Lab 9: Reshaping Votes

In 1998, Oregon became the first state to conduct its elections exclusively by mail. Every election, all registered voters are automatically mailed ballots to their home address roughly a month before the election. Voters then vote at their leisure and mail back or drop off their ballot sometime before the election closes. Due to concerns about the Covid-19 pandemic, many other states have implemented some version of Oregon's voting system in preparation for the November 3rd, 2020 election next Tuesday.

Since mid-October, when the first completed ballots started returning to Oregon election offices, the Secretary of State's office has been posting the ballot return data on their website. In this lab you'll be using this data to construct three visualizations that will help understand some of the dynamics of the 2020 election in Oregon.

Set-up

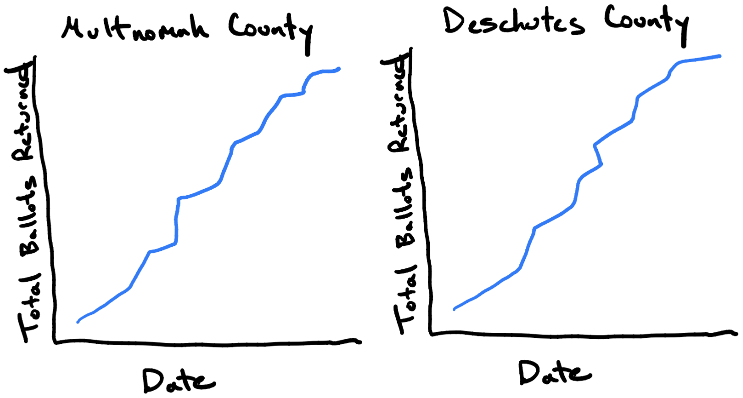
The election returns data is stored in a pdf on the website linked above and titled, "Unofficial Daily Ballot Returns". This is a common way that public data is distributed and it is . . . unfortunate. As a file format, a pdf is only meaningful to a program that is designed to display that format. You can't, for example, open it up in a text editor and pull out anything intelligible. It is meant as a *display* format, not a format to encourage further engagement and analysis.

Some years ago, this would be a dead end for data analysis unless you wanted to transcribe those data tables manually. Now, however, there is software that reads the pdfs and does its best to extract the tabular data. The `tabula` package is an example of such software and works quite well. It can be installed within an R chunk using `reticulate::py_install("tabula-py", pip = TRUE)` (although you install the package called `tabula-py`, you'll be importing a package called `tabula`).

1. Download the pdf from the Secretary of State's website to your machine and put it in the same directory as your lab .Rmd file. Use the function `tabula.read_pdf()` to

read in the pdf file and tinker with its arguments to figure out how it works. What data structure does the function return? How many tables total does the function identify in the pdf?

Plot 1: Cumulative ballot returns for Multnomah and Deschutes counties



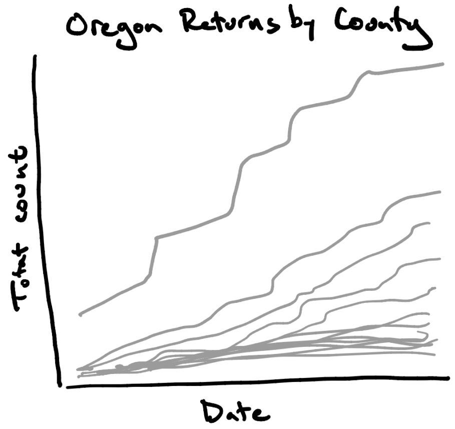
There are several steps needed to clean up and process the data before you can plot it.

2. You'll notice that there are several rows at the bottom of the table that contain aggregate information. Since you won't need them for your plot, strip out these rows.
3. The first column has a lengthy name, so `.rename()` it to `"County"`.
4. The unit of observation in your data set at this point is a single county and on that county you observe a count at each of several dates. Reshape this data frame so that the unit of observation is a county on a particular date and the variable recorded is the returned ballot count. Your resulting data frame should have three columns: `"County", "Date", and "Count"`.
5. When the data frame was read in, the `Count` column read in as a string Series with commas. Strip out those commas. There are multiple ways this can be done, but a good starting place is a data frame method called `.replace()` or string methods.
6. Now that the counts are in good shape, you need to be sure the data types of all of the columns are as you want them. `"County"` should be strings, so that one's all set. `"Count"`, however, should be either integer or numeric and `"Date"` should be a datetime. There are, as always, multiple ways to skin this cat. I recommend looking into a handful of Pandas functions named `to_XXX` where `XXX` is the type that you want to convert to. There is also a `.astype()` data frame method that works.

   The conversion of `"Date"` to a datetime can be tricky, so approach that one carefully. You'll need to specify the `format`, which you do as a string using a particular format code that indicates what you're giving it (in this case, the abbreviation of the month name and the day of the month). Post on Piazza if you run into problems.
7. Instead of plotting the raw county, the plot that you're aiming for has on the y-axis the *cumulative* count. Create that new column - the cumulative count within each county.

8. From this parent data frame, create two child data frames: one with the data from Multnomah County (Portland metro area) and the other containing the data from Deschutes County (Bend metro area).
9. Use `matplotlib` to construct the final plot shown above. Your main guide through this will be the first few pages in Python Data Science Handbook. A few notes:
   - You'll want to make a single figure with two subplots.
   - Rotate the labels on the x-axis so that they're legible.
   - Label the axes and add a title to each subplot.
   - Save the figure using `plt.savefig()` and include it in your Rmd by adding an R chunk containing `knitr::includegraphics("myfig.png")`.

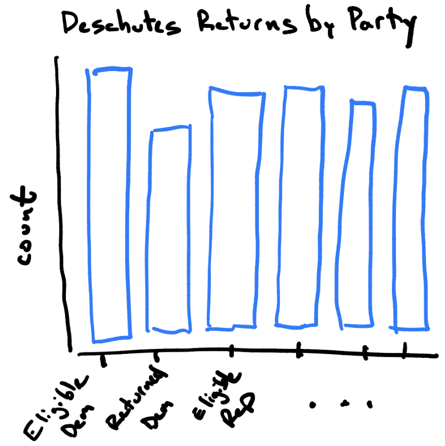
Plot 2: Cumulative ballot returns for all Oregon counties



10. Plot the cumulative ballot count curves for *all* Oregon counties on a single plot. This requires two steps: a) reshaping your data so that each row corresponds to a date time and there is a column for each county containing its cumulative counts and b) iterating over `plot()` to draw a line for each county onto the same plot. For step b), mimic the for-loop structure found in the example here. A few notes:
    - Make all lines the same color (there are too many to discern anyway).
    - Shine up the labels and add a title as before.
    - Save the file as before an include it in your Rmd.

    Yes, this is an ineffective plot for displaying this structure. We'll fix it at a later date.

Plot 3: Comparing ballot returns by party



The final page of the pdf adds in another piece of important information: it breaks out the ballot return numbers by party. Use it to create the plot above, which shows, as of October 29th, the voter turnout by among Democrat, Republican, and Unaffiliated voters in Deschutes County. Deschutes County is particularly interesting because it is fairly evenly split between voters of all three affiliations. As in plot 2, the form of this plot has some deficiencies that we'll discuss, but it's a place to start for now.

Some notes:

- You can recycle much of your code from plot 1.
- Pdf reading is not an exact science. Be sure to spot check the resulting data frame and make any necessary corrections.
- Focus only on Republican, Democrat, and Unaffiliated voters and only on Deschutes County.
- Instead of using `.plot()`, you'll be using `.bar()`. Read its documentation to understand the structure of the data the it expects.