The political and electoral situation in Israel in the years 2019 - 2022

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ABSTRACT

The political landscape in Israel has been in a state of stalemate for the past four years. In an effort to gain a deeper understanding of the factors contributing to this situation, we have developed a multi-component approach, combining big data tools, an interactive user interface, and advanced geo transformation algorithms. Despite limited success in gaining meaningful insights from the added geo data, we believe we have uncovered the main cause for the resolution of the political tie in the 2022 elections.

KEYWORDS

Big data, Spark, Geographic-Analysis, Elections, Israel, Politics, Streamlit

1 INTRODUCTION

The political landscape in Israel has undergone a overwhelming turbulence in the last three and a half years, characterized by the repeated occurrence of five elections. This state of stalemate has resulted in one of the most severe political crises in the country's history.

One of the key contributing factors to the current situation is the decline in voter participation, which has led to a parliament that fails to accurately represent certain sectors of the population. Furthermore, certain segments of the population are significantly under-represented, further exacerbating the situation.

It has been argued that the root cause of the political crisis lies in the ongoing trial of the current Prime Minister for bribery charges. This unprecedented situation has brought Israel to the brink of political instability and has had far-reaching consequences for the nation.

In our geo analysis we will try to uncover the numbers and the causes to this political crisis.

2 LITERATURE REVIEW

In the last three and a half years, Israel has held 5 different elections. This stalemate situation has led Israel to one of the worst political crises in the nation's history.

In research done by Shapira and Plesner (2022) [1] it has been suggested that in order to solve this political situation and add stability to Israel's political system it is required to harden the conditions for which it is possible to overthrow a ruling government. Where instead of having a majority of 51 percent it should require a majority of 66 percent. Additionally, they suggest canceling the automatic dismantling of the Israeli parliament in the case where the annual budget has not been approved.

A significant contributor to the current situation is the decline in voting participation which has led the Israeli parliament to be non-representative of some sectors of the population while under-representing other sectors. Shapira King and Luria (2022) [2] have explored the possibility of making it mandatory by law to vote at the elections, and have concluded that currently, this move is not justifiable but in the case where voting participation keeps declining then the option of applying fines to non-voters should be considered. Rodinsky (2020) [3] has looked at the Arab voters and compared them to other nations with large Muslim communities and tries to explain why 20 percent of the Israeli population does not fully participate in the democratic process of elections.

In a study done by Shamir and Rahat (2022) [4] it has been claimed that at the core of this political crisis is the fact that the current prime minister is trialed for bribery, which has led Israel to an unprecedented situation of five repeated elections. In another study done by Rahat (2019) [5] he reviews the claim that the israeli political landscape has changed from party-based politics to presona-based politics. In his review, he debates whether this persona-based politics strengthen or weaken our democracy.

3 PROPOSED METHOD

In order to implement our Geo analysis approach we have conducted the following steps:

1. Collecting settlement data for all settlements in Israel along with their coordinate location from the Survey of Israel data set.
2. Converting the UTM (Universal Transverse Mercator) which is the common coordinate system used in surveys in Israel to WGS 84 (World Geodetic System 1984) which is a global standard coordinate system for Geo spatial analysis. The difference between the two is that UTM is a projected coordinate system, while WGS 84 is a geographic coordinate system. The conversion from UTM to WGS 84 involves transforming the UTM easting and northing values into latitude and longitude values using a mathematical process known

as an inverse projection. This process involves calculating the latitude and longitude of the point based on the UTM coordinates, the UTM zone, and the ellipsoid parameters of the WGS 84 datum. The resulting latitude and longitude values can then be used to represent the location of the point in WGS 84. It is important to note that the conversion between UTM and WGS 84 is not a simple linear transformation and requires the use of complex mathematical algorithms and geodetic models to accurately represent the Earth's surface.

3. Collecting all election data from past elections in Israel and aggregating them into a single table

city name	lat	lon	num eligible to vote	total num of legal votes	elec num	party 1	party n
a	31.85	34.83	1576	1234	25	100	300
b	31.96	34.91	2234	2000	25	211	77
c	31.82	34.92	4431	4000	25	88	1000
a	31.85	34.83	1576	1100	24	111	221
b	31.96	34.91	2234	1800	24	110	70
c	31.82	34.92	4431	4200	24	115	970

Table 1: A schematic overview of the aggregated all elections voting table joined with the survey of Israel data set in order to create a single database to be displayed using our interactive map inside web application

Where city name is a string describing the city name, the lat and lon columns are the outcome coordinates of the geo transformation algorithm described above, num eligle to vote is the total number of Israeli citizens above the age of eighteen in the city, elec num is the Kneset number the elections were held for (where 25 is the last election held November 2022), and then the rest of the columns are a count for each party in each city, this number can range from zero to num eligible to vote.

4. We then manually divided all political parties that were part of the recent parliaments into three different groups:

a. Parties that are associated with the current conservative regime led by Benjamin Netanyahu

b. Parties that are associated with more liberal political view

c. Parties that are led by Muslim Arab Israelis

The reason we had to divide the parties into three groups instead of two is due to the nature of the Arab parties, which since the founding of Israel in the year 1948 and up to the year 2021 have objected both the liberal and conservative sides of the Israeli political spectrum.

