Measuring Cultural Dynamics through the Eurovision Song Contest

Paper Replication

Final Report

as part of the course

Computational Methods of Social Systems

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1. Introduction

The Eurovision Song Contest (ESC) is an annually held singing competition, which started in 1956. The original aim of this contest was to unite the European countries after World War II through a cross-border television broadcasting event (Eurovision Song Contest 2017).

The rules of the contest have changed over the years. Today, every member of the European Broadcasting Union (EBU) can participate in the ESC. The EBU represents mainly European countries, but there is no strict limitation in terms of geographical affiliation of Europe as such. Countries such as Azerbaijan, Israel and Australia are also allowed to participate, even though these countries do not belong to the European continent (European Broadcasting Union 2018).

Each country is allowed to submit a song that was written specially for the ESC. In two semi-finals all contestants perform their songs for the first time on the Eurovision stage. After that, people from all the participating countries may vote by calling or sending text messages for the song they liked best. It is obviously not allowed to vote for the entry from one's own country. In addition to this so-called public voting, every country has a jury of music experts, who also choose their favorite songs. For the final score, the public votes and the jury votes are combined. In the end, the ten most liked songs from the semi-finals are admitted to the grand final. Only the winner from the last contest and the five countries France, Germany, Italy, Spain, and the United Kingdom qualify for the final automatically, as these countries contribute the most financially to the EBU. The voting procedure stays the same in the final, the song with the most points (again a summary of public votes and jury votes) will win the ESC (Eurovision Song Contest 2017).

2. Motivation

Our motivation to work on this project was on the one hand to analyze relations between European countries due to their voting behavior in the Eurovision Song Contest. Precisely, we wanted to measure the dynamics of culture, the subjective biases between pairs of countries and we wanted to find out whether other factors influence the voting behavior as well. In addition to that our second focus lies on the replication of an existing paper, to compare and extend the results for the latest years. The paper this project is based on is from Garcia and Tanase (2013)[1].

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[1] García, David & Tanase, Dorian. 2013. Measuring cultural dynamics through the Eurovision Song Contest. Advances in Complex Systems.

Our research question is "Are jury voters less affected by cultural influences in Eurovision than tele voters?". To answer this question, we introduced three agent-based models, which are described in section 4.

3. Data Description

For this project we used voting data from the Eurovision Song Contests between 2016 and 2022. Originally the voting in the contest was not separated by jury and tele voting, but starting from 2016 it was. That change in contest rules enables us to have a detailed look at these two voting groups, as we can analyze them separately. It is interesting to see which voters (tele or jury) are influenced by culture and which are not, and to what extent.

4. Model Description

We use three agent-based models, which are described in the replicated paper (Garcia and Tanase 2013). The following subsections further describe the "Null Model", "Model 1" and the "Affinity Model", which we use to model the voter's dynamics in our paper replication. In addition to that we computed the Friend-or-Foe coefficient for all the respective countries.

4.1 Null Model

At the "Null Model", the countries are able to freely give points to other countries. The only restriction is that they have to assign a fixed total amount of points. The sum of the scores is a fixed value, which matches the total possible sum in the real contest. The votes in particular are chosen randomly. Figure 1, which is taken from the replicated paper, describes this process.

Null model

For each voting country c_v:

1. For each competing country c_c:

    - Sample $fit_v[c_c]$ from uniform distribution between 0 and 1

2. For each competing country c_c:

    - Assign $p_{v,c} = 58 * \frac{fit_v[c_c]}{\sum_c fit_v[c]}$

Figure 1: Null Model. García and Tanase 2013, page 14.

4.2 Model 1

Opposed to the "Null Model", the "Model 1" follows the rules of the Eurovision Song Contest. The different countries are allowed to give fixed scores (12, 10, 8, 7, 6, 5, 4, 3, 2, 1). Other than that, the assignment of points is not influenced by anything else. The process is described in Figure 2.

Model 1

scores $= [12, 10, 8, 7, 6, 5, 4, 3, 2, 1]$

For each voting country c_v:

1. For each competing country c_c:

    - Sample $fit_v[c_c]$ from uniform distribution between 0 and 1

2. For each competing country c_c:

    - If $rank(fit_v[c_c]) \leq 10$: assign $p_{v,c} = scores[rank(fit_v[c_c])]$
    - Else: assign $p_{v,c} = 0$

Figure 2: Model 1. García and Tanase 2013, page 15.

