage
Two exams (2 @ 20%)	40%
Final project (worth 15%, two milestones worth 5%)	20%
Pecha Kucha Presentation (1 in-class presentation)	10%
Weekly Reading Quizzes (8 x 1.25 points, lowest 2 dropped)	10%
Weekly Labs (6 x 2.5 points, lowest 2 dropped)	15%
Attendance & Participation (allowed 2 unexcused absences, each absence after -1% off)	5%
Total	100%

Final letter grade will be calculated based on the following scale:

A: 90 and above; B: 80-89.9; C: 70-79.9; Under 70 is U

The course grades are posted on Canvas for informational purposes only. The official overall grade is computed and kept in the instructor's grade book.

Quizzes

There will be 8 weekly reading quizzes, each due by the start of the next class. These quizzes will have required readings and/or videos to watch. They are generally targeted to take 2-3 hours to complete.

This quizzes will be Canvas quizzes using Canvas' lockdown browser. They will generally be multiple choice questions and can vary from 5 to 10 questions (10 to 15 minutes). Each quiz is worth 1.25 points and the lowest two quizzes will be dropped. Late quizzes will not be accepted.

Exams

The mid-term exam will be online using Canvas and the Locked Down Browser. You may use notes and textbooks (hard notes) but you cannot use any other online resource (including ChatGPT, LLMs, etc.) Questions on the exams will generally be taken from weekly reading quizzes, which are from the assigned readings of texts, class lectures, and assignments.

The final exam will be in-class and closed book. It will be largely taken from the quiz question bank with some additional "out-of-sample" questions.

If the answer to an exam question is disputed, the student should submit a written appeal, citing the source to the instructor. The instructor will take these appeals into account during grading.

Missed exams

In the event that the excuse **is approved before the exam date** (a rare case and requires documentation), the student will be given a make-up exam.

Labs

In lieu of homeworks, we'll generally spend the 2nd half of each class working on a Colab Jupyter notebook that includes a hands-on example along with open-ended questions. The goal is to complete these questions in class to minimize homework; however, if you miss class or do not finish in time, these labs serve as homework.

You may work individual or with 1 other partner (no more than 1); however, each student should upload their own lab.

Labs that are late will receive 25% penalty every day late; thus, after 4 days will not be accepted.

The lowest two lab grades will be dropped.

All changes in assignments or schedules will be posted on Canvas. It is your responsibility to keep up with the changes that are posted on Canvas.

Pecha Kucha Presentation

Each student is required to complete a Pecha Kucha presentation as part of their assessment for this course. A Pecha Kucha presentation consists of 20 slides, with each slide shown for exactly 20 seconds, making the total presentation time 6 minutes and 40 seconds. This format encourages precision and conciseness, challenging students to focus on key points and effective communication.

Topics:

Package name	Description	Presentation week
skorecard package	Credit scorecard (binning, WoE)	June 4 (Week 3)
XGBoost package	Gradient Boosting	June 11 (Week 4)
PiML package	Interpretable ML	June 11 (Week 4)
nannyml package	Model evaluation	June 11 (Week 4)
human-learn package	Rule-ML package	June 18 (Week 5)
bulk package	Bulk labeling/clustering	June 18 (Week 5)
BERTopic package	Transformer-based topic modeling	June 18 (Week 5)
llm package	Large language models	June 25 (Week 6)
llama-index package	Large language models	June 25 (Week 6)
langchain package	Large language models	June 25 (Week 6)

skforecast package	Forecasting	July 9 (Week 8)
Pymc-marketing package	Bayesian Marketing	July 16 (Week 9)

Instructions:
Select a Topic: Choose one of the provided topics. Your selection should align with your interests and the broader objectives of the course. You may request a different topic but need to get permission. Ideally, it is a package you want to explore for your final project.

Research: Conduct thorough research on your chosen topic. Your slides should be informed and backed by credible sources.

