ACAD 362 Analytics for Health Innovators

Units: 4
Meeting Times: Monday and Wednesday, 6:00 pm – 7:50 pm

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:


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/](https://rapidminer.com/products/studio/)

Grading Breakdown

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Assignments</td>
<td>20%</td>
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<tr>
<td>Labs</td>
<td>25%</td>
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<tr>
<td>Midterm</td>
<td>25%</td>
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<tr>
<td>Final Project</td>
<td>30%</td>
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<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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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 is 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

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic/Daily Activities</th>
<th>Readings and Homework</th>
<th>Labs/Assignments</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Analytics Methods and Models</td>
<td>Camm et al., Chapter 1</td>
<td>Lab 1</td>
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<tr>
<td></td>
<td>Overview of Healthcare Analytics</td>
<td>Md. Saiful Islam et al, paper; Reddy et al. Chap 1</td>
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<td>2</td>
<td>Overview of using Data – Descriptive Statistics</td>
<td>Camm et al., Chapter 2</td>
<td>Lab 2</td>
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<tr>
<td>3</td>
<td>Healthcare Data Sources - Basic Analytics on EHRs</td>
<td>Reddy et al., Chapter 2</td>
<td>Lab 3 Assignment 1</td>
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<td>4</td>
<td>Siegel: Introduction to Data Visualization</td>
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<td>Lab 4</td>
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<td></td>
<td>Crowley: RapidMiner stuff</td>
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<tr>
<td>5</td>
<td>Siegel: Data Visualization for Healthcare Data</td>
<td><a href="https://benfry.com/phd/dissertation/">https://benfry.com/phd/dissertation/</a></td>
<td>Lab 5 Assignment 2</td>
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<tr>
<td></td>
<td>Crowley: RapidMiner stuff</td>
<td>Read chapters 1 – 3 before class</td>
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<td>6</td>
<td>Simple and Multiple Linear Regression models in healthcare</td>
<td>Camm et al., Chapter 4</td>
<td>Lab 6</td>
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<td>Midterm Review</td>
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<td>7</td>
<td>Adoption models for Healthcare Analytics</td>
<td>HIMSS Analytics site.</td>
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<td>Midterm</td>
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<td>8</td>
<td>Time Series Analysis and Forecasting</td>
<td>Camm et al., Chapter 5</td>
<td>Lab 7 Final Project Part 1</td>
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<tr>
<td>9</td>
<td>Data Mining</td>
<td>Camm et al., Chapter 6</td>
<td>Lab 8 Final Project Part 2</td>
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<td>10</td>
<td>Mining of Sensor Data in Healthcare</td>
<td>Reddy et al., Chapter 4</td>
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<tr>
<td>11</td>
<td>Siegel: Project Part 2 presentations and data visualization feedback</td>
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<td>Final Project Part 3</td>
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<td>Crowley: TBD</td>
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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

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**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