MACS 30200: Perspectives on Computational Research

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Location: Online

Days & Time: Mon/Wed: 11:30 AM – 01:20 PM

1 Preliminaries

Technology:

- **Canvas**
- **Github Classroom**: *Students will receive in invitation link during the first week*
- **Zoom**: `https://uchicago.zoom.us/j/499340878`
- **Panopto**: For final presentations

Teaching Assistants:

- Joshua Mausolf, `jmausolf@uchicago.edu` | Office Hours: *TBD*
- Abhishek Pandit, `apandit@uchicago.edu` | Office Hours: *TBD*

2 Overview & Introductory Remarks

Welcome to *Perspectives on Computational Research*! This third course of the *Perspectives* sequence focuses on applying computational methods to creatively conduct social science research, culminating in a student-developed, full-scale research project. Students will identify a research question of their own interest that draws upon social science theory, use of data, and a significant computational component. Students will collect data, develop, apply, and interpret computational models, and generate a fully reproducible research paper. Our goal in the course is to rigorously walk through the entirety of the research process from a computational social science perspective, from data collection to the final communication of results to a variety of audiences. The interactive nature of the course will include both asynchronous learning modules and synchronous group-based virtual discussions on theoretical and practical considerations. These segments focus on topics such as epistemological questions about research design, writing and critiquing papers, cognitive consumption of visual information, and effective presentation of complex models and findings to a diverse audience.

3 Course Objectives

By the end of the course, students should be able to:

- Write research proposals for a variety of goals including, course projects, PhD applications, small research grants, and large research grants

- Understand the uniqueness of individual components in a research paper
- Compile individual components to write a full scale, academic research paper
- Clearly communicate complex research design, models, and findings in a variety of settings, including, conferences, class presentations, elevator pitches, domain experts, practitioners, and a general audience/non-experts
- Generate reproducible research reports using R markdown or Jupyter Notebooks

Prerequisites: Students should have taken and successfully passed: MACS 30000: Perspectives on Computational Analysis; MACS 30100: Perspectives on Computational Modeling; and/or equivalent training preparing students to read and critique academic research as well as statistical and computational modeling. Prospective students may approach the instructors for clarity or questions re: ability to succeed in the course.

4 Course Structure & Expectations

Our main goal in this class to cover the entirety of conducting research at a high, professional level from initial inception of an idea through completing the paper, and ending with communicating findings to different audiences. As this is the final core course in the *Perspectives* sequence, we want to ensure that all students have the ability to and have sufficiently laid the groundwork for successful transition to the thesis, which should ideally be closely linked to the final project and work accomplished in this course.

The course is broken down into three sections: *Develop an Idea*, *Formalize the Project*, and *Present the Project*.

4.1 Zoom and Remote Learning

We will use a blend of programs to faciliate and administer the class: **Canvas** for grading and some learning modules, **Github Classroom** for assignment submission and some group work, **Zoom** online conference services for synchronous/face-to-face discussion, and **Panopto** for final paper presentations.

To cover this ground, and given the constraints of remote learning, most weeks will include a discussion component and an interactive component, all based on readings. Some weeks this may be one in the same (e.g., discussing and critiquing the readings as it relates to individual student projects), or these may be separate (e.g., discussing readings, and then breaking into smaller groups for writing exercises).

Still, in general students can expect some blend of both synchronous (i.e., *at the same time*) discussion/group time, which will meet at the currently schedule class time (**Mondays and Wednesdays, 11:30 am - 1:20 pm, *CST***), as well as asynchronous (i.e., *not at the same time*) learning and discussion modules. The goal with blending these modes of instruction and engagement is to encourage interaction with each other and the content throughout the week, given the dearth of interpersonal communication and learning that we are used to in traditional in-seat contexts.

When we meet live via Zoom, we will adopt the same rules and norms as in a physical classroom (e.g., be present, take notes, participate by asking and answering questions, wear classroom-ready clothing, and so on). For everyone's benefit, please be sure to join the course in a *quiet*

place. Turn on your video, and mute your microphone unless you are speaking.

