DSC 510: Health Data Science
Monday, 5:45PM-9:00PM
Online
Spring 2021

Instructor Information

Instructor:	Stephanie Besser, M.S.P.A., M.S.A.S., M.S.A., M.A.C.J.C.
Office:	Online
Office Hours:	Monday, 5:15pm-5:45pm Monday, 9:00pm-10:00pm
Email:	sbesser1@depaul.edu
Course Page:	http://d2l.depaul.edu

Course Description

The course will focus on data science methods used in clinical studies and public health applications. Students will be introduced to a variety of health care data from electronic health records to payer data, geospatial and unstructured data, and will learn how to solve data science problems in the health sector. Topics include overview of healthcare analytics and typical research questions, epidemiology, data ethics, governance and security, applications of modeling techniques and machine learning methods to a variety of case studies in health care.

Course Objectives

1. Provides in-depth of knowledge of health care analytics for a variety of healthcare datasets and challenges.
2. Develops the student's ability to:
    a) Determine appropriate methods from research questions,
    b) Develop analytic skills appropriate to healthcare datasets,
    c) Demonstrate understanding of analysis findings, and
    d) Make informed insights health care end-users may consider to use in their decision-making process.

Course Outcomes

Students should be able to do the following after completing this course:

1. Applies appropriate data science techniques to analyze biomedical or public health data.
2. Uses data science software for compiling, analyzing, and gaining insights from various health data sources.
3. Communicates data analysis results effectively and provide meaningful insights to health care professionals to support their decision making.
4. Critically analyzes and discusses case studies and journal articles related to healthcare data topics.
5. Demonstrates understanding of data security, ethics, information governance, and other data challenges related to healthcare.
6. Proposes and creates a detailed research project that is intended to discover patient outcomes or improve quality care.

Course Topics
At the end of this course, the student should have a basic understanding of the following topics and be able to identify which research question and approach is appropriate for a given dataset and data analysis task to be performed:

- Overview of Healthcare Industry and Healthcare Analytics, Data security, ethics, fraud, information governance, and other healthcare data challenges (i.e. HIPAA and IRB Process)
- Introduction to Epidemiology, ICD Codes, Healthcare Research Questions, and Data Preparation with SAS and R
- Electronic Health Records (EHR) Implementation and Provider Datasets
- Payer Datasets
- Health Data Quality and Billing Datasets
- Unstructured Health Data using Text Mining and Social Media
- Geospatial Analysis (GIS) and Visualizing Healthcare Data
- Future Health Trends and Other Data Science Techniques: Artificial Intelligence, Machine Learning, and Big Data

Required Book
Woodside, Joseph M. (2018). "Applied Health Analytics and Informatics Using SAS." *SAS Institute*.
ISBN: 9781635266146

Recommended Book
Dinov, Ivo D. (2018). "Data Science and Predictive Analytics: Biomedical and Health Applications using R." Springer.
Hardcover ISBN: 978-3-319-72346-4
Softcover ISBN: 978-3-030-10187-9
eBook ISBN: 978-3-319-72347-1

Software
The use of the SAS and RStudio statistical systems will be taught in class and will be required for some homework problems. They will be the only officially supported platforms for the course and the homework assignments. However, the final project will allow you to use any software you wish to complete the analysis (e.g. SPSS, SAS, R, Python, etc.) as long as the software has sufficient features to complete the assignment/project. Instructor permission will be required in order to use external programs for the final project, which will be asked as part of the introductory project assignments. You are may use more than one software package to work on your final project. Different packages have different strengths and you should learn to leverage each package for its strengths.

Prerequisites
DSC 441 (Formerly IS 467): Fundamentals of Data Science. We also assume that you have had some experience with statistics, machine learning, and using electronic health records.

Grading
Grading in this course will be based on a combination of class discussions, assignments, case studies, final project with a presentation. The final grade will be computed based on the following weights:

- **Class Discussion Participation (Case Study and Lab):** 10%
- **2 Programming Assignments**: 35%
- **2 Case Studies**: 20%
- **Final project (proposal, project, and presentation)**: 35%

Undergraduate Students

- Students in all undergraduate classes, with the exception of those in CEO cohort programs, may opt to change the grading basis for any or all of their courses to Pass/D/Fail. A grade of Pass (P) will indicate that the student's work met expectations for a grade of at least C-. Work that would merit a grade of D+ or D in the traditional grading basis would still earn a D+ or D. Work that does not merit a passing grade will earn a Fail (F). The Pass/D/Fail grading option may apply to any graduation requirement, including courses in the major, minor, Liberal Studies Program or open electives.

https://resources.depaul.edu/coronavirus/faqs/Pages/classes-academics-students.aspx

Graduate Students

- School of Computing Students in graduate classes in the school will use the A/B/C/D/F grading basis.

