INST 728Q - Visual Analytics

Syllabus

- **Course hours:** Thursdays 2:00pm-4:45pm
- **Room:** HBK 0109
- **Term:** Spring 2016
- **Instructor:** Dr. Niklas Elmqvist, Associate Professor of Information Studies
  - **E-mail:** elm@umd.edu
  - **Office:** HBK 2177H (second floor of the Hornbake building, South Wing)
  - **Office hours:** Thursdays 11am to 12pm (or by appointment)

Introduction

Visual analytics is the use of interactive visual interfaces to facilitate analytical reasoning. In essence, visual analytics is based on the—not uncontroversial—idea that humans and computers working alone are insufficient for the data challenges of today and tomorrow, and that effective synthesis of both humans and computational algorithms are needed to create human-in-the-loop systems. Thus, visual analytics bridges human-centered disciplines such as visualization and human-computer interaction with computation-centered disciplines such as machine learning, probabilistic methods, and knowledge discovery. The course contents will include both theoretical foundations of this interdisciplinary science as well as practical applications of integrated visual analysis techniques on real-world problems.

Overview and Course Goals

The format for the course will be group discussions of papers, lectures by the instructor, and hands-on exercises conducted by students in class. The grading will be based on participation...
in class, assignments, and class projects. Class projects may be done individually or in groups. Projects have the potential of leading to work that forms the basis of a master's thesis or a Ph.D. research topic. Through readings, discussions, and activities, students will establish an understanding of scientific, societal, and commercial aspects of visual analytics. Building on this understanding, upon successful completion of the course, students will be able to:

- Understand human aspects such as perception, cognition, sensemaking, critical thinking, and the analytical process.
- Understand computational aspects such as data management, data transformations, knowledge representation, probabilistic methods, and text analytics, etc.
- Synthesize knowledge from fields such as visualization, human-computer interaction, machine learning, knowledge discovery, and text analytics towards helping people understand data.
- Use existing visual analytics tools to analyze disparate datasets from intelligence, homeland security, public safety, business, sports, science, and news.

Grading
The course outcomes will be assessed through the following mechanisms:

- **Data assignment (10%)**: an assignment on data wrangling, scraping, cleaning, and curation using existing tools as well as customized scripts.
- **Research talk (10%)**: a 10-minute talk that you will give in class on an assigned research paper.
- **Class participation (15%)**: in-class activities such as design sessions, quizzes, and presentations by students.
- **Class project (55%)**: a semester-long visual analytics project organized as an intelligence/news/sports/business analysis game.

Class Project
The class project is a major part of the course. It is intended to emulate a complete research project, including the initial proposal and literature survey and all the way to the implementation, writeup, and presentation. Grade distribution will be assigned for all kinds of activities during the project, including reports, weekly briefs, logbook entries, collaboration, etc. See the [Game Handbook](#) (work in progress) for more details.

Class Schedule

<table>
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<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings &amp; Assignments</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1/28</td>
<td>Course introduction, overview, and review of visual analytics</td>
<td>Class project begins</td>
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<tr>
<td>2</td>
<td>2/4</td>
<td>Analytical Reasoning (intelligence analysis, critical thinking, situation awareness)</td>
<td>Analytical reasoning assignment</td>
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<tr>
<td>Week</td>
<td>Date</td>
<td>Topic</td>
<td>Activity</td>
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<td>3</td>
<td>2/11</td>
<td>Human Aspects (Cognition, perception, sensemaking)</td>
<td>Analytical reasoning assignment</td>
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<tr>
<td>4</td>
<td>2/18</td>
<td>Dara Aspects (representations, transformations, and statistics)</td>
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<tr>
<td>5</td>
<td>2/25</td>
<td>Visual Aspects (visualization, interaction)</td>
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<td>6</td>
<td>3/3</td>
<td>Data Wrangling</td>
<td>Data assignment</td>
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<td>7</td>
<td>3/10</td>
<td>Temporal Statistics</td>
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<td>8</td>
<td>3/17</td>
<td>SPRING BREAK</td>
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<td>9</td>
<td>3/24</td>
<td>Spatial Statistics</td>
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<td>3/31</td>
<td>Machine Learning</td>
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<td>4/7</td>
<td>Text Analytics</td>
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<td>4/14</td>
<td>Production, Presentation, Dissemination</td>
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<td>4/21</td>
<td>Evaluation</td>
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<td>Advanced Topics</td>
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<td>15</td>
<td>5/5</td>
<td>Final Presentations</td>
<td>Final Presentations</td>
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**Syllabus Change Policy**
This syllabus is a guide for the course and is subject to change with advance notice.

**Academic Integrity**
Academic dishonesty is a corrosive force in the academic life of a university. It jeopardizes the quality of education and depreciates the genuine achievements of others. Apathy or acquiescence in the presence of academic dishonesty is not a neutral act. All members of the University Community - students, faculty, and staff - share the responsibility to challenge and make known acts of apparent academic dishonesty.

Students have a responsibility to familiarize themselves with violations of the Code of Academic Integrity. Among these include:

- **Cheating:** "Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise."
- **Fabrication:** "Intentional and unauthorized falsification or invention of any information or citation in an academic exercise."
- Facilitating Academic Dishonesty: "Intentionally or knowingly helping or attempting to help another to commit an act of academic dishonesty."
- Plagiarism: "Intentionally or knowingly representing the words or ideas of another as one's own in an academic exercise."

For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

Students with Disabilities
The University is legally obligated to provide appropriate accommodations for students with disabilities. The campus' Disability Support Services Office (DSS) works with students and faculty to address a variety of issues ranging from test anxiety to physical and psychological disabilities. If a student or instructor believes that the student may have a disability, they should consult with DSS (4-7682, email dissup@umd.edu). Note that to receive accommodations, students must first have their disabilities documented by DSS. The office then prepares an Accommodation Letter for course instructors regarding needed accommodations. Students are responsible for presenting this letter to their instructors.

Attendance Policy
University policy excuses the absences of students for illness, religious observances, participation in University activities at the request of university authorities and compelling circumstances beyond the student's control. Students who miss a single class for a medical reason are not required to provide medical documentation, but students who are absent more than once are responsible for providing various forms of documentation, depending on the nature of the absence.

Extensions
If you have to miss a deadline, you should inform the instructor as soon as possible, indicating when you will submit your work. The instructor will try to accommodate your needs. You should use this clause only for extraordinary personal reasons (e.g., personal illness, death in the family, etc.). The general policy is that late work will be deducted 20% of its total grade per calendar day, starting on the same day it is due. It is at the instructor's discretion to accept late work and assign late penalties.

Emergency Preparedness
See the following URL: http://www.umd.edu/emergencypreparedness/

Course Evaluation
Course evaluations are a part of the process by which the University of Maryland seeks to improve teaching and learning. The University Senate approved the implementation of a standard, online, University-wide course evaluation instrument. Each course evaluation contains a set of universal questions, and some are supplemented by questions from specific colleges.
Students who leave no "Pending" evaluations in their Evaluation Dashboard each semester can view the aggregate results of a sub-set of universal items online. Across the University, course evaluations are being administered through a web-based system dubbed CourseEvalUM. All information submitted to the Evaluation System is confidential. Instructors and academic administrators can only view summarized evaluation results after final grades have been submitted. Instructors and academic administrators cannot identify which submissions belong to which students. This standardized set of evaluation results provides the University with useful information on teaching and student learning across the campus.

For additional info see Student Fast Facts at https://www.irpa.umd.edu/Assessment/CourseEval/stdt_faq.shtml