Course Overview

"The purpose of visualization is insight, not pictures." - Ben Shneiderman

Catalog Description: This course covers the theory and application of data visualization. This includes issues in data cleaning to prepare data for visualization, theory behind mapping data to appropriate visual representations, introduction to visual analytics, and tools used for data analysis and visualization. Modern visualization software and tools will be used to analyze and visualize real-world datasets to reinforce the concepts covered in the course.

Comparison to CS 725/825: If you have already taken CS 725/825, then CS 625 is not appropriate for you. Future offerings of CS 725/825 may require (or strongly recommend) CS 625 as a prerequisite.

Course Objectives

After completing this course, you should be able to do the following:

- Use OpenRefine to explore and clean real-world data.
- Explain the difference between exploratory (discover task) and explanatory (present task) visualizations.
- Describe the channels of visual encoding and order them from most effective to least effective.
- Identify a visualization where an inappropriate arrange design choice was made and explain why the choice was inappropriate.
- Explain how different data types map most effectively to various visualization idioms (i.e., charts).
- Explain the importance choosing an appropriate colormap.
- Given a dataset, develop questions about the data that can effectively be answered with a visualization.
- Critique and redesign an existing visualization.
- Use Tableau, R, Vega-Lite, or other API or software to create effective standard charts, such as line charts, scatterplots, bar charts.
- Use Tableau, R, Vega-Lite, or other API or software to create an effective visualization of real-world data.
- Explain and defend the design choices that you made in creating your visualization.

Meeting Times and Course Delivery Method
This course will be organized based on the "flipped classroom" model. Students will be assigned readings and homework that will be due before the class meeting time. There will be few, if any, lectures by the instructor. Class time will be spent on discussions of the readings and assignments, demonstrations, and in-class work. *It is essential that each student be fully prepared to participate in class discussions each week.*

This course will be delivered in a hybrid method, with one face-to-face section in a traditional classroom and several online sections available. Course materials, including the link to the Zoom class session, will be made available in Blackboard.

**Face-to-face**
- CRN 19793
- TR 9:30-10:45am, CONST 2100 (capacity w/social distancing: 17 students)
- Social distancing measures will be practiced and masks will be required.
- Attendance is optional, recordings will be available. If you do attend class in person, I expect you to arrive on time.
- Students who are uncomfortable with participating in the classroom are encouraged to switch to the WC2 section to enable other students who might prefer the face-to-face environment to have a seat.
- Due to social distancing requirements, lab/in-class work days may be switched to a web conferencing-only environment. Changes to classroom meeting plans will be announced in advance.
- *You are strongly encouraged to stay home if you are not feeling well.*

**Online**
- CRN 19796 - WC2 (in Hampton Roads), CRN 19797 - WC5 (in Virginia, outside of Hampton Roads), CRN 19798 - WC7 (in US, outside of Virginia), CRN 20035 - WC8 (outside of US)
- The audio of face-to-face class meetings and all materials projected in class will be live streamed via Zoom.
- Attendance of the Zoom session during class meeting times is encouraged, but is not required. Recordings of the Zoom session will be available.
- Unless otherwise specified, online students must meet the same deadlines as face-to-face students. All deadlines are based on the local timezone in Norfolk, VA.

**Fall 2020 note:** The provision of face-to-face lectures and live Zoom streams are contingent on the setup of the classroom and supporting equipment, and the general level of COVID-19 activity in the Hampton Roads area. If I become uncomfortable with the safety precautions being taken, or feel that the classroom environment and equipment detract from the quality of the course, then I reserve the right to change to a pure web conferencing delivery mode. *Additional notes related to ODU’s Fall 2020 semester and COVID-19 can be found at the end of this Syllabus.*

**Instructor Contact and Office Hours**

Dr. Michele Weigle: mweigle at cs.odu.edu, https://www.cs.odu.edu/~mweigle/

My office hours will be Tuesdays 2-3:30pm, Thursdays 5-6:30pm, or by appointment. All office hours will be held via Zoom (see Blackboard for the link to the Zoom meeting room). Students will be placed into the waiting room until I am available.
If you cannot attend during regular office hours, please contact me to set up an alternate appointment time. If you absolutely need an in-person appointment, please contact me at least a day in advance to set up a time. *I will not be able to meet immediately after class as I teach another class at 11am. I will not be on campus MWF.*

Requirements

Prerequisites

There are no specific course prerequisites for this course, but I expect you to be comfortable with basic statistics. Extensive programming experience is not required, but you should be familiar with basic programming concepts (variables, arrays, functions, conditionals, etc.).

