HDSC August '22 Capstone Project Documentation: Public perception of AI.

A project by team Hadoop

Artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. As the hype around AI has accelerated, vendors have been scrambling to promote how their products and services use AI.

AI systems generally work by ingesting large amounts of labeled training data, analyzing the data for correlations and patterns, and using these patterns to make predictions about future states.

AI came to the fore in 1956 and has since gained traction worldwide, accompanied by varying beliefs, interests, and sentiments. It is undeniable that Artificial Intelligence (AI) is one of the most rapidly developing fields in computer science and with all its connotations and implications, the public's view of AI is extremely important.

The problem of AI carries numerous important questions that touch on some of the most important questions for a person, most notably, what even constitutes consciousness? with these implications, it is no wonder AI has captured public interest. Will it be a destroyer or the new 'God'? Let's explore.

1.1 Aim of the project

This project aims to determine the public perception of artificial intelligence and to conduct sentiment analysis to discover people's positive and negative perceptions of artificial intelligence.

1.2 Flow Chart

Data sourcing and wrangling → Data exploration → Hypothesis testing and modelling → Results

2.1 Data Sourcing

The dataset was sourced from Kaggle website:
https://www.kaggle.com/datasets/saurabhshahane/public-perception-of-ai

2.2 Dataset Description:

The dataset is organized so that it gives us the date of the article, the NYT section, the general AI Mood, and the AI Relevance. It also tells us whether it has a positive or negative mood about AI (using a 5-point scale with 3 being neutral, 5 being very positive, and 1 being very negative) and how related the article is to AI (again, using a 5-point scale).

We are also given a binary indicator in the dataset telling us whether or not the article includes fictional examples of AI (Fiction).

Then, for each article, the dataset gives a binary indicator of if there is negative or positive sentiment for each of the following categories:

- Merging of humans and AI (Cyborg)
- Ethics in AI (Ethics)
- Military applications (Military)
- Societal Progress using AI (Progress)
- The AI Singularity (Singularity)
- How AI will affect Work (Work)

These categories are what we used to measure not only the general sentiment of AI but also to try to do some predictions of the trends of AI in the future.

3. Data Preparation

3.1 Data Wrangling

The dataset was assessed programmatically using built-in Pandas methods. After assessing the dataset for missing values, duplicate values, and data types, 3 quality issues were found.

Before cleaning these issues, a copy of the dataset was created to use for our analysis. This dataset contained 5 duplicates which were removed using the drop duplicate method in Pandas.

Result in columns with missing rows being dropped and the date column being converted to a DateTime object. Lastly, there was also some metadata included that was removed, for it was not relevant to our analysis.

3.2 Data Processing and Manipulation

In order to obtain clean paragraphs from the articles and to analyse the sentiments, regular expression(re) was used to remove unwanted characters and punctuation.

To pre-process the content of each paragraph Natural Language Toolkit was used such as;

- Stopword - using NLTK to import stop words (Unnecessary words)

- Word_tokenize - splitting words (converting each word to a list)

4. Sentiment Analysis
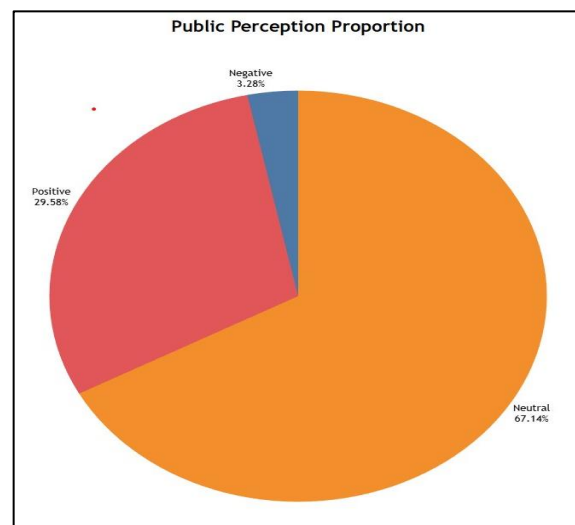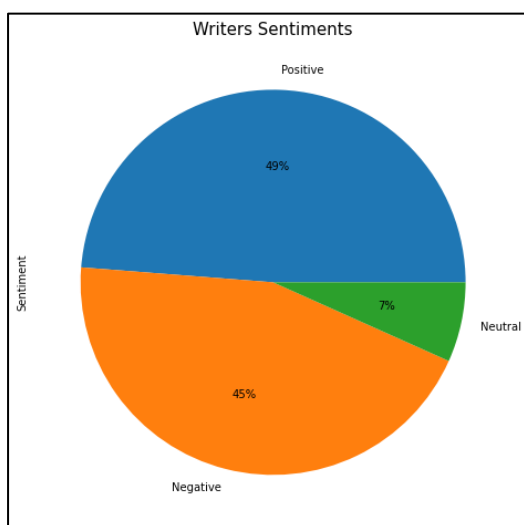
For this sentiment, the library TextBlob was used to get the polarity of the paragraphs between [< 0, >= 1]. The polarity score is identified as "Positive" when text > 0, "Neutral" when text equals 0, and "Negative" when text < 0.