Slide Creation: Design 20 slides. Each slide must be able to stand on its own with clear, concise information, and visually engaging content. You must include these slides (these topics may be across 3-4 slides):

- Motivation: problem the package is trying to solve
- Application: 1 use case
- Example: choose 1 example, simplify it show a minimal code example and the output
- Pros: advantages of the package
- Cons: challenges with the package

Rehearsal: Practice your timing. Each slide should transition after 20 seconds. Familiarity with your slides and content will ensure a smooth flow during the actual presentation. Recommend using Google slides and follow this video for how to set up auto-advance every 20 seconds.

Presentation: Submit your Pecha Kucha link or slides to Canvas. Your ability to stick to the timing, clearly convey your message, and engage the audience will be key parts to your grade.

Final Project

Students will complete the projects either individually or in pairs. Details will be made available via Canvas. There will be 2 milestones and a project presentation on July 30th.

Class Policies

Attendance and Participation Policy

5% of the final grade is allocated to case reading discussions and class attendance. The students are required to read the case studies before the class and are highly encouraged to contribute to the case

discussions in class. Other contributions to the class, including sharing personal experiences related to data science and business analytics, managerial insights, theoretical opinions, ... are all desirable as well. Attendance and participation are required and tardiness or early departure is disruptive and is, of course, discouraged. Students will be held responsible for any material covered, announcements made, assignments passed out, and any other type of work that they may miss during any absence from class. Up to 2 missed sessions will be allowed upon the instructor's approval in nonemergency cases.

Laptop Requirement
Students are required to have their personal laptop computer. The policy and the minimum system requirements are found at the link https://belkcollege.uncc.edu/laptop-policy.

Class Behavior Policy
Inappropriate behavior distracts from the ability of others to profit from their in-class experience. Such behavior includes arriving late, leaving early, talking, surfing the net, and so on.

Rude and inappropriate behavior **will not be tolerated**. Since it is my responsibility to provide an environment that is conducive to learning for everyone in the class, I will deduct points from the grade of any student who chooses to repeatedly distract others. In particularly egregious cases, I will have the student permanently removed from the class.

Under no circumstances will students be permitted to spend their lab time working on assignments for other classes, checking e-mail, surfing the Web, or printing out homework. Attempts to engage in such behavior will be reflected in lower grades and may lead to removal from the course.

Electronic Devices in Class
Use of cellular phones, pagers, music players, radios, and similar devices is prohibited in the classroom and laboratory facilities. Cellular phones MUST BE TURNED OFF DURING CLASS, except in cases of medical emergencies. Pagers must be set to vibrate, rather than beep. Calculators and computers are prohibited during examinations and quizzes, unless specified. Laptop-size computers may be used in lectures for the purpose of taking notes. **Use of instant messaging, email, or other communication technologies during class time is prohibited.** Use of computing devices for purposes other than those required for the purposes of the class topic is prohibited. This includes the use of laptops, lab computers, phones, or other devices for Internet browsing, game playing, reading news, texting, chatting, IM and other activities not required for the class.

Grade Appeals Policy
If you believe that the grade you received on an assignment or an exam was in error or unfair, you can appeal to the professor **in writing within 3 calendar days after the grades are posted**. The appeal should clearly state the reasons why you believe the grade to be unfair or the nature of the error.

Overdue appeals will not be considered.

Academic Integrity

As a program that helps to create business and government leaders, the College of Business has an obligation to ensure academic integrity is of the highest standards. Standards of academic integrity will be enforced in this course.

University regulations will be strictly enforced in all cases of academic irregularities, cheating, plagiarism or any variations thereof. Students assume full responsibility for the content and integrity of the academic work they submit. The guiding principle of academic integrity shall be that a student's submitted work, examinations, reports, and projects must be his/her own work.

All UNCC students have the responsibility to be familiar with and observe the requirements of The **UNCC Code of Student Academic Integrity** (see the Catalog and also http://integrity.uncc.edu/). This code forbids cheating, fabrication or falsification of information, multiple submission of academic work, plagiarism of written materials and software projects, abuse of academic materials (such as library books on reserve), and complicity in academic dishonesty (helping others to violate the code). Additional examples of violation of the Code include:

- Representing the work of others as your own.
- Using or obtaining unauthorized assistance in any academic work.
- Giving unauthorized assistance to other students.
- Modifying, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit.
- Misrepresenting the content of submitted work.

