

BUAN 370
Descriptive Analytics & Data Management
Spring 2025

Instructor:	Dr. Carl M. Rebman, Jr.	E-mail:	carlr@sandiego.edu
Office:	Olin 127	Class Times:	4:00-5:20 PM TTH
Phone:	619-260-4135	Classroom	MH 114
Office Hours:	TTH : 5:25 pm - 7:00 pm (MH 114) W: 12:30p – 2:30 pm (OH 127) TH: 1:45 pm– 2:15 pm (MH 114) <i>or by appointment</i>	Webpages:	http://ole.sandiego.edu http://carl.sandiego.edu/buan370
Teaching Schedule	SH 156B 10:45am-12:05, MH 114 2:30 AM – 3:50PM, MH 114 TTH, 4:00-5:30 TTH	Meeting Schedule	Every 1 st /2 nd TUE of the month (faculty/area), and every 2 nd /4 th THR (senate)

SYLLABUS

Course Description

Advances in our capability to generate and collect information coupled with decreasing disk-space prices are pushing us toward a world centered around data management. Data preparation and storage are the foundation of today’s business analytics. They ensure data are properly processed for later meaningful analysis. Data preparation includes data cleansing and data transformation. The objective of data preparation is to collect the data from various sources into a single location and transform it into a form that is ready for later analysis.

Databases are at the heart of modern commercial application development for data storage. Once data is prepared and properly stored, the first step of analysis usually involves summarizing basic facts about what has happened in the past. This preliminary examination of data falls in the category of descriptive analytics (exploratory data analysis). The purpose of this course is to provide a comprehensive introduction of the data management process - from data preparation, storage, to descriptive analytics applications.

Course Outcomes

After taking this course you will be able to:

- Describe and identify different basic data structure and their characteristics
- Identify and explain analytics uses in real world business situations.
- Interpret and communicate results to both technical and non-technical audiences.
- Access large datasets and doing the “wrangling” needed to prepare them for analysis
- Describe basic relational database and data warehouse concepts
- Write SQL queries for a variety of data definition and data manipulation scenarios
- Identify appropriate visualizations for different types of data and best practices for

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creating visualizations

Prerequisites

In order to be enrolled in this course, you should have satisfactorily completed ITMG 100, ECON 216 (OR ECON 217). Some experience scripting/programming will be useful, but not required.

Workload & Expectations

Analytics is time-intensive, but it pays off! Average “Business Analyst” salary is ≈\$84,484 (Indeed.com, 2024) and “Analytics Manager” salary is ≈ \$137,513 (Salary.com, 2024). Salaries of seasoned “Data Scientists” exceed \$156,846 annually. (Glassdoor.com, 2024, and <https://www.bls.gov/oes/current/oes152051.htm#st>). Analytics is naturally a time-intensive field, which is why salaries for business analytics professionals are higher than in other fields. Therefore, you should expect to spend **an average of 6 – 8 hours OUTSIDE** of class per week working on and learning the material. Some weeks you may spend more than 6 – 8 hours and some weeks you may spend less. It is vitally important that you be open to “hacking” by taking advantage of open access resources on the internet (ie: Stack Overflow, DataCamp, etc.) to *independently* supplement the course materials assigned. Being able to experiment *on your own* with trial and error is an important part of studying analytics. It is also critically important that you *follow directions carefully* to streamline efficiency and to avoid redundancies in questions and processes. An example of how you may allocate your 6 – 8 hours study time each week is as follows (everyone is unique so you may personally have a different allocation of your time; this is just an example):

- 2 hours: reading the relevant assigned readings and taking your own notes on the readings
- 1 hour: reviewing examples and notes from lecture
- 1 – 2 hours: working on assignments (worked examples, code chunks, problem sets, projects)
- 1 – 2 hours: going to office hours and/or reviewing with peers (group study)
- 1 hour: troubleshooting and researching

Course Materials

[1] R Programming for Data Science

Authors: Roger D Peng

Publisher: Leanpub

Required (as a reference guide)

Available *free* (or you can donate) at <https://leanpub.com>

[2] ggplot2: Elegant Graphics for Data Analysis

Edition: 2nd

Authors: Hadley Wickham

Publisher: Springer

Recommended

Can be found online for *free with a quick internet search*.