4.3 Affinity Model

The "Affinity Model" also sticks to the guidelines of the Eurovision Song Contest. However, each vote has a "quality" part (q) and a culture part (w). The culture part comes from a cultural affinity network, where each node represents a country which votes, and the edge weights are determined by a normal distribution with variable mu and sigma. The process is shown in Figure 3.

Figure 3: Affinity Model. García and Tanase 2013, page 16.

When implementing the above Agent-Based Model, we varied the following parameters:

- mu: 6 values, varying from -10 to 10
- sigma: 6 values, varying from 0 to 5
- alpha: 5 values ranging from 0.1 to 0.9

Note that the importance of q and w are influenced by alpha, which is the "objectivity" parameter for voting. Low alpha means low objectivity and thus higher influence of culture. Unlike in the replicated paper from 2013, we now have the possibility to vary alpha, as the data for jury and tele voting has been separated since 2016. Figure 4 shows the variation of alpha from 2016 until 2022. Since we have varied alpha in our ABM, we are able to analyze how "objective" a voting block has been. As expected, tele voters are generally less objective than jury voters. The year 2022 is a sort of anomaly here. Potentially, there might have been a sympathy wave for Ukraine in the 2022 edition of the contest, due to its invasion by Russia earlier that year. Because of this, voting towards other countries might have been objective. It is worth investigating this more rigorously in future work.
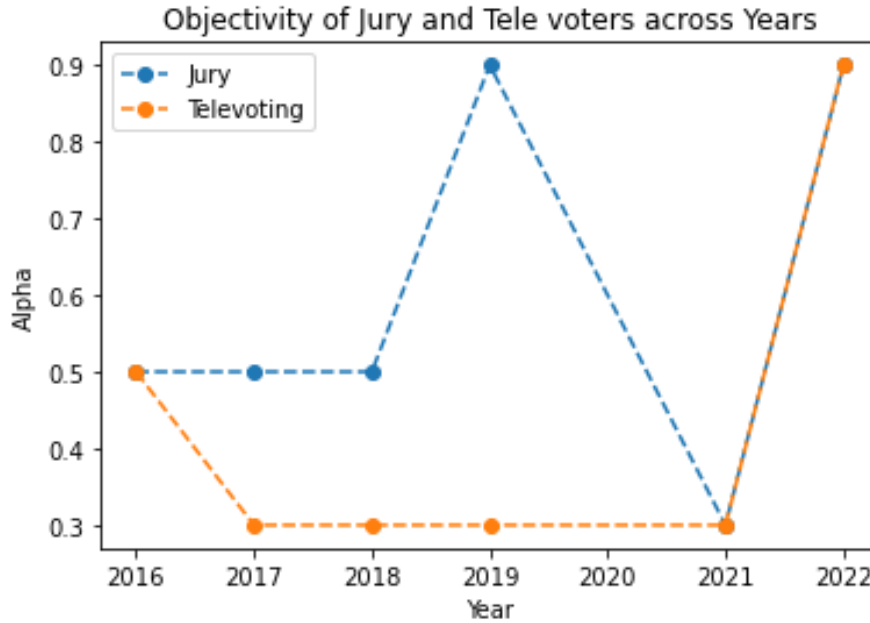
Figure 4: Varying of alpha from 2016 until 2022.

4.4 Friend-or-Foe coefficient

For the computation of the Friend-or-Foe (FoF) coefficient we used the formula from the original paper. It is computed like this: The points from the voting country are divided by the number of possible points (either 12, if only jury or tele voting are looked at or 24, if the overall coefficient is computed). This value is subtracted from the total received point that the respective country got over all minus the points from the voting country divided by the number of possible points (again either 12 or 24) times the total number of countries voting in the respective edition of the Eurovision Song Contest minus two. The FoF coefficient can have a value between -1 and 1, where a negative value implies a negative tension between the two countries and a positive value means a positive dynamic between them. The coefficient is based on the empirical data and was computed for each country pair individually; this was done for all the results from the contests of 2016 till 2022. The same coefficient was also calculated for each of the ABMs.

