California State University, Los Angeles
Computer Science Department
CS 4540 - Topics in Advanced Computer Science
(Intro. to Data Visualization)
(Spring 2020)

COURSE INFORMATION

Instructor Information
Instructor: Navid Amini
Office Location: E&T A407
Telephone: (323) 343-6687
Email: namini at calstatela dot edu
Class Days/Time: TuTh 10:50AM-12:05PM
Office hours: Tu 10:00AM-10:45AM or by appointment
Classroom: ET A220
Prerequisites: CS3112: Analysis of Algorithms
Required/Elective: Elective
Coordinators/TAs: TBD

Course Description
The course will serve as an introduction to the science, design, and technology of visualization. Both theoretical foundations of this interdisciplinary science as well as practical applications of integrated visualization techniques on real-world problems will be covered. The course emphasizes on Learn by Doing, which involves projects and papers in support of theoretical knowledge. Topics of this introductory course include elements of visual perception and cognition, data merging and exporting, interactive maps, data representations and transformations, effective graphs and charts, interactive exploration of data, and meaningful visual representations of complex statistics and large data sets.

Course Objectives/Outcomes
The Student Learning Outcomes that are addressed by the course are:
SLO #1. Students will be able to apply concepts and techniques from computing and mathematics to both theoretical and practical problems.
SLO #2. Students will be able to demonstrate fluency in at least one programming language and acquaintance with at least three more.
SLO #4. Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.
SLO #5. Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.
SLO #6. Students will embrace lifelong learning and exhibit the knowledge, skills and attitude for adapting to new environments and technologies.
Other outcomes of instruction: At the end of the course, students will be able to
1. Develop an understanding of data visualization theory.
2. Obtain hands-on experience with tools and libraries for visualizing current, real-life datasets.
3. Develop a programmatic understanding of translating data into useful visual forms.
4. Develop a critical vocabulary to engage and discuss data visualization.

REQUIRED COURSE MATERIALS

Textbook
Handouts and slides provided by the instructor

Recommended Book
Title: Visualization Theory Book: Visualization Analysis and Design
Author: Tamara Munzner
Edition: 2014

Additional Learning
Title: Learning Tableau 2019
Author: Joshua N. Milligan
Edition: 3rd Edition

Other equipment / material requirements
You are required to access lecture materials on CSNS learning management system. You will need to have an up-to-date browser, operating system, and Adobe Acrobat Reader software on your computer. Documents in this course will be available to you in PDF format.

COURSE POLICIES

You are not allowed to have make-up exams, late submissions, or incompletes. Your classroom participation and attendance will count towards your final grade. See the grading policy below. Your classroom participation entails discussions with your peers, in-class exercises/labs, and presentations for the classroom activities. Your attendance will be checked in the beginning of every class. To be considered in attendance, you must be present in the class for at least one half of the class time. If you missed classes more than 4 times, you will not receive any credit for participation or attendance. If you missed classes more than 6 times, you will receive an F. No cell phone usage is allowed during the class/exams.

Course Structure
The course will be conducted face-to-face. You will participate in the course using the CSNS learning management system.

Computer Requirements
You are required to use lab’s computers or your personal laptop (with a relatively powerful GPU) to complete in-class exercises, homework assignments, projects, and presentations. The length of the in-class exercises will vary based on topic. You should have the most recent version of Tableau Desktop installed on your computers. You are required to submit your assignments (programs or documents) via the CSNS learning management system. Check the ITS Helpdesk Student Resources page for any additional software.

**Required Software**

A significant amount of time that students spend completing their assignments and projects will involve the use of visualization software. Instruction will be focused and directed based on the capabilities/features of:

- Tableau Desktop (Student License / Teaching and Non-Commercial) – Heavily Used
- Microsoft Excel – Lightly Used
- R, RStudio and Python – Lightly Used

Students will be able to learn the basic features of one or more of these through lectures, training videos, self-directed studies or by using available resources online. The instructor is also willing to help with specific questions or techniques as needed.

**Students may use any technology platform for their projects, as long as work is presentable for in class review, and accessible for review by the course instructor.** If there is any question about whether work can be accessed for review or presentation (e.g., if it is not created in one of the software tools listed above), you must check with the instructor prior to submitting your work.

A full copy of Tableau Desktop is also available to full-time students for free for a year, available from Tableau. Microsoft Excel and Tableau Desktop Professional are available for both Apple Macintosh and Windows operating systems.

