

LIS 697: INFORMATION VISUALIZATION

Section: LIS-697-13
Semester: Fall 2011
Meeting Information: Wednesday, 6:30-8:50 pm
Location: PMC, Room 611
Credits: 3
Prerequisites: None

Chris Alen Sula, Ph.D.
Office: PMC, Room 604B
Office Hours: Tuesdays, 4:00-6:00 pm
p 212.647.7682
e csula@pratt.edu
w <http://chrisalensula.org>

COURSE DESCRIPTION

This course examines the art, science, and practice of information visualization. Particular emphasis is placed on the ways in which position, shape, size, brightness, color, orientation, texture, and motion influence perception of information and facilitate comprehension and analysis of large and complex bodies of information. Topics include cognition and visual perception; the aesthetics of visual media; techniques for processing and manipulating information for the purpose of visualization; studies of spatial, relational, multivariate, time-series, interactive, and other visual approaches; and methods for evaluating information visualizations.

COURSE GOALS + LEARNING OBJECTIVES

The goals of this course are to:

- explore various theoretical, practical, and aesthetic perspectives on information visualization
- examine cognitive and psychological studies relevant to visual perception and information processing
- develop familiarity with a wide variety of visual representations, with particular emphasis on selecting appropriate representations based on data frameworks and audience
- build skills in planning, developing, and evaluating information visualizations

By the end of this course, students will be able to:

- critically discuss information visualizations in light of current theories and empirical research
- plan and implement effective information visualizations
- design appropriate evaluative instruments for information visualizations

COURSE WEBSITE

All students enrolled in the course have access to course materials on Pratt's Learning Management System (a Moodle installation) available at my.pratt.edu. Please make sure you know how to access LMS and use Moodle. Also, please note that LMS facilitates communication using Pratt e-mail only. If you do not use your Pratt account, please use webmail to forward your Pratt e-mail to an account that you do use.

REQUIRED TEXTS

- Stephen Few, *Now You See It: Simple Visualization Techniques for Quantitative Analysis* (Analytics Press 2009) [ISBN 0970601980]
- Additional readings [available on Learning Management System via my.pratt.edu]

The required textbook is available at the Barnes & Noble Bookstore on Fifth Avenue at 18th Street.

COURSE FORMAT

This course will be structured as a lecture/seminar. While the professor will clarify the main points of each session and address more advanced research material, the main portion of class will be devoted to discussion of the required readings for that week. Students will bring their own ideas, experience, and interpretations to class and will learn from sharing and hearing others. Active preparation is therefore an important part of the class and contributes significantly to your grade.

COURSE REQUIREMENTS + ASSIGNMENTS

Readings

Each student is required to read the articles assigned on a weekly basis in advance of the session for which they are assigned. Additional readings will also be provided; though not required, many of these will be covered in lecture, and a judicious sampling of them will significantly enhance your understanding of the course material.

Methods of student assessment

Your grade in the course will be based on the following:

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| Participation and attendance | 5% |
| Weekly visualization analyses | 30% |
| GIS Project | 25% |
| Final project | 40% |

Participation and attendance (5%)

Students are expected to actively and thoughtfully contribute to classroom discussion. Failure to do so will result in a reduced grade. Students with three or more absences (for any reason, including documented medical reasons) cannot expect to receive an A in the course and, in accordance with Pratt Institute policy, may fail the course at the discretion of the professor. If you do miss a class, for whatever reason, it is your responsibility to notify the instructor as soon as possible and get notes from classmates.

Weekly visualization analyses (10 analyses, 30%)

During 10 of the weeks of the course, you will prepare a short analysis (approx. 500 words) of one or more information visualizations of your choice. The analysis should relate the visualization(s) to the readings for the session, and must be submitted by 5pm before each session. Students' analyses may be posted on the course website, and students are expected to discuss their analyses as part of class participation. There are 12 possible weeks for which you can prepare analyses; the excluded weeks are weeks 1, 12, 13, and 16. If you plan ahead, you should be able to skip weeks when other assignments are due or weeks when you are particularly busy with other classes.