Diving the hundreds of different parties which contended in the last 7 elections in to three separate groups, allowed us to label our data and make more concise claims and derive more meaning from our data set.

5. In order to add geo spatial context into our analysis we have used Streamlit to display our results. Streamlit is an open-source Python library for building modern, interactive, and responsive web-based data applications. Streamlit makes it easy to display, analyze, and visualize data in a variety of formats, including tables, charts, maps, and images. The library includes a large number of built-in components, such as text boxes, sliders, check boxes, drop down menus, and more, that can be used to create interactive and dynamic web applications. Streamlit automatically reloads the page as you make changes to your code, making it easy to test and debug your applications. The map displayed in our streamlit app adds the ability to run queries on our data set with a simple user interface, rendering both tabular, graphical, and geo spatial data simultaneously. Then in order to ease our visual analysis we defined the following symbology: each city will have a circle where its color defines the party that received the most votes in that city and the radius of the circle symbolizes the number of voters in that city.

6. For our web app to run as fast as possible we have combined Pypark with the Streamlit caching mechanism. This is done in order to optimize the performance of interactive applications. Upon encountering a function with specific parameter values and code for the first time, Streamlit executes the function and stores the returned value in a cache. Subsequently, whenever the same function is invoked with identical parameter values and code (e.g. as a result of user interactions within the application), Streamlit bypasses the execution of the function and returns the cached value instead. This results in a significant reduction in computational overhead and improved response time for the user.

During the development phase, the cache is updated dynamically to reflect any changes made to the function code. This automatic updating of the cache ensures that the latest version of the function is always stored, providing the developer with immediate access to the updated results without the need to manually invalidate the cache.

The process of serialization and deserialization of the cached object results in the creation of a duplicate of the original DataFrame. Although this copying behavior may appear redundant, it is crucial in the caching of data objects. This is because it effectively eliminates the potential for mutations and concurrency issues. By creating a separate copy of the original data object, the cached version remains unchanged and immune to any modifications that may occur during concurrent processes. As a result, the cached data is protected from any unintended alterations and remains consistent for subsequent access.

Additionally PySpark is utilized to perform computations in a highly efficient manner. Its architecture is designed to process large amounts of data in parallel, making it ideal for handling complex computations and data-intensive tasks. By utilizing PySpark, the necessary calculations can be executed quickly, thereby reducing the lagging when running queries in the system

4 EVALUATION

By incorporating geographic information into the voters data, it was anticipated that additional insights could be gained. Despite these efforts, it was observed that the patterns observed on the map did not have a significant impact on the overall results.

This lack of impact can be attributed to several factors. Firstly, minor changes in major cities have a more pronounced effect on
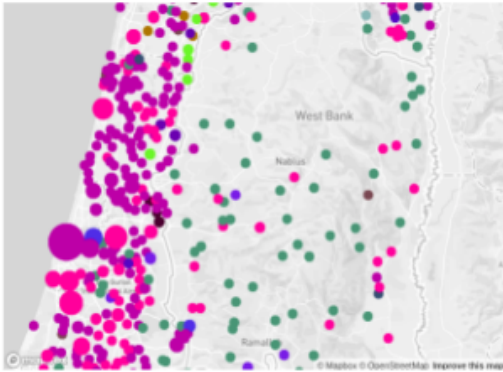
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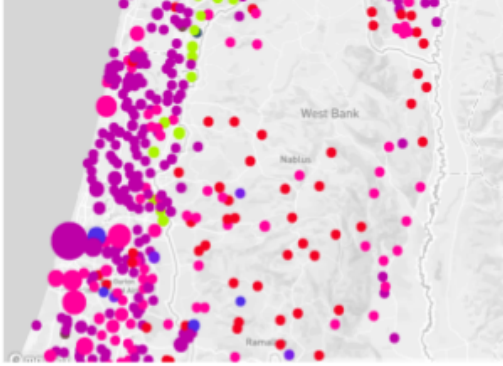
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Figure 1: These two images show a very dramatic shift in voting patterns between elections number 24 and elections number 25. Clearly many of the Jewish settlements in the west bank have had a different leading party between these two election campaigns

the overall results compared to major changes in minor settlements. Furthermore, changes in isolated locations on the map can appear more significant than changes in densely populated regions, where the circles may overlap and obscure one another. In practice, the opposite is often true. Lastly, the close margins in the previous five elections made it difficult to observe clear shifts in voting patterns when displayed on a map view.

Despite our inability to gain addition insights from our added geo data, it was still important to understand the factors that contributed to breaking the stalemate in the latest election. To this end, an analysis was conducted to examine three key variables: voting participation in major cities, the percentage of conservative votes, and the percentage of votes for Naftaly Bennett's party (the former prime minister who did not contend in the last election campaign).

