Leveraging Machine Learning For Depression Identification In Social Media

20BCE2362 | Vishvesh Mishra | Dr. Poornima N | SCOPE

Introduction

In our modern world, social media has reshaped how we interact, yet it also impacts our mental health. Our project bridges this gap by using technology to examine social media data for signs of depression. By blending innovation with compassion, we strive to foster digital well-being in today's interconnected society.

Motivation

With a shared goal of nurturing a kinder online world, our project explores the complex relationship between mental health and social media. Using advanced tech and empathy, we strive to uplift, inform, and transform the digital realm.
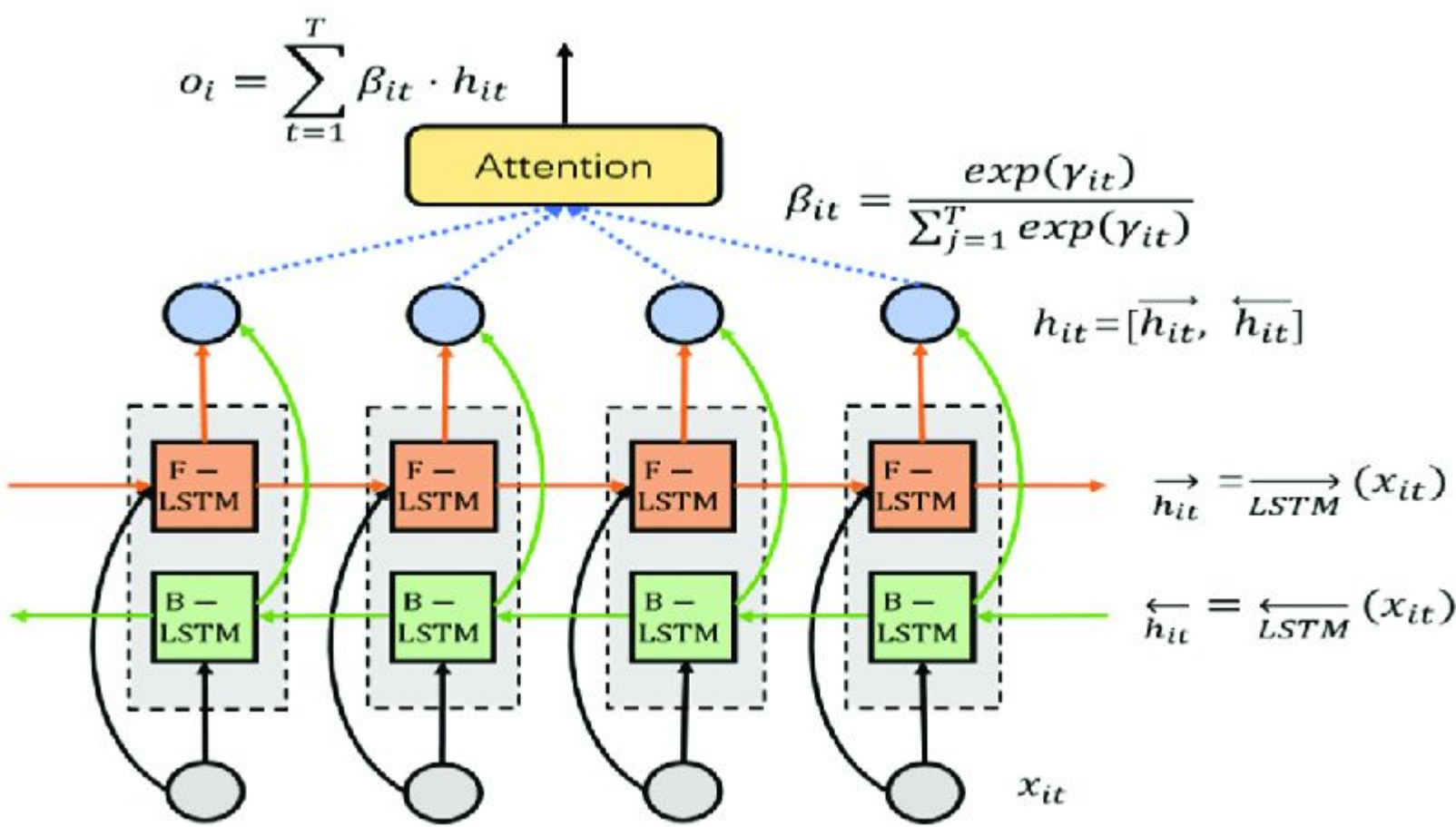
Scope of the Project

Our project dives deep into understanding mental health on social media. We're all about spotting signs of depression, using smart tech like NLP and deep learning.

