

Project Proposal

Team Information

Project Title: Visualizing Bilateral Trade Between Countries

Project Repository: <https://github.com/candrewlee14/data-viz-project>

Team Members:

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Background and Motivation

When China first joined the World Trade Organization (WTO) in 2002, few people expected how the world's economic dynamics would be so fundamentally impacted by this event. In a span of just two decades, China's exports rose from \$333 billion in 2002 to \$3,548 billion (or \$3.5 trillion) in 2021, a whopping 965% increase. By 2020, China had overtaken the US as the world's biggest trade partner. But as China's trade relations with the world grew, so did tensions between the US and China. In 2018, the Trump administration launched its "trade war" against China by slapping tariffs on two-thirds of Chinese exports to the US. One of the US's main goals was to reduce its deep trade deficit with China which stood at \$481 billion before Trump took office.

Franklin is from China and Andrew is from the US. We both are very interested in the trade relations between the US and China. We are particularly interested in gaining more insight into the countries' bilateral export and import data both in gross volume and by product category over the years. This project is our attempt to create a visualization that makes the analysis on any two countries' bilateral trade data more accessible to the general public.

Project Objectives

The visualization allows a user to select two countries in the world to study their bilateral trade relations. Through exploring the visualization, a user will be able to answer:

- How much did country A import from and export to country B over the years?
- What products are country A's top exports and imports with country B?
- How much of a specific product did country A export to country B in a given year?
- How much is the trade balance between country A and country B in a given year?
- How has the bilateral trade balance changed over the years?

The goal is to help the user develop a deeper understanding and intuition of the trade relations between two specific countries.

Data

The dataset we are using will likely come from the World Trade Organization (<https://stats.wto.org/>). Countries periodically report their trade information with other countries. These trades are broken down into product/sector categories (Animal, Dairy, Chemical, Manufacturing, etc).

The bilateral import data they publicly offer includes the following information and more:

- Importing country
- Exporting country
- Product category
- Volume in US dollars
- Year

Data Processing

There shouldn't be a lot of data processing and wrangling involved in this project. The data from the World Trade Organization is highly structured, tabular data in CSV files with clearly defined types, so it should be relatively straightforward to use that data when making our visualizations. Most of the difficulty of this project will be on the frontend design and visualizations.

Visualization Design

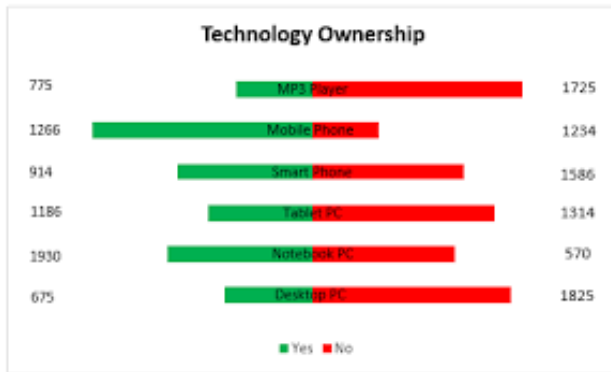
Brainstorm

We first come up with many different types of visualization we can create to present the data.

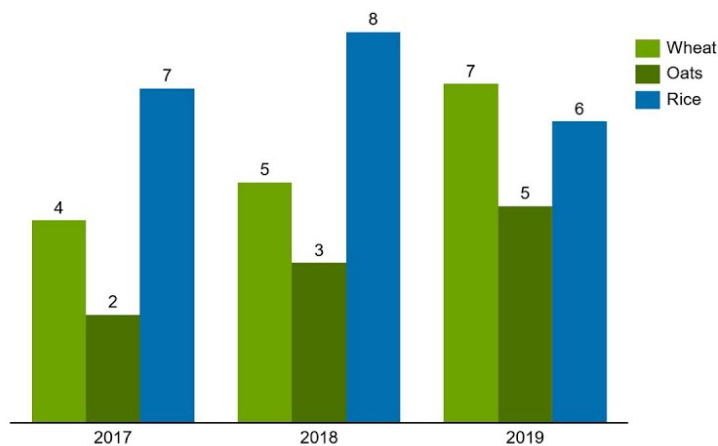
- A tree map can be used to show a given country's exports based on the volumes of product/sector categories.