[3] Database Design

Edition: 2nd

Authors: Warr and Eng

Required

Download for free from B.C. Open Textbook Collection.

[4] A First Course in Database Systems

Edition: 3rd

Authors: Ullman and Widom

ISBN: 978-0136006374

Recommended

[5] Exploratory Data Analysis with R

Authors: Roger D Peng

Publisher: Leanpub

Recommended

Available *free* (or you can donate) at <https://leanpub.com>

[6] Statistical Inference for Data Science

Authors: Brian Caffo

Publisher: Leanpub

Recommended

Available *free* (or you can donate) at <https://leanpub.com>

[7] Regression Models for Data Science in R

Authors: Brian Caffo

Publisher: Leanpub

Recommended

Available *free* (or you can donate) at <https://leanpub.com>

[8] Resource for relational database and SQL

<http://ovid.cs.depaul.edu/Classes/CSC355-S14/CSC355-links.htm>

Software

Required:

- ♦ [9] **R**, a statistical computing package that can be downloaded for free here: <https://www.r-project.org/>. You can find a useful video for installing R here: <https://youtu.be/JNy-7OjNKQ>. While this is the software that we will use, the main tool in the course will actually be item [2] below, the IDE, RStudio, that “sits on top of” R.

- ♦ [10] **RStudio**, An integrated development environment (IDE) for R, an open source statistical computing software package. You can download the most recent (desktop) version (compatible for Mac and Windows) for free at www.rstudio.com. All other packages and extensions can be loaded seamlessly from within the IDE. Here is a useful video for installing RStudio: <https://youtu.be/wvmFQfK6pyl>.
- ♦ [11] **GitHub**, a version control software that will be helpful when it comes to collaborative editing of data or documents in the cloud. Will also require PC users (but not Mac) to download Git (Mac users will need to use their terminal window). You can download Git for Windows here: <https://git-scm.com/download/win>.
- ♦ [12] **SQL** (Structured Query Language), a language used to query relational databases. We will leverage a virtual MS SQL Server as well as an open source library in R called *sqldf* that will allow us to run SQLite queries from within RStudio.

Recommended:

- ♦ [13] **SWIRL** — a supplemental package for self-teaching tutorials in R in the event you need additional practice. You can find instructions for installing the SWIRL lesson modules in code chunk #1 SWIRL INSTALLATION INSTRUCTIONS on Blackboard. Here is a useful video walking you through the installation: https://youtu.be/_NI_CQCf9BE. While these lessons are optional (you can ignore the submission instructions at the end of each module), it is *highly recommended* that you complete *at least the first set of lessons (15 lessons) for the R Programming module in parallel with the first batch of DataCamp assignments*. It is also strongly recommended that you complete the following modules (multiple lessons each) outside of class in parallel with the course content (in the following order, see the schedule below): Getting and Cleaning Data (4 lessons), Exploratory Data Analysis (15 lessons), Statistical Inference (14 lessons), and Regression Analysis (13 lessons).

Guacamole (Virtual Machine) Access

If you are having trouble installing R or RStudio locally on your personal machine, you may access a virtual PC using USD's Guacamole system. To run RStudio remotely using a virtual machine (VM) using USD's Guacamole system, login to <https://guacamole.sandiego.edu/> using your AD credentials. There should be a list of forty virtual machines. When you choose one of the VMs after logging in (that isn't being used currently - may have to check a few of them), you should see a windows Desktop screen that you can navigate as if it was your own computer (you're controlling it remotely since you've "remoted in") and RStudio is accessible from the desktop. Note: you may have issues saving your workspace / script files on the VM as well as navigating / specifying the active working directory, so all work done should be saved locally (you can email it to yourself). The virtual machines may have their memory wiped between sessions.