GRADING SCALE:

93 - 100: A
90 - 92: A -
87 - 89: B +
83 - 86: B
80 - 82: B -
77 - 79 C +
73 - 76 C
70 - 72 C -
67 - 69 D +
60 - 66 D
60 – 0 F

Course Drop Dates
Last day to drop SQ2020 classes with no penalty – Friday April 9, 2021
(100% refund of tuition if applicable and no grade on transcript)

Last day to withdraw from AQ2020 classes – Friday May 14, 2021
See Academic Calendar: https://academics.depaul.edu/calendar/Pages/default.aspx

Homework/Programming Assignments and Case Study Report Policies

Case Studies/Programming Assignments
There will be homework/programming assignments, which are due at the beginning of class one or two weeks after they are assigned. Late assignments will be accepted up to one lecture later than the assigned due date with a 25% penalty. No assignments will be accepted beyond a week after the due date. The assignments must be submitted online at https://d2l.depaul.edu. No assignments will be accepted via e-mail.

Tentative Homework Assignment/Final Project Milestones Due Dates

- Final Project Proposal: Due Sunday, April 11, 2021
- Case Study 1: Due Sunday, April 18, 2021
- Programming Assignment 1: Due Sunday, April 25, 2021
- Final Project Data Analysis Rough Draft – Due Sunday, May 9th, 2021
- Case Study Report 2 Due – Sunday, May 23, 2021
- Programming Assignment 2 Due – Sunday, May 30, 2021
- Final Project Rough Draft Due – Sunday, June 6th, 2020
- Final Project Presentations – Monday, June 7, 2021
- Final Paper – Due Friday, June 11, 2021

The Final Project:
Depending upon the class size, the final project will be a group project **with three to four students to a project**. The project will be to thoroughly analyze and apply course techniques to a large dataset. You will be expected to apply a range of techniques from the course and from your own readings to the data, and to draw conclusions from your analysis. Your grade in the project will be based on both individual (40%) and group (60%) performance, including the following components:

- Periodic milestones throughout the quarter which will entail both group and individual work
- Minutes of all team meetings documenting your discussions
- A group final summary report in the form of a journal article for which all members are expected to contribute
- Peer evaluations

The groups will be formed in the first two weeks of the class. Group dynamics play an important role in any project, and you are expected to make every effort to both contribute to the group effort and make the environment safe, comfortable and respectful for your team members.

Final projects will be presented on the 11th weeks of class, Monday, June 7, 2021. Each group must present their projects. Online students are encouraged to participate either through helping to build the presentation or by recording a part of the presentation to be played during the presentation.

Non-performance as a team-member on a project
Usually, the peer evaluation and documentation, including the meeting minutes, in addition to an overall desire for excellence, is sufficient motivation for individuals to contribute a fair share to the team project. However, in extreme cases, individuals have been known to completely cease contributing to a team project. If this is the case, a team has the right to notify the instructor that the individual is no longer contributing and the team no longer wants the individual on the team.
This is not a decision to be made lightly, as expulsion from a team will result in the **loss of 40% of the final project grade**. Because this is such a serious decision, any team that makes this decision will also experience a point deduction. In this situation, **each remaining team member will lose 10% of the final project grade.**

What to Expect
As with any course in mathematics and computer science, you are expected to spend a significant amount of time outside of class reviewing lectures and working on homeworks/projects. The best way to learn mathematical or statistical techniques is to experiment with them on a variety of problems. You will, of course, have a range of problems posed on the homeworks, but the more you can experiment with these techniques on real datasets, the better you will learn their nuances, and the better prepared you will be to apply them in novel situations.

The topics in this course build on each other, much in the same way as in any programming or math course. Be sure to monitor your progress carefully in this course and see me immediately if you miss a class or start to fall behind so that we can discuss how you can resume and complete the course.

E-Mail questions
I receive many e-mails each week, as well as teach multiple classes, so in order to help insure that you receive a prompt response from me, you are required to preface each e-mail's subject line with **DSC 510:<subject>** (note: capital letters on DSC and no space). **If you do not do this, you may not receive a response to your e-mail.** Outside of office hours, the best way to reach me is by email, whereby I will return emails within a timely manner, usually within 24-48 hours. Online students can email me to schedule alternative office hours during the quarter.

Email
Email is the primary means of communication between faculty and students enrolled in this course outside of class time. Students should be sure their email listed under "demographic information" at http://campusconnect.depaul.edu is correct, and if your DePaul email is being forward to a secondary email

address that the forwarding process is working properly. **DO NOT WAIT UNTIL THE LAST MINUTE TO SEND ME EMAILS REGARDING ASSIGNMENTS OR THE FINAL PROJECT!**

Attendance
It is expected that you will attend every class; it is the single most important action you can take in mastering the course objectives. You are responsible for all material covered, assignments delivered or received, and announcements made in class sessions that you miss. For distance learning students, this means viewing the classes in a timely manner, participating in the discussion forums, and being sure to email me with any course or concept questions as soon as possible.

