Course Name and Number: DATA 607 – Data Acquisition and Management
Credits: 3 cr.
Prerequisite(s): none

How is this course relevant for data analytics professionals?

Most data analytics professionals spend *most* of their time getting data and preparing it for analysis. This is the course that teaches these key skills, as we work with both structured and unstructured data.

Course Description:
In this course students will learn about core concepts of contemporary data collection and its management. Topics will include systems for collecting data (real time, sensors, open data sets, etc.) and implications for practice; types of data (textual, quantitative, qualitative, GIS, etc.) and sources; an overview of the use of data, including what and how much should be collected and the distinction between data, information, and knowledge from a data-centric point of view; provenance; managing data with and without databases; computer and data security; data cleaning, fusing, and processing techniques; combining data from different sources; storage techniques including very large data sets; and storing data keeping in mind privacy and security issues.

Students will be required to create a working system for a large volume of data using publicly available data sets.

Course Learning Outcomes:
By the end of the course, students should be able to:
- Load data into R from various data sources, including CSV files, Excel spreadsheets, relational databases, APIs, and web pages.
- Perform various data cleansing and transformation work, including splitting, combining; resampling; variable creation; data aggregation; sorting and filtering data; strategies for working with outliers and missing data; data visualization and analysis in support of data cleansing activities.
- Understand different information architectures, data types, and data structures.
- Understand relational and non-relational database design and querying.
- Provide context for data science

Program Learning Outcomes addressed by the course*:
- Business Understanding. Apply frameworks and processes to build out data analytics solutions from understanding of business goals.
- Data Culture. Embody and champion the highest standards for the ethical and moral use of data; understand issues related to data privacy and data security.
- Solid foundational data programming skills, using industry standard tools, essential algorithms, and design patterns for working with structured data, unstructured data and big data.
- Data understanding. Collect, describe, model, explore and verify data.
- Data preparation. Selecting, cleaning, constructing, integrating, and formatting data.

Assignments and Grading:

Assignments (6 x 50)	30%
Projects (3 x 90)	27%
Final Project Proposal (1 x 20)	2%
Final Project (1 x 150)	15%
Final Project Presentation (1 x 30)	3%
Discussion Participation (14 x 10)	14%
Data Science in Context Presentation (1 x 50)	5%
TidyVerse recipes	4%
TOTAL	**100%**

Quality of Performance	Letter Grade	Range %
Excellent - work is of exceptional quality	A	93 - 100
	A-	90 - 92.9
Good - work is above average	B+	87 - 89.9
Satisfactory	B	83 - 86.9
Below Average	B-	80 - 82.9
Poor	C+	77 - 79.9
	C	70 - 76.9
Failure	F	< 70

Notes

- All discussions, projects, and assignments--unless otherwise noted--are due end of day on Sundays.

> **Late projects are not accepted.** However, there are eight assignments and four projects assigned, and your final grade is based on your six highest-scoring assignments and your three highest-scoring projects.

- Each course week will be available on the previous Friday at 6:00 a.m. ET.
- **Course Completion Requirements**. To pass this course, you must complete at least six assignments, three projects, the final, and make the final presentation. If you cannot deliver your final presentation in our 05/18 Meetup, you'll need to make available a recorded version of your final presentation before 05/18.
- There will also be **short ungraded hands on labs** most weeks that will help you prepare for your weekly programming assignments and projects.
- **"Discussion", "Data Science in Context Presentations", and "TidyVerse Recipes"** While this material is important, please note that this work only makes up only 23% of your grade. Please do the readings and participate in the discussions and any discussion-related group assignments, make your Data Science in Context presentations, and participate in the creation and editing of TidyVerse recipes on the shared GitHub site.   At the same time, if you have limited time for the course, please remember to invest most of your efforts in completing the projects and assignments. The assignments merit close attention because they will help you to be successful on the projects.
- **Reproducibility Requirement, Testing Requirement, But Not Perfection!** Students are responsible for providing all code and data so that I can test your work. If you turn in code that does not run, you will not receive credit, unless you also include an explanatory note at the time of submission. At the same time, you don't need to turn in perfect code. Generous partial credit will be given for deliverables that are timely, tested, and reproducible. Cutting corners—as long as they are documented at the time of submission—is also acceptable.
- **Groupwork** is encouraged on most projects and assignments and required on Project 3. Effective virtual collaboration is highly valued in the data science marketplace; because of its interdisciplinary nature, much of the work that needs to be done requires more than one person, and increasingly often at multiple locations.
- **Earning a Grade of A**. If you complete the course work correctly and on time, you'll comfortably pass the course. A grades will be reserved for students that go above and beyond, such as consistently taking on challenge assignments.