**ASSIGNMENTS AND GRADING POLICY**

Throughout the course, you are required to participate in the class discussions, complete in-class exercises, labs, presentations, homework, and exams. The homework assignments involve both analytical/behavioral problems and programming projects. Each programming assignment has a set of well-defined cores that need to be implemented. The instructor is not responsible for debugging your code. It is acceptable to discuss high-level concepts with your fellow students/groups. However, if that person/group significantly contributes to your understanding, it is required you that you cite. Late submissions or make-up exams are not allowed. In case of an emergency, contact the instructor. Students must attain an overall passing grade (>60) on the weighted average of exams in the course in order to obtain a clear pass. Your final grade will be determine based on the following table (subject to change):

**Grading Criteria (Tentative)**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Exams (2-3)</td>
<td>50%</td>
</tr>
<tr>
<td>Presentations and Projects (1-2)</td>
<td>25%</td>
</tr>
<tr>
<td>Assignment</td>
<td>Percentage</td>
</tr>
<tr>
<td>------------------------------------</td>
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</tr>
<tr>
<td>Homework Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>In-Class Programming and Participation</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100%</strong></td>
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**Grading Scale**

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90% and above</td>
</tr>
<tr>
<td>A-</td>
<td>85% and below 90%</td>
</tr>
<tr>
<td>B+</td>
<td>80% and below 85%</td>
</tr>
<tr>
<td>B</td>
<td>75% and below 80%</td>
</tr>
<tr>
<td>B-</td>
<td>70% and below 75%</td>
</tr>
<tr>
<td>C+</td>
<td>65% and below 70%</td>
</tr>
<tr>
<td>C</td>
<td>60% and below 65%</td>
</tr>
<tr>
<td>C-</td>
<td>55% and below 60%</td>
</tr>
<tr>
<td>D</td>
<td>45% - below 50% (D-, D, D+)</td>
</tr>
<tr>
<td>F</td>
<td>below 45%</td>
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**Grades**

Grades for each assignment will be emailed via CSNS as soon as grading is finished. Any grading issues must be communicated through email with the instructor. Please do not post any grading concerns in a discussion forum.

**COURSE COMMUNICATION**

**Interaction with Instructor**

The Instructor will make every effort to communicate frequently with students through email and announcements within the CSNS. Post any questions or comments you have about the course content and/or requirements in the CSNS course forum. Questions of a more personal nature can be sent to the instructor via email. You are responsible for being aware of all announcements that are made in class, such as changes in due dates of homework, exam date, and cancellation of class. You are responsible for announcements made on days that you are absent. You must check CSNS and your email account regularly for information from the instructor and the Department. Failure to do so may result in missed deadlines or other consequences that might adversely affect you.

**Netiquette**

When posting on the discussion boards and chatrooms it is important to understand how to interact with one another online, **netiquette**. You can read more about the rules of netiquette at [15 Rules of Netiquette for Online Discussion Boards](#).

**HELPFUL STUDENT RESOURCES**

**Technical Resources**

Information on CSULA technical support resources for students: [Technical Support](#)
Student Support Services
Information on CSULA student support resources for students: Student Services

Academic Support Services
Information on CSULA academic support resources for students: Academic Support

COURSE & UNIVERSITY POLICIES

Student Handbook
Information on student rights and responsibilities, academic honesty, standards of conduct, etc., can be found in the University Catalog. In addition, the Student Handbook summarizes the university and the department’s expectations and requirements.

Dropping and Adding
Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. Students should be aware of the current deadlines and penalties for adding and dropping classes by visiting the GET home page (Registrar news and information).

Americans with Disabilities Act (ADA)
Reasonable accommodation will be provided to any student who is registered with the Office of Students with Disabilities and requests needed accommodation. For more information visit the Office for Students with Disabilities homepage.

Academic Honesty/Student Conduct
All work you submit must be your own scholarly and creative efforts. Any act of using ideas, words, or work of another person or persons as if they were one’s own is considered as cheating. Cheating will not be tolerated. Cheating on any assignment or exam will be taken seriously. All parties involved will receive a grade of F for the course and be reported to the University Official. Please check Appendix D: Academic Honesty and Appendix E: Student Conduct for more information.

Diversity Statement
I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class.

Course Topics
General statistics and programming skills as well as a familiarity with charting tools like Microsoft Excel are necessary, along with access to the Internet for research and data gathering.

The tentative topics of the class include but are not limited to the following items:
- Intro to Visualization
- Data Evaluation
- Data Abstraction and Transformation
- Fundamental Graphs
- Marks and Channels
- Color Visualizing
- Network Data
- Visualizing Geolocated
- Data Visualizing
- Temporal Data Interaction
- Mini Projects