

MATH 6397 – Information Visualization

Class Number: 17794

Semester: Spring 2019 [January 14 – May 11]

Time: Friday 3:00 – 5:00PM

Class Room: CBB 214

Instructor: Dr. Dvijesh Shastri

Office: PGH 677

E-mail: shastriD@uhd.edu

Office Hours: 2:00 – 3:00 PM [Friday] or by appointment

TA: Junyu Ding

Office: PGH 619

E-mail: junyu@math.uh.edu

Office Hours: TBD

Catalog Description: The course presents comprehensive introduction to information visualization and thus, provides the students with necessary background for visual representation and analytics of complex data. The course will cover topics on design strategies, techniques to display multidimensional information structures, and exploratory visualization tools.

Course Prerequisites: With consent of the instructor.

Course Objectives: After taking this course, students should be able to

- LO1. Identify the constraints and capabilities of **cognition and visual perception** in designing and creating visualizations for information.
- LO2. Apply **visualization theories and methods** to link the technical requirements (from the scientific community) to the design aspects of visualizations (outlined by the design community).
- LO3. Apply **exploratory visualization** tools such as *Tableau* and *Power BI* to identify significant and meaningful patterns in data. The tools facilitate quick exploration of data by generating multiple views of the same data set.
- LO4. Communicate research findings via **visual storytelling**.

Workload: 7-10 hours/week (Average)

Mode of Instruction: Hybrid, meaning the course features both face-to-face and online learning. The face-to-face learning will occur during the class time. For online learning, the course material (e.g., online assignments, PowerPoint slides, etc.) will be made available on blackboard periodically, typically, right before and/or right after face-to-

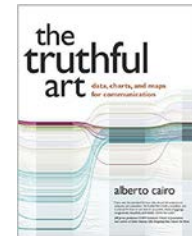
face meetings. The online component will require students to assume responsibility of an active learner, completing tasks necessary to understand the material.

Online Course Support: The Blackboard system (<https://elearning.uh.edu>) will be used for online course material. As the semester progresses, various materials will be posted there including lecture notes, projects, and course announcements.

Required Textbooks

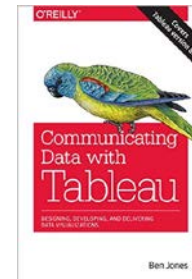
- **Foundations + Visualization Methods**

The Truthful Art: Data, Charts, and Maps for Communication, by Alberto Cairo, 2016, 1st Edition, Pearson publisher. **(TA)**
Paper Book-ISBN 13: 978-0321934079



- **Visualization Tool**

Communicating Data with Tableau by Ben Jones, 1st Edition, O'Reilly Media publisher. **(CD)**
ISBN: 978-1449372026



- Online Tutorials for Tableau tool
<http://www.tableausoftware.com/>

Course Topics: The following topics will be covered as time permits.

Fundamentals (TA)

1. Why Visualize: From Information to Wisdom (Chapter 1)
2. The Five Qualities of Great Visualizations (Chapter 2)
3. Truth Continuum (Chapter 3)
4. The Scientific Stance (Chapter 4)

Visualization methods (TA)

5. Basic Principles of Visualization (Chapter 5)
6. Exploring Data with Simple Charts (Chapter 6)
7. Visualizing Distributions and Uncertainty (Chapter 7)
8. Revealing Change (Chapter 8)
9. Seeing Relationships (Chapter 9)
10. Mapping Data (Chapter 10)

Visualization Tool (CD)

11. Introduction to Tableau (Chapters 1, and 2)
12. How Much and How Many (Chapter 3)
13. Ratios and Rates (Chapter 4)
14. Proportions and Percentages (Chapter 5)
15. Mean and Median (Chapter 6)

- 16. Variations and Uncertainty (Chapter 7)
- 17. Multiple Quantities (Chapter 8)
- 18. Time-Series Analysis (Chapter 9)
- 19. Maps and Location (Chapters 10, and 11)
- 20. Dashboards (Chapters 12, and 13)

Topic Prerequisites: The course is essentially self-contained. The necessary material from statistics is integrated into the course.

Course Grade: Course grades will be determined as follows:

Assignment	Weight
Exam-1 (TA: Chapters 1-7, 11 and CD: Chapters 1-7)	20 %
Final Exam (Comprehensive)	40 %
Homework Assignments (10) [Group mode]	20 %
Course Project [Group mode] (2 video presentations + 1 face-to-face presentation)	15 %
In-class Labs (10) [Individual mode]	05 %

Your final course grade will be determined by the standard college formula based on your course average:

	95.00-100.00 → A	90.00-94.99 → A-
87.00-89.99 → B+	83.00-86.99 → B	80.00-82.99 → B-
77.00-79.99 → C+,	73.00-76.99 → C	70.00-72.99 → C-
67.00-69.99 → D+,	63.00-66.99 → D	60.00-62.99 → D-
00.00-59.99 → F		

Late Submission and Make-up Policies

- **Homework assignments** are to be completed and turned in *by the due date*. For each late day, **30% of the total possible points will be deducted** (a day ends at the due time). No work will be accepted more than 3 days late.
- **In-class Labs** are to be completed and turned in *by the due date*. No labs will be accepted after the due date.
- **Exams:** Make-up exams will *only* be given in cases of documented emergencies. It is your responsibility to contact me with documentation of your emergency.
- All missed grades will be recorded as zeros.

