Predicting news truthfulness through graph-based retweet patterns.

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Project Idea

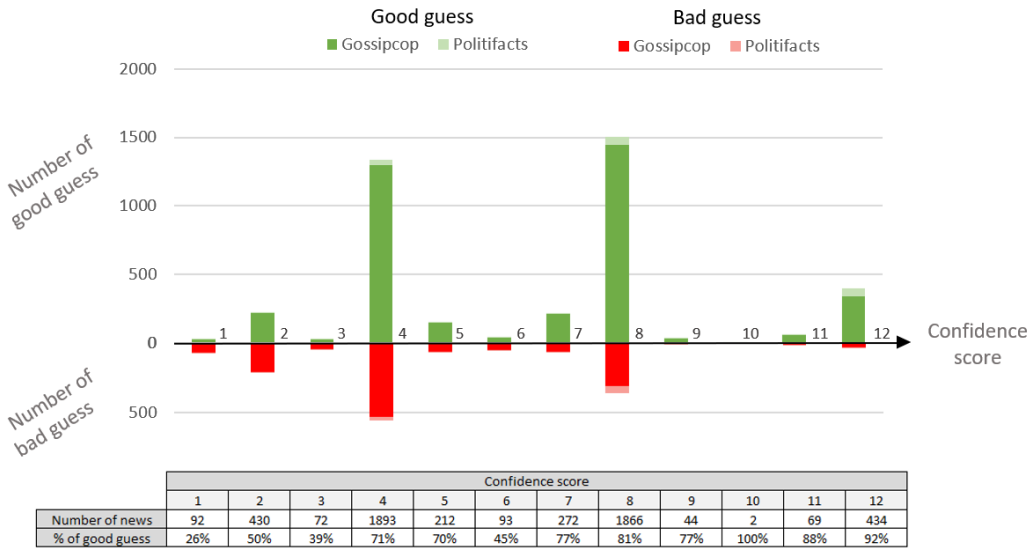
The main objective and idea of the project haven't changed since the proposal. The purpose of this project is to prove whether it's possible to classify news as real or fake based solely on the "pure" retweet graph structure, independently of user metadata.

Implementation

During this period of time the group has implemented some basic programs in Python (using NetworkX[1]) in order to extract useful information about the Graphs of news retweets, such as:

- **Diameter**
- **Max Degree**
- **Standard Deviation of Timestamps**
- **Degree Centrality**
- **Closeness Centrality**
- **PageRank**

A system of prediction based on score has also being implemented. It gets some graphs data as input and determines how much it deviates from the averages calculated with previous algorithms.



	Confidence score											
	1	2	3	4	5	6	7	8	9	10	11	12
Number of news	92	430	72	1893	212	93	272	1866	44	2	69	434
% of good guess	26%	50%	39%	71%	70%	45%	77%	81%	77%	100%	88%	92%

The image above is just an example on how it can display the prediction and its accuracy. It represent a confidence score on how sure we are about a news label. The confidence score rate the similarity of the results to the average values of its class (Real / Fake). We should obviously split the data into training and test sets, but for now, from what we can see, there is a correlation between the data extracted from the graphs and their actual label.

Implementation published in the github repository[2]

Machine Learning

As we discovered the correlation between the data and the graphs label, the last part we need to implement is the machine learning model that can actually infer the label of a graph given as input. We have been discussing about the models we should use and the ideas haven't changed. We are talking about using:

- **Support Vector Machine**
- **Feed Forward Neural Network**
- **Random Forest**

As the project move towards the final results we might try different models in order to find the best predictors.

User Ranking

At the end we would like to give a more detailed information about the user trustfulness using a ranking function:

UserScore = US
Normalized number of false retweets = FR
Normalized true to false ratio = TFR
Normalized betweenness of node = NB
Normalized pagerank of node = NP

$$US = 0.4 \times FR + 0.3 \times TFR + 0.2 \times NB + 0.1 \times NP \tag{1}$$

References

[1] NetworkX library: `https://networkx.org/documentation/stable/`

[2] Github Repository: `https://github.com/davidebaggio/LFN_proj`

Contribution

Contributors:

- Baggio Davide ($\frac{1}{3}$ of the work): All the work documented in the proposal, finishing the implementation of the extraction of information about the dataset, preparing the data into a ".csv" ready for the ML models.
- Martinez Zoren ($\frac{1}{3}$ of the work): All the work documented in the proposal, starting to implement the firts ML models, creating the ranking function based on importance of the features.
- Brocheton Damien ($\frac{1}{3}$ of the work): All the work documented in the proposal, finishing the implementation of the probabilistic algorithm that gives a score to a graph in order to predict if it is a Real or Fake news.