Additionally, if you choose to use certain APIs (not required), you should be familiar with Unix, HTML, CSS, JavaScript, and jQuery. If you need a refresher on Unix, see the CS 252 webpage. There are many excellent resources available online for common web languages. Some can be found in the notes from my previous CS 312 and CS 418 courses.

Course Materials

The required textbook for this course is *Visualization Analysis and Design* by Tamara Munzner

- includes author's slides from half-day and full-day tutorials, PDF versions of all figures
- textbook errata
- author's keynote at d3.unconf (55 min), overview of material from book

*You will be required to write clearly about your visualization designs and design process.* For writing help, I always suggest two inexpensive books:

- Writing for Computer Science by Justin Zobel
- The Elements of Style by Strunk and White

In addition, see the online writing resources collected on the ODU-CS New Student Resources page.

Grading

Assignment Types

Your grade in this class will be based on the following components:

**Participation - 10%**

- in addition to being present, students are expected to be prepared to talk about examples and figures in the required readings, explain learning checks, discuss their homework submissions, and participate in online discussions
will receive points (0-2) for each week of class

in-class rubric:
- 0 - no participation during the week
- 1 - late to class or not prepared to participate
- 2 - on time to class and actively participating in discussions and in-class work

online rubric:
- 0 - no access of the class recording before the next class meeting or participation in online discussions
- 2 - watched the class recording before the next class meeting and actively participating in online discussions

Learning Checks - 10%
- preparation for the next class meeting, submitted via Blackboard before the class meeting time
- I will not correct your answers, but correct answers with references to the textbook will be provided after the due date
- rubric:
  - 0 - not submitted
  - 1 - did not answer all questions or late submission (within 48 hours of due date)
  - 2 - answered all questions and submitted on time

Homework - 50%
- implement concepts from a previous class meeting, submitted via GitHub
- grading scale: 0-10, where 10 is the absolute best (don't expect to get 10s on a regular basis)
  - 2 points are reserved for the required writeup about the assignment
  - late assignments have a maximum score of 8

Midterm Exam - 30%
- demonstrate comprehension and application of concepts discussed during the first half of the semester
- open book, open notes

Grading Scale

The grading scale is as follows:

<table>
<thead>
<tr>
<th>%</th>
<th>letter grade</th>
</tr>
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<tbody>
<tr>
<td>94-100</td>
<td>A</td>
</tr>
<tr>
<td>90-93</td>
<td>A-</td>
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<tr>
<td>87-89</td>
<td>B+</td>
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<tr>
<td>84-86</td>
<td>B</td>
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<tr>
<td>80-83</td>
<td>B-</td>
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<tr>
<td>78-79</td>
<td>C+</td>
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<tr>
<td>74-77</td>
<td>C</td>
</tr>
<tr>
<td>70-73</td>
<td>C-</td>
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<tr>
<td>0-69</td>
<td>F</td>
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</tbody>
</table>
**Late Assignments**

Any assignment submitted after its deadline is considered late. Submissions over 48 hours late are not accepted. This time limit includes weekends -- they are counted just like weekdays.

I reserve the right to specify that late submissions will not be accepted for particular assignments.