Hence, from the graph on left it seems that there's a positive feeling about AI, however the general perception of AI is getting more and more neutral as time passes

5. Exploratory Data analysis

5.1 What the numbers say!

The following insights were drawn from the dataset. As seen below, there is a slight trend downward in the general opinion on AI, but it does remain slightly above three, which means it stays positive.

As we can see, if we remove all of the neutral articles, then the trend becomes a little bit clearer. Not only are articles generally positive around the 90's, but the trend downwards as we get closer to modern day is pronounced.
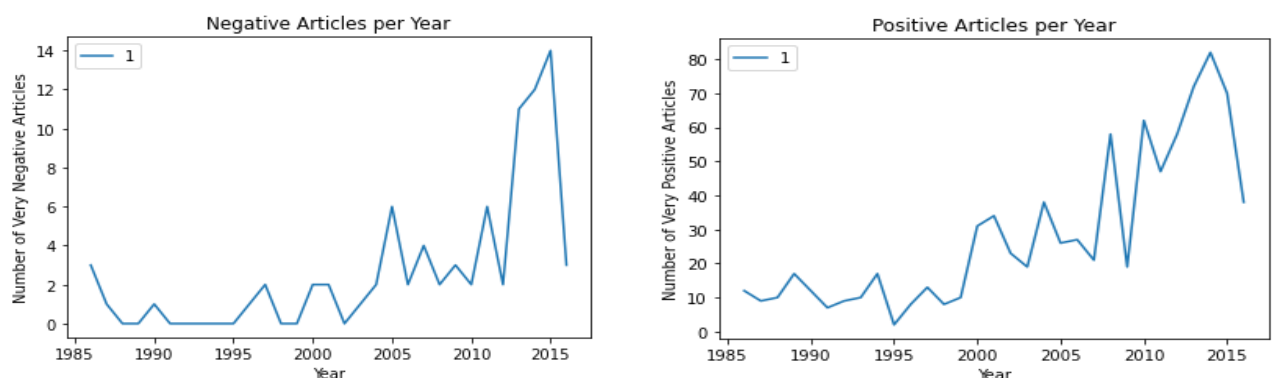
From the graph on right, we can infer that, for both positive and negative articles, the number increased substantially, which is not surprising.

However, one interesting phenomenon is how around the year 2000 is when the number of positive articles abruptly increased, while only in the year 2005 did the number of negative articles increase.

This fits the idea that with all of the positive hope about AI comes a delayed sense of foreboding about its future. It seems like for a while, there is lots of talk about the positives, but it takes some time for people to realize the negatives of AI.

Also, something noteworthy is that, from 2012 to 2015, there was an extremely intense increase in negative articles, much more than positive articles.

This could mean that negativity is increasing at a much faster rate in recent years.

6. Hypothesis testing and modelling

It is easy to see that topics regarding AI are getting more prominent in the public eye, but which fears, exactly, do people worry about the most? If we were to project into the future, what issues are increasing the most relative to all the others? Another interesting piece of information is to see if any fears are strongly correlated. For example, we would hypothesize that Articles on the Singularity will have a strong correlation with Articles about work being affected by AI since the singularity strongly implies almost any job being automated.