But we're not just sticking to text – we're also looking at images and videos. And with our friendly GPT API, we're offering personalized support to those who might need it. It's all about making social media a kinder, safer space for everyone.

Methodology

The code implements a methodical approach to develop a depression detection model using deep learning. It starts by preprocessing labeled training data and Instagram captions, preparing them for input into a Bidirectional Long Short-Term Memory (BiLSTM) neural network. Notably, an attention mechanism is integrated into the model to weigh word importance dynamically, enhancing its ability to capture relevant information effectively.

Once trained, the model predicts depression labels for Instagram captions, appending them to the data DataFrame. Captions exceeding a specified depression label threshold are filtered, highlighting potentially depressive content for further analysis. The methodology allows for iterative refinement of the model's architecture and parameters to improve its accuracy in identifying depression indicators within social media posts.

$$o_i = \sum_{t=1}^{T} \beta_{it} \cdot h_{it}$$

$$\beta_{it} = \frac{exp(\gamma_{it})}{\sum_{j=1}^{T} exp(\gamma_{it})}$$

$$h_{it} = [\overrightarrow{h_{it}}, \overleftarrow{h_{it}}]$$

$$\overrightarrow{h_{it}} = \overrightarrow{LSTM}(x_{it})$$

$$\overleftarrow{h_{it}} = \overleftarrow{LSTM}(x_{it})$$

RNNs like LSTM are well-suited for sequential data, making them ideal for analyzing social media posts where the order of words matters. However, traditional RNNs suffer from the vanishing gradient problem, limiting their ability to capture long-range dependencies.

BiLSTM addresses this issue by processing the input sequence in both directions, allowing it to capture context from both past and future tokens. This enables our model to understand the temporal dynamics of social media posts and identify patterns indicative of depression.

We assign a weight equally to each classifier, then the probability that a sample belongs to a certain class is the weighted sum of probabilities that this sample belongs to this class predicted by all classifiers

Results

Based on the components outlined in the project methodology, we have developed a comprehensive system for detecting signs of depression in social media posts. Our system begins by preprocessing unstructured text data from Instagram, including text extraction from images using OCR algorithms. Tokenization breaks down the text into manageable units, while word embeddings capture semantic information to understand the meaning of words in social media posts.

The core of our model comprises a Bidirectional LSTM layer, which processes input sequences bidirectionally to capture context effectively. The Multi-head Attention mechanism enhances the model's ability to capture complex relationships in social media posts, while the GPT API generates personalized messages for users identified as potentially experiencing depression. Finally, a dense layer classifies the extracted features, providing insights into the mental health status of individuals.

