Master of Business Analytics

BAX431 Data Visualization
Fall 2017 Syllabus

Part 1: Course Information

Instructor Information

Instructor: Yifan Lu, Ph.D.
Office Hours: Mondays 5-6 pm
E-mail: yifanlu@gmail.com

Course Description

In order to derive useful business intelligence, students learn the purpose and methods of data visualization necessary to obtain preliminary insights while exploring large and multi-dimensional data. The course covers visual artifacts including standard formats (such as histograms, boxplots, geo-data visualization, charts, and dashboards), and specialized visualization formats (such as network analysis, heat map, word clouds, tree mapping, and dendograms), and implementation and computational aspects of these using visualization tools (such as in R, Python, Tableau, D3.js and other).

Prerequisite

Basic R programming

Textbook & Course Materials

Required Text

- **Show Me the Numbers**, 2nd Edition, Stephen Few, ISBN 9780970601971

Recommended Texts & Other Readings (via handouts)

- The Visual Display of Quantitative Information, 2nd Edition, Edward Tufte, ISBN 9781930824133
- Storytelling with Data, Cole Nussbaumer Knaflic, ISBN 9781119002253
- Information Dashboard Design, 2nd Edition, Stephen Few, ISBN 9781938377006

Course Software Requirements

R studio and ggplot2 package

Tableau v10

Course Structure

This course will be interactive and focuses on hands-on experience, therefore each session will have both theory lecture led by instructor, and a practical lecture consists of lab, discussion, students presentation etc. This course has five sessions and each session emphasizes on a key topic in data visualization.

Class Courtesy:

- Attendance will be taken every class. If you miss 4 hours or more during the quarter, you won't receive a grade higher than B for the class
- No make-up quiz, assignment or project will be organized
- Arrive on time

If you cannot be in class at the beginning of the lecture, wait until the break to enter the class

- No texting
- It is expected that all class members will treat each other with respect and dignity

Part 2: Student Learning Outcomes

In this course, instructor will lay out theories in the field of data visualization to build a good foundation of data visualization. Practical techniques and tools then are added to the class to ensure students gain hands-on experience. Finally, instructor will teach two most commonly used skills in industry: dashboarding and story-telling. Students will be equipped with both theories and skills to create effective visualizations after completing this course.

From 5 modules that instructor designed for this course, students will gain a good understanding of

1) Importance of effective visuals and types of visuals in business analytic process;

2) Different data visualization techniques and how they are used;

3) Data visualization toolset;

4) Dashboard;

5) Story-telling with data visualization

You will meet the objectives listed above through a combination of the following activities in this course:

- Attend all sessions
- Complete project assignments
- Participate in-class discussion and student projects

Part 3: Topic Outline/Schedule

Module 1:
Topic: Effective visuals in business analytics
Reading: *The Visual Display of Quantitative Information* by Edward Tufte; *Show Me the Numbers* by Stephen Few
Theory lecture: Introducing theories in data visualization; Choosing an effective visual; types of different visuals: scatterplot; boxplots; histogram; bar charts; visuals to be avoided: pie charts, donut charts; 3D charts. Students learn how to critique and improve an ineffective visual
Practical Lecture: Setting up R and ggplot2; get familiar with the first dataset; create visualizations such as scatterplots to understand data.
Individual Assignment 1: Students get familiar with R by working on a given dataset; students are able to use ggplot2 to add different layers to see how data visualization changes. This is assignment 1.

Module 2:
Topic: Exploratory visualization and explanatory visualization;
Reading: sections from *Storytelling with Data* by Cole Nussbaumer Knafilc; *Show Me the Numbers* by Stephen Few
Theory lecture: The difference between exploratory and explanatory data visualization; give examples on when to use one type of visualization vs. the other;
Practical Lecture: Give students a specific business question and a dataset; divide students into groups to run some descriptive analyses and present using both exploratory and explanatory techniques.
Group Assignment 1: Students refine their work including analyses and visualizations from practical lecture. Then they work with their teammates to make a report. They are required to present their work at next class. Students learn how to use Github as repository and version control tool. This is a group assignment.

Individual Assignment 2: Students choose a data visualization tool and research the followings and write a one-page report:

- Name of the tool
- Pricing
- Best use in (Web application, GIS, generic…)
- Skills required
- An example (you can show an example of existing visuals done by this tool)

Module 3:
Topic: Common data visualization toolset; common techniques for different types of data.
Reading: readings about different data visualization tools other than R: Python, D3.js, Tableau, Gephi and Google Charts; Review chapter 6 from Show Me the Numbers by Stephen Few
Quiz on chapter 6 from Show Me the Numbers by Stephen Few
Theory lecture: Discuss current data visualization tools; review characteristics of different data types and what visualization techniques should be used to display information from these types of data
Practical Lecture: Students presentation of their work from last assignment. This is a group assignment 1.
Individual Assignment 3: Students choose one data visualization tool other than R to practice creating visuals, using the same data set from Module 1.

Module 4:
Topic: Dashboard
Reading: Information Dashboard Design: Displaying Data for At-a-Glance Monitoring by Stephen Few
Theory lecture: Learn approaches to construct metrics and using dashboard to track metrics; common dashboard tools such as Tableau and other BI tools (Microstrategy, Cognos, Lumira, etc)
Practical Lecture: Learn how to use Tableau to create a dashboard to display metrics
Individual Assignment 4: Students are given a business problem and a dataset, and they are required to create metrics that make business sense then display them on a dashboard. This is assignment 4.

Module 5:
Topic: Storytelling
Reading: Chapter 7 and 8 from *Storytelling with Data* by Cole Nussbaumer Knafilc; Chapter 13 in Show Me the Numbers by Stephen Few
Theory lecture: Think about audience when communicate findings and make recommendations; learn to find stories from data and tell stories. Strategies for effective story telling such as power of repetition, narrative flow, and various tactics to ensure story comes across from data communications.
Practical Lecture: Give students a business problem and a new dataset. Ask students to apply what they learned from this course to tell a story and make recommendation.
Final Project: Continue working on story telling presentation from practical lecture. Their work product is a project for final.

Final Presentation on Dec 16 3-5pm to present the final project.

BAX431 Data Visualization
Fall 2017 Syllabus

Part 4: Grading Policy

Graded Course Activities

Points	Description
40	Individual assignments
20	Group assignment
10	In class quiz
30	Final project
100	Total Points Possible

Students are expected to be prepared for class by complete assigned readings and assignments, and are expected to participate in class discussions and group exercises.

Late Work Policy

Be sure to pay close attention to deadlines—there will be no make up assignments or quizzes, or late work accepted without a serious and compelling reason and instructor approval.