

# Challenge 3 (ECEN-689-606)

## Insights from Population Parameters

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**Abstract-** Using Gephi to do network analysis on population parameters.

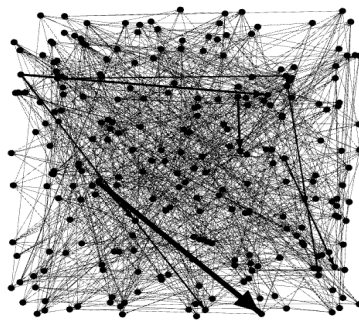
### I. INTRODUCTION

Goal is to find relationship between different countries using modern visualization techniques. Network Analysis will be used to draw graph of all countries and link it with countries whose coefficients have been used to predict its population.

### II. NETWORK ANALYSIS

#### A. Initialization

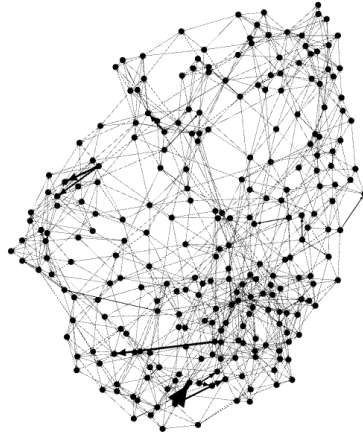
Two files namely nodes(country names) and edges(source, target and coefficients) are extracted from population\_parameters.csv. Both the files act as a input in gephi to plot network graph. Figure 1. shows how network graph looks without any analysis.



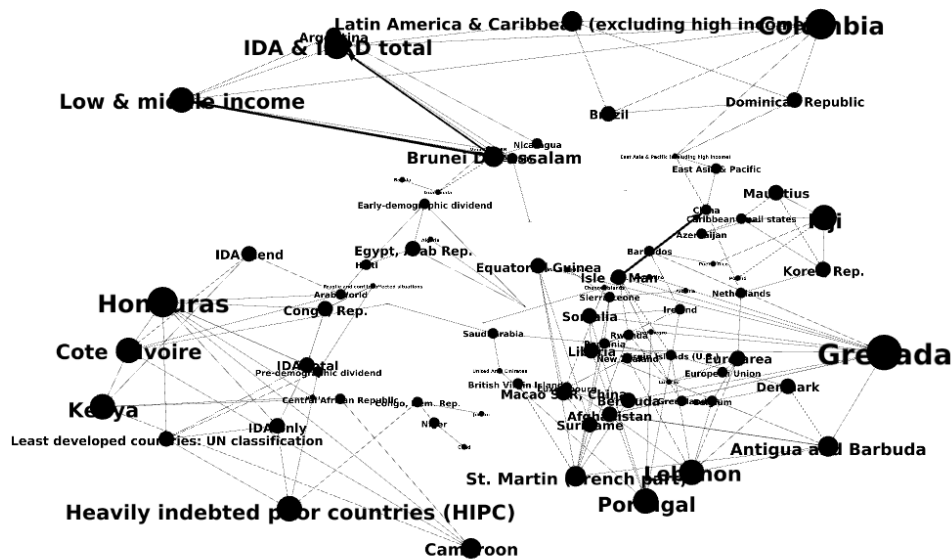
**Figure 1.** Initial Network Graph in Gephi

### B. Analysis

To start with analysis to draw insights we run a ‘Yifan Hu Proportional’ layout on the the network graph. This will produce the Figure 2. After this we use some apply some statistics measures(network diameter) on the graph and also set some filters like In-Degree range and Out-Degree range to see how are coefficients selected. In our case In-degree would be 5 for most of the countries. Out-Degree will give us some useful insights.

