Information and Visualization

Time: Fall 2017, Friday 9-12  
Location: Room N52-337  
Instructor: Richard The rthe@mit.edu  
TA: Yue Wu yuewu@mit.edu  
Required of Design Minor students  
Credit Units 2-4-6 U/G

Course description

This class provides an introduction to working with information, data and visualization in a hands-on studio learning environment. Studies the history and theory of information, followed by a series of projects in which students apply the ideas directly. Progresses through basic data analysis, visual design and presentation, and more sophisticated interaction techniques. Topics include storytelling and narrative, choosing representations, understanding audiences, and the role of designers working with data.

Subject Objectives

- Demonstrate advanced knowledge of, and be able to critically analyze content, form, dynamics and interactivity as it applies to data visualization.
- Develop skills to design effective visual communication and information displays, by learning a framework for educated exploration and invention.
- Gain experience in describing, analyzing, and evaluating various data visualization approaches through recurrent presentations and critiques.
- Conceptualize and implement static and dynamic design concepts for qualitative and quantitative data.
- Demonstrate a deeper understanding of how to create visualizations of pre-existing data sets.
- Create data visualizations using development environments and web-based programming libraries.

Evaluation Criteria

Coursework

Quantity in and of itself is not a marker of quality or growth. Students are expected to be producing work of high caliber. The work should articulate intended ideas and concepts and demonstrate an independence of thought and be original in nature. The execution of the work should effectively employ technical, formal, and/or conceptual strategies that effectively work together to communicate the intended meaning of the work.

Critiques, presentations, and meetings

Students are expected to possess knowledge and understanding of their own work and the issues surrounding it, and be able to articulate them. Participants are expected to be well prepared for all presentations and meetings. A lack of attendance and considered preparation overall will impact the final grade. As a contributing member of a collaborative academic group, students are expected to evaluate the work of other participants and express critique in a professional, constructive manner.
Assignments and projects

Thorough and on-time completion of all assignments is essential. Failure to meet deadlines, late or incomplete assignments will dramatically reduce your grade. Repeated or chronic lateness or incomplete assignments will result in a failing grade for the course.

Weekly Readings

Each week we will be having a discussion based on a reading that you will have completed prior to the start of class. One or two students will sign up as discussion leaders on one of the first classes.

If you are the discussion leader, you’ll be asked to present the following:

A 15 to 20 minute presentation. The presentation should include information about the author. Be sure to research who they are, what time period they were active, and what they are most well known for. If the article mentions other topics (i.e. a museum website that you’ve never heard of, or an art historical movement) be sure to have a few slides about this, as well. Your presentation should end with 2 discussion questions for the class.

If you are an audience member, you’ll be asked to do the following:

Submit one discussion question to that week’s google doc. Please be sure to write your initial before the question so that you receive credit for participating.

Sparks

In addition to the weekly readings we will start off with a short 5 minute presentation by one student who will share a website, technology, or current event that they find interesting. Please upload this to your GitHub account.

Final Grade Calculation

10%: Exercise 1 – Mapping Time (2 weeks)
10%: Exercise 2 – Mapping Quantities, Categories, and Summarized Data (2 weeks)
10%: Exercise 3 – Mapping Textual and Qualitative Data (2 weeks)
10%: Exercise 4 – Visualize geospatial data (2 weeks)
30%: Final Project
10%: Research Report
20%: Class Participation + Attendance

Attendance

Attendance for the full duration of each class is mandatory. You are allowed three excused absences for the semester. An excused absence is defined as one that was discussed with and approved by the professor at least 24 hours prior to the date of absence, or a family or medical emergency that is confirmed by your physician or a dean in Student Support Services. Absences beyond the three allotted will result in a decrease in your final grade. If you miss six or more classes, you will be asked to drop the subject or receive a failing grade.
### Grading Definition

A Exceptionally good performance demonstrating a superior understanding of the subject matter, a foundation of extensive knowledge, and a skillful use of concepts and/or materials.

B Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject.

C Adequate performance demonstrating an adequate understanding of the subject matter, an ability to handle relatively simple problems, and adequate preparation for moving on to more advanced work in the field.

D Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating deficiencies serious enough to make it inadvisable to proceed further in the field without additional work.

F Failed. This grade also signifies that the student must repeat the subject to receive credit.

### Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Activity</th>
<th>Assignment/Due</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>9/8/17</td>
<td>Introduction, Syllabus handed out</td>
<td>Assignment: Exercise 1</td>
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<td></td>
<td></td>
<td>Syllabus review</td>
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<td></td>
<td></td>
<td>Overview of Data Visualization</td>
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<td>2</td>
<td>9/15/17</td>
<td>Exercise 1 check in</td>
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<td></td>
<td></td>
<td>Lecture: Mapping Time</td>
<td>Due: Reading</td>
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<td>Reports</td>
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<td>3</td>
<td>9/22/17</td>
<td>Exercise 1 final</td>
<td>Due: Exercise 1</td>
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<td>Assignment: Exercise 2</td>
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<td></td>
<td>9/29/17</td>
<td>NO CLASS</td>
<td>Due: Research Reports, Exercise 2 check in</td>
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<td>4</td>
<td>10/6/17</td>
<td>Review Exercise 2</td>
<td>Due: Exercise 2</td>
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<td>Lecture: Mapping Textual and Qualitative Data</td>
<td>Assignment: Exercise 3</td>
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<td>5</td>
<td>10/13/17</td>
<td>Exercise 3 check in</td>
<td>Due: Research Reports</td>
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<td>6</td>
<td>10/20/17</td>
<td>Review Exercise 3</td>
<td>Due: Exercise 3</td>
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<td>Lecture: Mapping Space</td>
<td>Assignment: Exercise 4</td>
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<td>Week 7</td>
<td>10/27/2017</td>
<td>Exercise 4 check in</td>
<td>Due: Research Reports</td>
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<td>Week 8</td>
<td>11/3/2017</td>
<td>Review Exercise 4 Mapping Hierarchies and Networks</td>
<td>Due: Exercise 4 Assignment: Final Project Proposal</td>
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<td>11/10/2017 NO CLASS</td>
<td>Due Final Project Proposal Assignment: Final Project Parsing</td>
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<td>Week 9</td>
<td>11/17/2017</td>
<td>Review Final Project Parsing</td>
<td>Due: Final Project Parsing Assignment: Final Project First Design</td>
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<td>11/24/2017</td>
<td>NO CLASS</td>
<td>Due: Final Project Design Due: Research Reports Assignment: Final Project Design Iteration</td>
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<td>Week 10</td>
<td>12/1/2017</td>
<td>Review Assignment: Final Project Design iteration</td>
<td>Due: Final Project iteration Due: Research Reports Assignment: Final project refinement</td>
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<tr>
<td>Week 11</td>
<td>12/8/2017</td>
<td>Final presentation with guest crits</td>
<td>Due: Final project</td>
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**Required reading**


https://getit.library.nyu.edu/link_router/index/180650304


http://www.katecrawford.net/docs/CanAnAlgorithmBeAgonistic-April2016.pdf

**Recommended reading**


https://getit.library.nyu.edu/go/9370313?umlaut.institution=NS


**Divisional, Program and Class Policies**

MIT’s expectations and policies regarding academic integrity should be read carefully and adhered to diligently:  http://integrity.mit.edu

**NAAB Student Performance Criteria (For graduate students)**

Required by NAAB and organized by “realms” to better understand the relationships between individual criteria. (The “NAAB Student Performance — Educational Realms & Student Performance Criteria” document is available on the Faculty Handbook website.) Include the criteria your subject addresses:
Realm A: Critical Thinking and Representation

- A1. Communication Skills: Ability to read, write, speak and listen effectively
- A2. Design Thinking Skills: Ability to raise clear and precise questions, use abstract ideas to interpret information, consider diverse points of view, reach well-reasoned conclusions, and test alternative outcomes against relevant criteria and standards.
- A3. Visual Communication Skills: Ability to use appropriate representational media, such as traditional graphic and digital technology skills, to convey essential formal elements at each stage of the programming and design process.
- A4. Technical Documentation: Ability to make technically clear drawings, write outline specifications, and prepare models illustrating and identifying the assembly of materials, systems, and components appropriate for a building design.
- A5. Investigative Skills: Ability to gather, assess, record, apply, and comparatively evaluate relevant information within architectural coursework and design processes.
- A6. Fundamental Design Skills: Ability to effectively use basic architectural and environmental principles in design.
- A7. Use of Precedents: Ability to examine and comprehend the fundamental principles present in relevant precedents and to make choices regarding the incorporation of such principles into architecture and urban design projects.
- A8. Ordering Systems Skills: Understanding of the fundamentals of both natural and formal ordering systems and the capacity of each to inform two- and three-dimensional design.
- A9. Historical Traditions and Global Culture: Understanding of parallel and divergent canons and traditions of architecture, landscape and urban design including examples of indigenous, vernacular, local, regional, national settings from the Eastern, Western, Northern, and Southern hemispheres in terms of their climatic, ecological, technological, socioeconomic, public health, and cultural factors.
- A10. Cultural Diversity: Understanding of the diverse needs, values, behavioral norms, physical abilities, and social and spatial patterns that characterize different cultures and individuals and the implication of this diversity on the societal roles and responsibilities of architects.

