USC Viterbi
School of Engineering
Information Technology Program

ITP 249: Introduction to Data Analytics

Units: 4
Section: 31841
W 5-8:30 pm, THH208
Spring 2020

Instructor: Eric Coe
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IT Help:
USC IT (ITS): https://itservices.usc.edu/contact/
Viterbi IT: https://viterbi.usc.edu/resources/vit/contact-us.htm

Course Description

Data is now an integral part of our lives and to be successful in today's business landscape, we need to be able to leverage data to make critical business decisions. This course will teach students how to use data to make those decisions confidently.

Learning Objectives

After completing this course, students will be able to:

- Use MS Excel, MS Access, SQL, NoSQL, MongoDB and leading industry tools
- Model database and formulate/code database queries
- Pose questions, collect relevant data, analyze data, interpret data and provide insights
- Present data-driven insights using data visualization and dashboards
- Tell compelling stories with data

Prerequisite(s): None

Course Notes

Lecture slides and any supplemental course content will be posted to Blackboard. All announcements for the course will be posted to Blackboard.

Students are introduced to several tools most used in the industry: MS Excel, MS Access, SQL, MySQL, NoSQL, MongoDB, SAS and Tableau.

All Labs will be conducted during second portion of class.
Bringing your laptop to class is mandatory.
Additional reference material will be provided in class as needed.

Optional Books

Robert Stine and Dean Foster. *Statistics for Business Decision Making and Analysis*. Essex, UK: Pearson Education Limited, 2014. (SF) ISBN-13: 978-0134497167

Carlos Coronel, Steven Morris and Peter Rob. *Database Systems: Design, Implementation, and Management*. Boston, MA: Cengage Learning, 2014. (CMR) ISBN-13: 978-1111969608

Additional reference material will be provided in class as needed.

Description and Assessment of Assignments

This course will make use of Blackboard for assignments. All assignments will be posted to Blackboard under the "Assignments" section. Each assignment will include instructions, a due date, and a link for electronic submission. Assignments must be submitted using this link.

Grading Breakdown

The weight of the graded material during the semester is listed below:

Item	**% of Grade**
Homework, labs	30
Project	10
Midterm	30
Final	30
Total	**100**

Grading Scale

Course final grades will be determined using the following scale:

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Individual Homework Assignments

This course will make use of Blackboard for assignments. All assignments will be posted to Blackboard under the "Assignments" section. Each assignment will include instructions, a due date, and a link for electronic submission. Assignments must be submitted using this link.

Project

For a hands-on experience, there will be a final team project. The goal of the project is to solve real world problems using data analytics. This is a team project with each consisting of 2 to 3 members. Each team will work together to identify a problem to solve, collect the necessary data, prepare, clean and format the

data, analyze the data, create visualizations, dashboards and models to analyze and understand the problem and to use insights to develop solutions.

The project grading breakdown is listed below:

Item	% of Grade
Project Statement, methodology and accuracy	25
Final Report	50
Peer Evaluation	25

Policies

Students are expected to attend and participate in lecture discussions, in-class exercises and team meetings. Attendance will be taken during lecture sessions electronically using Blackboard. Do not share the code with students that are not in the room; doing so is an academic integrity violation. If they would like to be considered for an excused absence, email the instructor and include name, week (1-15), day, date, reason, and documentation.

Students are responsible for completing individual assignments and their fair share of team assignments by stated deadlines. Assignments turned in late will have **25% of the total points** deducted from the graded score for each late day.

No make-up exams (except for documented medical or family emergencies) will be offered. If the student will not be able to attend an exam due to an athletic game or other valid reason, then they must coordinate with the instructor before the exam is given. The student may arrange to take the exam before they leave, with an approved university personnel during the time they are gone, or within the week the exam is given. If students do not take an exam, then they will receive a 0 for the exam.

Disability Services and Programs

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to your course instructor (or TA) as early in the semester as possible. If you need accommodations for an exam, the form needs to be given to the instructor at least two weeks before the exam.

DSP is located in STU 301 and is open from 8:30am to 5:00pm, Monday through Friday. Contact info: 213-740-0776 (Phone), 213-740-6948 (TDD only), 213-740-8216 (FAX), ability@usc.edu, http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html.

