Master thesis

Simon Lorent

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Fake news detection using machine learning

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Acknowledgement

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Master thesis

Fake news detection using machine learning

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Abstract

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Chapter 1

Introduction

1.1 What are fake news?

Fake news have quickly become a society problem, being used to propagate false or rumorus informations in order to change behaviors of peoples. Before stating to work on detecting fake news, it is needed to first understand what they are. It have been show that propagation of fake news have had a non negligable influence of 2016 US presidential elections[1]. A few facts on fake news in the United States:

- 62% of US citizen get there news for social medias[2]
- Fake news had more share on facebook than mainstream news[3].

Fake news have also been used in order to influence the referendum in the United Kingdom for the "Brexit".

Shu et al[4] provides multiples features that can be used for fake news detection:

- News Content Features:
  - Linguistic-based
  - Visual-based
- Social Context Features:
  - User-based
  - Post-based

  - Network-based

They also provides multiples approaches in order to build the model.

- News Content Models:
  - Knowledge-based
  - Style-based
- Social Context Models:
  - Stance-based
  - Propagation-based

1.2 Datasets

1.2.1 Fake News Corpus

This works uses multiples corpus in order to train and test different models. The main corpus used for training is called Fake News Corpus[5]. This corpus have been automatically crawled using `opensources.co` labels. In other words, domains have been labeled with one or more labels in

- Fake News
- Satire
- Extreme Bias
- Conspiracy Theory
- Junk Science
- Hate News
- Clickbait
- Proceed With Caution
- Political
- Credible

These annotations have been provided by crowdsourcing, which means that they might not be exactly accurate, but are expected to be close to the reality. Because this works focus on fake news detection against reliable news, only the news labels as fake and credible have been used.

TODO: Expliquer comment le dataset a t nettoy et mis dans une base de donnes afin d'augmenter les performances.

1.2.2 Fake News Net

The second dataset used is fake news net[6, 7, 4]. This corpus is made of news from two different sources, PolitiFact and GossipCop. An older version also provide news from BuzzFeed. News are categorized in two classes: fake and non fake. Being quite smaller than fake news corpus, this dataset will be used as a test dataset.

1.2.3 Liar, Liar Pants on Fire

The third and last dataset is **Liar, Liar Pants on Fire** dataset[8], which is a collection of twelve thousand small sentences collected from various sources and hand labeled. They are devided in six classes:

- pants-fire
- false
- barely-true
- half-true
- mostly-true
- true

This set will be used a second test set. Because in this case there are six classes againt two in the other cases, a threshould should be used in order to fix which one will be concidered as true or false.

It should be noted that this one differ from the two other dataset is it is composed only on short sentences, and thus it should not be expected to have very good results on this dataset for models trained on Fake News Corpus which is made of full texts.

1.3 State of the Art

Chapter 2

Data Exploration

2.1 Introduction

A good starting point for the analysis is to make some data exploration of the data set. The first thing to be done is statistical analysis such as counting the number of text per class or counting the number of words per sentence. The second step consit of doing Latent Dirichlet Allocation[9] in order to make unsupervised clustering of the text and see if there is some kind of correlation between the clusters to which a text belongs and its labels.

2.2 Dataset statistics

2.2.1 Fake News Corpus

Because **Fake News Corpus** is the main dataset, the data exploration will start with this dataset. And the first thing is to count the number of items per class.

Because the dataset have been cleaned, numbers provided by the dataset creators and number computed after cleaning will be provided. We found the values given at **Table 2.1**. It shows that the number of fake news is smaller by a small factors with respect to the number of reliable news, but given the total number of items it should not cause any problems. But it will still be taken into account later on.

To have a better view of the distribution of categories, an histogram is provided at **Figure 2.1**.

Type	Provided	Computed
Fake News	928,083	
Satire	146,080	
Extreme Bias	1,300,444	
Conspiracy Theory	905,981	
Junk Science	144,939	
Hate News	117,374	
Clickbait	292,201	
Proceed With Caution	319,830	
Political	2,435,471	
Credible	1,920,139	

Table 2.1: Number of texts per categories

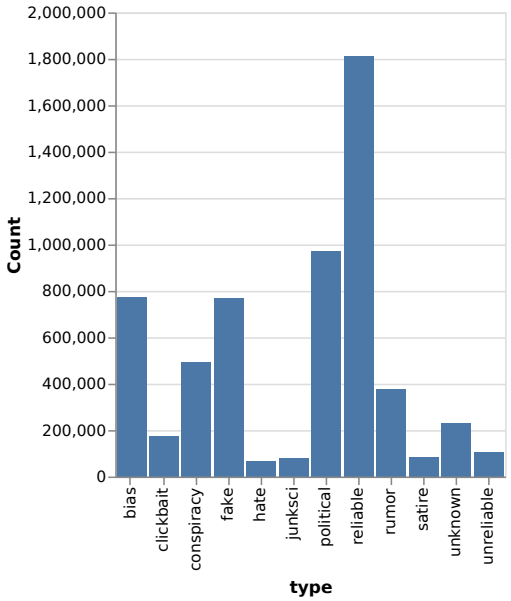

Figure 2.1: Histogram of text distribution along their categories on the computed numbers.

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