PA 5929: Data Visualization  
Course Syllabus - Spring 2018

Course Name: PA 5929 — Introduction to Data Visualization: Telling Stories with Numbers
Instructor/Contact: Geoff Maas / maas0021@umn.edu / 763.772.4287
Classroom: HHH 85 (Computer Lab);  
Time: 6:00 – 8:45 pm, Mondays;  
Office Hours: 8:45 pm – 10:00 pm (HHH 85) – Mondays directly after class and lab  
Credits & Format: 1.5 credits / Lecture and Lab;  
Pre-Requisites: Enrollment preference is given to Humphrey students

Course Introduction: Presenting information is a crucial skill for professional development in the work of urban planning, public policy and public health. Whether working in a small non-government organization (NGO) or large federal agency, students will need to be able to clearly present information to a wide variety of audiences during their career.

Being able to summarize data and create accurate, attractive and compelling summaries and visualizations is as valuable as good writing. An effective figure or table adds authority and clarity to its accompanying research. Data visualizations are a potent and effective tool for reaching audiences in the public policy realm and beyond.

This course is for for assisting Humphrey students Capstones and Professional papers, but most importantly, as a practical tool for your career development. The course endeavors to teach you how to organize and present data effectively. The lectures will explore some of the theories and elements of graphs and tables design, but emphasis will be on learning how to actually create tables, graphs and to organize data.

Course Goals: The central goal of the course is to provide Humphrey students with the tools for communicating information in an intelligent, effective and persuasive way. Upon completion of the course, students should be able to:

- Determine which types of statistical measures are most effective for each type of data and message;
- Understand and be able to deploy core concepts in of design, layout, typography and color to maximize the impact of their data visualizations;
- Determine which types of design to use for communicating quantitative information;
- Design graphs and tables that are intelligent and compelling for communicating quantitative information; and
- Understand different types of information, and how to use and communicate data effectively.

Course Description: The class will combine lecture, in-class lab work and weekly assignment. Classes will begin with a lecture period to introduce topics with relevant visual examples. Emphasis will be on ‘hands on’ work with the software so students can work with and explore data to complete the assignments and relate their skills to their own research interests.
Recommended Texts and References:

*) The Chicago Guide to Writing about Numbers, Second Edition
Jane E. Miller, University of Chicago Press, 2015

*) Show Me the Numbers: Designing Tables and Graphs to Enlighten
Steven Few, Analytic Press, 2012 (Either 1st or 2nd Edition)

*) Data at Work: Best practices for creating effective charts and information graphics in Microsoft Excel


Software and Logistics:

We will be using the software packages Microsoft Excel, Tableau and Adobe Illustrator. In the Humphrey Computer Lab 85, we will be working from the “T:” Drive (or comparable drive). There are two sub-directories on this drive containing the data resources and workspaces for the course:

PA5929_maas0021_Data contains the data sets to be used in the assignments as well as the general course materials, syllabus, readings, handouts and assignments.

PA5929_maas0021_Students contains the ‘workspace’ for the course. A group of subfolders, one for each student (labeled with their x500 ID), provides each student with a private workspace. The instructor has access to each student’s workspace as well, and may—from time to time—copy data directly into a student’s folder as needed. Students will place their final assignment submittals in the ‘Students’ folder.

Moodle. Course materials will also be published on the Moodle site including readings and instructions for assignments and in-class lab exercises.

Food and drink are not permitted at the workstations in the lab to protect the equipment from damage.
**Evaluation:** Students will be evaluated based upon performance of the following:

- Class attendance and In Class Exercises (14% of grade)
- A series of five Assignments (6 assignments, 14 points each: 72% of grade);
- A final report and presentation (15 points, 14% of grade)

For their final project, students are encouraged to choose a planning or public policy topic or to research that aligns with their area of interest. The instructor will provide guidance early in the course for helping students to shape, define, refine and begin their final project. Students will be expected to present their final project concept to the class at the end of the term.