Professionalism (attendance, participation, originalism)

Attendance is critical for success in this class. It is in the student's best interest to attend class

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every day. It is understood that events may cause one to have to miss class to which advance notice is preferred. A portion of the course grade is allocated towards professionalism (includes attendance, class participation and professionalism). Failure to be in class in the event attendance is taken can result in a reduction in this grade component. This can also include being late after attendance has been taken or leaving class early. Furthermore, failure to attend more than 50% of all class lecture (and/or lab sessions) will result in failing the course. Lastly keep in mind that attendance, participation, and professionalism are three separate items, that is, you need to more than just show up; you are expected to be prepared and contribute to class activities and discussion. Also engaging in Internet surfing, messaging, games, or sending emails during class will not be tolerated and will result in a reduction in points. Plus, you will find it much easier to keep up and master the material if you attend regularly. You are responsible for all material covered in class, assigned out-of-class, or assigned during a class even if you were absent. Please contact me as soon as possible if you know in advance that you must miss a class. If you use AI to assist you in troubleshooting code (ie: ChatGPT) or use publicly accessible use cases (ie: Stackoverflow) to reference and repurpose code, this is appropriate and should be *explicitly referenced* in your report (and works cited / data sources if applicable). Otherwise, using AI to generate unoriginal content (ie: to write the report and to write your code) in lieu of using your own faculties is not acceptable and will be met with a heavy point deduction on the course assessments. If you are not sure if you are acting appropriately, consult the course instructor. Any exam missed for a legitimate, university approved and documented reason may be made up or re-weighted at the discretion of the instructor. **Canvas quizzes cannot be made up FOR ANY REASON since they are available on day 1 with deadlines fully set in the Canvas calendar. DO NOT EMAIL ME ASKING ME TO PROVIDE AN EXTENSION ON A CANVAS QUIZ.**

Quizzes

At the end of every week (starting week 2), there will be a brief (10 questions) asynchronous Canvas quiz involving a variety of question formats (including multiple choice, numeric response, and check all that apply). The quiz questions will involve a combination of conceptual questions and lab-oriented tasks related to concepts introduced that week (with a slight cumulative component due to how all of the topics are built on one another). The lab-oriented questions may involve programming and analyzing data in R / RStudio. The quizzes will be made available on Thursday and can be submitted any time prior to the Sunday 11:59pm deadlines for the associated quiz for that week. It is recommended that you complete the DataCamp exercise for

the week *prior* to taking the quiz for the week as it (the quiz) may draw on information from the DC exercise. You get as many submission attempts as you'd like and only your best attempt will be scored. You will get to automatically drop your lowest quiz score at the end of the term (a missed quiz will be your dropped quiz). *Canvas Quizzes cannot be made up for any reason since they have been available since day 1 and due dates made known on day 1 in the Canvas calendar. If you fail to submit a quiz prior to the deadline, you will not be able to see the questions and will have to ask a classmate if you would like to review the questions for study. **DO NOT EMAIL ME ASKING TO PROVIDE LENIENCY ON A CANVAS QUIZ IF YOU MISS THE DEADLINE.***

DataCamp Programming Assignments

This course will leverage DataCamp, an online learning platform, to help introduce concepts related to both the course content (theory) and applications that will leverage a state-of-the-art software visualization tool, Tableau. You will need to enroll in the DataCamp course (you should have an email invitation in your USD inbox) in order to access and submit assignments (the first *two* are due before 2/11/25). There is approximately one assignment per week through the end of November. Assignments can take roughly an average of 4 hours for any given week, so you should allocate your time carefully to these activities. You will receive one "point" for completion of a chapter in Canvas following the due date of an assignment (see below). *You must complete the chapter so that the completion "bar" reads 100% for credit - without 100% completion, you will receive ZERO credit for the chapter.* Otherwise, your score on these assessments will be determined by the product of two numbers: the fraction of the modules completed and the fraction of XP (experience) points gathered in the modules - there is 58300 total possible XP for the class, but you will only be scored relative to a total of 56000 XP provided you completed all of the modules - so you can miss or "skip" roughly 2000 XP points (see the next part about "skipping"). All of the due dates for the exercises have been set and you can work on these at your leisure (so get a jump start if you'd like!). DataCamp exercises will generally involve brief tutorial /videos followed by questions and applications. Note that you can "skip" modules if you happen to get stuck, but will sacrifice the XP associated with that module (you can take hints which are less costly to help you move through the modules). Expectations are that students wouldn't need to skip more than one or two parts of any chapter. Here is the assignment summary for the course:

