

**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
NORTHEASTERN UNIVERSITY**

**EECE 5642 Data Visualization
Spring 2020**

Instructor: This class will be taught by Mr. Yulun Zhang

Office: 427 Richards Hall

Email: zhang.yulu@husky.neu.edu

Electronic communication: We will use [Blackboard](#) for posting assignments, notes, any on-line discussions, and other forms of electronic communication. It will be assumed that you check your email regularly, and it is your responsibility to make sure that the instructor has a good email address for you. In particular you should make sure that the email address that Blackboard has for you is one you check regularly---you can change it if you wish on Blackboard.

Prereq. Basic programming skills, knowledge of fundamental data structures and algorithms

Teaching Assistant: Ms. Huixian Zhang, SMILE Lab, Room 427, Richards Hall, Email: zhang.hu@husky.neu.edu

Class and Office Hours:

Class Hours : Monday and Thursday 11:45 am - 01:25 pm in West Village H 110

Office Hours: Tuesday 09:00 am - 11:00 am in Ricards Hall 427

Textbook

Class lecture slides will be provided by the instructor, either printout or electronic file. Students will be asked to find more self-learning content from Internet resources. Recommended textbooks are:

1. The Visual Display of Quantitative Information (2nd edition), Edward Tufte, Graphics Press, ISBN 0961392142.
2. Visualizing Data, Ben Fry, O'Reilly (2007), ISBN: 0596514557.
3. Show Me the Numbers, by Stephen Few, Analytics Press, ISBN: 0970601999.
4. Data Visualization (principles and practice), Alexandru C. Telea., A K Peters, Ltd.
5. Information Visualization (perception for design) (2nd Edition), Colin Ware, Elsevier Press.

Catalog Course Description: Introduction to relevant topics and concepts in visualization, including computer graphics, visual data representation, physical and human vision models, numerical representation of knowledge and concept, animation techniques, pattern analysis, and computational methods. Tools and techniques for practical visualization. Elements of related fields including computer graphics, human perception, computer vision, imaging science, multimedia, human-computer interaction, computational science, and information theory. Covers examples from a variety of scientific, medical, interactive multimedia, and artistic applications. Hands-on exercises and projects.

Grading

Students will be graded on class participation, three assignments, a mid-term examination, a mid-term project and a final project and presentation. The final grade will be composed as follows:

Class Participation..... 10% Homework..... 30%
Mid-Term Exam..... 20% Final Project..... 40%

Course Topics and Schedules

Week	Date	Monday	Thursday	HW	Exam
1	Jan 06 & 09	Introduction	Data Representation		
2	Jan 13 & 16	Image Model and Human Vision System	Visual Cognition	HW 1	
3	Jan 20 & 23	No class (Martin Luther King Jr.'s Birthday)	Visual Perception		
4	Jan 27 & 30	Visualization Design	Trees and Networks & HW1 Recitation [TA]		
5	Feb 03 & 06	Color and Visualization Tools	Dimensionality Reduction	HW 2	
6	Feb 10 & 13	Table and Graph	Mid-term Exam (Take-home exam, no class)		Mid-term
7	Feb 17 & 20	No class (Presidents' Day)	Paper Discussion		
8	Feb 24 & 27	Paper Discussion	Paper Discussion	HW 3	
9	Mar 09 & 12	Paper Discussion	Maps, Mid-term Exam Recitation [TA]		
10	Mar 16 & 19	Interactive Visualization [Guest]	Proposal Presentations		
11	Mar 23 & 26	Human and Face Visualization [Guest]	HW3 Recitation [TA]		
12	Mar 30 & Apr 02	Image-based Rendering and Beyond [Guest]	Geographic Visualization [Guest]		
13	Apr 06 & 09	No class (Prelim Preparation)	Project Presentations		
14	Apr 13 & 16	Project Presentations	Project Presentations		
15	Apr 20 & 23	No class (Patriots' Day)	Final Report Due at 5pm		Final

* Guest lecturers will be invited to present some topics if funding is available for honoraria or expenses.

* Courtesy of Prof. Hanspeter Pfister, Harvard University.

Final Project

The final project has two options: visualization demo design or software tool design. The basic idea of the two directions is the same which is to collect some scientific data and visualize them. The demo design mainly focuses on the visual animations, 2D/3D graphics, video making, and computer vision based visualization techniques. The tool design is mainly to design and implement a visualization tool that can analyze the data with any kind of visualization concepts or formats, summarize some useful results/conclusions, answer questions, and provide suggestions or comments. The data should be real data, which can be either collected by individual or borrowed from somewhere (with permission and acknowledgement). Students can use any API or programming language they like. Students can work on the project by themselves or team up with other students in the class. The team members cannot be more than two.

To grade the final project, three aspects will be considered. 1) proposal presentation (20%); 2) final project presentation (30%); 3) final project report and software package (50%). Late submission without instructor permission may not be considered. Typically, we do not anticipate that the grades for each team member will be different. However, we reserve the right to assign different grades to each team member if the efforts or contributions they make are apparently different and unbalanced. Bonus points may be earned if the project shows significant novelty and large potentials for real-world applications. Those projects may get our guidance for further paper publications.

Proposals and Reports

Please consider following contents when you prepare for your proposals and final reports:

- Project title
- Team members names, affiliations and emails (one or two members)
- The project option you choose (demo or tool)
- Motivations of the project
- Real-world applications
- Data source and background (in detail)
- Tools and programming languages used in the project
- Contributions of the work (the work by the authors)
- Novelty of the work (optional)
- Visualization techniques (need to present details)
- Division of work for each team member
- Challenges and solutions
- Future work, extensions, improvements
- Additional comments
- References (including all papers, links, source codes, etc.)

Project Presentations

PPT or PDF slides and demos can be used for final project presentations.

Schedule: TBA

Submission

The presentation slides, the final report and software package should be submitted to Blackboard on time, **5pm on Apr 23**.

Policy: If submitting latter than 5pm without permission, we will reduce the score with a penalty of 20%. If submitting after midnight of today without permission, we do not count it as a successful submission.

This syllabus is updated on Feb 4, 2020