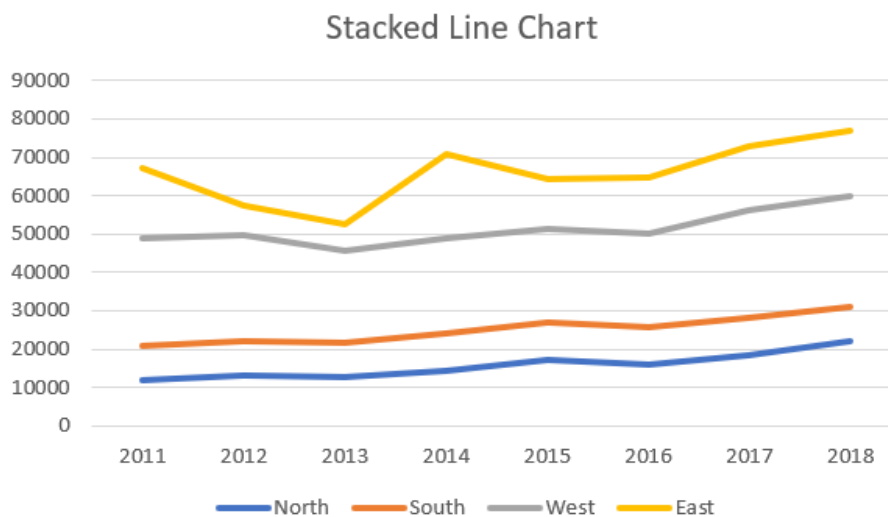
- The trade balance of different product categories between two countries can be represented by a centered stacked bar chart. We can rank these bars based on various criteria such as the trade surplus towards either country.



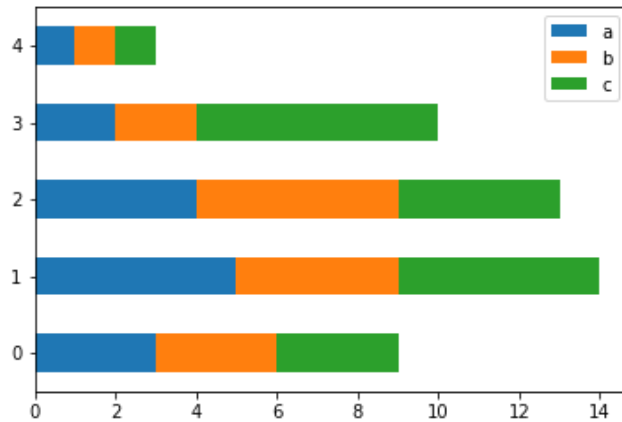
- Clustered bar chart can also be used to show the change in export volumes across different product categories over the years.



