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# CSCI 125.00: Computation in the Sciences

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# CSCI 125: Computation in the Sciences
## Autumn 2018

## Course Information
- Professor: Dr. Oliver Serang
- Office: SS 408
- Email: oliver.serang@umontana.edu
- Lectures:  M 4:00 pm - 4:50 pm in SS 344
- Labs: {section02: TH 1:00pm – 1:50pm, section01: WF 4:00pm – 4:50pm} in SS 344
- Office Hours: After lecture (SS 408) and by appointment
- Course web page:  alg.cs.umt.edu/lectures.html

## Course Overview
This course develops data analysis and basic programming skills for students in the sciences.

## Learning Goals
Non-Computer Science majors will learn how to apply computing to scientific problems in their home discipline. They will learn to:
1. Write short, modular programs of moderate complexity in Python.
2. Read and write data with different formats, including spreadsheet files.
3. Apply data analysis and numerical methods to solve scientific problems.
4. Understand and use simple data structures including strings, lists, dictionaries, and objects.
5. Establish statistical significance though simulation in the realm of scientific (e.g. biological) data
6. Create simple graphical representations of scientific data
7. Use appropriate testing and debugging techniques to create correct programs.

## Learning Outcomes
The learning outcomes for this course are:
1. Students will successfully complete coding exercises.
2. There will be quizzes and a final exam.
3. Students will be able to parse data files, gather statistics, generate simple visual representations of those data, and perform basic simulations.

## Textbook
No textbook is required for this course!

## Final exam
TBD

## Grading
Students will be graded using the following criteria:

1. Attendance (40%)
2. Quizzes (40%)

3.  Final exam (20%)

## Tentative Course Schedule / Topics

Monday 27 August 2018
  Variables
  If-else statements
  Loops (over range, list, tuples, enumerate, etc.)
  List comprehensions

Monday 03 September 2018
  Functions
  Recursion

Monday 10 September 2018
  Sets
  Dictionaries
  *args
  **Kwargs

Monday 17 September 2018
  Classes

Monday 24 September 2018
  File I/O
  Basic algorithms
    Sorting
    Monte Carlo

Monday 01 October 2018
  Packages
    Date / time
    TSV reader
    Solving linear equations
    Solving with sympy

Monday 08 October 2018
  Plotting
    Scatter with error bars
    Bar plot
    Heatmap
    Log-scale
    Multiplot

Monday 15 October 2018
  Draw gene-gene interactions with networkx; finding cliques
  Plotting genotypes and scatterplots for polyploid genotyping
  Plotting chromosome

Monday 22 October 2018

Brute force + itertools (for M&Ms puzzle)
  Numpy (for Strassen matrix multiplication)

Monday 29 October 2018
  Eigendecomposition with numpy
  Eigendecomposition with numpy via power algorithm

Monday 05 November 2018
  Principle components w/ European food consumption

Monday 19 November 2018
  Plotting IP addresses on world map

Monday 26 November 2018
  Speeding up your code

Monday 03 December 2018
  Exam review

## Course Guidelines and Policies

### Student Conduct Code
The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community.  This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations.  Full student conduct code:  http://www.umt.edu/vpsa/policies/student_conduct.php

### Course Withdrawal
Students may use Cyberbear to drop courses through the first 15 instructional days of the semester.  Beginning the 16th instructional day of the semester through the 45th instructional day, students use paper forms to drop, add and make changes of section, grading option or credit.

### Disability Modifications
The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406-243.2243. I will work with you and Disability Services to provide an appropriate modification.