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### M 561.01: Advanced Data Science Analytics

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**M461 - Data Science Analytics**  
**M561 - Advanced Data Science Analytics**  
**(Fall 2021)**

**Instructor information:**

Instructor: Javier Pérez-Álvaro

Office: M301

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Office hours: See <http://www.umt.edu/people/perezalvaro> for up-to-date OH.

**Course Format:**

Meetings: Monday, Wednesday, Friday 9:00-9:50 a.m.

**Course content:**

Algorithms are the machinery behind the data analytics (the subject matter and focal point of the course). To be good at data analytics, one must be a competent programmer and have experience with the data and the algorithms of data science. To gain an understanding of algorithm design and good programming practices, students will work with a set of prototypical algorithms that are representative of data analytics. To learn how to function as a data scientist in a relatively short time, the student will be actively engaged in turning the algorithms into code and using them with real data

After successfully completing the course, you will have a good understanding of the following topics and their applications:

1. Data Visualization, Data Mapping and Data Reduction
2. Classification Algorithms
3. Ensemble Methods and Random Forests
4. Naive Bayes and Text Classification
5. Linear Regression
6. Clustering and Segmentation
7. Recommender Systems and Similarity Measures
8. Distributed Computing using MapReduce Algorithms

**Learning outcomes:**

1. Understand the purpose of data reduction and information extraction (e.g., associative statistics and data mapping).
2. Develop understanding and practical experience regarding reduction of massive data sets and data streams.
3. Understand the mechanics of distributed computing.
4. Ability to implement algorithms for processing massively large data sets. Ability to compute histograms, correlation matrices, and linear regression estimators using massively large data sets.
5. Understand the objectives of multiple regression and examining model assumptions. Ability to carry out and interpret hypothesis tests.
6. Competency using Python.

**Textbook:** None

**Course GitHub repository:** <https://github.com/um-perez-alvaro/Data-Science-Practice>

**Getting Python:**

You can download Python from Python.org. If you do not already have Python, I recommend instead installing the Anaconda distribution (www.anaconda.com), which already includes most of the tools that you need to do Machine Learning/Data Analysis

**Homework and Practice Problems:**

Homework exercises emphasizing applications of the algorithms and/or theory will be assigned bi-weekly.

Practice problems will be assigned daily. Practice problems will be graded based on completion.

**Take-home Final Exam:**

The final exam consists of two parts. Part 1: Data Analysis. Part 2: Machine Learning.

**Grading policy:**

Your course grade will be based on homework, practice problems and a take-home exam.

Item	Percentage
Homework	70%
Practice problems	10%
Take-home final exam	20%

**Student Conduct:**

All students need to be familiar with the Student Conduct Code. You can find in the "A to Z Index" on the UM home page. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.

**Accommodation:**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors and Disability Services for Students (DSS). If you think that you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommasson Center 154 or call 406.243.2243. I will work with you and DSS to provide an appropriate accommodation.

**Safety:**

1. Mask use is required within the classroom.
2. Each student is provided with a cleaning kit. The expectation is that students will clean their personal workspace when they arrive for class, and before they leave the classroom.
3. Students are discouraged from congregating outside the classroom before and after class.
4. Drinking liquids and eating food is discouraged within the classroom.
5. Stay home if you feel sick and/or if exhibiting COVID-19 symptoms.
6. If you are sick or displaying symptoms, please contact the Curry Health Center at (406) 243-4330.

**Digital Access:**

Digital devices (like laptops and cell phones) are becoming increasingly important to success in college. I recognize that some students are unable to afford the cost of purchasing digital devices and that other students rely on older, more problem-prone devices that frequently break down or become unusable. I also recognize that those technology problems can be a significant source of stress for students. Given those challenges, I encourage students to contact me if you experience a technology-related problem that interferes with your work in this course.

**Important note:**

Announcements made in class are considered addenda to this syllabus. Make sure you stay informed as the progress of the class.