Please be sure to always close all browser tabs, apps and any programs not required for participating in class ahead of time.

It is most important to emphasize that most of us are all new at online/remote learning. We as instructors are learning how to most effectively administer a class in this environment, while you as students also are learning how best to engage with the course, instructors, and fellow classmates. Thus, we want to stress here and throughout the course the need for patience with each other as there will likely be many bumps along the way.

That said, we also think this is an exciting opportunity to innovate and try new things, such as blending time in (synchronous) and out (asynchronous) of class. Regardless, as this is a much less technical course that is also highly dependent on discussion and interaction, it is vital that all reading for an assigned day be done ahead of time. This will ensure the best most fruitful use of our time.

Finally, it is important to note that we have been asked by the University to record every live session and post it on Canvas for the benefit of those who are unable to make class at different points throughout the quarter. If you are uncomfortable being recorded, you can turn off your video when you're speaking and keep your mic muted when not speaking. We want to make sure, though, that everyone has access in some form to the fulls cope of the course, regardless of sickness, strength of internet connection, and other similar types of unavoidable reasons to miss a given class session. Still, we would ask that if you know you are going to miss to please let the instructors or TAs know in advance so we can anticipate a smaller class size and adjust accordingly.

5 Text & Materials

Required:

1. Sign up for a free GitHub account at: `https://github.com`
2. Sign up for/claim Zoom account
3. Booth et al. 2016. *The Craft of Research*, 4th ed. Chicago: University of Chicago Press
4. Numerous papers, book chapters, additional readings assigned throughout the quarter

Recommended:

- Ware, Colin. 2008. *Visual Thinking for Design.* Burlington: Elsevier.

6 Evaluation & Assessment

All final grades are rounded to the nearest decimal (e.g., 88.38% = 88.4%). Note that due to the extreme circumstances surrounding COVID-19 and the remote administration of this course, we are willing to allow students to take this course for a grade of *Pass*. To take advantage of this option students must **first** reach out and let both instructors know this is their preference, and **second** must earn at a minimum of a B – on **all** assignments, including the participation component of the course grade. Students should be aware that there are both benefits and drawbacks to taking courses for a *Pass* grade. We recommend taking this core course for a letter grade as it is very much in our your interest to take courses for a letter grade whenever

possible (especially if you expect to earn a B – or higher). A transcript with many *Pass* grades will likely be unattractive to a Ph.D. admissions committees, and may also raise questions for employers looking for evidence that you have particular skills. Still, we are willing to allow for a *Pass* grade in this course if it would sufficiently alleviate stress or challenges associated with online learning during these extreme and trying circumstances.

We use the following grading scheme to determine your final grade: A (93-100), A- (90-92), B+ (88-89), B (83-87), B- (80-82), C+ (78-79), C (73-77), C- (70-72), D+ (68-69), D (63-67), D- (60-62), F (0-59). We deduct a letter grade per day any assignment is late (the "clock" starts the minute after the deadline; e.g., for assignment x due at submission time, $t = 5$, $t_x \in \{5:01, \ldots, 11:59\} = B$).

All assignments should be submitted via the appropriate repository in the Github classroom. Feedback will be given in most cases via pull request by the TAs and/or instructors.

There are two major components to grades: (1) Deliverables (75%), and (2) Participation (25%)

1. **Deliverables** (75%)

   → *Proposal* (10%): The research proposal is the foundation of the research project. It contains the general research question, a brief survey or outline of relevant literature, proposed methods, expectations, and a general statement on the connection between the project and the broader field. This will likely be an update to the proposal developed during the first Perspectives on Computational Analysis course in the Autumn term. The proposal will be the foundation of the first working group during week 2.

