Final Project Info
Mathematics of Social Choice
Duchin, Spring 2021

Basics

Your section is responsible for producing a 50-60 minute video. Since each section has roughly 20 members, that divides out to about 3 minutes per person. You'll be organized into smaller teams working on a theme, which you should select in conversation with your TA. Our final exam slot is **Wednesday May 12 at noon**. Your video is due before the exam begins.

Timing

Friday April 30 - communicate a team/theme preference to your TA. You're welcome to choose from the prompts below or propose a different topic!

Monday May 3 - teams assigned. Work with your TA to develop *roles* within the team.

Thursday May 6 - deadline to show a plan/outline to Moon and/or TAs for feedback.

Sunday May 10 - deadline for everyone's personal recording to be complete and shared with the video editors in your section.

Tuesday May 12 - videos due at noon.

Expectations and Evaluation

We expect you to invest 10 hours in this project over the next two weeks. Recommended breakdown: 5 hours research and planning, 5 hours execution.

Each person's face needs to be on screen for at least a minute. You can record yourself presenting something (using Zoom or Loom, for instance, if you want to share a screen, or just recording yourself with a smartphone doing a voice-over, with a separate screen capture).

You'll be assessed on creativity, relevance to course, and depth.

Sample Prompts

Section 1 - Python and Policy (Bhushan/Talia)

- **Random ballots.** Investigate how common various kinds of outcomes occur when preference schedules are randomized. For instance, how common are Condorcet candidates? How common are multiple winners under various systems?
- **Turnout.** One Person, One Vote equalizes population across districts—but turnout can vary. Research the extent of turnout differentials in real U.S. elections and discuss the impact on fairness.
- **Enumeration and apportionment.** We just saw that even small swings in Census enumeration can cause surprising differences in Congressional apportionment. Explore and discuss.
- **Orange/Pinkland.** In our orange-pinkland, 40% of the votes earned an average of 23% of the seats Try other 40% orange configurations! See what you can learn about how patterns of residential concentration can impact representation.

Section 2 - International (Tasia)

- **Patterns in system adoption.** You've seen a large database explaining what voting systems are used around the world. Look for patterns in which systems are used where, and discuss reasons and impacts.
- **Sortition.** The idea of replacing elections with random selection is gaining traction around the world. Investigate and discuss.
- **Legislative apportionment.** For a selection of countries, measure the degree of legislative malapportionment: estimate how many residents are represented by each member of the legislature. Discuss the reasons for variation.
- **Pathological elections.** Find examples of international elections for which you have evidence that there was an outcome that is weird in the ways we've discussed in class: spoilers, Condorcet candidates who did not win, etc.

Section 3 - Civil Rights and Law (Heather)

- **Prison gerrymandering.** Probably better called prison malapportionment, this is the issue that people are counted where they sleep, which boosts enumerations in some areas and depresses it in others. Research the background, and look for examples of this effect.
- **Vote dilution.** We generally believe that all votes should weight equally, but what does this mean precisely? Authors have proposed various ways of measuring the weight of a vote, and relatedly of saying who is harmed by gerrymandering (and by how much). What do you think?

- **Computers and fairness.** How have courts reacted to the use of computers in measuring gerrymandering? Start with oral argument transcripts and the opinions attached to the Supreme Court's decision in *Rucho v. Common Cause*.
- **The apportionment wars.** Washington's first-ever presidential veto was over an apportionment scheme. Research the arguments for different apportionment methods and their connection with ideals of fairness.

Section 4 - Science, Technology, and Society (Robert)

- **Technology and authority.** How have computers changed our ways of conducting and understanding elections? What is the role of old-fashioned media like paper ballots? Explain how some of our voting systems studied in class are tied to technologies for casting and tabulating votes.
- **Metrics of fairness.** Our textbook has a long and detailed treatment of *fair division*. Research various metrics for dividing goods fairly among several parties. Relate these to fairness metrics we have discussed.
- **Ballots and voter intent.** Ranked choice ballots require you to put some or all candidates in preference order. There are other kinds of ballots, relating to systems like approval voting, cumulative voting, etc. Research the options and discuss the different ways ballot styles let us understand voter intent... and measure fairness.
- **Who counts?** The Census aims to make a detailed tally of all the persons in the United States. How has the Census changed their counting methods over time? How do these changes affect democratic outcomes? Are there other counting practices in the U.S. that have an impact on voting and redistricting? Are there other democracies who experienced their own paradigm shifts for counting and classification?