GIS project (25%)

This semester, our course will partner with LIS 630 Research Methods and LIS 613 Government Information Sources to analyze demographic and other data from SILS students. As part of this project, you will assist in creating visualizations of this data, often based on GIS information. Your specific contribution to this project will be determined by your interests in the data and different visualization techniques and in consultation with me. Your visualizations will be due on or before November 30, 2011.

Final project (35% visualization and paper, 5% presentation)

Students will be required to complete a final project that visualizes a dataset of their choice. The visualization(s) may be print or digital, static or interactive, as appropriate to the data and intended audience. The project will consist of three parts:

1. a proposal of no more than 300 words due on or before November 16, 2011 and requiring approval by the professor before the presentation
2. a presentation of your draft visualization(s) suitable for commentary in class on December 14, 2011, and
3. a final visualization and short paper (approx. 1,500 words) due on or before December 19, 2011.

This project is modeled on scientific posters, with background literature and critical analysis supplementing main results—in this case, your visualization(s).

A detailed description of each assignment will be provided separately in class and made available on LMS.

GRADING

All graded assignments are due on the date indicated. The date of submission, your name, the course number, and the title of the assignment should be included at the top of each assignment. A detailed description of each assignment will be provided separately and made available online. **Written assignments must be submitted both in hard copy by the beginning of the class in which they are due and uploaded to LMS on the same day.** Non-graded assignments and in-class exercises will be also administrated over the semester and evaluated as part of participation and attendance.

Grades will be awarded as follows:

- A sustained level of superior performance demonstrated in all areas of course requirements
- B consistent level of performance that is above average in a majority of the course requirements
- C performance that is generally average and course requirements are achieved
- D below average performance and achievement of the course requirements
- F accomplishment of the course requirements is not sufficient to receive a passing grade

Late work will receive a reduced grade and not will be annotated with comments or other feedback.

POLICIES

Academic Integrity

Students are expected to adhere to the Academic Integrity Code and Judicial Process of the Pratt Institute available online at <http://www.prattsenate.org/learning/02-academic.htm>. All infractions will be reported, and I am disposed to fail all violators for the entire course.

Disabilities

Students who require special accommodations for disabilities must obtain clearance from the Office of Disability Services at the beginning of the semester. For further information, contact the Coordinator of Disability Services in the Office of the Vice President for Student Affairs at 718.636.3711.

Incompletes

Incompletes will not be awarded except in cases of documented medical reasons and at the discretion of the professor.

Institute-Wide Policies

Students must adhere to the Pratt Community Standards listed in the current Student Handbook available online at http://www.pratt.edu/uploads/Online_Student_HandbookFINAL.pdf.

Revisions to the Syllabus

While this syllabus provides a reliable framework for the course, including readings and assignments, it is subject to change pending notice in class and on the course website.

COURSE SCHEDULE

This is a tentative outline of topics, readings, and assignments. On occasion, I may add, delete, or substitute topics or readings. Changes will be announced in class and posted to LMS; no printed updates will be given.

| WEEK | DATE | TOPICS, READINGS, AND ASSIGNMENTS |
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FOUNDATIONS OF INFORMATION VISUALIZATION

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| 1 | 8/31 | Course Introduction <ul style="list-style-type: none">• Pousman Zachary, John T. Stasko, and Michael Mateas. (2007). "Casual Information Visualization" <i>IEEE Transactions on Visualization and Computer Graphics</i> 13(6): 1145–1152• Heer, Jeffrey, Michael Bostock, and Vadim Ogievetsky. (2010). "A Tour through the Visualization Zoo: A survey of powerful visualization techniques, from the obvious to the obscure" <i>ACM Queue</i> 8(5)• Keim, et al. (2008). "Visual Analytics: Scope and Challenges" in <i>Visual Data Mining, LNCS 4404</i>, eds. S. J. Simoff, et al., 76–90. |
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No visualization analysis due