Use of Class Material

COURSE MATERIALS ARE TO BE USED ONLY BY THE STUDENTS IN THIS CLASS AND CANNOT BE REDISTRIBUTED IN PAPER FORM OR ON THE INTERNET VIA ANY WEBSITES. This includes course lectures, homework questions, homework answers, the midterm review, or any articles presented in class or for homework.

Class Recordings
Recordings of each lecture will be available a few hours after the "live" class, and can be found at the course website https://d2l.depaul.edu. Online students are expected to watch the lectures every week and to keep up with the course information posted on the course website.

Changes to Syllabus
This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L and sent via email.

University Policies

Attendance/Class Discussion: Student participation in class discussions will be measured in two ways. First, students are highly encouraged to ask questions and offer comments relevant to the day's topic. Participation allows the instructor to "hear" the student's voice when grading papers. Secondly, students will be called upon by the instructor to offer comments related to the reading assignments. Students must keep up with the reading to participate in class discussion.

Attitude: A professional and academic attitude is expected throughout this course. Measurable examples of non-academic or unprofessional attitude include but are not limited to: talking to others when the instructor is speaking, mocking another's opinion, cell phones ringing, emailing, texting or using the internet whether on a phone or computer. If any issues arise a student may be asked to leave the classroom. The professor will work with the Dean of Students Office to navigate such student issues.

Civil Discourse: DePaul University is a community that thrives on open discourse that challenges students, both intellectually and personally, to be Socially Responsible Leaders. It is the expectation that all dialogue in this course is civil and respectful of the dignity of each student. Any instances of disrespect or hostility can jeopardize a student's ability to be successful in the course. The professor will partner with the Dean of Students Office to assist in managing such issues.

Preferred Name & Gender Pronouns
Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the quarter so that I may make appropriate changes to my records. Please also note that students may choose to identify within the University community with a preferred first name that differs from their legal name and may also update their gender. The preferred first

name will appear in University related systems and documents except where the use of the legal name is necessitated or required by University business or legal need. For more information and instructions on how to do so, please see the Student Preferred Name and Gender Policy at http://policies.depaul.edu/policy/policy.aspx?pid=332.

Cell Phones/On Call: If you bring a cell phone to class, it must be off or set to a silent mode. Should you need to answer a call during class, students must leave the room in an undisruptive manner. Out of respect to fellow students and the professor, texting is never allowable in class. If you are required to be on call as part of your job, please advise me at the start of the course.

Academic Integrity and Plagiarism
This course will be subject to the university's academic integrity policy. More information can be found at https://resources.depaul.edu/teaching-commons/teaching/academic-integrity/Pages/default.aspx.

Academic Policies
All students are required to manage their class schedules each term in accordance with the deadlines for enrolling and withdrawing as indicated in the University Academic Calendar. Information on enrollment, withdrawal, grading and incompletes can be found at:
http://www.cdm.depaul.edu/Current%20Students/Pages/PoliciesandProcedures.aspx

Plagiarism
The university and school policy on plagiarism can be summarized as follows: Students in this course, as well as all other courses in which independent research or writing play a vital part in the course requirements should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work a report, examination paper, computer file, lab report, or other assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails or how to properly acknowledge source materials be sure to consult the instructor.

Incomplete Grades
An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptions cases will receive such approval. Information about the Incomplete Grades policy can be found at http://www.cdm.depaul.edu/Current%20Students/Pages/Grading-Policies.aspx

Students with Disabilities
Students seeking disability-related accommodations are required to register with DePaul's Center for Students with Disabilities (CSD) enabling them to access accommodations and support services to assist with their success. There are two office locations:

- Loop Campus – Lewis Center #1420 – (312) 362-8002
- Lincoln Park Campus – Student Center #370 – (773) 325-1677

Students who register with the Center for Students with Disabilities are also invited to contact Dr. Gregory Moorhead, Director of the Center, privately to discuss how he may assist in facilitating the accommodations to be used in a course. This is best done early in the term. The conversation will remain confidential to the extent possible.
Please see https://offices.depaul.edu/student-affairs/about/departments/Pages/csd.aspx for Services and Contact Information.

Online Course Evaluations

Evaluations are a way for students to provide valuable feedback regarding their instructor and the course. Detailed feedback will enable the instructor to continuously tailor teaching methods and course content to meet the learning goals of the course and the academic needs of the students. They are a requirement of the course and are key to continue to provide you with the highest quality of teaching. The evaluations are anonymous; the instructor and administration do not track who entered what responses. A program is used to check if the student completed the evaluations, but the evaluation is completely separate from the student's identity. Since 100% participation is our goal, students are sent periodic reminders over three weeks. Students do not receive reminders once they complete the evaluation. Please see https://resources.depaul.edu/teaching-commons/teaching/Pages/online-teaching-evaluations.aspx for additional information.