   → *Paper Draft* (15%): The final paper includes most, if not all, key components of the paper from introduction, to methods, results, discussion, and conclusion. This draft should be around 5000 words, with the expectation that final papers will be further edited/rewritten by the end of the course based on draft/presentation comments and working group discussions. This full, but *draft* version of the paper is due the Thursday before the working group during week 6.

   → *Paper Presentation* (20%): For your final paper presentation, you will submit a two-minute recorded video presentation about your final project via **Panopto** on Canvas. You are welcome to use visuals and other media as necessary (e.g., narrated slides, interactive visualization, etc.). Presentations must be **submitted by 11:59 pm Sunday, 5/31**, as students will spend regular class hours on Monday 6/1 and Wednesday 6/3, browsing through and commenting fellow students' presentation videos. More details to come.

   → *Final Paper* (30%): This is the culmination of work accomplished throughout the course. The final paper should include all substantive sections (Introduction, Methods, Results, Discussion, Conclusion), be around 5000 words in length, and be a polished version of the paper draft due at the quarter mid-point, previously mentioned. Though ideally of journal quality, the expectation with the final paper is that it is free of common and distracting errors and that it tells a cohesive story, while addressing a substantive social science question. Yet, as many students will likely make this final paper the basis for their MA thesis, we don't necessarily expect

journal-quality with this final course paper, though this should be the goal. Instructions for submission are posted on Canvas.

2. **Participation** (25%)

   → *Working Group Participation in Class* (5%): During weeks 2 and 6, students will briefly present, discuss and critique the submitted version of the assignment due at that time, either proposal (week 2) or full draft (week 6). This portion of the participation grade is determined by presentation respective students' assignments.

   → *Working Group Participation on Github* (10%): This portion of the working group grade is determined by quality of comments posted on Github prior to scheduled presentations. More details to come.

   → *Weekly Class Attendance* (10%): This is the portion of grades relating to general attendance and participation during online, synchronous Zoom sessions. For these, we expect all students to attend, if able, and to participate at an appropriate level, dependent on the day's task and topic.

7 Diversity & Inclusion

The University of Chicago is committed to diversity and rigorous inquiry from multiple perspectives. The MAPSS, CIR, and MACSS programs share this commitment and seek to foster productive learning environments based upon inclusion, open communication, and mutual respect for a diverse range of identities, experiences, and positions.

Any suggestions for how we might further such objectives both in and outside the classroom are appreciated and will be given serious consideration. Please share your suggestions or concerns with your instructor, your preceptor, or your program's Diversity and Inclusion representatives: Darcy Heuring (MAPSS), Matthias Staisch (CIR), and Chad Cyrenne (MACSS). You are also welcome and encouraged to contact the Faculty Director of your program.

This course is open to all students who meet the academic requirements for participation. Any student who has a documented need for accommodation should contact Student Disability Services (773-702-6000 or `disabilities@uchicago.edu`) and the instructor as soon as possible.

8 Course Outline & Schedule

Note: below is a tentative outline of the quarter. Any changes made will be announced with sufficient time for adequate adaptation.

Note: days in ALL CAPS in the schedule represent days that require student action in some form (e.g., submission deadlines).

Section 1: Develop an Idea

Week 1 Course Introduction and Writing Proposals

- **Monday** (4/6): Introduction to the class & Open research and science

  * **Required Reading**
    1. Syllabus
    2. Wallach, Hanna. 2018. "Computational social science ≠ computer science + social data." *Communications of the ACM*, 61(3): 42-44
    3. Grimmer, Justin. 2015, "We Are All Social Scientists Now: How Big Data, Machine Learning, and Causal Inference Work Together." *PS*
    4. King, Gary. 1995, "Replication, Replication." *PS*
    5. McKiernan et al, "How open science helps researchers succeed" (*skim*)
    6. Ram 2013, "Git can facilitate greater reproducibility and increased transparency in science" (*skim*)

- **Wednesday** (4/8): Research proposals

  * **Required Reading**
    1. Large scale grant proposal: James Evans
    2. Small scale grant proposal: Philip Waggoner
    3. PhD application research proposal: Jon Clindaniel
    4. NSF dissertation grant proposal: Justin Kirkland (UVA)
    5. Data Request (AirBnB): James Evans
    6. Dear colleague letters on highlights for good proposals
    7. NSF guidelines for proposals/grants (*skim*)

- **THURSDAY** (4/9): Full (but *preliminary*) Proposals due by 11:59 pm

- **SUNDAY** (4/12): Read and comment on each person's proposal in your group by Sunday at 11:59 pm, via Github (e.g., questions, suggestions, confusion, etc.)