We analyzed various voting patterns in the fourteen largest cities in Israel with a population of at least 100,000 eligible voters. Our findings revealed that the most notable pattern was the correlation between the difference in voting participation in the last two elections and the percentage of votes going to the conservative side of the political spectrum.

The Pearson correlation coefficient between these two parameters was calculated and showed a positive correlation of 0.542, indicating a moderate positive relationship. Furthermore, when accounting for the reduction in votes received by Naftaly Benet's party, the correlation became even stronger, with a coefficient of 0.644.

These results suggest that there is a significant relationship between the change in voting participation and the shift towards the conservative side of the political map, especially when accounting for the impact of Naftaly Benet's party.

Where Pearson correlation is defined as:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

$$x = 25participation - 24participation$$

$$y = conservativepercent25 - conservativepercent24 - benetpercent24$$

Interesting enough when looking at the entire data set of 1200 municipalities we have not observe a significant correlation at all. This is probably due to the fact that when looking at percentages, the absolute size of the municipality is not accounted for, which results in a skewed representation of the data.

5 DISCUSSION

The recent change in government in Israel, as seen in the 2022 elections, can be attributed to a number of factors. One of the most significant of these is the growing resistance against the existing regime, which has motivated the conservative voters who were previously left out of the coalition. This increased voter turnout among conservatives has played a major role in the shift in political power.

At the same time, the widespread belief that the regime would not change, despite the efforts of the opposition, has led to a sense of apathy among liberal voters. This, combined with a perception that their vote would not make a difference, has resulted in a lower level of participation among this demographic.

city name	conservatives votes election number 24	election 24 voting %	conservatives votes election number 25	election 25 voting %	votes for Naftaly Benet elections number 24
Ashdod	60.30%	61.60%	67.90%	64.30%	2.99%
Askelon	56.65%	58.50%	66.85%	61.90%	3.55%
Be'er Sheva	57.06%	56.50%	67.51%	61.30%	4.00%
Bnei Brak	96.93%	73.90%	97.98%	76.50%	0.60%
Bat Yam	50.00%	48.50%	58.38%	50.70%	2.30%
Holon	48.19%	61.00%	57.18%	64.00%	3.65%
Haifa	30.87%	55.10%	34.73%	55.50%	2.61%
Jerusalem	69.87%	59.10%	76.14%	61.60%	3.91%
Netanya	54.24%	56.40%	62.84%	58.20%	3.69%
Petach Tikva	46.73%	66.00%	56.48%	67.80%	5.82%
Rishon Letzion	39.45%	64.40%	48.51%	66.10%	3.99%
Rehovot	43.54%	66.70%	51.25%	68.80%	4.55%
Ramat Gan	29.24%	64.70%	35.10%	65.20%	3.70%
Tel Aviv Yafo	23.41%	59.90%	27.05%	59.60%	2.18%

Table 2: a comparison of voting patterns in elections number 25 vs elections number 24 alongside the additional determining factor of voting percentage for Benet's party
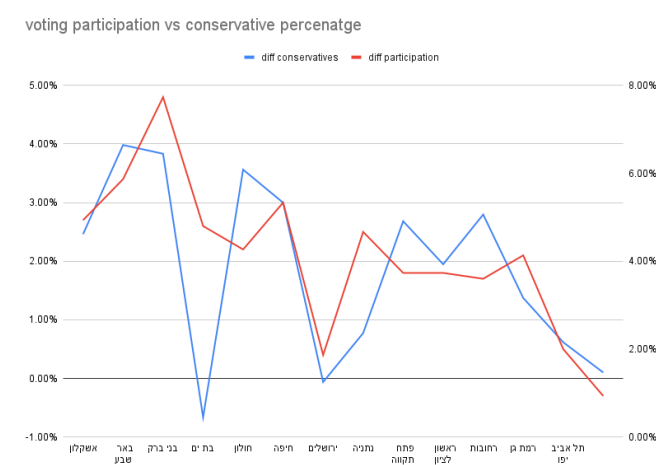

Figure 2: a plot showing the relationship between overall voting participation in major Israeli cities and the percentage of votes to conservatives parties

The combined effect of these two trends has had a profound impact on the outcome of the election and has ultimately led to the change in government. It is clear that the resistance against the existing regime and the resulting polarization of the voter base was a key factor in the shifting political landscape.

6 CONCLUSIONS

The high correlation coefficient of 0.644, which is considered extremely rare in the field of social sciences, is a strong indicator that the conservative segment of the political spectrum was highly motivated to change the ruling party during the elections. On the other hand, the liberal and Arab voters were relatively uninterested or uninvolved on the day of voting.

This result provides valuable insights into the political motivations of different groups in the society and their level of engagement in the election process. It highlights the importance of understanding and addressing the political attitudes and motivations of different segments of the population in order to enhance the democratic process and ensure that all voices are heard and represented.

Further research should be conducted to gain a deeper understanding of the factors contributing to this disparity in political engagement and motivation among different groups in the society. This information can then be used to improve political representation and engagement, and promote a more inclusive and democratic political process.