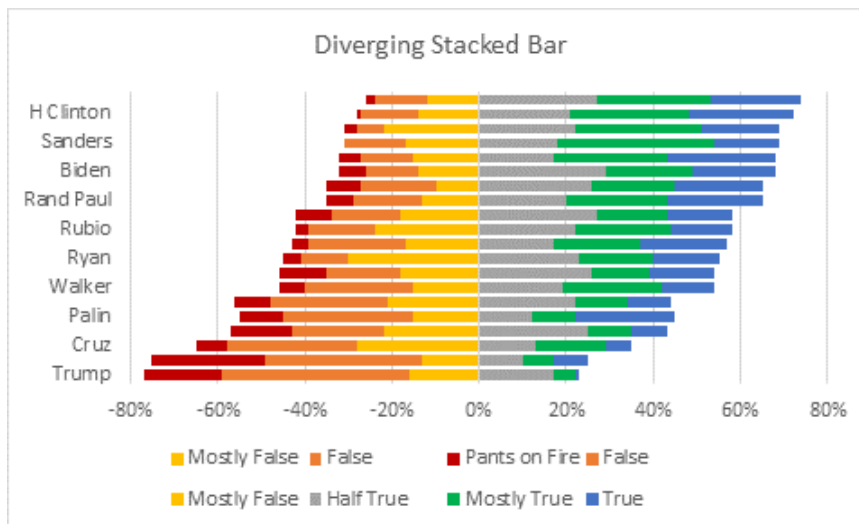
- We can also use a line chart to show how a country's exports/imports change over the years.



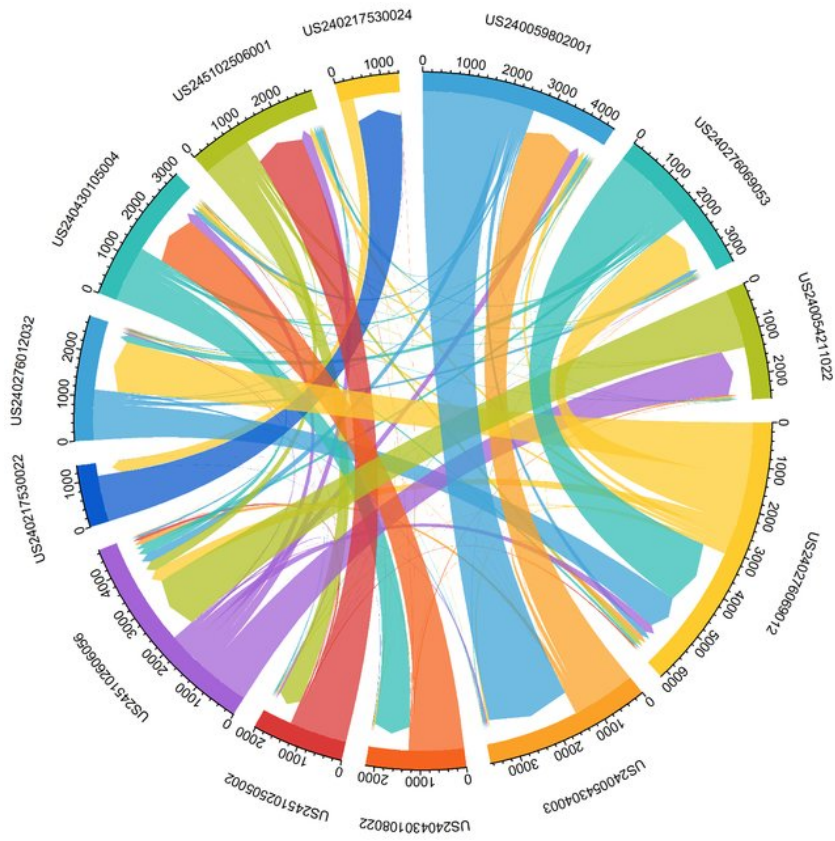
- A stacked bar chart can be used to compare two countries' exports/imports broken down by product category.