5. Model Analysis

For comparison of the empirical and simulated FoF coefficients, we selected for each of the models the one that yielded the lowest value in the Kolmogorov-Smirnov statistic for the corresponding year and separately for tele and jury votes.

5.1 Performance of the Agent-based models

Starting with the year 2016, we can see in Figure 5 that for the jury voters the affinity model's FoF and model 1's FoF distribution show a similar shape. The null model's FoF distribution in contrast differs from their shape. All of them do not represent the shape of the empirical FoF distribution and have a higher density.

The tele voters plot shows that the affinity and model 1 FoF distribution are closer to the shape of the empirical FoF distribution. Nevertheless both have a lower density (around 0.5). The null model's FoF distribution differs from the empirical FoF's distribution shape.
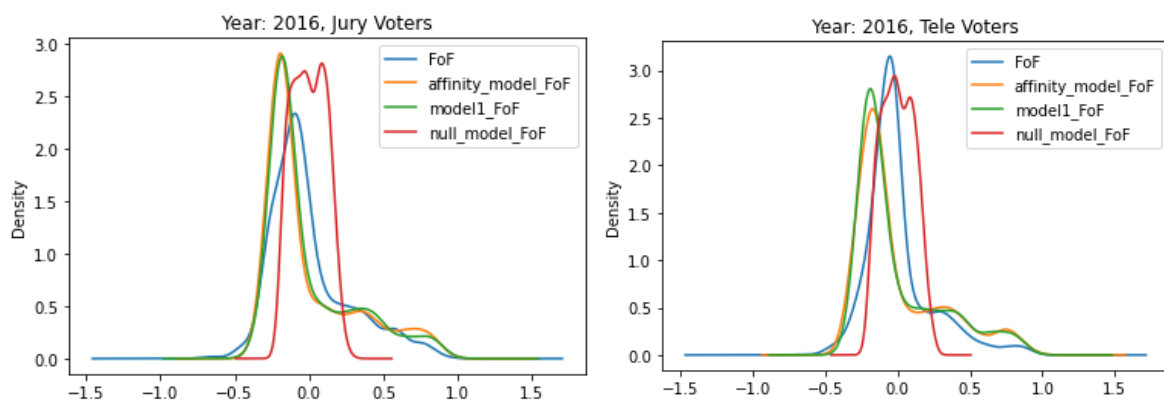

Figure 5: Comparison of jury and tele votes by performance of the three models and FoF in 2016.

In 2017 (see Figure 6) for jury voters affinity and model 1 FoF show a slightly offset approximate shape to the empirical FoF distribution. The null model's FoF's distribution differs from the empirical one, but reaches around the same height of density.

For the tele voters, the shape of the affinity and model 1 are again very similar to each other. As for the jury voters, these two distributions come closer to the distribution shape of the empirical FoF than the null model FoF, which differs from all others. The density is lower than the empirical FoF for all simulated distributions.
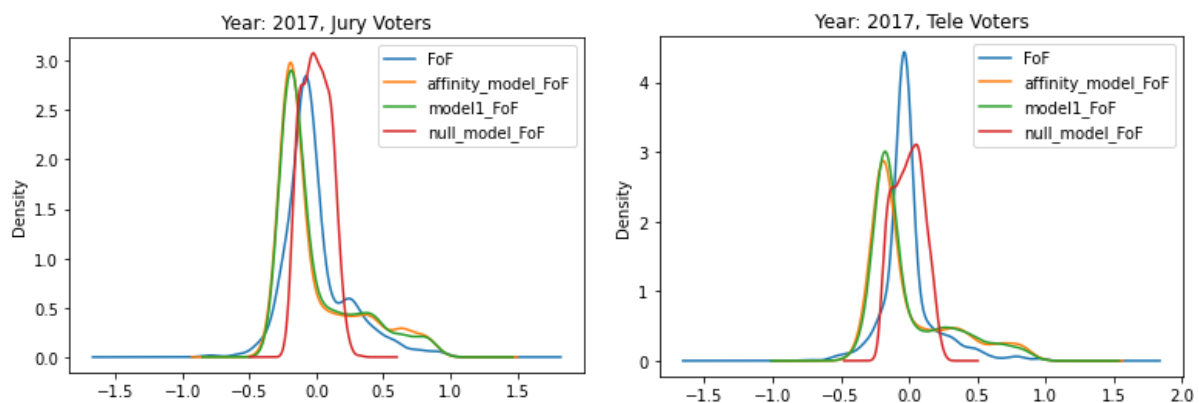

Figure 6: Comparison of jury and tele votes by performance of the three models and FoF in 2017.