Students are expected to report cases of academic dishonesty they become aware of to the course instructor who is responsible for dealing with them.

For this course, it is permissible to assist classmates in general discussions about the homework. General advice and interaction are encouraged. Each person, however, must develop his or her own solutions to the assigned homework and laboratory exercises. A student may not use or copy (by any means) another's work (or portions of it) and represent it as his/her own. If you need help on an assignment, contact your instructor or the TA, not other classmates.

Any further specific requirements or permission regarding academic integrity in this course will be stated by the instructor, and are also binding on the students in this course.

Students who violate the code can be punished to the extent of being permanently expelled from UNCC and having this fact recorded on their official transcripts. The normal penalty is zero credit on the work involving dishonesty and a further substantial reduction of the course grade. In almost all

cases, the course grade is reduced to "F."

If you are unclear about whether a particular situation may constitute an honor code violation, you should meet me to discuss the situation. Feel free to discuss the definition of cheating and/or plagiarism with me if you are unclear on these terms or have questions about the acceptability of a particular type of action.

The instructor may ask students to produce identification at examinations and may require students to demonstrate that graded assignments completed outside of class are their own work.

Disability Accommodations
UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office at Fretwell 230.

Diversity
The Belk College of Business strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Incomplete Grade Policy
Receiving a grade of incomplete ("I") is not based solely on a student's failure to complete work or as a means of raising his/her grade by doing additional work after the grade report time. An incomplete grade can be given only when a student has a serious medical problem or other extenuating circumstance that legitimately prevents completion of required work by the due date. In any case, for a student to receive an 'I' grade, the student's work to date should be passing, he/she must have completed a significant portion of the course, and the student must provide proper written proof (e.g., a doctor's note) of the extenuating circumstances.

Course Changes Policy
The instructor reserves the right to make any necessary changes to the course content, schedule, and policies. Changes will be announced in class and will also be posted online.

Religious Accommodation for Students Policy
The instructor will observe University Policy 409 (https://legal.uncc.edu/policies/up-409) on matters of religious accommodation. Please note that the procedure prescribed by this policy requires a notice to the instructor prior to the census date of the semester (typically the tenth day of instruction).

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University's statement on disability accommodations

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Tentative Class Schedule

*** This tentative schedule is subject to change ***

Please bring your own laptop for all classes			
Week	**Date**	**Topics**	**Due**
Introduction: Data Manipulation & Predictive Modeling			
Week 1	May 20	• Course Introduction • Python/Colab setup • Data manipulation with SQL, pandas and Ibis	
Week 2	May 27	• scikit-learn with regression, pipelines, feature engineering and preprocessing	Lab 1, Quiz 1, Select Pecha Kucha topic/date
Credit Scorecard Modeling			
Week 3	Jun 4	• Business problem, regression, binning, and building credit scores	Lab 2, Quiz 2
Week 4	Jun 11	• Advanced models (XGBoost, Random Forest), model evaluation and risk management	Lab 3, Quiz 3, Project 1 milestone
Text Mining for Customer Insights on Social Media			
Week 5	Jun 18	• Text analytics with dimensionality reduction and clustering	Lab 4, Quiz 4
Week 6	Jun 25	• Prompt Engineering & In-context Learning	Lab 5, Quiz 5
Week 7	Jul 2	**Mid Term Exam Online**	
Marketing & Sales			
Week 8	Jul 9	• Time Series and Forecasting Sales	Lab 6, Quiz 6, Project 2 milestone
Week 9	Jul 16	• Marketing Mixed Modeling with Bayesian Statistics and PyMC-Marketing	Lab 7, Quiz 7
Week 10	Jul 23	• Customer Lifetime Value: Bayesian Statistics and Survival Analysis	Lab 8, Quiz 8
Week 11	Jul 30	Project Presentations & Final Exam Prep	
Week 12	Aug 6	**Final Exam In Class Exam: 6:30pm**	