> **Policy on Sharing and "Stealing" Code.** In this course, you may collaborate, and you may take base code from whatever sources you wish. But you must document what you started with, and what you added, so you are graded only on your own contributed work!

Course Learning Materials

- *R for Data Science* by Garrett Grolemund and Hadley Wickham. O'Reilly, 2017. Freely readable here: http://r4ds.had.co.nz/. Print copies are also available.
- *Text Mining with R: A Tidy Approach*, Julia Silge and David Robinson. O'Reilly, 2017. Freely readable
- Max Kuhn and Kjell Johnson, *Feature Engineering and Selection: A Practical Approach for Predictive Models* (Chapman & Hall/CRC Data Science Series) 1st Edition, 2019. Freely readable at https://bookdown.org/max/FES/intro-intro.html

Recommended Texts:

- Any book on SQL, such as *The Language of SQL, Third Edition* by Larry Rockoff. ISBN: 978-0137632695. Alternatively, there are many excellent on-line resources, such as http://sqlzoo.net.

Relevant Software, Hardware, or Other Tools:

We will make use of the R programming environment and the RStudio IDE. We will use other open source software, including (your choice of) MySQL or PostgreSQL, MongoDB, Neo4J, Hadoop, and Spark. Details for obtaining and installing the appropriate software will be provided in the course materials. All of the software will work on (or from) both PCs and Macs.

Contact Information:

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How This Course Works:

Meetups take place every week on Wednesdays from 6:45 p.m. to 7:45 p.m. ET. Please see course site for specific dates. You are strongly encouraged to attend; all meet-ups will be recorded. You are not required to attend the meetups, but you are responsible for watching the recording if you're not able to attend.

Occasional Weekend Office Hours A few times during the semester, we'll have optional weekend office hours on topics of interest, especially around data engineering. Our first weekend office hours will be scheduled in February, and will cover window functions.

Regular Office Hours can be scheduled by e-mail appointment. If you need extra help and are willing to invest the time and effort to be successful, I'll make the time to help you. But…you should not be asking for extra help on a project the day before it's due, since this indicates that you're not investing the time and effort to be successful.

You are encouraged to ask questions on the "Ask Your Instructor" forum on the course discussion board where other students will be able to benefit from your inquiries. I can set up a Zoom session for screen sharing. For the most part, you can expect me to respond to questions by email within one business day.

In addition to the graded discussion items on the Blackboard Learning Management System course site, there is a Slack channel for support and general questions here:

- **https://join.slack.com/t/sps-x2l3628/shared_invite/zt-11qmtajee-zqRgT7oXczMmZyfEjoOyrQ**
- **https://data607spring2022.slack.com**

Here is the link to sign up for your Data Science in Context presentations:

https://doodle.com/poll/r452dr9p5e9kxntu

Here is our weekly meetup link:

https://zoom.us/j/99498039934?pwd=Q0R1MVNMbi9oYjRGaEhmVVJCMFEzZz09
Meeting ID: 994 9803 9934, Passcode: 139406,
Use computer audio or call +1 646 876 9923 US (New York)