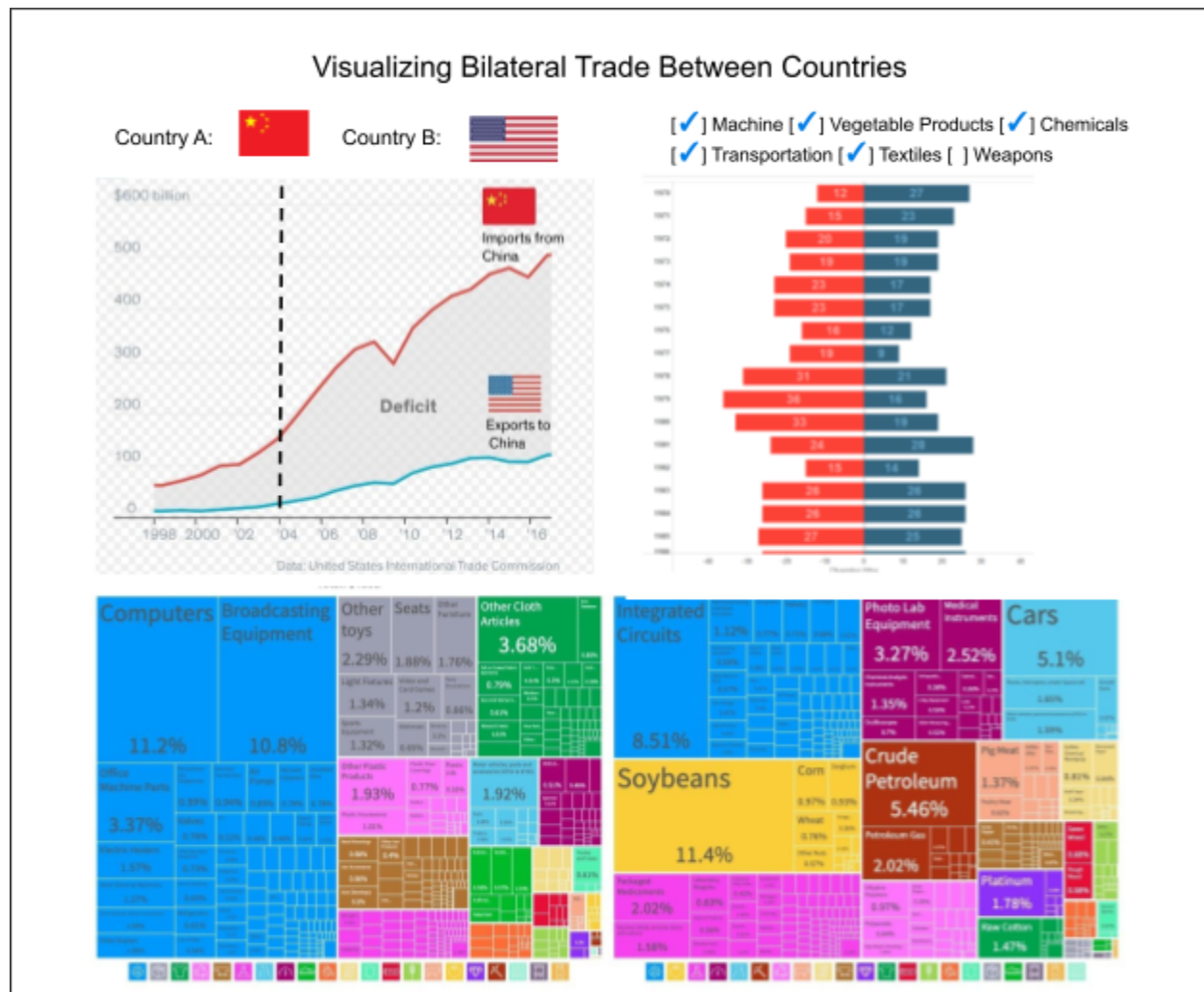
- A diverging stacked bar can be used to view multiple product's sub-categories.



- A country-to-country export/import chord graph (arrow indicates trade direction) if we want to see the trade relations between more than two countries. This can get a bit overwhelming with too many categories or countries.