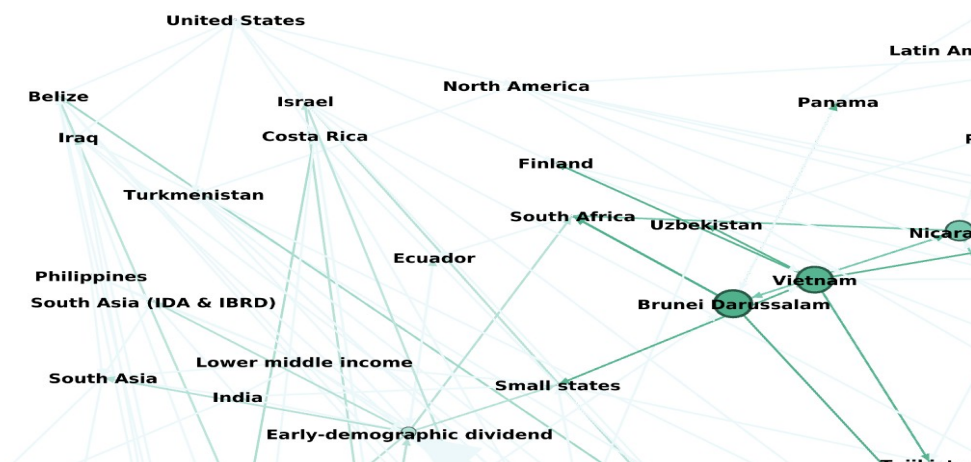


**Figure 2.** Network Graph after ‘Yifan Hu Proportional’ layout



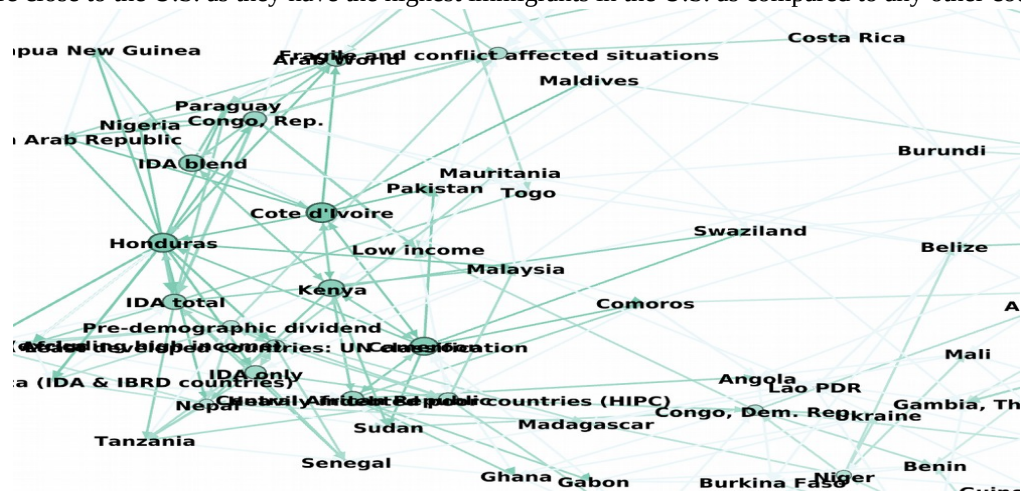
**Figure 3.** Network Graph after Out degree criteria between [6,14]

After this we apply some customization on the node appearance and use closeness centrality as a criteria for ranking and then we can focus on a particular country to find relationship. For e.g. United States according to figure 4 population of the U.S is either affected by or has affected these countries like Belize, Israel, Iraq, Costa Rica, North America, Finland, Turkmenistan which can be inferred if we see either political or geographical relations of U.S. with these countries.



**Figure 4.** Network Graph for United States

Moving on if we try to find relationship in clusters we can easily see countries which are in one continent are closer and affect each others population greatly. For this first apply appearance and then delete some countries which looks majority and then again apply ‘Yifan Hu Proportional’ layout and we will get all the countries in from one continent together. For example all African countries are nearby (Figure 5) and same for European countries (Figure 6). There are some countries like Nepal and Bangladesh which come with Africa reason for this is because these countries have low economy which is a similar characteristic with African countries. The U.S is placed in middle (Figure 7) as it is having the highest number of immigrants which keeps the U.S. in the middle of the network. Latin America countries are close to the U.S. as they have the highest immigrants in the U.S. as compared to any other country.