Unit	Topic	Core Readings	Deliverables
Week 1 Jan 28 – Feb 06	Building out your Data Science Development Environment. R: Data Types and Basic Operations	*R for Data Science, https://r4ds.had.co.nz/ chapters 1, 2, 3, 4, 6, 11, 17-21, 26, 27, 29, 30*	Meetup on 02/02, 6:45 p.m. EST Week 1 Assignment
Week 2 Feb 07 – Feb 13	R and SQL	*R for Data Science, https://r4ds.had.co.nz/ chapter 8, 9, 10, 13* FES, http://www.feat.engineering/, ch 1, 2	Meetup on 02/09, 6:45 p.m. EST Week 2 Assignment
Week 3 Feb 14 – Feb 20	R: Character Manipulation and Date Processing	*R for Data Science, https://r4ds.had.co.nz/ chapters 14, 15, 16* FES, http://www.feat.engineering/, ch 4	Meetup on 02/16, 6:45 p.m. EST Week 3 Assignment
Week 4 Feb 21 – Feb 27	R: Exploratory Data Analysis; Data Imputation	*R for Data Science, https://r4ds.had.co.nz/ chapters 3 (review), 7, 28* FES, http://www.feat.engineering/, ch 1	Meetup on 02/23, 6:45 p.m. EST Project 1
Week 5 Feb 28 – Mar 06	R: Working with Tidy Data	*R for Data Science, https://r4ds.had.co.nz/ chapters 5, 12, 13 (review)* FES, http://www.feat.engineering/	Meetup on 03/02, 6:45 p.m. EST Week 5 Assignment
Week 6 Mar 07 – Mar 13	R: Data Transformations; Feature Engineering	FES, http://www.feat.engineering/, ch 6, 7, 8, 10	Meetup on 03/09, 6:45 p.m. EST Project 2
Week 7 Mar 14 – Mar 20	Web Technologies; MongoDB		Meetup on 03/16, 6:45 p.m. EDT Week 7 Assignment Project 3 Team Document
Week 8 Mar 21 – Mar 27	Scraping Web Pages		Meetup on 03/23, 6:45 p.m. EDT Project 3
Week 9 Mar 28 – Apr 03	Working with Web APIs		Meetup on 03/30, 6:45 p.m. EDT Week 9 Assignment Tidyverse Recipes Initial Post due
Week 10 Apr 04 – Apr 10	Natural Language Processing	*R for Data Science, https://r4ds.had.co.nz/ chapters 22 -25* *Text Mining w/ R, https://www.tidytextmining.com/, ch 1-4*	Meetup on 04/06, 6:45 p.m. EDT Week 10 Assignment
Week 11 Apr 11 – Apr 17	Recommender Systems	*Mining Massive Datasets, http://www.mmds.org/, ch 9*	Meetup on 04/13, 6:45 p.m. EDT Week 12 Assignment Tidyverse Recipes Extension due
Spring Recess Apr 17 – Apr 24	Spring Recess	*No Readings*	No Meetup!
Week 12 Apr 25 – May 01	Graph Databases		Meetup on 04/27, 6:45 p.m. EDT Project 4; Final Project Proposals due; DS in Context recordings due for students that did not present
Week 13 May 02 – May 08	Working with Data in the Cloud; Deployment		Meetup on 05/04, 6:45 p.m. EDT Work on final projects and presentations
Week 14 May 09 – May 15	Automated Machine Learning		Meetup on 05/11, 6:45 p.m. EDT Work on final projects and presentations
Week 15 May 16 – May 18	Final Presentations	*No Readings*	Meetup on 05/18, 6:45 p.m. EDT Final Project Presentations

Accessibility and Accommodations
The CUNY School of Professional Studies is firmly committed to making higher education accessible to students with disabilities by removing architectural barriers and providing programs and support services necessary for them to benefit from the instruction and resources of the University. Early planning is essential for many of the resources and accommodations provided. Please see: http://sps.cuny.edu/student_services/disabilityservices.html

Online Etiquette and Anti-Harassment Policy
The University strictly prohibits the use of University online resources or facilities, including Blackboard, for the purpose of harassment of any individual or for the posting of any material that is scandalous, libelous, offensive or otherwise against the University's policies. Please see:
http://media.sps.cuny.edu/filestore/8/4/9_d018dae29d76f89/849_3c7d075b32c268e.pdf

ACADEMIC INTEGRITY
Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the educational mission of the City University of New York and the students' personal and intellectual growth. Please see:
http://media.sps.cuny.edu/filestore/8/3/9_dea303d5822ab91/839_1753cee9c9d90e9.pdf

STUDENT SUPPORT SERVICES
If you need any additional help, please visit Student Support Services:
http://sps.cuny.edu/student_resources/