Course Title: Special Topics in Data Science
         – Big Data in Social, Behavioral, and Health Sciences (BINF-667)
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Description of the Course

Empowered by the advances in information technology, Big Data such as social media and electronic health records, present unprecedented opportunities for social, behavioral, and health sciences. This emerging field has generated innovative ways of collecting data, developed cutting edge analytical and statistical techniques, and provided novel approaches of visualizing and presenting information. The objective of the course is to familiarize students with big data analysis as a tool for addressing substantive research questions in social, behavioral, and health sciences.

Learning Objectives

- Students will **understand the opportunities and challenges** that the digital and data science age creates for social, behavioral, and health research.
- Students will **evaluate research** from the perspectives of both data science and social, behavioral, and health.
- Students will **develop research proposals** that blend ideas from data science and social, behavioral, and health.
- Students will **practice the techniques** needed to actually conduct proposed research (optional).

Required Textbook

Salganik, M. J. (2017). *Bit by bit: Social research in the digital age*. Princeton University Press. *Note*. Free digital copy available online.

Computational Tools

R packages for statistical analysis and visualization

Course Requirements

1. **Readings, Reaction Paragraphs, and Discussion**. Students are expected to actively engage in the weekly readings and provide thoughtful critiques. Students will provide short paragraphs of critique for the reading assignments of the week. Students will also comment on each other's critiques on the discussion board.

2. **Outline of Research Proposal and Peer Review**. Students will submit an outline of a research proposal of how big data analytical tools could be applied to research topics of interest to you. Students will also provide peer review to two classmates' proposal outline.

3. **Final Research Proposal**. At the end of the semester, students will submit a full version of the research proposal.

Critique of Readings

Students are expected to read papers thoroughly for each class, and raise at least one question/comment related to each paper. For empirical papers, questions that have the potential to lead to future empirical studies are preferred. For each question/comment, students should write a short paragraph to elaborate your point. Meaningful and productive discussion follow only if everyone has completed the readings thoroughly and thoughtfully. The critique CANNOT be a simple summary of the paper.

In your critiques, please try to think about the following questions:

- How are the studies related to your areas of interest?
- How would you design the experiment differently?
- Can you develop future studies based on the paper?
- What are the strengths and weaknesses of the paper?
- Are there methodological confounds in the study? If so, how would you address those issues?
- Are there alternative explanations to the findings?
- What are the implications of the paper?

Research Proposal & Outline

Students are required to write an APA style term paper in the form of a research proposal. You will choose a big data method to test your hypotheses. The paper should include: a research question, a critical review of relevant literature on the topic, a statement of hypothesis, method, a research design for conducting an empirical study (e.g., selection of relevant dependent and independent variables, description of samples, research materials), expected results, and references. You should also provide a discussion of potential implications if your results prove to be consistent with the predictions. This proposal CANNOT be a simple replication of study read in class.

To facilitate the thinking and writing of the final proposal, you will be first asked to write a **two-page outline** that describes the key components of the research proposal.

The outline is due on **Friday, Mach 14, 2021** by 5pm EST.

The research proposal and the revised outline are due on **Friday, May 21, 2021** by 5pm EST (Please keep a copy for your own records.) The paper is expected to be 8-10 double-spaced pages plus references (12 point font). Late papers will NOT be accepted.

Course Evaluation

Final grades will be assessed based on the assignments described above according to the following breakdown:

Critique of Readings:	40%
Discussion and Peer Review:	20%
Research Proposal Outline:	10%
Final Research Proposal:	30%

Topics (Tentative and subject to change):

- Topic 1 Introduction to Big Data and Computational Social Science

- Topic 2 Handling and Processing Big Data

- Topic 3 Survey Research in Digital Age (e.g., Political Elections)

- Topic 4 Running Experiments in Digital Age

- Topic 5 Exploratory vs. Theory Driven Approach

- Topic 6.1 Machine Learning – An Introduction

- Topic 6.2 Machine Learning – Applications (e.g., Well-Being)

- Topic 7.1 Social Network Analysis – An Introduction

- Topic 7.2 Social Network Analysis – Applications (e.g., Personality, Psychopathology, Well-Being)

- Topic 8.1 Text as Data – An Introduction

- Topic 8.2 Text as Data – Applications (e.g., Personality, Emotions and Well-Being, Cognitive and Clinical Applications)

- Topic 9 Methodological Challenges and Ethics in Big Data

Note. These topics are based on a full 3-credit course, and thus will be tailored for a 1-credit course.