In 2018 the shapes of affinity and model 1 are again similar, whereas the density of the affinity FoF distribution is higher than the one of the model 1 FoF distribution (see Figure 7). As in the previous year, both have a higher density than the empirical FoF distribution. They are closer to the shape of the empirical FoF distribution than the null models FoF distribution.

For the tele voters we see that affinity and model 1 are again similar in its shape and approach the empirical FoF distribution. They have a slightly higher density. The null models FoF distribution shape is similar to its shape of the previous years and differs from the empirical FoF distribution.
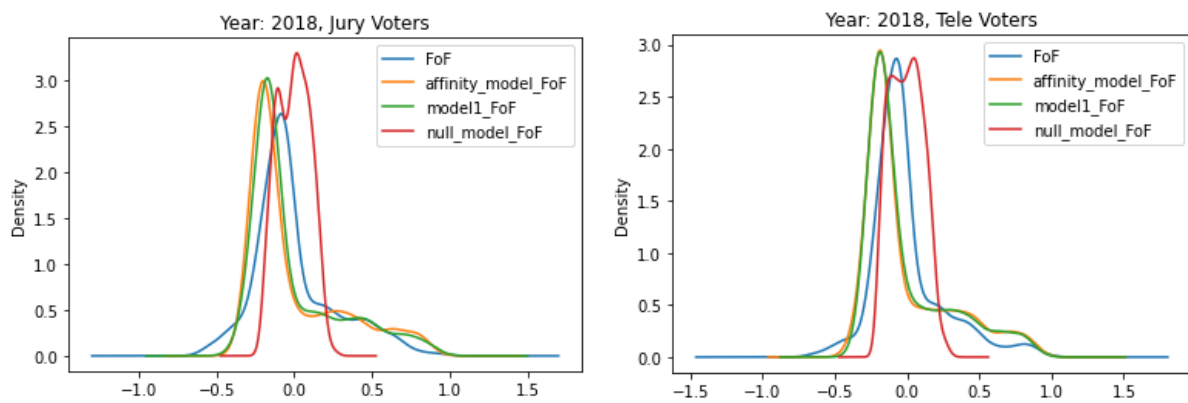

Figure 7: Comparison of jury and tele votes by performance of the three models and FoF in 2018.

In 2019, for jury voters we can see affinity's and model 1's distribution being largely similar in their shape as of the empirical FoF distribution, except between 0 and 1 where they show an opposite form to the empirical FoF distribution. The shape of the null model is different to all of the others. This can be seen in Figure 8.

For the tele voters we see as in 2017 despite the similar shapes of affinity's and model 1's distribution, which approximate the one of the empirical FoF distribution shape, both have a lower density. The Null Model shows the same shape of its distribution as in the previous years.
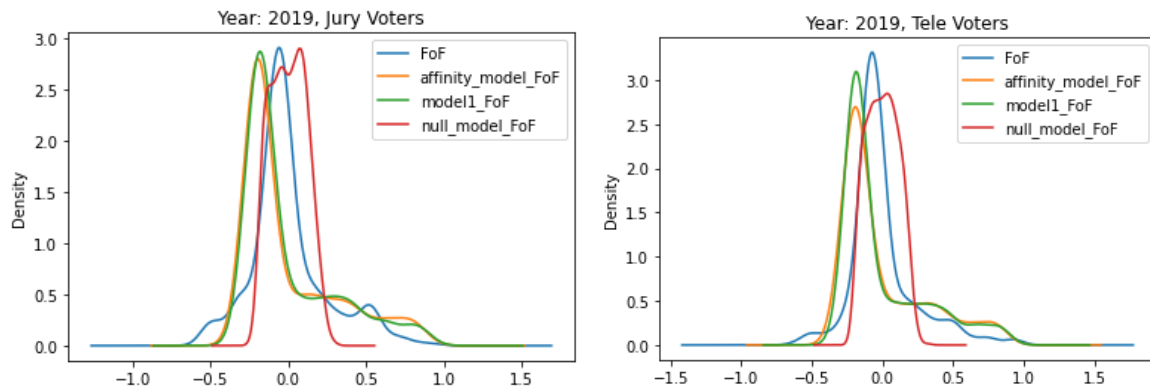
Figure 8: Comparison of jury and tele votes by performance of the three models and FoF in 2019.

