Italian Government Stability

Davide Cremonini

Master's Degree in Artificial Intelligence, University of Bologna
davide.cremonini8@studio.unibo.it

March 5, 2025

Abstract

This mini project aims at finding an approximate model for predicting stability conditions for the Italian government. After building a Bayesian network based on reasonable assumptions, it was trained using data from all governments from the first to the eighteenth legislation and used to validate some common claims or make simple predictions.

Introduction

Domain

Historically, Italy had and still has a problem with the stability of its governments, which seem to be more fragile that all the others observed in the rest of Europe, with an average of 424 days each. Political instability is indeed a problem for the reliability of the country in many aspects, both from an economical and geopolitical perspective.

Italy is a Parliamentary Republic, meaning that every five years at most citizens vote to elect a two-house parliament which then proceeds to give its confidence through a majority vote to a government previously proposed by a group of parties (a coalition) and approved by the President of the Republic. If the confidence vote is passed in both houses the government takes office and the parties outside the coalition form the so called 'opposition' which may decide to support or oppose each vote. The parliament detains most of the legislative initiative while the government, led by the Prime Minister, holds the executive power. It's common for a government to contain more than one party, the more relevant each party is the more seats it usually can claim inside the government composition. As each government requires legitimacy from the parliament it is possible for it to lose it in many different ways, leading to its fall. Once confidence is lost or the PM resigns a new government has to be proposed or snap elections will be held to reset the whole process with new party percentages.

The project was developed on a personal interest for the subject as there seem to be little to no attempts at approaching the topic with this type of probabilistic methods. As a consequence of this the model itself and the dataset used for training the network were entirely developed from scratch using simplified assumptions founded on political conventions. During the development of the model the concept of political alignment was omitted in order to keep the project politically unbiased, so the main focus both in the dataset creation and network construction was on objective data from each government from the first to the eighteenth legislation.

Aim

The project aimed at the definition of a model capable of small predictions to reason upon Italian political data from the last seventy years. The goal was for the model to be capable of providing validation for some commonly believed claims or help disprove them. The project itself represents also an attempt at probabilistic modeling of political scenarios and may become the basis for a larger scale project in the future.

Method

The development of the project was pretty straight-forward:

1. Data was collected and selected from the sources to produce a dataset

2. Data was divided into discrete larger categories to highlight eventual relationships, this was performed using the pandas python library

3. Using the draw.io web app a network was drawn following a top-down approach, starting from the most conceptually independent variables available in the dataset causal links to other variables were added until the leaves variables were left

4. Using the python pgmpy library the network was implemented and trained

5. Using pgmpy queries were then performed to test the prediction capabilities of the network.

Results

Due to the nature of the domain itself predictions can't be considered certain and thus verified exactly but can be used to support claims about political scenarios in Italy. For example, the model confirmed the claim that non politically aligned Prime Ministers have higher chances of leading a large, diversified, majority for a long time. Another interesting prediction made by the model is about the current government, which was predicted to fall due to a reshuffle.
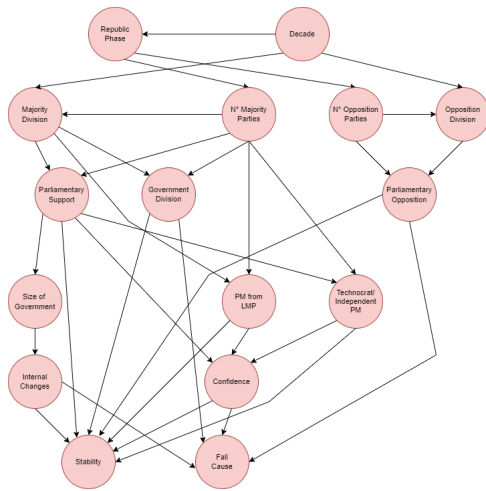
Figure 1: Bayesian Network Model

Model

Different attempts were made trying to create the most structurally sound network, the final result can be seen in (Figure 1)

As shown in figure 1 the model is moderately complex and there are a total of 16 variables, most of which present at least one causal link entering them. This report will describe only those variables which will mostly be used in the following queries. The description for the others can be found in the notebook.

- **Stability**, it's the output variable which represents the predicted stability of a government. It was obtained categorizing the effective duration of governments into 5 possible categories, each one related to a range of days from under 100 days (*Unstable*) to over 1000 days (*High Stability*).

- **Majority Division**, **Opposition Division**, **Government Division**, all express the internal division of their respective aspect, they were originally real numbers between 0 to 1 which were encoded as categories according to ranges. The higher the value, the higher the division it represents.

- **Parliamentary Support** and **Parliamentary Opposition**, are categorical data that express ranges of percentages for majority and opposition.

The network itself was built by reflecting on all the available variables with the intention of examining every possible connection between a variable and the others. The process started with the **Decade** variable trying to understand which were the nodes which could have been more influenced by it. This process was repeated for every variable which was pointed at the previous iteration until all of them were covered, leaving Fall Cause and Stability as the sole output nodes. The motivation for adding each causal link is provided in the notebook. The list of casual links which were added may not be exhaustive, only those which were

deemed relevant were included in order to keep the model itself reasonably complex.

Analysis

Experimental setup

Aside from a test query, a total of five interrogations were performed using the model: for each one of these a brief presentation was provided before each one, while an interpretation followed after. As each result may be subject to interpretation it was considered a success if the potential explanation wasn't too unrealistic or if the outcome ended up proving the claim presented before. The performed queries were:

1. What is the predicted stability of the current government and how will it fall?

2. Is it true that, given a strong parliamentary support, a Technocrat-lead government is more stable than a Politically-led one?

3. If we know that a government fell for external pressure and we know it had a strong opposition, what are the probabilities of it being divided in its composition?

4. If we want a Government to have at least a Solid Stability and reach the end of legislation, what are the best configurations for Majority Division and Government Division?

5. If a government aims at changing the constitution directly without consulting oppositions, how many parties should it contain and how divided, is the majority expected to be? How much time will such a government have to perform this reforms?

Results

Considering the simplification made to achieve the model, the complexity of queries performed was kept simple but the obtained results were still accurate enough as each prediction could be reasonably justified. A positive result we can recognise is that the model seems more reliable than previously thought. The only query which seems to have missed the mark is the first one, which was admittedly the most ambitious; despite this, one of its outcomes has yet to be proven false, and would be impressive if it ended up being true.

Conclusion

This project provided a small and simple model capable of making political predictions and was an effective way to reflect on the design of the network as each causal link can be justified by analysing the domain, giving insight one of the most discussed daily topics. An interesting extension of this project may be the addition of political alignment related variables or a generalization to include data from other countries with a similar form of government.

References

The idea for this project was inspired by LeonidasY's 'State-Collapse-Network', found at `https://github.com/LeonidasY/master-ai-projects/blob/main/state-collapse-network/Report.pdf`