**Summary Schedule**

(Updated 8/2/2020)

*Note: This is a tentative schedule and may be updated during the semester.*

ODU Fall 2020 academic schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Textbook Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sep 1, 3</td>
<td>Introduction, What's Vis and Why Do It?</td>
<td>Ch 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Objectives</td>
<td></td>
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<tr>
<td>2</td>
<td>Sep 8, 10</td>
<td>Data and Data Cleaning</td>
<td>Ch 2</td>
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<td></td>
<td></td>
<td>Objectives</td>
<td></td>
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<tr>
<td>3</td>
<td>Sep 15, 17</td>
<td>Marks and Channels</td>
<td>Ch 5</td>
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<td></td>
<td></td>
<td>Objectives</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sep 22, 24</td>
<td>Arrange Tables</td>
<td>Ch 7</td>
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<tr>
<td></td>
<td></td>
<td>Objectives</td>
<td></td>
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<tr>
<td>5</td>
<td>Sep 29, Oct 1</td>
<td>Arrange Tables (continued)</td>
<td>Ch 7</td>
</tr>
<tr>
<td>6</td>
<td>Oct 6, 8</td>
<td>Map Color and Other Channels</td>
<td>Ch 10</td>
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<td></td>
<td></td>
<td>Objectives</td>
<td></td>
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<tr>
<td>7</td>
<td>Tues, Oct 13</td>
<td>Review</td>
<td></td>
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<td></td>
<td>Thurs, Oct 15</td>
<td>MID-TERM EXAM</td>
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<tr>
<td>8</td>
<td>Oct 20, 22</td>
<td>Reduce Items</td>
<td>Ch 13 (through 13.4.1)</td>
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<td></td>
<td></td>
<td>Objectives</td>
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<tr>
<td>9</td>
<td>Oct 27, 29</td>
<td>Exploratory Data Analysis (EDA)</td>
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<td></td>
<td>Nov 3, 5</td>
<td>NO CLASS - Election Day</td>
<td></td>
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<tr>
<td>10</td>
<td>Nov 10, 12</td>
<td>Storytelling Vis</td>
<td></td>
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<tr>
<td>11</td>
<td>Nov 17, 19</td>
<td>Rules of Thumb, Maps</td>
<td>Ch 6, Ch 8.1-8.3</td>
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<tr>
<td></td>
<td></td>
<td>Ch 6 Objectives</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Ch 8 Objectives</td>
<td></td>
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<tr>
<td>12</td>
<td>Dec 1, 3 - online</td>
<td>Multiple Views</td>
<td>Ch 12 (skip 12.4.4)</td>
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<tr>
<td></td>
<td></td>
<td>Objectives</td>
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Course Policies

Email/Piazza

Each student must check the class Piazza site and email daily. You should use Piazza to ask and answer general course-related questions. I will use Piazza to notify you about important updates (assignment deadline changes, class cancellations, office hours cancellations, etc.).

Attendance (in-class students)

Since much of the course is based on discussion and in-class work, I expect you to arrive on time for class. Your grade will be affected if you are consistently tardy. If you have to miss a class, you are responsible for checking the course Blackboard site to find any assignments or notes you may have missed. Students may leave after 15 minutes if the instructor or a guest lecturer does not arrive in that time.

If there are days on which the scheduled class meeting time is cancelled due to weather, there may still be assignments made and due. A post will be made to Piazza (with an email notification) whenever the class meeting time is cancelled.

Classroom Conduct

Please be respectful of your classmates and instructor by minimizing distractions during class. Cell phones must be turned to silent during class.

Make-up Work

Make-ups for graded activities are possible only with a valid written medical or university excuse. It is the student's responsibility to give the instructor the written excuse and to arrange for any makeup work to be done. A makeup exam may be different (and possibly more difficult) than the regularly scheduled exam.

Disability Services

In compliance with PL94-142 and more recent federal legislation affirming the rights of disabled individuals, provisions will be made for students with special needs on an individual basis. The student must have been identified as special needs by the university and an appropriate letter must be provided to the course instructor. Provision will be made based upon written guidelines from the University's Office of Educational Accessibility. All students are expected to fulfill all course requirements.

Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided.
to instructors each semester.

Seeking Help

The class Blackboard site should be your first reference for questions about the class. If you have questions about course requirements or materials, post questions using the class Piazza site. For extra help, attend office hours.

Academic Integrity

Old Dominion University is committed to students' personal and academic success. In order to achieve this vision, students, faculty, and staff work together to create an environment that provides the best opportunity for academic inquiry and learning. All students must be honest and forthright in their academic studies. Your work in this course and classroom behavior must align with the expectations outlined in the Code of Student Conduct, which can be found at https://www.odu.edu/oscai.