Course	Due Date
Introduction to Statistics	2/11/2025
Introduction to R	2/13/2025
Intermediate R	2/20/2025
Introduction to Importing Data in R	2/25/2025
Introduction to Data Visualization with ggplot2	3/04/2025
Introduction to the Tidyverse	3/06/2025
Intermediate Data Visualization with ggplot2	3/10/2025
Introduction to SQL	4/7/2025
Intermediate SQL	4/14/2025
Joining Data in SQL	4/21/2025
Cleaning Data in R	5/5/2025

Exams

There will be two noncumulative midterm exams administered at approximately weeks 5 (20 march) and weeks 10 (1 may) of the course. The final exam takes the form of the final project for the course.

Course Project

The goals of the team project are (1) to integrate and apply what you have learned in the class; (2) to give you experience working in team situations; and (3) to enhance your communication and presentation skills. Throughout the course, you will complete two major analytics tasks: a descriptive task and a database task. Details for these two tasks will be made available after the appropriate material has been covered. In general, the projects will provide you the opportunity to express yourself creatively within the constraints of the task using the statistical software package to showcase your analysis and demonstrate your competency with coding and debugging your work.

Grading:

Grade Weights	Percent
Datacamp Assignments	30%
EXAM ONE	15%
EXAM TWO	15%
Project	30%
Professionalism (attendance, participation)	10%
TOTAL PERCENT	100%

The course is graded on a relative curve (as is any college course). In particular, students will all be ranked from highest to lowest course score according to your final course grade calculated from the raw exam score weighting above. Letter grade assignments will depend on your percentile ranking in the class and a subjective assessment by the instructor in borderline cases (say, if there was marked improvement).

In the past, a student could typically guarantee themselves an A by ranking in the top 25% of students in the course and a B by ranking in the top 60% of students. The median score for the course curves to around a B-.

During the course of a semester a student might have concerns or challenges and wish to have a grade appeal. This is fine; however, any grade petition/appeal must be done **within two days** after the grade has been returned. All grade petitions/appeals can be done in person but **MUST** also accompanied with an email petition/appeal submission.

All grade petition/appeals must be resolved after one week. **NO GRADES or GRADE PETITION/APPEALS will be entertained after ONE WEEKS.** Once this time has elapsed the window for grade reconsideration is expired. Please note that no grade appeals will be entertained during a class session, you must either come to me office hours, or contact me via phone or email.

Scale	Total Points
A+	>97 %
A	93 % - 96%
A-	90 % - 92.9%
B+	87% - 89.9%
B	83% - 86.9%
B-	80 % - 82.9%
C+	77% - 79.9%
C	73% - 76.9%
C-	70% - 72.9%
D+	67% - 69.9%
D	63% - 66.9%
D-	60% - 62.9%
F	59% and below

Important NOTICE: This grading scale is extremely strict. You must have the exact minimum number of points to receive the grade you desire, that is exactly 930 is an A, but 92.9 (or 929.9999) is an A-, and so on. Therefore, note that in advance all petitions to round up to the higher point value will be denied. Also note the instructor reserves the right to modify or change any part of this syllabus at any time.

Classroom Decorum and Email

To avoid distracting others in the classroom, please arrive on time. In extreme cases the

instructor reserves the right to decrease the letter grade by an entire letter for a student due to inappropriate behavior. Please restrict the use of email to the minimally necessary volume, put the course number (BUAN 370) in the subject of the email

– I teach other classes, and this is the fastest way for me to know who I'm responding to. Put your *full name* at the end of email messages as well. Your email decorum should be professional. You should make sure you address the email formally and properly and use college level grammar.