Prototype 1: Line chart, Centered Stacked Bar Chart, Tree Map



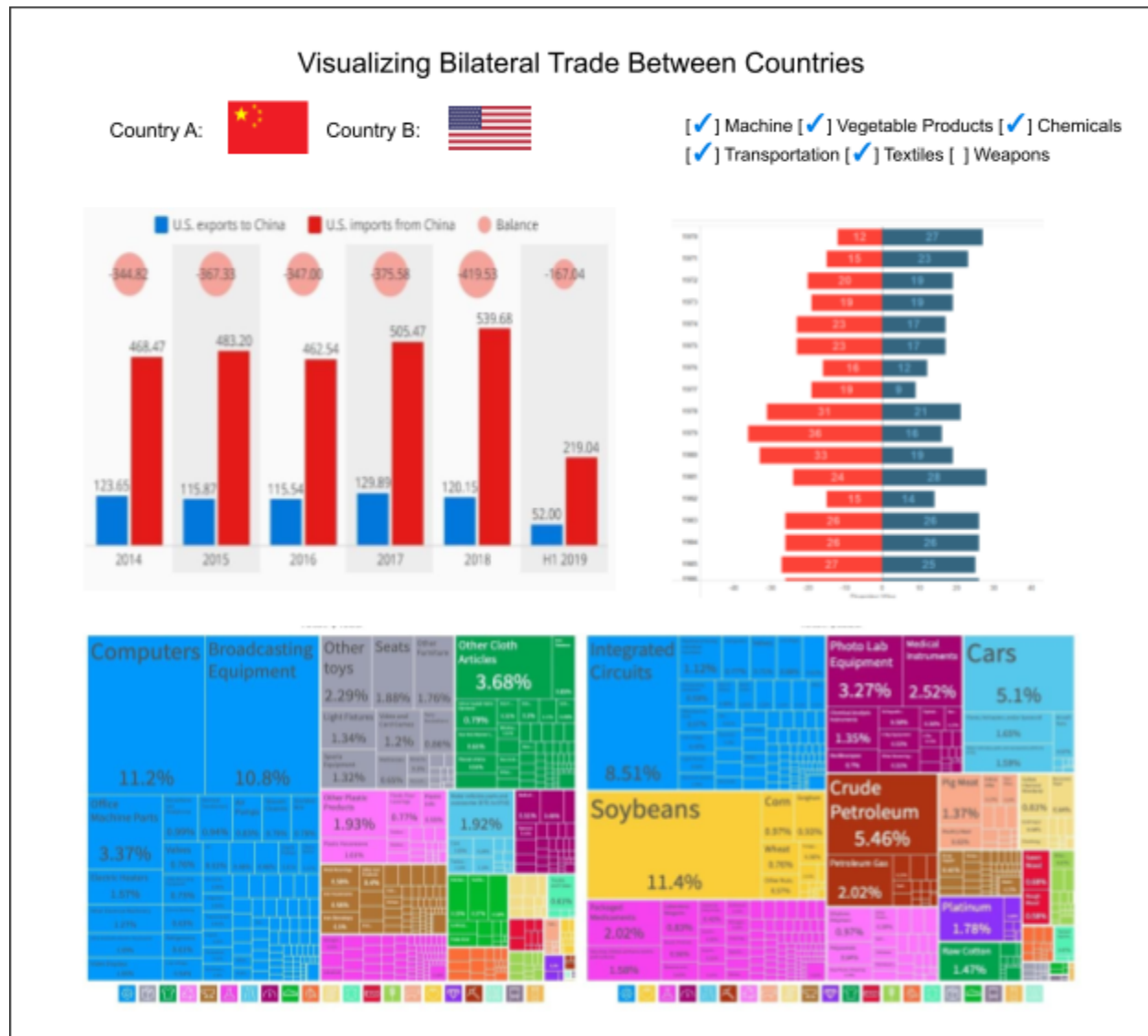
- A user can change country A and country B
- In this version, the main visualization will be the line chart where both countries' exports over the years are compared. If a user can select a specific year on the line chart which will automatically update the other views.
- Centered stacked bar chart: a user can select any number of product categories to show the trade balance. The bars can be reordered based on various criteria.
- Tree maps: one for country A on the left and one for country B on the right, showing each country's major export to the other country grouped by product categories. When the mouse hovers over a rectangle, more details will appear.