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| 2 | 9/7 | History and Theory of Information Visualization <ul style="list-style-type: none">• Few, <i>Now You See It</i>, Ch. 1• Friendly, Michael (2008). "A Brief History of Data Visualization" in <i>Handbook of Data Visualization</i>, eds Chun-houh Chen, Wolfgang Härdle and Antony Unwin. Berlin: Springer, 15–56.• Fekete, et al. (2008). "The Value of Information Visualization" in <i>Information Visualization: Human-Centered Issues and Perspectives</i>, eds. Andreas Kerren, et al. Berlin: Springer, 1–18• Purchase, et al. (2008). "Theoretical Foundations for Information Visualization" <i>Information Visualization: Human-Centered Issues and Perspectives</i>, eds. Andreas Kerren, et al. Berlin: Springer, 46–64 |
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| 3 | 9/14 | From Data to Design <ul style="list-style-type: none">• Few, <i>Now You See It</i>, pp. 24–27• Ward, Matthew (2010). "Data Foundations" from <i>Interactive Data Visualization</i>, eds. Matthew Ward, Georges Grinstein, Daniel Keim. Natick, MA: A. K. Peters, Ltd., 45–71• Few, Stephen (2005). "Effectively Communicating Numbers: Selecting the Best Means and Manner of Display" ProClarity• Huff, Darrell (1954). <i>How to Lie with Statistics</i>. New York: W. W. Norton [Intro, Chs. 5–6, 9]• Bateman, et al. (2010). "Useful junk? The effects of visual embellishment on comprehension and memorability of charts" <i>CHI '10 Proceedings of the 28th international conference on Human factors in computing systems</i>: 2573–2582 |
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| 4 | 9/21 | Perception and Visual Processing <ul style="list-style-type: none">• Few, <i>Now You See It</i>, Ch. 3• Healey, Christopher G. (2009) "Perception in Visualization" http://www.csc.ncsu.edu/faculty/healey/PP/index.html• MacDonald, Lindsay W. (1999). "Using Color Effectively in Computer Graphics" <i>Computer Graphics and Applications, IEEE</i> 19.4: 20–35 |
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REPRESENTING INFORMATION

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| 5 | 9/27 | Elements of Representations <ul style="list-style-type: none">• Few, <i>Now You See It</i>, Ch. 5• Pfitzner, Darius, Vaughan Hobbs, and David Powers. "A Unified Taxonomic Framework for Information Visualization" <i>APVis '03 Proceedings of the Asia-Pacific symposium on information visualisation</i> 24: 57–66 |
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| 6 | 10/5 | <p>Spatial & Textual Representation</p> <ul style="list-style-type: none"> • Few, <i>Now You See It</i>, Chs. 6, 8 • Wise, et al. (1995). "Visualizing the Non-Visual: Spatial Analysis and Interaction with Information from Text Documents" <i>Proceedings of the IEEE Conference on Information Visualization 1995</i>: 51–58 • Julien, Charles-Antoine, John E. Leide, and France Bouthillier (2008). "Controlled User Evaluations of Information Visualization Interfaces for Text Retrieval: Literature Review and Meta-Analysis" <i>Journal of the American Society for Information Science and Technology</i> 59(6):1012–1024 |
| 7 | 10/12 | <p>Relational Representation 1: Part-to-Whole Deviation, Distribution, Correlation</p> <ul style="list-style-type: none"> • Few, <i>Now You See It</i>, Chs. 9–11 |
| 8 | 10/19 | <p>Relational Representation 2: Hierarchy, Network</p> <ul style="list-style-type: none"> • Graham, Martin and Jessie Kennedy (2010), "A Survey of Multiple Tree Visualization" <i>Information Visualization</i> 9(4): 235–252 • Herman, Ivan, Guy Melançon, and M. Scott Marshall (2000). "Graph Visualization and Navigation in Information Visualization: A Survey" <i>IEEE Transactions on Visualization and Computer Graphics</i> 6(1): 24–43. • Becker, Richard, Stephen G. Eiks, and Allan R. Wilks (1995). "Visualizing Network Data" <i>IEEE Transactions on Visualization and Computer Graphics</i> 1(1): 16–21 |
| 9 | 10/26 | <p>Time-Series Representation</p> <ul style="list-style-type: none"> • Few, <i>Now You See It</i>, Ch. 7 • Ainger, et al. (2008), "Visual Methods for Analyzing Time-Oriented Data" <i>IEEE Transactions on Visualization and Computer Graphics</i> 14(1): 47–60 • Silva, S. F. and Catari, T. (2000) "Visualization of Linear Time-Oriented Data: A Survey" <i>First International Conference on Web. Information Systems Engineering (WISE)</i>: 310–319 |
| 10 | 11/2 | <p>Multivariate Representation</p> <ul style="list-style-type: none"> • Few, <i>Now You See It</i>, Ch. 12 • Inselberg, A. (1997). "Multidimensional Detective" <i>Proceedings of the 1997 IEEE Symposium on Information Visualization (InfoVis '97)</i>: 100–107 • Wattenberg, Martin (2006). "Visual Exploration of Multivariate Graphs" <i>CHI '06 Proceedings of the SIGCHI conference on Human Factors in computing systems</i>: 811–819 |
| 11 | 11/9 | <p>Interactive Representation</p> <ul style="list-style-type: none"> • Few, <i>Now You See It</i>, Ch. 4 • Dix, Alan and Geoffrey Ellis (1998). "Starting Simple—Adding Value to Static Visualisation through Simple Interaction" <i>AVI '98 Proceedings of the working conference on advanced visual interfaces</i>: 124–134 • Cockburn Andy, Amy Karlson, and Benjamin B. Bederson (2008). "A Review of Overview+Detail, Zooming, and Focus+Context Interfaces" <i>ACM Computing Surveys</i> 41(1) • Yi, et al. (2007). "Toward a Deeper Understanding of the Role of Interaction in Information Visualization" <i>IEEE Transactions on Visualization and Computer Graphics</i> 13(6): 1224–1231 |
| 12 | 11/16 | <p>GIS Workshop</p> <ul style="list-style-type: none"> • Goodchild Michael F. (2007) "Citizens as Sensors: The World of Volunteered Geography" <i>GeoJournal</i> 69(4): 211–221 • Skupin, André (2000). "From Metaphor to Method—Cartographic Perspectives on Information Visualization" <i>IEEE Symposium on Information Visualization</i>: 91–97 <p><i>No visualization analysis due</i> <i>Final project proposals due</i></p> |
| 13 | 11/23 | <p>NO CLASS—Thanksgiving Recess <i>No visualization analysis due</i></p> |