Academic Integrity

You, your colleagues, faculty, staff, and alumni are the University of San Diego. These and many other persons have worked very hard since the founding of USD in 1949 to build a quality university. The philosophy and mission of USD <http://www.sandiego.edu/about/mission-vision-values.php> emphasizes the idea of personal and academic integrity. The following is a synopsis of the academic integrity policy. For more information click on this hyperlink <http://www.sandiego.edu/associated-students/branches/vice-president/honor-council/integrity-policy.php> or download this pdf <http://www.sandiego.edu/conduct/documents/HonorCode.pdf>

“All members of the University community share the responsibility for maintaining an environment of academic integrity since academic dishonesty is a threat to the University. Acts of academic dishonesty include: a) unauthorized assistance on an examination; b) falsification or invention of data; c) unauthorized collaboration on an academic exercise; d) plagiarism; e) misappropriation of resource materials; f) any unauthorized access of an instructor's files or computer account; or g) any other serious violation of academic integrity as established by the instructor.”

Academic Dishonesty will not be tolerated in any form. Helping each other study is anticipated. However, only original work will be accepted. There will be no sharing of materials, wearing hats, or using cell phones/PDAs during tests. All assignments unless otherwise noted are individual assignments. If an incident of academic dishonesty occurs in this course the student could receive a grade of "F" for the semester and could possibly face further disciplinary action.

Student Disability Policy

The University of San Diego complies with the American with Disabilities Act and Section 504 of the Rehabilitation Act. It is a University of San Diego Disability Services policy that when students are scheduling exams (midterm exams or final exams) in the DLDRC, they must submit an “Authorization to Administer Exam” at least one week prior to the exam date. If a student does not give DLDRC this notice, the DLDRC can deny them the right to the accommodation, as the DLDRC is not given adequate time to prepare (and set up office space during established exam scheduling times.) Please provide me (your instructor) with a Letter of Accommodation drafted by the DLDRC as soon as possible. There are no retroactive accommodations for Disabled students. As your instructor I am not obligated to provide accommodations until I receive the Letter of Accommodation drafted by the DLDRC. If a student does not give the Letter of Accommodation to me (your instructor), within adequate time to make exam arrangements, I am not obligated to fulfill any such request. If you have any questions or concerns about the process please contact, the USD Disability Services office (Serra Hall, Rm 300), phone at 619-260-4655 or via email at disabilityservices@sandiego.edu as soon as possible.

Student Athletes

You are responsible for providing me advanced written notice, (email), any time you will be unable to attend class. You are also responsible for determining alternate dates/times to make up missed work in class. Without written notice, no assignments, quizzes or tests, either due or taken in class, can be made up.

Tentative Course Schedule of Select Topics (Subject to Change)

Week	New
1	Intro to Analytics / Branches of Problem Types/ Exploratory Data Analysis /Getting Started /
2	Descriptive Statistics in R / An Example/ Boolean Logic / For & While Loops / Automating CleaningExample
3	Simulation/ GGLOT/ Preprocessing & Cleaning Data Fundamentals / Data Structures
4	Panel Data Example / Cross Sectional Cleaning Example w / NHIS Survey Data
5	Querying dataframes with dplyr using the Tidyverse
6	Combining dplyr and ggplot2 for descriptive analysis and data visualizations
7	Analytics Programming Exam / Stochastic Simulation / Monte Carlo
8	Intro to Database / Overview / Relational Databases / Entity-Relationship Diagram ERD
9	ERD / Database Design / Normalization
10	SQL / Connection to SQL Server / Writing SQL CRUD Queries
11	SQL Aggregates/ Joins Two Tables / Nested Queries / Views
12	SQL IIS Interactions / SQL Injections / Data Warehousing / Other OOB DB
13	SQL Skills Exam
14	Dealing with Missing Information, TIDY Data , Deletion vs. Deletion when necessary
15	Final Project Work Week
	FINAL EXAM - PROJECT PRESENTATION