Prototype 2: Line Chart, Sankey Diagram, Tree Map

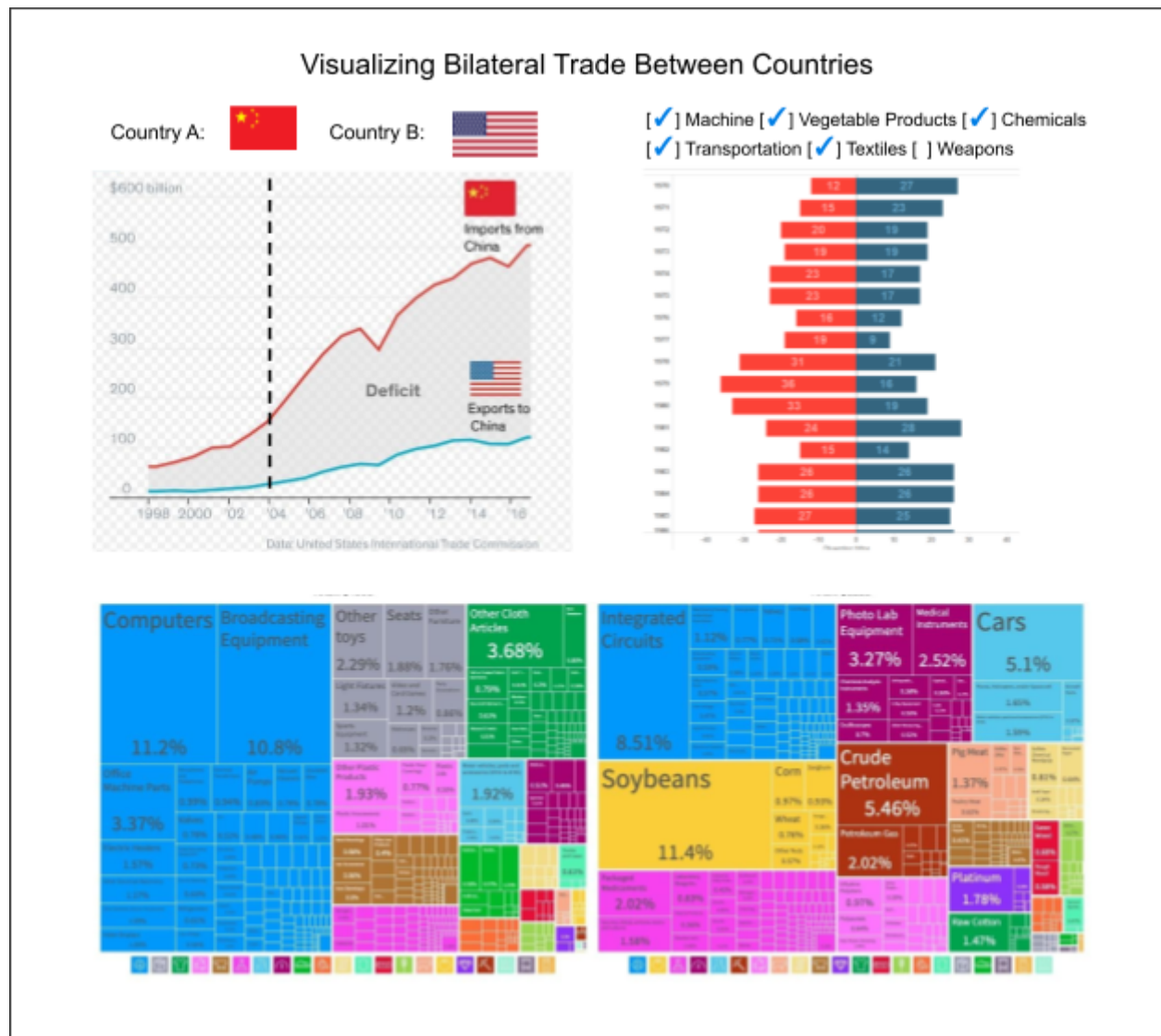


- The main difference between Prototype 1 and Prototype 2 is the visualization on the top right. Instead of a bar chart, Prototype 2 has a Sankey diagram that shows the export flows between the two countries grouped by product categories. A user can select and unselect product categories to show on the diagram.

