ISM 646: Visualizing Data to Design Strategy

Spring 2019

Instructor Information

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Catalog Description

Data are analyzed to answer questions. Students are exposed to concepts and techniques to understand analytics results and appropriately infer relationships to answer questions and visualize results using contemporary techniques.

Student Learning Outcomes

Upon successful completion of this course students will be able to:

1. Analyze business problems to evaluate and design effective visualization strategies
2. Develop effective visualizations using contemporary software applications.
3. Apply principles of effective data visualization to inform problem solving strategies.
4. Implement visualization strategies for problem solving.
5. Evaluate visualization techniques and applications for problem solving.
6. Synthesize technical and organizational requirements for effective problem solving using data visualization strategies.

Required Materials:

Books:

While you are not required to buy any specific textbooks for the course, the following books available for you to download in the library as eBooks. They will be used as text books for the course. I encourage you to download and review these books. The first two are text books and provide perspective on design strategies for information visualization. The second two are essentially professional guides to help you learn the two main software tools (Tableau and R) that we will use to build visualization solutions and interpret results to design problem solving strategies.

The first two books (i and ii) provide study material to guide your understanding of data visualization as a means of exploring and communicating information.

Books iii and iv are technology-specific professional references for the two primary technology platforms that we will work with in this course – Tableau and R. Please note that there are

multiple books, guides and references available for both Tableau and R. My choice of text reflects my desire to manage the cost of textbooks, while maintaining the quality of materials. I encourage you to explore alternative, and perhaps more current, resources for Tableau and R that are readily available on the web and find what work for you. Please share your finds and preferences with the rest of the class.

  i.   Knaflic, C. N., (2015) *Storytelling with Data: A data visualization guide for business professionals.* John Wiley and Sons, Avaialble at: https://onlinelibrary-wiley-com.libproxy.uncg.edu/doi/book/10.1002/9781119055259

  ii.   Yau, N. (2013) *Data Points: Visualization that means something*. John Wiley and Sons, Available at: https://ebookcentral-proquest-com.libproxy.uncg.edu/lib/uncg/detail.action?docID=1158630

  iii. Milligan, Joshua N.. (2015) *Learning Tableau,*. ProQuest Ebook Central, Packt Publishing Ltd, 2015 available at: https://ebookcentral-proquest-com.libproxy.uncg.edu/lib/uncg/detail.action?docID=2037694

  iv.   Fischetti et al. (2016). *R Data Analysis and Visualization*. (Available at: https://proquest-safaribooksonline-com.libproxy.uncg.edu/9781786463500)

Canvas Learning Management System:
UNCG Canvas is available at https://canvas.uncg.edu. Course materials, announcements and updates will be posted on Canvas regularly. I request you to check daily.

Development Environments
We will Tableau (https://www.tableau.com/) and R as tools in this course. I do not expect you to have any prior experience with Tableau or R.

Tableau is available for students as a free download at https://www.tableau.com/academic/students. I will provide access keys and a guide to downloading and installing Tableau for you in canvas and via email.

We will use R Studio (https://www.rstudio.com/) to design and develop analytics and visualizations in R. R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing. R Studio is a code editor and development environment that helps you develop R software and visualizations.

At the end of the course, depending on time and progress, we will also briefly cover other visualization technologies such as SAS Enterprise Guide or PowerBI or D3. SAS EG is available to you as part of the university license with SAS. PowerBI is the Microsoft Business Intelligence product. D3 (data-driven documents) is an open-source JavaScript library that makes use of SVG, HTML, and CSS to create visual representations of data.

You will get specific instructions on how to download and use all the software tools in canvas and over email.

Magic Quadrant

Figure 1. Magic Quadrant for Business Intelligence and Analytics Platforms

Source: Gartner (February 2015)

Additional Resources

In learning to develop data visualizations to solve problems, we use books as references and software as tools to solve problems. This is different from the traditional use of books as text books and single software environments – the idea is not to learn the tool, but to use the tool to solve problems. Tools change with time; the principles and ideas do not - this is the focus of the course.