Week 2 Working group on student proposals

- **Monday** (4/13): First random half of class presents/all discuss
- **Wednesday** (4/15): Second random half of class presents/all discuss

Section 2: Formalize the Project

Week 3 Identifying and Integrating Scholarly Literature

- **Monday** (4/20): Writing and Critiquing "Draft 0"
  - **Required Reading**
    1. Booth et al., ch. 12
- **Wednesday** (4/22): Engaging with Scholarly Literature
  - **Required Reading**
    1. Booth et al., chs. 5, 6, 14

Week 4 Designing the Data & Methods Section

- **Monday** (4/27): Designing a good empirical strategy
  - **Required Reading**
    1. Kallet, Richard. 2004. "How to Write the Methods Section of a Research Paper." *Respiratory Care*, 49(10)
    2. King, Gary. 2006. "Publication, publication." *PS*
- **Wednesday** (4/29): Discussion on unifying a paper through methods

Week 5 Results

- **Monday** (5/4): Writing up your Results and Discussing your Findings
  - **Required Reading**
    1. Booth et al., ch. 9
    2. "Results." https://mitcommlab.mit.edu/eecs/commkit/journal-article-results/. Accessed March 2020.
    3. "Discussion." https://mitcommlab.mit.edu/broad/commkit/journal-article-discussion/. Accessed March 2020.

- **Wednesday** (5/6): Putting the final pieces in place

  * **Required Reading**
    1. Booth et al., ch. 13, 16, 17

- **THURSDAY** (5/7): Full (but *preliminary*) Papers due by 11:59 pm

- **SUNDAY** (5/10): Read and comment on each person's paper draft in your group by Sunday at 11:59 pm, via Github (e.g., questions, suggestions, confusion, etc.)

Week 6 Working group on full, but *preliminary* papers

- **Monday** (5/11): First random half of class presents/all discuss

- **Wednesday** (5/13): Second random half of class presents/all discuss

Section 3: Present the Project

Week 7 Creating and Consuming Visual Information

- **Monday** (5/18): Cognition and visualization in multiple contexts

  * **Required Reading**
    1. Booth et al., ch. 15
    2. (Recommended) Ware. 2008. *Visual Thinking for Design*

- **WEDNESDAY** (5/20): Create **3 *different* visual depictions of the *same*** concept, phenomenon, relationship, etc. from your project (*students will share these via screen share in class Wednesday*)

- **Wednesday** (5/20): Small group (2-3 students, assigned at random) workshop, discussion, and critique on different ways to visualize a single concept

Week 8 Presentation skills

- **Monday** (5/25): **Class Canceled, Memorial Day**

- **Wednesday** (5/27): Presenting complex things to diverse audiences

  * **Required Reading**
    1. Booth et al., chs. 2 and 17 (again)
    2. (Recommended) Waggoner. 2017. LaTeX seminar booklet

- **SUNDAY** (5/31): Final presentations due by 11:59 pm **submitted via Panopto**

Week 9 Final presentations

- **Monday** (6/1): Final virtual presentations (view and comment)
- **Wednesday** (6/3): Final virtual presentations (view and comment)
- **THURSDAY** (6/4): **Final papers for *graduating* students due by 11:59 pm**
- **MONDAY** (6/8): **Final papers for *non-graduating* students due by 11:59 pm**
  → **Submit final papers here:** `https://classroom.github.com/a/qXOapdql`