Prototype 3: Clustered Bar Chart, Centered Stacked Bar Chart, Tree Map



- The main difference between Prototype 1 and Prototype 3 is the visualization on the top left. Instead of a line chart, Prototype 3 has a clustered bar chart that shows the export changes across different product categories over the years. Like the line chart, a user can use the mouse to select which year to reflect in the other views.



- A time slider will be added to allow users to change the year of the data which will automatically update the Bar Chart and the Tree Maps.

Must-Have Features

- Dropdown menu for choosing country A and country B
- A line chart
 - X-axis: year
 - Y-axis: trade volume
 - When hovered over, the other views will update automatically based on selected year in the line chart
- A centered stacked bar chart
 - Diverging color

- Filtering based on product categories
 - Option to reorder the bars based on certain criteria
- Two tree maps
 - Color encoding for different product categories
 - Hover to show details
- A time slider to adjust the year

Optional Features

- Playable animations that show the change in bilateral trading over time. The boxes in the treemap could change shape, and the bars in the centered bar chart may shift sizes and rankings.

Project Schedule

Week 0 (October 16–October 22)

- Explore different datasets
- Prepare Project Proposal
- **October 21, 2022:** Project Proposal Due

Week 1 (October 23–October 29)

- Data acquisition and wrangling
- Plan overall technical architecture and the website's framework
- **October 25, 2022:** Mandatory class meeting to discuss our project

Week 2 (October 30–November 5)

- Implementation part 1

Week 3 (November 6–November 12)

- Implementation part 2
- **November 11, 2022:** Project Milestone Due (a functional project prototype)
 - Code in its current state
 - Process book in its current state
 - Working visualization prototype

Week 4 (November 13–November 19)

- Implementation part 3
- Mandatory project review with TA Mentor

Week 5 (November 20–November 26)

- Debugging
- Refine website design
- Any other catch up

Week 6 (December 27–December 3)

- Finish process book write-up
- Record screen-cast
- **December 2, 2022:** Final Project Due
- Finish peer evaluation

Additional thoughts:

Country selector:

- Default value for country
 - *OTLC defaults the selected country's exports to continents*
- Please select a country: dropdown menu (flags and country code)
- Please select a trade partner: dropdown menu (flags and country code)
- A button to switch the two countries

Over Time Line Chart (HS1-level):

- HS1 sector level, spans 5 years
- *Hovering*: shows product category, trade value, year
- *Filtering*: by HS1 sector level product category
- *Options*: layout can be either in Total Value or Share

Time Slider:

-

Product Category Filter:

-

Net Trade Flow Stacked Bar Chart:

- HS1 sector level, year-specific
- *Hovering*: shows product category, export and import values, trade surplus/deficit
- *Ordering*: by HS1 sector product category (asc-dsc), **net trade value** (asc-dsc), **gross export value** (asc-dsc), **gross import value** (asc-dsc), **etc.**
- *Filtering*: by HS1-level product category
- Transitions

2 Treemaps:

- Year-specific; side by side comparison (country A's export to country B; country B's export to country A)
- *Hovering*: shows product category, trade value, share
- *Filtering*: by HS1-level product category
- Transitions
- *Options*: *product category detail level can be either HS1 or HS2 sector level*

Visualizing Bilateral Trade Between Countries

Country A:  Country B: 

[☒] Machine [☒] Vegetable Products [☒] Chemicals
[☒] Transportation [☒] Textiles [☐] Weapons