The following behaviors along with classroom disruptions violate this policy, corrupt the educational process, and will not be tolerated.

- Cheating: Using unauthorized assistance, materials, study aids, or other information in any academic exercise.
- Plagiarism: Using someone else's language, ideas, or other original material without acknowledging its source in any academic exercise.
- Fabrication: Inventing, altering or falsifying any data, citation or information in any academic exercise.
- Facilitation: Helping another student commit, or attempt to commit, any Academic Integrity violation, or failure to report suspected Academic Integrity violations to a faculty member.

In particular, submitting anything that is not your own work without proper attribution (giving credit to the original author) is plagiarism and is considered to be an academic integrity violation. It is not acceptable to copy source code or written work from any other source (including other students, online resources), unless explicitly allowed in the assignment statement. In cases where using resources such as the Internet is allowed, proper attribution must be given.

Any evidence of an academic integrity violation (cheating) will result in a 0 grade for the assignment/exam, and the incident will be submitted to the Department of Computer Science for further review. Note that academic integrity violations can result in a permanent notation being placed on the student's transcript or even expulsion from the University. Evidence of cheating may include a student being unable to satisfactorily answer questions asked by the instructor about a submitted solution. Cheating includes not only receiving unauthorized assistance, but also giving unauthorized assistance. For class files kept in Unix space, students are expected to use Unix file permission protections (chmod) to keep other students from accessing the files. Failure to adequately protect files may result in a student being held responsible for giving unauthorized assistance, even if not directly aware of it.

Students may still provide legitimate assistance to one another. You are encouraged to form study groups to discuss course topics. Students should avoid discussions of solutions to ongoing assignments and should not, under any circumstances, show or share code solutions for an ongoing assignment.
All students are responsible for knowing the rules. If you are unclear about whether a certain activity is allowed or not, please contact the instructor.

More information on academic integrity is available on the ODU-CS academic integrity page.

**Fall 2020 COVID-19 Policies**

**Hybrid and Online Learning**

This course may have to modify its in-person instruction based on guidance from ODU and the Virginia Department of Health. It may entail moving to an online format if COVID-19 infections require such a move. Students should pay close attention to class announcements on Blackboard and/or Piazza for changes to course delivery.

**Face Coverings**

Students are required to wear face coverings in accordance with the provisions set forth in [ODU Policy 1006: COVID-19 (Interim Policy)](https://www.cs.odu.edu/~mweigle/CS625-F20/Home), especially in those instances when at least six (6) feet of physical separation cannot be maintained. The face covering must cover the mouth and nose and must be worn at all times in the building before, during, and after class. Students who have medical reasons that prevent wearing a face covering must meet with the University’s [Office of Educational Accessibility](https://www.cs.odu.edu/~mweigle/CS625-F20/Home) for alternative course delivery solutions. Students who are disruptive in class about face coverings or physical social distancing may not remain in class and will be referred to the Office of Student Conduct & Academic Integrity.

**COVID-19 Response**

If you are experiencing any symptoms of a possible COVID-19 infection or have come into contact with someone with COVID-19, please do not come to class. In addition, you **must** report your symptoms using the [COVID-19 daily check-in](https://www.cs.odu.edu/~mweigle/CS625-F20/Home). If you show symptoms, immediately self-isolate and follow appropriate guidance on when and where to seek medical care. Take every precaution to mitigate potential spread to fellow students, ODU faculty, staff, and others in the community.

If you need to quarantine or isolate, please inform your instructor so that he or she can adjust assignments and provide the level of support necessary to help you succeed in class. Your professor will make accommodations to help you learn the course material and succeed in the class if you are unable to attend due to COVID-19. If necessary, your instructor will suspend in-person classes for a 14-day period to reduce the possibility of community spread. If the instructor shows signs of COVID-19 infection and needs to quarantine or isolate, class will be immediately moved online for a minimum of 14 days. Instruction will continue online until the quarantine/isolation period has ended and/or conditions warrant a return to in-person instruction.

*Your best action, as a Monarch, is to protect your peers! If in doubt, immediately isolate and report symptoms of COVID-19.*

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