

## Team 39 - Fake News Detection

### **Problem Statement: (please describe the project in 1-2 sentences)**

Real or Fake? Identifying Fake News Using Natural Language Processing. This project explores machine learning methods of natural language processing (NLP) and recurrent neural networks (RNN) as means to identify and address the issue of fake news.

### **Which question(s) do you want to explore? Why do you think this particular question is interesting?: (1-2 paragraphs elaborating on the project's relevance)**

Disinformation and manipulation in the media have always existed, but with the advent of social media, there has been an increase in the amount of misinformation spread, the ability of anyone to contribute false information, and the speed at which this information can be spread to larger audiences. Fake news has even drawn more attention as it is widely used to sway opinions in the past and upcoming elections.

Interesting questions:

- What are the topics/areas that are most susceptible to fake news?
- Can we identify conspiracy theories or themes of fake news relevant to COVID-19 and the upcoming elections?
  - Can we track the evolution of fake news over time and are there any patterns (e.g. compare news in election years)?
- What is the relationship between location and fake news i.e. are there certain areas which have higher incidences of a certain type of fake news?

### **Which datasets do you plan to use? Why? Are there any data sources that you have failed to find? (List relevant datasets)**

Our corpus consists of 17,903 fake news articles and 20,826 real news articles, which are part of a publicly available Kaggle dataset that can be accessed [here](https://www.kaggle.com/mdepak/fakenewsnet). Each news item has been classified as 'True' or 'False' by the non-profit fact-checking website PolitiFact. The fake articles mainly come from satirical news websites such as addictinginfo.org and the majority of the real news articles are taken from Reuters.

Other datasets:

<http://www.fakenewschallenge.org>

<https://www.kaggle.com/mdepak/fakenewsnet>

### **Please describe the plan or methodology that you will use to answer your question (1-2 sentence description of statistical analysis techniques)**

**Word Embedding:** Word embedding uses efficient, dense representations of words, which transform similar words into similar encodings. Specifically, an embedding is a dense vector of floating point values learned by the model during training.

**RNN:** Recurrent neural networks recognize the data's sequential characteristics and use patterns to address classification and regression tasks. Each recurrent unit in the network

contains value composed by input at time  $t$  and memory from previous input at time  $t-1$ . For each input sentence or article of length  $T$ , the network unfolds for a sequence of recurrent state of length  $T$  and updates its memory with each word. During training, the network applies backpropagation through the recurrent state and improves the network by optimizing the loss function.

**LIME:** Oftentimes when we work with NLP models, we want to see what words or phrases the model is looking at when making classification. LIME provides the importance of individual words and phrases in the corpus and helps explain the model's output.

**Transfer Learning:** Oftentimes with complex NLP problems, using a pre-trained model is common to avoid starting from scratch. For our work we will try to find pre-trained models relevant to our problem and then train the final layers to fit to our data.

**Final Product:** We would like to package our analysis in a form of a web tool or chat bot. In this tool, the user will have the ability to input a news article and the tool will flag the article as fake or real. If the article is flagged as fake, the fake text will be highlighted as explanation for the result.

An additional action item is determining common themes of fake news across various of the States, so that campaigns can be run to dispel myths or conspiracy theories; this is relevant for fake news surrounding elections and COVID-19.