We began by using some basic regression analysis to ascertain which categories of interest are increasing the most rapidly. We exclude the year 2016 in these algorithms because there was an artificial dip in the number of articles for all categories in 2016. And created dataframe out of the rest. For our modelling, we used ensemble techniques and concretely trained classifiers ranging from Decision Tree, K-Nearest-Neighbors, ExtraTrees, and Random Forest classifiers. Before training, we created an optimal ExtraTrees Classifier model to find the feature importance and determine which features are least important.
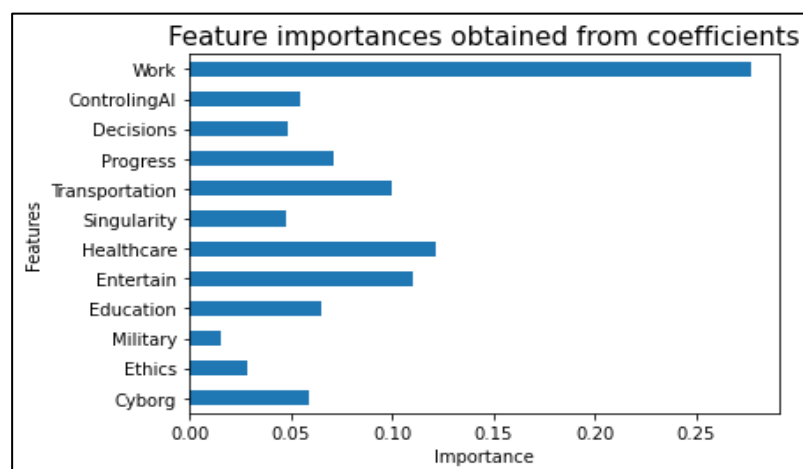
From the plot displayed above Military and Ethics have rather low importance. These features were dropped from the model because a simpler model tends to generalize well.

Decision trees perform very well, and even random forest (let's think of it for now as a bunch of trees that work better together).

7. Result

Based on our hypothesis testing, 'Work' stood out as statistically significant. 'Work' fits the bill, it increases the articles per year with a z-score of 2.2042, which is a large outlier from all of the other data. This strongly implies that the increase in articles related to work is not due to chance, and is likely a real phenomenon, which in retrospect may be unsurprising. In a capitalistic society if you can't work then you can't survive, so people would naturally be worried about AI taking their jobs, even more with all the recent advancements in AI.

There were a couple of other topics that were most significant. Healthcare had a large increase of 1.236, and Military and Education had a pretty large decrease with -0.906 and -1.004 respectively. However, these z-scores were much closer to 0, and therefore it is difficult to say they are significant.

We checked if there is one AI Mood category that is dominating the entire dataset, so let's calculate what proportion of the dataset are 1's, 2's, 3's, 4's, and 5's.

- The proportion of Moods that are 1: 0.008997147245995173

- The Proportion of Moods that are 2: 0.048935703313583497

- The Proportion of Moods that are 3: 0.7259161729207813

- The Proportion of Moods that are 4: 0.12080315997366689

- The Proportion of Moods that are 5: 0.09534781654597323

From the calculation, there was a somewhat dominant strategy for a potential Machine Learning Algorithm to simply choose 3 as the AI Mood for every single article, which gave it an accuracy of around 72.6%.

From our Random Forest Classifier, it had an accuracy of around 76.4%, which means it is not simply using that dominant strategy, which is good.

However, our accuracy still isn't very good. Why is this? One possibility is that our dataset simply isn't great for this kind of machine-learning analysis. In the dataset, articles are having an overabundance of 3's and also in our model, which may also be hurting our algorithm, because the dataset doesn't have enough diversity. However, the fact that our accuracy is above the dominant strategy means that our algorithm is learning somewhat.

8. Conclusion

From the project; Foremost, perhaps the most noteworthy conclusion is that the general feeling about AI is getting more and more neutral as time passes. Is this just due to the public having a broader understanding of the reality of AI, or is it indicative of how AI will become more and more feared? It's important to say because there's also a sense of negativity as we can show trends to depict this fact. This is important to realize, because this sort of trend is exactly how to progress in AI can be hampered, how technology can be demonized, and how reactionary groups can start to spring up. Ethics are of major importance when dealing with the public interest.

9. Future prospects

Artificial intelligence scope has also been the reason why Different fields have been transformed from the core, and it is only expanding. Our dataset "Public perception of Ai", Is more of an exploratory dataset rather than a more statistical one. Hence, Building the prediction model out of

this dataset will not only be irrelevant but the output will also be vogue. Maybe adding more volumes of Diverse unbiased data with more statistical relevance might help to achieve greater accuracy and precise result for the algorithm.

Tableau Dashboard Link:

Here is the link to the tableau public [dashboard](#), from our project.

GitHub Link:

Here is the link to the [GitHub](#) to access the code.

Participating members:

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