91-729: Business Analytics for Managers

Spring 2024

Mini 4 (Mar 14th to Apr 25th, 2024)

PLEASE NOTE: ANY CHANGES TO THE COURSE WILL BE PUBLISHED PRIOR TO THE COMMENCEMENT OF CLASS.

Instructor:

Vijay Sai vijaysai@cmu.edu

Office Hours: See Course website.

Teaching Assistant:

(Office hours & location for each TA will be posted on Canvas by the end of first week)

Class Meeting Times:

Lectures: In-person: Thursday, 6:30 PM – 9:20 PM ET; HBH 1005

Recitation: Remote: Saturday: 2:00 – 3:20 P.M. ET; Zoom (refer Canvas)

This course is offered as an in-person only class. The recitation is delivered remotely using Zoom. If you do have any unforeseen constraints that prevent you from attending class, please send email in advance to the extent possible. Appropriate support will be extended.

If any of our class meetings conflict with your religious events, please let me know so that we can make alternative arrangements.

Class Web Site: https://canvas.cmu.edu/courses/40077. Please note that the course will not be published until the first week of class i.e., week of March 11, 2024.

Course Description

Business analytics is defined by Thomas Davenport as “the broad use of data and quantitative analysis for decision making within organizations.” Business analytics encompasses both the reporting of performance and the attempt to understand and predict it, emphasizing statistically and mathematically derived insights. This course will cover the underlying fundamental concepts and principles behind business analytics, focusing on those the manager needs to understand to both envision opportunities, and work effectively with data scientists to realize those opportunities. In addition, the course will provide students skill development in the use of an Excel-based analytic tool, XLMiner (aka Analytics Solver Cloud/Desktop). We will continue to refer to the tool as XLMiner for the purpose of this course.

Prerequisites

Successful completion (or exemption) of the following two courses:

- Introduction to Database Management (90-728 or 93-732);
- Statistics core course (91-801, 90-707 or 90-711)

Course Texts

Required

Numsense! Data Science for the Layman, Annalyn Ng, Kenneth Soo, 2017, ISBN: 978-981-11-1068-9. Available for purchase from Amazon. Your first reading assignment, which is due April 1, is from this book. For this assignment only, I will scan and post the reading materials. Be sure to have this book in time for the second reading assignment released on April 1.

Course Software

The class will make use of the software package XLMiner (aka Analytics Solver Cloud/Desktop). XLMiner is an add-on for Excel from the developers of Solver. Instructions for how to access the software will be provided to you later in the course. If you use a MAC, there is a cloud version you will be able to use.

Course Rationale

There is growing evidence that business managers need an understanding of the fundamental concepts and frameworks behind data analytics to achieve the business benefits of data analytic projects.

McKinsey and Company estimate "there will be a shortage of talent necessary for organizations to take advantage of big data. By 2018, the Unites States alone could face a shortage 140,000 to 190,000 people with deep analytical skills as well as **1.5 million managers and analysts** with the know-how to use the analysis of big data to make effective decisions." (Big data: The next frontier for innovation, competition, and productivity", McKinsey Global Institute Report, May 2011)

Research cited in a recent article in MIT Sloan Management Review revealed that with more access to useful data, companies are increasingly using sophisticated analytical methods. This often results in a gap between an organization's capacity to produce analytic results and its ability to apply them effectively to business issues. Increasingly, business managers must make decisions based on the results of analytic methods they do not completely comprehend. ("Minding the Analytics Gap", Ransbotham, Sam, David Kiron, Pamela Kirk Prentice, Spring 2015).

This gap is particularly problematic given many data science projects are undertaken to improve managerial decision making. Foster Provost and Tom Fawcett in their book "Data Science for Business" state *"Data analytic projects require a close interaction between the data scientist and the businesspeople. Firms where the businesspeople do not understand what the data scientists are doing are at a substantial disadvantage, because they waste time and effort, or worse, because they ultimately make wrong decisions."* (O'Reilly,2013)

The course Business Analytics for Managers is designed for managers, not data scientists. This business analytics course is designed to provide the knowledge and skills that enable managers to become more intelligent consumers of data analytics.

Course Objectives

Course Goal: Students will be able to identify opportunities to use predictive analytics in their organizations, assess the business value and risk, and work effectively with data scientists to realize those opportunities.

Learning Objectives:

- Translate a business problem into a predictive analytic task, determine the needed data, assess machine learning methods for the task, and identify expected benefits and risks.
- Explain the value of each stage defined by the Cross Industry Standard Process for Data Mining (CRISP-DM).
- Identify how best to use predictive analytics to enhance decision making in your organization.
- Understand various issues raised from the use of predictive analytics including data bias, equity, privacy, and lack of predictive transparency.
    - Describe current and evolving approaches (technical and organizational) for addressing those challenges.
- Develop a knowledge base that will serve as a foundation to build on as the field of predictive analytics continues to evolve.

