USC Iovine and Young Academy
Arts, Technology and the Business of Innovation

Keck Medicine of USC

ACAD 362 Analytics for Health Innovators

Units:	**4**
Meeting Times:	**Monday and Wednesday, 3:00 pm – 4:50pm**

Instructor:	**Michael Crowley**
Office:	**crowley@usc.edu**
Office Hours:	**Wed, 12:00–2:00 pm**

Course Description

The growing healthcare industry is generating a large volume of useful data on patient demographics, treatment plans, payment, and insurance coverage—attracting the attention of clinicians and data scientists alike. This course will introduce students to various sources of health data and discuss how to apply various statistical techniques to mine useful information and knowledge that is then applied to clinical practice, healthcare administration and various patient disease treatment and therapies. We will also explore how "intelligent hospitals" are utilizing analytics and deploying them across the industry to become more strategic and efficient in order to provide better healthcare at a lower cost. We will emphasize on the design aspects of building innovative health applications that are fueled by analytics in the backend.

Learning Objectives

By the end of this course, students should be able to:

- Explain how data is converted to knowledge and insights
- Demonstrate good understanding of various statistical techniques applied to health data
- Understand various health analytics models and their adoption by medical practitioners
- Deal with EHR data, biomedical signal data, sensor and IoT data and other types of health data to mine for patterns and insights
- Understand design challenges in incorporating analytics in medical information/decision systems
- Go to the real world and conduct research on how hospitals and healthcare institutions are implementing data analytics

Required Readings:

[1] Chandan K. Reddy, Charu C. Aggarwal. Healthcare Data Analytics (Chapman & Hall/CRC Data Mining and Knowledge Discovery Series) (Hardcover)

[2] Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W Ohlmann, David R. Anderson. Essentials of Business Analytics. (Hardcover) 696 pages. Published January 1st 2014 by Cengage Learning

RapidMiner Tool

In this course you will learn and use RapidMiner, an open-source GUI-based data mining tool. Students will be able to implement a step-by-step process for predicting an outcome or discovering hidden relationships from the data using RapidMiner.

You can download RapidMiner Studio from https://rapidminer.com/products/studio/

Grading Breakdown

In-class activities	10%
Labs	40%
Midterm	25%
Final Project	25%
Total	**100%**

Grading Scale
Course final grades will be determined using the following scale.

A	93-100
A-	90-92
B+	88-89
B	83-87
B-	80-82
C+	78-79
C	73-77
C-	70-72
D+	68-69
D	63-67
D-	60-62
F	59 and below

Course Structure
Students are expected to:
> • Complete weekly labs, readings, in-class activities, and final project

Students are responsible for completing assigned work by stated deadlines.

Policies
Due dates and requirements for all assigned work will be posted on the course site on Blackboard.

It if the student's responsibility to post work by the due date following the defined class procedures, even if you miss class. Work turned in late will be assessed the following penalties:
- Up to 24 hours late: 20% deduction
- 24 to 48 hours late: 50% deduction
- After 48 hours, zero score.

Academy Student Attendance Policy

The Academy maintains rigorous academic standards for its students and on-time attendance at all class meetings

is expected. Each student will be allowed two excused absences over the course of the semester for which no explanation is required. Students are admonished to not waste excused absences on non-critical issues, and to use them carefully for illness or other issues that may arise unexpectedly. Except in the case of prolonged illness or other serious issue (see below), no additional absences will be excused. Each unexcused absence will result in the lowering of the final grade by 1/3 of a grade (e.g., an A will be lowered to A-, an A- will be lowered to B+, etc.).

Students remain responsible for any missed work from excused or unexcused absences. Immediately following an absence, students should contact the instructor to obtain missed assignments or lecture notes and to confirm new deadlines or due dates. Extensions or other accommodations are at the discretion of the instructor.

Automatically excused absences normally may not be used for quiz, exam or presentation days. Using an excused absence for a quiz, exam or presentation, such as in the case of sudden illness or other emergency, is at the discretion of the instructor.

In the case of prolonged illness, family emergencies, or other unforeseen serious issues, the student should contact the instructor to arrange for accommodation. Accommodation may also be made for essential professional or career-related events or opportunities. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.

Course Schedule: A Weekly Breakdown

	Topic/Daily Activities	Readings and Homework	Labs/Assignments (week assigned)
Week 1	Introduction to Analytics Methods and Models; Introduction to RapidMiner; In-class activity	Camm et al., Chapter 1	Lab 1
	Overview of Healthcare Analytics; Healthcare Analytics Failure: Case Study	Reddy et al. Chapter 1	
Week 2	Overview of using Data – Descriptive Statistics; In-class activity	Camm et al., Chapter 2	Lab 2
	Healthcare Data Sources – Introduction to EHRs	Reddy et al., Chapter 2	
Week 3	**No class on Monday – Labor Day**		Lab 3
	Data Visualization; In-class activity	Camm et al., Chapter 3	
Week 4	Simple and Multiple Linear Regression Models in Healthcare; In-class activity	Camm et al., Chapter 4	Lab 4
	Mining of Sensor Data in Healthcare	Reddy et al., Chapter 4	
Week 5	Time Series Analysis and Forecasting; In-class activity	Camm et al., Chapter 5	Lab 5
	Genomic Data Analysis for Personalized Medicine	Reddy et al., Chapter 6	
Week 6	Data Mining; In-class activity	Camm et al., Chapter 6	Lab 6
	Natural Language Processing and Data Mining for Clinical Text	Reddy et al., Chapter 7	
Week 7	Linear Optimization Models; In-class activity	Camm et al., Chapter 8	
	Midterm Review		
Week 8	Mining the Biomedical Literature	Reddy et al., Chapter 8	Lab 7
	Midterm Exam		

Week 9	Integer Linear Optimization Models; In-class activity	Camm et al., Chapter 9	Lab 8
	Social Media Analytics for Healthcare	Reddy et al., Chapter 9	
Week 10	Nonlinear Optimization Models; In-class activity	Camm et al., Chapter 10	Final Project Part1
	A Review of Clinical Prediction Models	Reddy et al., Chapter 10	
Week 11	Monte Carlo Simulation; In-class activity	Camm et al., Chapter 11	
	Temporal Data Mining for Healthcare Data	Reddy et al., Chapter 11	
Week 12	Decision Analysis; In-class activity	Camm et al., Chapter 12	Final Project Part2
	Visual Analytics for Healthcare	Reddy et al., Chapter 12	
Week 13	Predictive Models for Integrating Clinical and Genomic Data	Reddy et al., Chapter 13	
	Information Retrieval for Healthcare	Reddy et al., Chapter 14	
Week 14	Final Project Part 2 presentations		Final Project Part 3
	Thanksgiving Break – no class on Wednesday		
Week 15	Data Analytics for Pervasive Health	Reddy et al., Chapter 16	
	Clinical Decision Support Systems	Reddy et al., Chapter 19	
Dec 13 2 – 4pm	Final Exam Period – Final Project Presentations		

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" 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. 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. 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. 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: 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. 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. 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. 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. 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. 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. emergency.usc.edu

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