There are multiple resources that you should become aware of and familiar with, that will help you learn the tools and get a better understanding of the environments:

1. Learning Tableau: https://www.tableau.com/learn
2. R Studio Resources: https://www.rstudio.com/resources/
3. Towards Data Science: https://towardsdatascience.com/interactive-data-visualization-with-d3-js-43fc3428a27e

These will give you examples, complete code as well as documentation and step-by-step guidance on how to build and *play with* applications.

Developing visualization is like solving puzzles. The same person may take 2 hours or 20 hours to solve the same problem. My advice to you is – *don't get stuck and don't get frustrated.* I am here to help you learn and master the material. In addition, multiple resources are available for you to view, learn from and adapt into your own solution. We don't need to re-invent the wheel – we simply need to see how other wheels work in other vehicles and learn from them enough to adapt them into your own.

When (not if) you get stuck, please ask. Ask questions and learn from the multitude of resources available. There will *never* be a *right* answer or an exact solution for you are looking for, but discussion communication and online resources will help you find solutions that you can use and solution that you can adapt to find your answer.

The overall learning philosophy of the course follows a process of *Discovery Learning* (https://www.learning-theories.com/discovery-learning-bruner.html) In discovery learning, you learn by asking questions, by seeing and doing so you can discover the solution to your own problem. You explore and manipulate possible paths and solutions and build your experience to discover processes and answers. Most of the time, the process you engage and the information you seek and assimilate is the most valuable lesson you learn.

We follow a *Problem-based Learning* (https://en.wikipedia.org/wiki/Problem-based_learning) approach in this course. There is much joy in solving problems. Many times, one begins to feel that the problem is impossible – it is not. Non-trivial problems are challenging – they require your diligence and creativity. Think about when you were learning to ride a bicycle or learning to swim – they seemed impossible and frustrated you till things began to fit together and you felt great that you accomplished the seemingly impossible task – application development is like that. It seems impossible till you get it and then it seems easy in hindsight and it's a lot of fun – please have fun and as you learn – I require it.

Evaluation and Grading

Assignments:

Designing and developing problem solving strategies constitute a significant aspect of your skill development in this course. Much of this is accomplished through discovering solutions as you solve problems presented in your assignments. Assignments, therefore, are an integral part of your learning in the course.

Students are required to complete each assignment and submit them on time. All assignments will be due at 11:59 pm on the assigned due date. Assignments submitted after their due dates may be accepted with penalty based on valid reasons and documented cause, following discussion with the instructor.

Materials in subsequent assignments often build on previous ones. Delayed submission, therefore, have a carry-over effect. Please make every possible effort to stay on time with your assignments.

Participation

Student are expected to regularly discuss their progress in the course and participate in discussions using WebEx and the topic/assignment specific discussion boards on canvas.

Exams

We will have a mid-term and a final exam. We will go over more information about the exams as the semester progresses.

Grades

Course grades will be based on the following:

Assignments	40 %
Class Participation	5 %
Midterm Exam	20 %
Final Exam	35 %
Total	100

The following grading scale will be applied to calculate your final letter grade based on the total grades you earn.

A	A-	B+	B	B-	C+	C	F
93-100%	90-92%	87-89%	83-86%	80-82%	77-79%	70-76%	< 70%

Topics and Tentative Schedule

This schedule is tentative.

Modification and adjustment may be required during the semester. You will be notified on any changes on canvas. More details will be provided regarding specific due dates and times on canvas.

Week	Topic	Deliverables
Week 1:	Orientation and Introduction	
	Understanding the nature of data and data analytics	
	Appreciating the need for effective data visualization.	
Week 2:	Building your first Visualization	
	Tableau Fundamentals. Working with Data.	
Week 3:	Working with Data and Aggregations. Building charts and dashboards.	
Week 4:	Formatting Table data and building data visualization.	
Week 5:	Telling stories with data – advanced visualizations	
Week 6:	Advanced Visualization, live data and Presenting Visualizations	Assignment 1
Week 7:	Fundamentals of R	
Week 8:	Assignment 2 Midterm Exam	
Week 9:	Fundamentals of R (continued)	
Week 10:	Analytics with R.	
Week 11:	Building Visualizations with R.	Assignment 2
Week 12:	Visualizing Analytics with R	
Week 13:	Dashboards and advanced visualization with R and other technologies.	
Week 14:	Building Visualizations with contemporary analytics technologies.	
Week 15:	Putting it all together – Solving Problems and informing strategies with Visualization.	Assignment 3
	Final Exam: Details TBA – follow university schedule	

Additional Information

Attendance Policy:

It is the student's responsibility to attend class and to participate in class discussions. It is the student's responsibility to stay on track with readings and assignments to be successful in the course.