CLASS POLICIES

Class Attendance Policies: Regular class attendance of all class meetings is expected of every student enrolled in this class. “Your failure to attend class, or make contact with your instructor to adequately explain your absence by the 10th class day of the semester will result in your being administratively dropped from this course. Being dropped from this course may affect your enrollment status and/or your financial aid eligibility.”

Student Conduct In Class Policy

Any acts of classroom disruption that go beyond the normal rights of students to question and discuss with instructors the educational process relative to subject content will not be tolerated, in accordance with the Academic Code of Conduct described in the Student Handbook.

Children In Class Policy

Only in extreme cases are children allowed in classroom or laboratory facilities, and then only with approval of the instructor prior to class.

Electronic Devices In Class Policy

Cellular phones, pagers, CD players, radios, and similar devices are prohibited in the classroom and laboratory facilities. Calculators and computers are prohibited during examinations and quizzes, unless specified. Reasonable laptop-size computers may be used in lecture for the purpose of taking notes.

Academic Dishonesty: You are encouraged to generally discuss assignments with fellow students, but may not copy their solution or code. **Doing so constitutes academic dishonesty which will be sanctioned with a grade of F in the course.** See <https://www.uh.edu/provost/policies/honesty/> for more information on UH’s policy on academic dishonesty.

Campus Carry Law

Beginning August 1, 2016, the new campus carry law that was signed by Governor Abbott on June 13, 2015 allows persons with a state mandated concealed handgun license (CHL) to carry a concealed handgun in certain areas on campus so long as the area has not been designated by the University as an exclusion zone. The University’s campus carry policy can be found here:

<http://www.uh.edu/af/universityservices/policies/mapp/07/070105.pdf> .

Tentative Course Outline

Week	Date	Topic	In-class	Homework
1	01/18 Fri	Why Visualize: From Information to Wisdom <ul style="list-style-type: none"> TA: Chapter-1 	Lab-0	HW-0
2	01/25 Fri	Introduction to Tableau CD: Chapters 1 and 2 How Much and How Many CD: Chapter 3 Course Project Discussion	Lab-1	HW-1
3	02/01 Fri	The Five Qualities of Great Visualizations <ul style="list-style-type: none"> TA: Chapter 2 Ratio and Rates <ul style="list-style-type: none"> CD: Chapter 4 	Lab-2	HW-2
4	02/08 Fri	Truth Continuum <ul style="list-style-type: none"> FA: Chapter 3 The Scientific Stance <ul style="list-style-type: none"> TA: Chapter 4 Proportions and Percentages <ul style="list-style-type: none"> CD: Chapter 5 	Lab-3	HW-3
5	02/15 Fri	Basic Principles of Visualization <ul style="list-style-type: none"> TA: Chapter 5 Mean and Median <ul style="list-style-type: none"> CD: Chapter 6 	Lab-4	HW-4
6	02/22 Fri	Exploring Data <ul style="list-style-type: none"> TA: Chapter 6 Visualizing Distributions <ul style="list-style-type: none"> TA: Chapter 7 CD: Chapter 7 (pp. 101-115) Project Proposal Due (Video Presentation)	Lab-5	HW-5
7	03/01 Fri	Visualizing Uncertainty <ul style="list-style-type: none"> TA: Chapter 11 CD: Chapter 7 (pp. 115-123) 	Lab-6	HW-6
8	03/08 Fri	Exam-1 (1 hr. and 30 min)		
		<i>Spring Break (03/11 – 03/16)</i>		
9	03/22 Fri	Dashboards <ul style="list-style-type: none"> CD: Chapters 12, and 13 Advanced Dashboard (Self-study) <ul style="list-style-type: none"> CD: Chapter 14 	Lab-7	HW-7

10	03/29 Fri	Seeing Relationships <ul style="list-style-type: none"> • TA: Chapter 9 Multiple Quantities <ul style="list-style-type: none"> • CD: Chapter 8 	Lab-8	HW-8
11	04/05 Fri	Mapping Data <ul style="list-style-type: none"> • TA: Chapter 10 Maps and Location <ul style="list-style-type: none"> • CD: Chapters 10, and 11 	Lab-9	HW-9
12	04/12 Fri	Revealing Change <ul style="list-style-type: none"> • TA: Chapter 8 Changes Over Time <ul style="list-style-type: none"> • CD: Chapter 9 	Lab-10	HW-10
13	04/19 Fri	<i>Buffer Lecture</i>		
14	04/26 Fri	Final Project Presentation		
		<i>Reading Days (04/30 – 05/01)</i>		
	05/03 Fri	Final Exam (1 hr. and 30 min) [Tentatively]		