Course Structure

The class consists of preparatory readings and questions, lectures, in-class exercises, assignments, and discussions. There are also labs using XLMiner (aka Excel Solver) to create analytic models.

Course Schedule

Please refer to the separate document titled Course Schedule at a Glance (posted to Course Website) for a listing of weekly lecture topics, labs, and assignments. Assignment due dates are also posted in the Course Schedule.

Student Evaluation

Your final letter grade will be determined based on a combination of weighted individual assignments, labs, preparatory assignments, quizzes, and a final exam. Final grades are based on the following weights:

- Assignments (3/4) 60%
- XLMiner Labs (2) 10%
- Quizzes (2) 10%
- Exam (take home) 20%

You can earn **one participation point** from regular participation in this course. Regular means answering or asking questions, making comments that are related to the lecture content in 40% or more of the class meetings.

Final letter grades are assigned to your body of work in this course according to the following scale:

A+	97% to 100%	Exceptional
A	93% to 96%	Excellent
A-	90% to 92%	Very Good
B+	87% to 89%	Good
B	83% to 86%	Acceptable
B-	80% to 82%	Fair
C+	77% to 79%	Poor
C	73% to 76%	Very Poor
C-	70% to 72%	Minimal Passing
R	less than 70%	Failing

The average grade in a required Heinz course is expected to be 3.33-3.4, equivalent to a B+. This expected average reflects the degree of difficulty and/or breadth of coverage for a core course.

Late Homework Policy and Make-up Exams

Assignments

Normally, late homework is not accepted other than with the use of the late pass. If you have an extenuating, unexpected circumstance (illness, accident, unexpected family matter, etc.) that is outside your control, notify me as early as possible and I will take that into consideration.

You will have ONE late pass you can use on an Assignment (not prep or lab assignment). The late pass allows you to submit the assignment work 48 hours (2 days) after the due date and still receive full credit. Alternatively, you can split the 48-hour pass into two 24-hour passes.

Quizzes

The two quizzes will be timed, online quizzes. For each, there will be a 36-hour window in which you will have the ability to choose the 40-minute period when you want to complete the quiz. More information about the quiz will be provided prior to the first quiz. See Course Schedule for quiz dates.

Managing Stress

Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me. However, problems with relationships, family worries, loss, or a personal struggle or crisis can also contribute to decreased academic performance. CMU provides mental health services to support the academic success of students. Counseling and Psychological Services (CaPS) offers free, confidential services to help you manage personal challenges. In the event I suspect you need additional support, I will express my concerns and the reasons for them, and remind you of campus resources (e.g., CaPS, Dean of Students, etc.) that might be helpful to you.

Disability Accommodations

If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

Respect for Diversity

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and very much appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

Policy on Collaboration and Cheating

Excluding assignments that are assigned as group work, the work you submit should reflect individual effort. You are encouraged to discuss assignments with fellow students***, but the final work product must reflect your knowledge and effort, not your classmates'.***

Cheating includes but is not necessarily limited to:

1. Submission of work that is not your own for papers, assignments, lab exercises, or exams.
2. Submission or use of falsified data.
3. Theft of or unauthorized access to an exam, current or previous.
4. Use of an alternate, stand-in or proxy during an examination.
5. Use of unauthorized material including textbooks, internet material, notes, or computer programs in the preparation of an assignment or during an examination, unless otherwise indicated.
6. Supplying or communicating in any way unauthorized information to another student for the preparation of an assignment or during an examination.
7. Collaboration in the preparation of a solution to a problem unless expressly allowed by the instructor.
8. Plagiarism which includes, but is not limited to, failure to indicate the source with quotation marks or footnotes where appropriate if any of the following are reproduced in the work submitted by a student:
    a. A graphic element.
    b. A proof.
    c. A phrase, written or musical
    d. Specific language.
    e. An idea derived from the work, published or unpublished, of another person.
    f. Program code or algorithms.

If you are unsure about what is acceptable collaboration, you should consult with me.

Penalties for Cheating

Penalties imposed are at the instructor's discretion. In this class, the penalty imposed can be any of the following depending on the violation:

- zero on the assignment
- a letter reduction on final grade (final grade of A- becomes B-)
- a failing grade in the course

Regardless of the penalty imposed, all incidents of cheating are reported to the Associate Dean. Additional penalties may be imposed.