**Attendance Requirements:** As PA 5929 has both a lecture and lab component, attendance is important to the student’s success in the course. The instructor has each student initial a course roster at the beginning of each class period and students receive full points for attendance (1.75 points). Students will receive partial points (0.5 points) for excused absences (by contacting the instructor prior to the class meeting via phone or email) so long as their assignments are submitted in a timely fashion. Students receive no points for being absent (0.0 points). As noted above in Evaluation section above, attendance is an integral part of Class Participation and forms 14% of the final grade for the course.

**Extra Credit:** No extra credit options are available for PA 5929. Grades are specifically based upon attendance, completion of in class labs, assignments and the final project submittal.

**Late Work:** The student may arrange with the instructor for handling situations where timing or scheduling prohibits a student is unable to submit an assignment on its scheduled due date. The instructor encourages the students to be pro-active and contact the instructor as early as possible if known schedule conflicts are anticipated. Instructor reserves the right to reduce points awarded for complete work that is turned in after the posted assignment deadline.

**Mid-Term and Final Exam:** There are no exams in PA 5929.

**Student Academic Integrity and Scholastic Dishonesty:** Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else’s work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

*Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging , or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask.*

The University of Minnesota’s Office for Student Conduct and Academic Integrity’s website contains the University’s policies and procedures on conduct and disciplinary actions: [www.oscai.umn.edu](http://www.oscai.umn.edu)
**Student Conduct Code:** The University seeks an environment that promotes academic achievement and integrity, and protects free inquiry and which serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community. As a student at the University, you are expected to adhere to Board of Regents Policy: **Student Conduct Code.** To review the Student Conduct Code, please see: [http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf)

Note that the conduct code specifically addresses disruptive classroom conduct, which means “*engaging in behavior that substantially or repeatedly interrupts either the instructor’s ability to teach or student learning*.” The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities.

**Makeup Work for Legitimate Absences:** Students are not penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances.

Such circumstances do not include voting in local, state, or national elections. For complete information, please see: [http://policy.umn.edu/education/makeupwork](http://policy.umn.edu/education/makeupwork).

Students are encouraged to be proactive and contact the instructor as early as possible (in person, via email or via phone) if they anticipate needing to miss a scheduled class period.
PA 5929 Class Schedule and Assignments – Spring Semester 2018

Please note, this schedule is a general framework. The instructor will adhere to this general schedule, but reserves the right to modify the schedule to best present the material and instruct the students and to respond to new topical ideas, student interest and technological developments which may enhance the course.

Week 1: Monday, March 19

- **Introduction to Data Visualization & Speaking and Writing about Numbers**

  **Lecture 1:** Course Introduction  
  Terms, Concepts, Context and Examples  
  Writing About Numbers

  **In Class 1:** Thinking and Writing about Numbers: Employment and Gender in Norway

  **Assignment 1:** Working with Excel - Basic Graphics Functions

Week 2: Monday, March 26 (Assignment 1 is due)

- **Human Cognition and Data Visualization Pioneers**

  **Lecture 2:** Human Cognition & Data Visualization Pioneers

  **In Class 2:** Working with Pivot Tables & Slices

  **Assignment 2:** Working with Excel - Dual Y-Axis Graphs: Minneapolis Climate Data

Week 3: Monday, April 2 (Assignment 2 is due)

- **Organizing Data, Summary Measures and Color Theory**

  **Lecture 3:** Organizing data, summary measures and color theory

  **In Class 3:** Downloading and massaging data exercise (.csv)

  **Assignment 3:** Working with Excel:  
  Data Clean-Up Techniques – Prepping Data for Graphing and Charting  
  Organizing data and finding patterns using data analysis techniques;
Week 4: **Monday, April 9 (Assignment 3 is due)**

- **Best Practices for Layout and Design & Use of Tables**

- **Lecture 4:** Best Practices for Layout and Design & Use of Tables
  - When to use graphs and tables; adding text for context
  - Representing categories; working with multiple variables