For the year 2021 (see Figure 9) we see the model 1 approaching the empirical FoF distribution in its shape as well as its density for the jury voters, it is only set slightly to the left. The affinity model has a slightly higher density than the model 1, but shapewise it is similar to the real FoF. The null model has two peaks, whereas the first peak is almost a perfect fit to the real FoF.

The tele voters show a slightly lower density in the affinity and model 1 FoF distribution, but also approaches its general shape, except the end from around 0.4, where it shortly increases (instead of decreasing - like the real FoF is doing). At the value of 1, their behavior is aligned again. The null model has two peaks (as in the jury voting), but is not aligned with the real FoF.
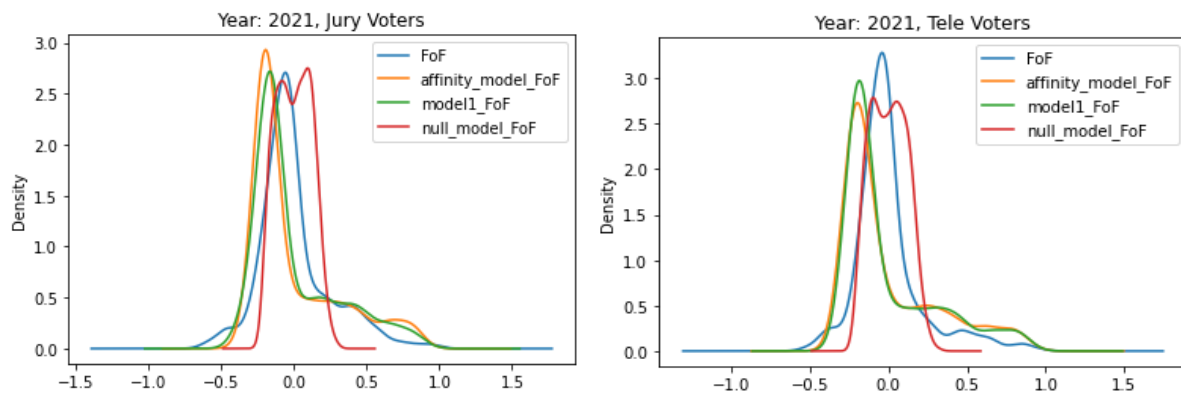

Figure 9: Comparison of jury and tele votes by performance of the three models and FoF in 2021.

In 2022 we see for jury voters that the affinity model's FoF distribution is almost the same as the model 1's distribution. Both are in its shape as well as density close to the empirical FoF distribution, only from 0.5 to 1 they show opposite shapes. The null model has a similar shape to the distribution of 2022, but is not at all close to the real FoF.

For tele voters we see that the affinity model distribution has a lower density than the empirical FoF distribution. The model 1's distribution is slightly higher, but not as high in density as the real FoF. The shapes of the affinity model and the model 1 differ especially between 0.5 and 1 from the empirical FoF, after which they become the same, as seen in Figure 10. The null model has no common shape with the real FoF.
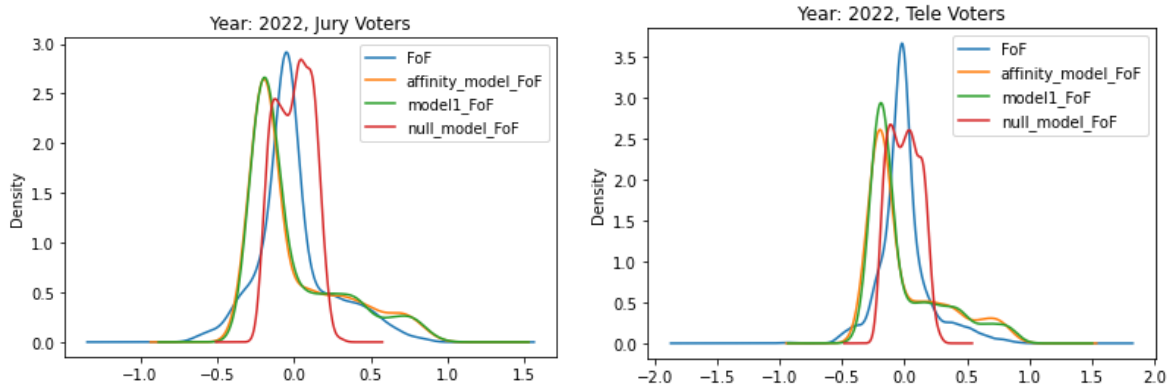
Figure 10: Comparison of jury and tele votes by performance of the three models and FoF in 2022.