EVALUATING INFORMATION VISUALIZATIONS & FUTURE DIRECTIONS

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| 14 | 11/30 | <p>Empirical Evaluations</p> <ul style="list-style-type: none">• Carpendale, Sheelagh (2008). "Evaluating Information Visualizations" in <i>Information Visualization: Human-Centered Issues and Perspectives</i>, eds. Andreas Kerren, et al. Berlin: Springer, 19–45• Chen, Chaomei and Mary P. Czerwinski (2000). "Empirical evaluation of information visualization: An Introduction" <i>International Journal of Human-Computer Studies</i> 53: 631–635• Plaisant, Catherine (2007). "The Challenge of Information Visualization Evaluation" <i>AVI '04 Proceedings of the working conference on advanced visual interfaces</i>: 109–116• Schneiderman, Ben and Catherine Plaisant (2006). "Strategies for Evaluating Information Visualization" <i>BELIV '06 Proceedings of the 2006 AVI workshop on beyond time and errors: novel evaluation methods for information visualization</i>: 1–7 <p><i>GIS project contributions due</i></p> |
| 15 | 12/7 | <p>Future Directions</p> <ul style="list-style-type: none">• Few, <i>Now You See It</i>, Ch. 13• Chen, Chaomei (2005). "Top 10 Unsolved Information Visualization Problems" <i>IEEE Computer Graphics</i> 25(4): 12–16• Heer, et al., "Creation and Collaboration: Engaging New Audiences in Information Visualization" in <i>Information Visualization: Human-Centered Issues and Perspectives</i>, eds. Andreas Kerren, et al. Berlin: Springer, 92–133• Danis, et al. (2008). "Your Place or Mine? Visualization as a Community Component" <i>CHI '08 Proceeding of the twenty-sixth annual SIGCHI conference on human factors in computing systems</i>: 275–284 |
| 16 | 12/14 | <p>Final Project Presentations</p> |
| | 12/19 | <p><i>Final project visualization and paper due</i></p> |