Canvas:

You must check your Canvas course regularly. I may send email updates or add new info on Canvas on an ongoing basis. You will be responsible for any information or announcements provided to you through email and for any updates on Canvas.

e-Mail:

- Always include a subject line.
- Remember without facial expressions some comments may be taken the wrong way. Be careful in wording your emails. Use of emoticons might be helpful in some cases.
- Use standard fonts.
- Do not send large attachments without permission.
- Special formatting such as centering, audio messages, tables, html, etc. should be avoided unless necessary to complete an assignment or other communication.
- Respect the privacy of other class members

Netiquette:

The same guidelines that apply to traditional classes should be observed in the virtual classroom environment. Please use proper netiquette when interacting with class members and the professor.

Policy on Server Unavailability or Other Technical Difficulties:

The university is committed to providing a reliable online course system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will extend the time windows.

What you need to take this course:

1. Textbooks, Tableau and RStudio.
2. You must have access to a computer that connects to the Internet. The course materials are only accessible online by logging in to canvas.uncg.edu - your student identification number is required. If you do not own a computer, the computer labs on campus will be open during this semester.
3. You must have a working e-mail account. Your first assignment will be to update your e-mail address on the course Web site. Instructions are online at canvas.uncg.edu - you must log in to see the course materials.
4. Because of e-mail viruses, you must use the subject ISM 646 and your full name typed in the message, or the e-mail may be ignored.
5. If you have questions, please do not respond to a Canvas Announcement, rather send me a direct email.
6. You must check your e-mail account regularly throughout the semester. Official announcements will be made by e-mail, and on the course Web site at canvas.uncg.edu.
7. You are responsible for saving all assignments correctly, so you can turn them in electronically. You should be comfortable using word processing software, programming software and have

reasonable keyboarding skills. No assignments will be accepted in handwritten form.

8. Supplies: Although you will be publishing (uploading) your assignments, it's a good idea to keep copies of everything.

Academic Integrity Policies:

Students in the Bryan School must conform to all existing principles found in UNCG's Academic Integrity Policy and the Student Code of Conduct. Further details may be found at the following site: http://sa.uncg.edu/handbook/

Expectations of Faculty and Students in the Bryan School:

Students should read the Guidelines for Faculty and Students presented on the web pages found at: http://bryan.uncg.edu/wp-content/uploads/2012/08/faculty_student_guidelines.pdf

A note about learning:

Students learn best in quite different ways. One of the advantages of the online format of the course is that it allows students to approach the course in ways that suit their personal styles and preferences. In classrooms, instructors are inclined to teach either as they themselves were taught, or as they think "the average student" prefers. Online, all of the instructor-presented class material is laid out at once, and students can do with it whatever they prefer in order to learn in as personal and unique a fashion as possible.

To understand how you might learn best and how you might approach the course, it's suggested that you complete a learning style inventory, use the information given to figure and interpret your score, and plan your learning strategy accordingly. Another couple of online tools of this sort are the Keirsey Temperament Questionnaire (http://www.keirsey.com/sorter/register.aspx) and the Keirsey Character Questionnaire (http://www.keirsey.com/).

This course by design specifically accommodates different learning styles by involving a variety of components, including text, video clips, self-check quizzes, reference lists, online discussion, blogs and wikis. Since you are probably used to learning more or less as prescribed or required by a classroom teacher and are not used to designing your own learning strategy, it might take a little time to do that and to settle into a comfortable routine. I think you'll find that as you figure out on your own (and with the help of the online questionnaires mentioned) how to learn the material, everything will fall into place. Online learning, you will find, is quite different than classroom learning. It requires different attitudes, responsibilities, and communication skills.