To conclude our interpretation of the plots, we can basically perceive a similarity between the shape of the distribution of the affinity model and the model 1 in all years. They also converge to the empirical distribution shape, whereas they are slightly shifted to the left in all years and fluctuate in their density, sometimes different between themselves, sometimes similar and sometimes closer to the density of the empirical distribution shape. In 2017 and 2022, we see a larger difference in density between both the affinity model and the model 1 and the empirical distribution among tele voters. Furthermore, we can say that the affinity model and the model 1 increased in all the years more steeply than the empirical distribution.

The null model, on the other hand, shows no similarity to the distribution shape of the other two models, nor to the empirical distribution shape. The shape of the null model is characterized by a consistent two-peaked shape, which also varies in density. Affinity model and model 1 are ultimately more similar to the empirical distribution shape than those of the null model, which shows no similarity to the empirical distribution shape. Nevertheless, our results fluctuate too much for further conclusions and statements.

5.2 Friend-or-Foe of EU-15 countries

In addition to the three agent-based models, the FoF coefficient was computed for all the countries. This was done to see how well countries get on with each other. In order not to overcrowd the plots, only EU-15 countries are taken into account for this analysis. The EU-15 countries entered the EU prior to the 1st of May 2004, namely Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

In the following plot (see Figure 11) the results of this analysis are shown for the years from 2016 till 2022. Only the countries who made it to the Grand Finals are plotted here, as there is no data available for semi final voting. Therefore the number of nodes (each representing

one country) varies from year to year. A red line means that there is a negative tension between those countries, a blue line means that there is a positive attitude towards this country.

In the year 2016 it can be seen that Belgium and Germany were not liked by many other countries, there was a negative tension towards them. Sweden, Italy and Spain were liked very much by other countries. It is not so easy to find a suitable explanation, why the tensions were as they were. Events that occured before the contest were a Shooting in Belgium and the VW scandal in Germany.

In the year 2017, more countries made it to the Grand Final. Austria, Great Britain, the Netherlands and Germany are not liked very much in that year. Positive notions can be seen towards Portugal and France. Events that happened shortly before the contest that year were the announcement of Brexit and Austria's controversial asylum policy introduced by Sebastian Kurz.

In 2018, a lot of negative tension is visible in the plot. Barely any country is getting on well with each other that year. Events that would explain this overall negative notion are not clearly identifiable. Catalonia aimed to be independent from Spain, but failed and new dimensions of the VW scandal occurred.

In 2019, Denmark, Germany and France were not liked by many other countries. Spain, the Netherlands and Italy were treated with a positive attitude. In this year the Fridays for Future Movement started in Sweden and Notre Dame in France burned down.

In 2020, no Eurovision Song Contest took place due to the global COVID-pandemic. Therefore the next contest was held in 2021. There can be seen a lot of negative tension towards Spain, Germany, Great Britain and Belgium. Positive attitude can be observed towards France and Finland. There didn't occurre any external events other than COVID in this year shortly before the contest.

In the year 2022 a lot more positive attitude can be seen within the EU-15 countries. Especially towards the Netherlands, Finland, Belgium, Germany and Italy this can be observed. France and Portugal are not very liked in that year. The event that influenced this contest was clearly the ongoing war in the Ukraine. Ukraine also won the Eurovision Song Contest, Russia was excluded (as one of the first sanctions put into practice).