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.
https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class.
https://equity.usc.edu/

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. http://dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. https://diversity.usc.edu/

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, http://emergency.usc.edu

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.
Provides overall safety to USC community. http://dps.usc.edu

Course Schedule: A Weekly Breakdown

	Topics	Reading	Assignment
Jan 15 **Week 1**	**The Value of Data** • Explanation of course objectives and tools • Syllabus Review • Discussion of the value and impact of data-driven decision making • Discussion of visual analytics and common presentation strategies • Excel Analytics • Brief history of databases and their role in information systems • Different types of databases and their organizational context • Survey of DBMS	• **Syllabus** • **Lecture 1**	• **Viterbi VDI** • **BlueJeans Demo**
Jan 22 **Week 2**	**Foundations of Databases and SQL Data Modeling** • Data models • Business rules • Relational and entity-relationship modeling • Entities, attributes, relationships • Keys: primary, foreign, candidate, surrogate, super • Minimum and maximum cardinality Lecture 2 will be posted to Blackboard for review.	• **Lecture 2** • **Lecture 3**	HW1 MS Access
Jan 29 **Week 3**	**Foundations of Databases and SQL Data Modeling** • Data models • Business rules • Relational and entity-relationship modeling • Entities, attributes, relationships • Keys: primary, foreign, candidate, surrogate, super • Minimum and maximum cardinality **Designing Entity Relationship Diagram**	• **Lecture 2** • **Lecture 3**	HW2 MS Access HW3 ERD
Feb 5 **Week 4**	**Normalization** • Anomalies and the need for normalization • Normal forms • First, second, third normal forms • Denormalization • Dependency Diagrams	• **Lecture 4**	HW4 Normalization

	Topics	Reading	Assignment
Feb 12 **Week 5**	**Introduction to SQL** • Database structures • Introduction to SQL's SELECT statement with WHERE clauses • Query command tools: GROUP BY, HAVING, DISTINCT, COUNT, AND, and OR • Conditional operators: =, !=, >, <, IN, NOT IN, and BETWEEN • Aggregation functions: MIN, MAX, SUM, AVG, and COUNT	• Lecture 5	HW5 SQL
Feb 19 **Week 6**	**Combining Data in SQL** • Appending similar data together • Combining data from different tables together • Commands for combining data: JOIN and UNION **Cleaning Data and Creating Multiple Joins** • Creating relationships between tables: INNER, RIGHT, FULL OUTER, EXCEPTION and CROSS JOINs • Optimizing queries: WHERE, LIMIT and COALESCE	• Lecture 6	HW6 Joins
Feb 26 **Week 7**	**Subqueries** • Asking multiple questions in a single query • Nesting queries • Multi-step aggregation or filtering	• Lecture 7	HW7 Subqueries
Mar 4 **Week 8**	**NoSQL – Big Data Analytics** • Drawbacks of SQL • Why NoSQL • Introduction to MongoDB • Non-relational databases **Midterm Review**		
Mar 11 **Week 9**	**Midterm Exam**		
Mar 18 **Week 10**	**Spring Break**		
Mar 25 **Week 11**	**Business Intelligence Systems** • Business intelligence • Data warehouses and data marts • Business reporting and intelligence • Data mining **Fundamentals of MongoDB** • Data storage • Data Retrieval • Queries		HW8 MongoDB
Apr 1 **Week 12**	**MongoDB Aggregation Framework** • Defining a stage • Creating aggregation pipeline		HW9 Aggregation

	Topics	Reading	Assignment
Apr 8 **Week 13**	**Basic Data Visualization** • Charting Overview • Types of Variables (categorical, numerical) • Types of Standard Charts • Charting Considerations		HW10 Visualization
Apr 15 **Week 14**	**Advanced Charts & Dashboards** • Heat Maps • Interactive • Animated		
Apr 22 **Week 15**	**Final Project**		
Apr 29 **Week 16**	**Final Review** **Lab Time – Final Project**		
May 6 Week 16	**Final Exam 4:30pm – 6:30pm**	Refer to USC 2020 Final Exam Schedule for more details about exams scheduling conflicts: https://classes.usc.edu/term-20201/finals/	