

## Tools used for all visualisations

To create all visualisations, I used Python 3.9 along with the `Vega-Altair` library from PyPI. To process the data given to us, I used the `Pandas` and `NumPy` libraries from PyPI.

## How I implemented the visualisation

Firstly, I parsed the data from my `Napoleon-Russian-Campaign.xlsx` file containing data given to us by Professor John Dingliana. I used this data to create a chart showing the relative size of the army along their trail with the `mark_trail()` function in `Vega-Altair` with the size parameter as the "SURV" column in the dataset and "LONP" and "LATP" columns for the x and y axis. I set color conditions for each trail; division 1 was brown for the approach and orange for the retreat, division 2 was dark green for the approach and light green for the retreat, and division 3 was blue for the approach and light blue for the retreat. After experimenting with various colors and ways of depicting the path of the army, I chose this because it was easy to understand for the reader and showed the distinct turning points for each army division. Furthermore, I made a chart showing the position of cities with text beside them using the `mark_circle()` and `mark_text()` functions. I also used the `mark_text()` function to add survivor counts using data from every third row along the trail so that the reader can see how the army decreased in size over time. I combined these individual charts using the "+" operator, and then created a temperature plot to show the temperature during retreat using `mark_circle()` to create the points, `mark_line()` to connect the points, and `mark_text()` to show the temperature/date when each datapoint was recorded; I used the "LONT" and "TEMP" columns for the x and y axis. I added red dotted lines from each temperature recording to the latitude and longitude in the retreat above it with the `mark_rule()` function. Once the survivor chart and the temperature chart were made, I created a legend using the `mark_rect()` function and combined these three charts using `Vega-Altair`'s `vconcat()` function which vertically concatenates the charts one below another.

## Specific features of relevance

Although I wanted to use Minard's general style for my visualisation, I also wanted to improve upon his work. I felt that the lack of color in his visualisation made it dull and the black lines connecting the temperature points to points on the survivor chart made it unappealing. Therefore, I made sure to add different colors for each division and direction of the army along with red dotted lines to show the connection between the temperatures and the points where they were recorded in the retreat. I ensured this didn't confuse the reader by adding a legend to show what each color meant. Furthermore, I made sure to choose darker colors for the approach and lighter colors for the retreat to mimic the tension and status of the army along their trail.