**Figure 5.** African Countries

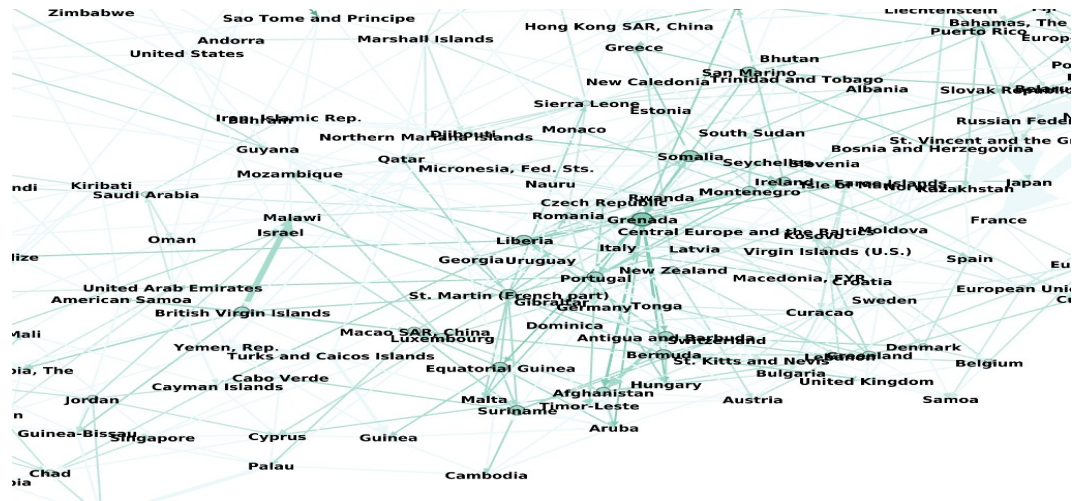


Figure 6. European Countries

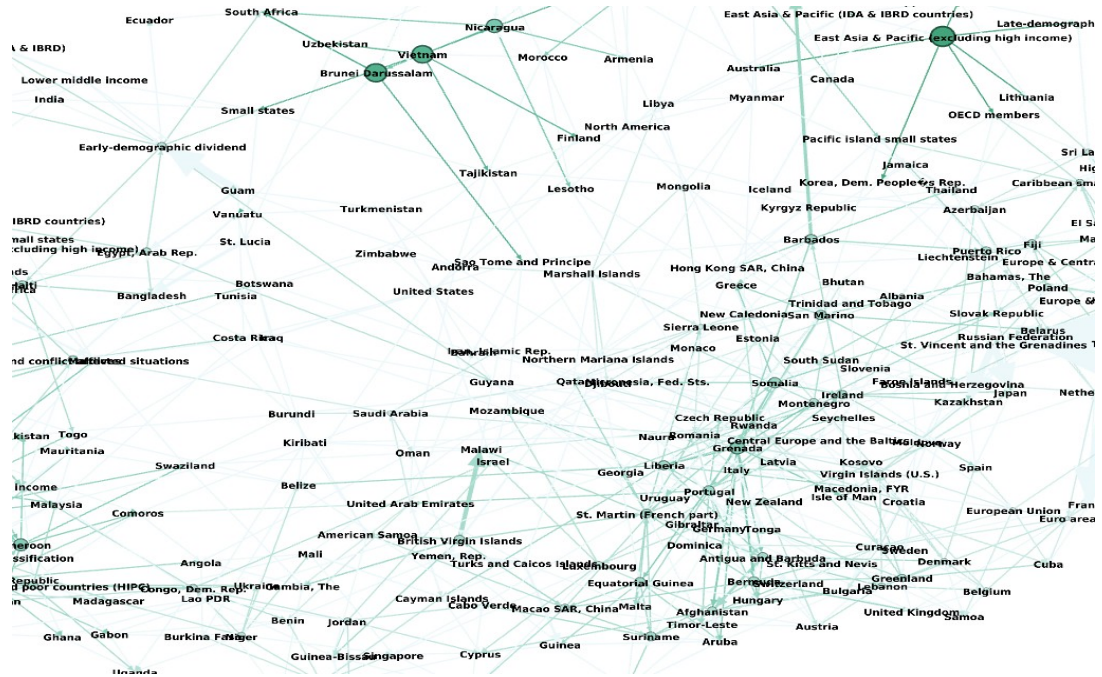


Figure 7. United States is in the middle of the network

### C. Conclusion

All these relationship observed from the network analysis are supported by history. This proves that network analysis can be used as a to find relationship among between different things or objects in a same sector or field. This graphical representation also tells how strong the affect. For further discussion we can also use dynamic graphs to show change in relationship along with time.