In conclusion to this plot interpretation it can be said that it seems like Europe stands closer together when there is a threat of invading this peace within Europe. This can be seen in 2017 (where the threat was Brexit) and in 2022 (where the threat was the war in the Ukraine).
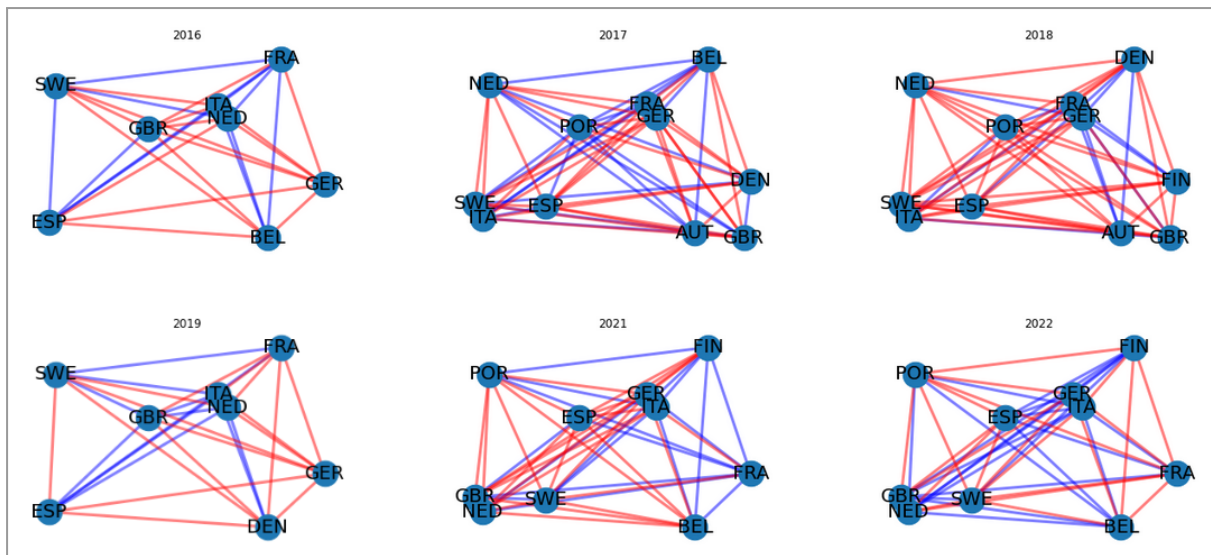
Figure 11: Friend-or-Foe coefficient for EU-15 countries, 2016 - 2022.

The relationship between the FoF coefficient of two countries can also be compared over a longer time period. In the following plots there is one example for a very positive attitude towards each other shown and one example for a very negative tension between each other. The relationship between Cyprus and Greece (see Figure 12) can be seen in the following plot. The scaling is a bit misleading, but the FoF coefficient is always very high between those two countries, which means that they really like each other. The voting for the other country can therefore not be seen as anyhow influenced by the quality or the performance of the song, it is purely influenced by culture.
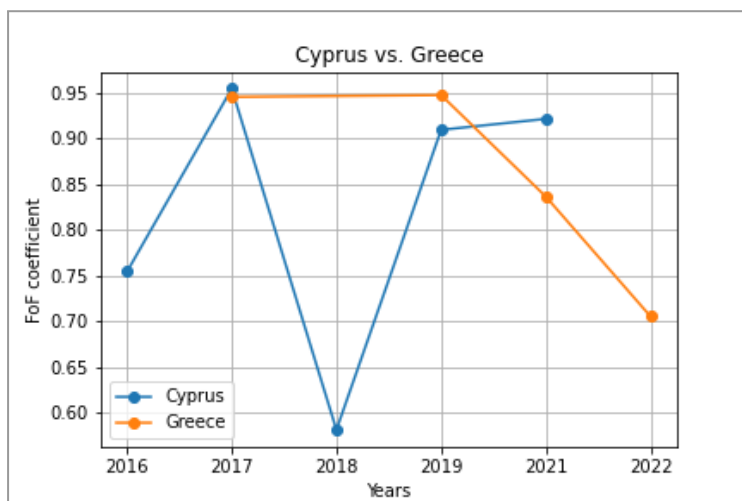

Figure 12: Friend-or-Foe coefficient for Cyprus vs. Greece, 2016 - 2022.

