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, 6:00 pm – 7:50pm**
Instructor:	**Michael Crowley**
Office:	**crowley@usc.edu**
Office Hours:	**Thurs, 3:00–5:00 pm**

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. In particular, we will emphasize on the design aspects of building innovative health applications that are fueled by analytics in the back-end.

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 hospitals
- Deal with EHR data, biomedical signal data, sensor and IOT data and other types of health data to mine for patterns and insights
- Talk to healthcare professionals about their analytics plans
- Understand design challenges in incorporating analytics in hospital 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

Islam, M. S., Hasan, M. M., Wang, X., Germack, H. D., & Noor-E-Alam, M. (2018). A Systematic Review on Healthcare Analytics: Application and Theoretical Perspective of Data Mining. *Healthcare (Basel, Switzerland)*, *6*(2), 54. doi:10.3390/healthcare6020054

RapidMiner Tool

In this course we will learn and use RapidMiner, an open source GUI-based data mining tool. Students will be able to implement a simple 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

Assignments	20%
Labs	25%
Midterm	25%
Final Project	30%
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, assignments, and final project

Students are responsible for completing assignments and labs by stated deadlines.

Policies

Due dates and requirements for all labs and assignments 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 1	Introduction to Analytics Methods and Models Overview of Healthcare Analytics	Camm et al., Chapter 1 Md. Saiful Islam et al, paper; Reddy et al. Chap 1	Lab 1
Week 2	Overview of using Data – Descriptive Statistics	Camm et al., Chapter 2	Lab 2
Week 3	Healthcare Data Sources - Basic Analytics on EHRs	Reddy et al., Chapter 2	Lab 3 Assignment 1
Week 4	Siegel: Introduction to Data Visualization Crowley: RapidMiner stuff		Lab 4
Week 5	Siegel: Data Visualization for Health Care Data Crowley: RapidMiner stuff	https://benfry.com/phd/dissertation/ Read chapters 1 – 3 before class	Lab 5 Assignment 2
Week 6	Simple and Multiple Linear Regression models in healthcare Midterm Review	Camm et al., Chapter 4	Lab 6
Week 7	Adoption models for Healthcare Analytics Midterm	HIMSS Analytics site.	
Week 8	Time Series Analysis and Forecasting	Camm et al., Chapter 5	Lab 7 Final Project Part 1
Week 9	Data Mining	Camm et al., Chapter 6	Lab 8 Final Project Part 2
Week 10	Mining of Sensor Data in Healthcare	Reddy et al., Chapter 4	
Week 11	Siegel: Project Part 2 presentations and data visualization feedback Crowley: TBD		Final Project Part 3

Week 12	Text Mining and Social Media Analytics	Reddy et al., Chap 9	
Week 13	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