Course Overview: This course will equip you with foundations and techniques for visual understanding of Big Data. The course will cover recent advances in many-core and multi-core processors, displays, and interaction tools as they impact visual computing for big data. We will also survey long-standing foundational principles of human perception, sampling and filtering, multiresolution techniques, and visual knowledge discovery techniques. We will study case studies from a variety of application domains, such as the life sciences, finance, ecology, GIS, and social networks to understand solutions that have worked in the past in transforming massive datasets into meaningful visual representations that are easy to understand and communicate.

Lectures: Tuesdays 2:00pm – 4:45 pm AVW 2119

Professor: Amitabh Varshney, 2119 AVW, (301)405-6722, varshney@umiacs.umd.edu.

Office hours: By appointment. For an appointment, just drop by my office, or call my assistant Edna (5-6722), or send her an email (edna@umiacs.umd.edu) and we can fix up a time.

Texts: There is no textbook for this course but papers and weblinks will be posted on the class webpage

Prerequisites: One course in graphics, visualization, or HCI at grad or undergrad level.

Grading: Presentations: 20%, Midterm: 20%, Project: 30%, Final Exam: 30%

Final Exam: Final Exam will be 10:30am – 12:30pm on Wednesday, May 15

Academic Conduct: I expect high standards of professional conduct and ethics. All work that you submit in this course must be your own or approved in advance by the instructor.

Qualifying course for MS and PhD: This course will count towards PhD and MS qualifying coursework in the Visual and Geometric Computing area. The MS comprehensive course grade will be based on midterm and final exams (in the 40-60 ratio specified above).
Course Plan

Overview
Jan 24       Visual Computing Pipeline and Big Data Challenges
Jan 29   Visual Knowledge Discovery

Foundations
Jan 31   Perception and Saliency
Feb 5    Processor Advances: CPUs and GPUs
          Displays and Cameras
Feb 12    Scientific Visualization
          Information Visualization
Feb 19   Sampling and Filtering

Techniques
February 26  Project proposal presentations, reports, and web pages
             Project critiques and discussion
Mar 5       Interaction for Visualization   (sample midterm handed out)
             Multiresolution Techniques
Mar 12   Clustering
Mar 14    **Midterm Exam**
Mar 19 and 21 **Spring Break**
Mar 26   Data Analytics
Mar       Cache/Memory-aware Visualization

Applications
Apr 2   Meshes, Graphs, and Network Layouts
        Streaming Data: Financial, Ecological, Network, Sensors
Apr 9   Astronomical Data Visualization: Ross Adelman
        Cell Imaging: Justin Wagner
Apr 16  Bioinformatics Visualization: Mahfuza Sharmin
        Point clouds and Laser scanning: Gregory Kramida
Apr 23   GIS Visualization: Hsueh-Chien Cheng
        Climate simulations
Apr 30   Text Visualization
        Social Network Visualization: Jonas Martinsson
May 7    **Project Presentations and Final Project Report**
        Course Wrap-up
May 15   **Final Exam**, Wednesday, 10:30am – 12:30pm