Realm B: Integrated Building Practices, Technical Skills and Knowledge:

- B1. Pre-Design: Ability to prepare a comprehensive program for an architectural project, such as preparing an assessment of client and user needs, an inventory of space and equipment requirements, an analysis of site conditions (including existing buildings), a review of the relevant laws and standards and assessment of their implications for the project, and a definition of site selection and design assessment criteria.
- B2. Accessibility: Ability to design sites, facilities, and systems to provide independent and integrated use by individuals with physical (including mobility), sensory, and cognitive disabilities.
- B3. Sustainability: Ability to design projects that optimize, conserve, or reuse natural and built resources, provide healthful environments for occupants/users, and reduce the environmental impacts of building construction and operations on future generations through means such as carbon-neutral design, bioclimatic design, and energy efficiency.
- B4. Site Design: Ability to respond to site characteristics such as soil, topography, vegetation, and watershed in the development of a project design.
• B5. Life Safety: Ability to apply the basic principles of life-safety systems with an emphasis on egress.

• B6. Comprehensive Design: Ability to produce a comprehensive architectural project that demonstrates each student’s capacity to make design decisions across scales while integrating the following SPC:
  o A.2. Design Thinking Skills
  o A.4. Technical Documentation
  o A.5. Investigative Skills
  o A.8. Ordering Systems
  o A.9. Historical Traditions and Global Culture
  o B.2. Accessibility
  o B.3. Sustainability
  o B.4. Site Design
  o B.5. Life Safety
  o B.8. Environmental Systems
  o B.9. Structural Systems

• B7. Financial Considerations: Understanding of the fundamentals of building costs, such as acquisition costs, project financing and funding, financial feasibility, operational costs, and construction estimating with an emphasis on life-cycle cost accounting.

• B8. Environmental Systems: Understanding the principles of environmental systems’ design such as embodied energy, active and passive heating and cooling, indoor air quality, solar orientation, daylighting and artificial illumination, and acoustics; including the use of appropriate performance assessment tools.

• B9. Structural Systems: Understanding of the basic principles of structural behavior in withstanding gravity and lateral forces and the evolution, range, and appropriate application of contemporary structural systems.

• B10. Building Envelope Systems: Understanding of the basic principles involved in the appropriate application of building envelope systems and associated assemblies relative to fundamental performance, aesthetics, moisture transfer, durability, and energy and material resources.

• B11. Building Service Systems: Understanding of the basic principles and appropriate application and performance of building service systems such as plumbing, electrical, vertical transportation, security, and fire protection systems.

• B12. Building Materials and Assemblies: Understanding of the basic principles utilized in the appropriate selection of construction materials, products, components, and assemblies, based on their inherent characteristics and performance, including their environmental impact and reuse.

• Realm C: Leadership and Practice

• C1. Collaboration: Ability to work in collaboration with others and in multidisciplinary teams to successfully complete design projects.

• C2. Human Behavior: Understanding of the relationship between human behavior, the natural environment and the design of the built environment.

• C3. Client Role in Architecture: Understanding of the responsibility of the architect to elicit, understand, and reconcile the needs of the client, owner, user groups, and the public and community domains.

• C4. Project Management: Understanding of the methods for competing for commissions, selecting consultants and assembling teams, and recommending project delivery methods.

• C5. Practice Management: Understanding of the basic principles of architectural practice management such as financial management and business planning, time management, risk management, mediation and arbitration, and recognizing trends that affect practice.
• C6. Leadership: Understanding of the techniques and skills architects use to work collaboratively in the building design and construction process and on environmental, social, and aesthetic issues in their communities.

• C7. Legal Responsibilities: Understanding of the architect’s responsibility to the public and the client as determined by registration law, building codes and regulations, professional service contracts, zoning and subdivision ordinances, environmental regulation, and historic preservation and accessibility laws.

• C8. Ethics and Professional Judgment: Understanding of the ethical issues involved in the formation of professional judgment regarding social, political and cultural issues in architectural design and practice.

• C9. Community and Social Responsibility: Understanding of the architect’s responsibility to work in the public interest, to respect historic resources, and to improve the quality of life for local and global neighbors.