The relationship between Armenia and Azerbaijan (see Figure 13) is the total opposite of the mentioned relationship above. Due to the long ongoing dispute between those two countries, the relationship in the Eurovision Song Contest also suffered. These two countries hate each

other. No matter how well the song is or how well it is performed, these countries will not give each other any points.
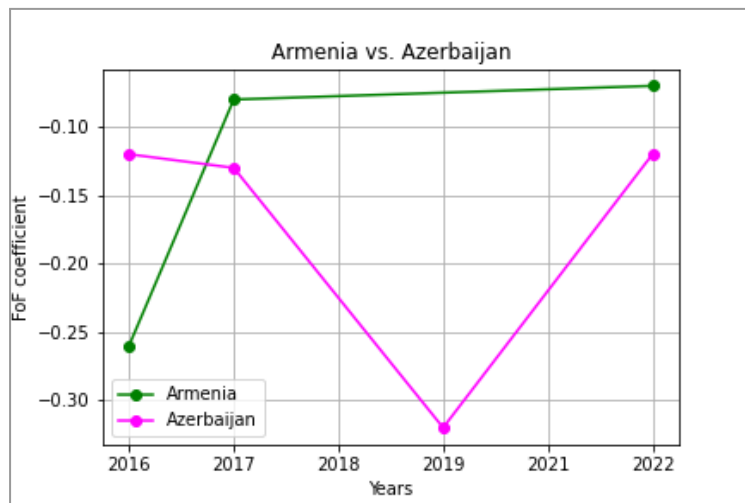

Figure 13: Friend-or-Foe coefficient for Armenia vs. Azerbaijan, 2016 - 2022.

6. Conclusion

This project gave us an opportunity to revisit a decade-old paper that leveraged the Eurovision Song Contest to investigate cultural relations between European countries. The biggest difference between then and now is that the data is now more fine-grained and richer. This is because the ESC has, since 2016, announced jury votes and tele votes separately. This has enabled us to compare and contrast the voting behavior of jury members (who are expected to be more objective) with that of tele voters (who are expected to be more susceptible to letting cultural biases affect their votes).

We used the same three models of voting dynamics as the original paper. Unlike García & Tanase (2013), we were not able to conclusively identify cultural affinity as an influence on voting behavior neither for juries nor for tele voting. However, we could clearly see that the voting was not random, but influenced by the contest voting rules.

Due to the availability of richer data, we were able to address a new research question, which was "Are jury voters less affected by cultural influences in Eurovision than tele voters?". Based on our plot of the alpha values across the years (see Figure 4) , we conclude that overall, jury voters are more objective than tele voters, which matches our intuition and previous research (Haan 2005). Counterintuitively, however, both jury voters and tele voters are considered highly objective in 2022. This might be because our model cannot handle the anomaly presented by the sympathy wave towards Ukraine due to the invasion earlier that year. Potentially, apart from Ukraine itself, the voting for other countries

was indeed highly objective. That is, perhaps the cultural sympathy factor was overwhelmingly towards Ukraine, and all other countries were treated objectively.

Notably, the (empirical) Friend-or-Foe networks of EU-15 countries seem to indicate that there is some cultural and political dimension to the voting patterns of these countries. The disunity and unity within these networks corresponds roughly to various events that shaped the political space across the last six years.

The code for agent-based modeling is publicly available on github:

https://github.com/Ppandda/Computational-Modelling-Social-System

6.1 Limitations and Future Work

In this project we found some interesting results. For further improvement of the project, we would advise the following things:

- Our analysis, counterintuitively, did not find large differences between a model of contest rules and a model that incorporates cultural affinity. It might be useful to develop a more sophisticated model for affinity than a linear combination of a qualitative part and a cultural part.

- Due to the fact that jury and tele voting data were only separated in ESC announcements starting in 2016, we were only able to work with data from the last six years (there was no contest in the year 2020 due to COVID). This paucity of data is a limitation of our analysis. In the upcoming years, it might be possible to identify more stable trends when more data is available.

- It might be worth trying larger variations of the free-parameters of the cultural affinity model (mu, sigma and alpha), as it is possible that the impact of culture might be underestimated by the current analysis.

- It might be unrealistic to treat voters within a country as a homogeneous bloc, as a voter with cultural ties (familial, religious, linguistic, …) to another country might have slightly different relationships with a third country than fellow residents would have.

Overall we think that we were able to produce interesting results, which hopefully will lead to even more interesting findings in the future.

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