- **In Class 4:** Table Design Exercise

- **Assignment 4:** Part-To-Whole Chart Design

Week 5: **Monday, April 16 (Assignment 4 is due)**

- **Lecture 6:** Bar Chart Best Practices
  - Illustrations

- **In Class 6:** Bar Chart Design

- **Assignment 6:** Hawaii’s Energy Profile Data: Working with Adobe Illustrator

Week 6: **Monday, April 23 (Assignment 5 is due)**

- **Working with Bar Charts & Illustrations as Data Visualizations**

- **Chart types:** Working with 3D graphs, pie charts; best practices for scatter plots

- **Lecture 5:** Graphs to Enlighten
  - Problems with 3D figures and pie charts
  - Best Practices working with scatterplots and line graphs

- **In Class 5:** Intro to Tableau:
  - Working with Scatter Plots - European Union Status data

- **Assignment 5:** Working with Tableau:
  - Inter-War Era Housing in England and Wales, 1919-1939
Week 7: Monday, April 30 (Assignment 6 is due)

- The ‘Process’ Graphic – Turning descriptions into graphics

  Lecture 7: The Process Graphic: Illustrating and communicating a complex process
  Visualizing narrative information

  In Class 7: Process Graphic Exercise: National Environmental Policy Act process

- Course Evaluation

Use of Personal Electronic Devices in the Classroom: Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: http://policy.umn.edu/education/studentresp.

Scholastic Dishonesty: You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Student Conduct Code:
If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: http://policy.umn.edu/education/instructorresp.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty:
http://www1.umn.edu/oscai/integrity/student/index.html.

If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class—e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.
**Appropriate Student Use of Class Notes and Course Materials:** Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: [http://policy.umn.edu/education/studentresp](http://policy.umn.edu/education/studentresp).

**Grading and Transcripts:** The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.000 – Represents achievement that is outstanding relative to the level necessary to meet course requirements</td>
<td>4.000</td>
</tr>
<tr>
<td>A-</td>
<td>3.667</td>
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<tr>
<td>B+</td>
<td>3.333</td>
<td></td>
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<tr>
<td>B</td>
<td>3.000 – Represents achievement that is significantly above the level necessary to meet course requirements</td>
<td>3.000</td>
</tr>
<tr>
<td>B-</td>
<td>2.667</td>
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<tr>
<td>C+</td>
<td>2.333</td>
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</tr>
<tr>
<td>C</td>
<td>2.000 – Represents achievement that meets the course requirements in every respect</td>
<td>2.000</td>
</tr>
<tr>
<td>C-</td>
<td>1.667</td>
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<tr>
<td>D+</td>
<td>1.333</td>
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<tr>
<td>D</td>
<td>1.000 – Represents achievement that is worth of credit even though it fails to meet fully the course requirements</td>
<td>1.000</td>
</tr>
<tr>
<td>S</td>
<td>Represents achievement that is satisfactory, which is equivalent to a C- or better</td>
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For additional information, please refer to: [http://policy.umn.edu/education/gradingtranscripts](http://policy.umn.edu/education/gradingtranscripts).

**Sexual Harassment** "Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: [http://regents.umn.edu/sites/regents.umn.edu/files/policies/SexHarassment.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/SexHarassment.pdf).

**Equity, Diversity, Equal Opportunity, and Affirmative Action:** The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: [http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity EO AA.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity EO AA.pdf).

**Disability Accommodations:** The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations. If you are registered with DS and have a current
letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course. For more information, please see the DS website: https://diversity.umn.edu/disability/.

**Mental Health and Stress Management:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: http://www.mentalhealth.umn.edu.

**Academic Freedom and Responsibility, for courses that involve students in research:**
Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom and conduct relevant research. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.* When conducting research, pertinent institutional approvals must be obtained and the research must be consistent with University policies. Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.