

# Advanced Topics in Data Science

## MATH 485/CSCI 485

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### Course Description

Getting connected to current events in Data Science and building an online presence. Ethics of predictive analytics and privacy and open data. Reporting and dissemination of research using interactive dashboards and web-publishing. Introduction to current scalable technologies to handle Big Data. Introduction to advanced statistical analysis and machine learning techniques for Data Science. CSCI 485 and MATH 485 will be cross listed courses.

### Course Objectives

After successful completion of this course, you will be able to

- Work effectively with a remote team using modern collaboration tools.
- Build and update a professional online presence.
- Create a self-service interactive dashboard for user-driven data questions.
- Identify the characteristics of a predictive model that make it potentially dangerous to society.
- Train and validate predictive and classification models for a variety of situations.
- Apply basic principles of parallel computing.
- Analyze data too large to fit on a personal computer.

### Course Prerequisites

Prereq: MATH 385 or CSCI 385, MATH 456 (co-requisite)

### Materials

- **Computer:** Bring to class every day. A solid internet connection is a must. If you do not have access to a laptop please contact the instructor ASAP to make arrangements.
- **Software & Accounts:**
  - R <http://cran.r-project.org/>
  - R Studio <http://www.rstudio.com/products/rstudio/download/>
  - L<sup>A</sup>T<sub>E</sub>X <https://www.latex-project.org/get/> (suggested proTeXt or MacTex)
  - git <https://www.atlassian.com/git/tutorials/install-git>
  - Github <https://github.com/>
  - Slack <https://slack.com/>
- **Required Textbooks and readings**
  - R for Data Science <http://r4ds.had.co.nz/> (free)
  - Happy Git and GitHub for the useR <http://happygitwithr.com/> (free)
  - Introduction to Statistical Learning <http://www-bcf.usc.edu/~gareth/ISL/> (free)
  - Weapons of Math Destruction, Cathy O’Neil (ISBN-10 0553418815)
  - Doing Data Science, Straight Talk from the Frontline, O’Neil & Schutt (ISBN-10 1449358659)

## Outline of Topics

- Keeping up with the current state of Data Science
- Collaboration tools and Social media for data scientists
- Building your professional online presence
- Intermediate R programming tools
- Deeper dive into the data analytics lifecycle: Data cleaning, modeling, predictions, dissemination, automation
- Statistical learning / machine learning methods
- Ethics and concerns around machine learning algorithms
- Parallel processing, batch jobs
- Big data: current ecosystem, logistics, analysis tools

## Academic Evaluation

You will be graded based on: assignments, peer-reviews, discussions (in class and online discussions), projects and a final exam.

## Academic Integrity

You will be held to high academic standards. Any academic misconduct, intentional or through negligence, may be reported to Student Judicial Affairs (SJD). A first offense (in any course) may result in a negative score equal to the assignment value. Further offenses result in a failing grade and referral to SJD. Egregious incidents of academic dishonesty may result in immediately failing the course and referral to SJD. If you have any doubts or questions about academic integrity, please see the Student Judicial Affairs website. If you have any doubts or questions about academic integrity, please see the Student Judicial Affairs website<sup>1</sup>.

Academic dishonesty includes, but is not limited to:

- Copying work from another student
- Providing work for another student to copy
- Copying work from unapproved sources (e.g., the Internet, a book)
- Failing to protect your work from copying (e.g., leaving your work in a public place, poor file permissions on shared systems)
- Receiving so much help that your work does not represent your efforts

## Acceptable Behavior

You must act in accordance with university guidelines and refrain from disrupting the learning environment. Any behavior that diminishes the learning opportunities of fellow students may result in eviction from the class, removal from the course, immediate failure of the course, or referral to Student Judicial Affairs.

## Religious Holidays

I will work with you so this class and its assignments, exams, and activities do not interfere with religious holidays. However, you must notify me ahead of time so we can make appropriate arrangements.

## Americans with Disabilities Act

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as

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<sup>1</sup><http://www.csuchico.edu/sjd/integrity.shtml>

they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

Accessibility Resource Center

530-898-5959

Student Services Center 170

arcdept@csuchico.edu

## Confidentiality and Mandatory Reporting

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I may also have a mandatory reporting responsibility related to my role. It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in our one-on-one meetings. I will seek to keep information you share private to the greatest extent possible. However, I am required to share information regarding sexual misconduct with the University. You may speak to someone confidentially by contacting the Counseling and Wellness Center (898-6345) or Safe Place (898-3030). Information on campus reporting obligations and other Title IX related resources are available here:<http://www.csuchico.edu/title-ix>.