Overall, our model leverages cutting-edge techniques to analyze social media data and detect signs of depression, aiming to improve mental health outcomes for individuals by enabling early intervention and support.
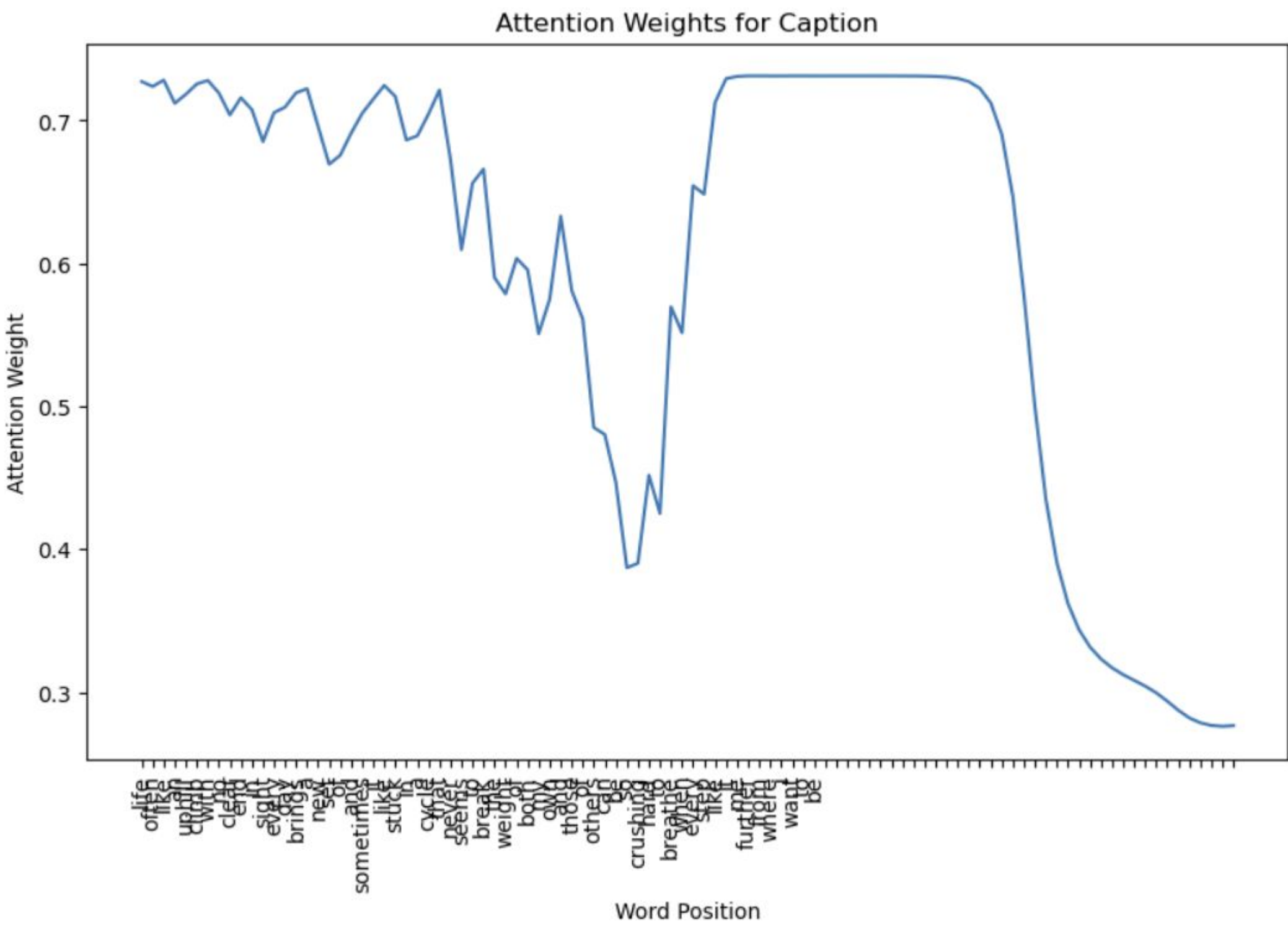
	id	timestamp	text	predicted_depression_label
0	18227088265280124	2024-05-04T13:05:43+0000	66\n\nIam bent, but not broken. |\nam scarred,...	1.000000
1	18227088265280124	2024-05-04T13:05:43+0000	I wish I could see a way out, but the path for...	0.846694
2	18001978385605323	2024-05-04T13:05:02+0000	(\n\n"Relationships are like —\nglass. Someti...	0.336164
3	18001978385605323	2024-05-04T13:05:02+0000	There's an emptiness that follows when a relat...	1.000000
4	18028155728062543	2024-05-04T13:01:15+0000	0. Xa Se St. AS MN\n®6\n\nTears are words the\...	0.928574
5	18028155728062543	2024-05-04T13:01:15+0000	Life often feels like an uphill climb, with no...	1.000000
6	18063719863538580	2024-05-04T12:53:06+0000	It's not always the\ntears that measure the\np...	0.999996
7	18063719863538580	2024-05-04T12:53:06+0000	The bottle seemed like a quick escape from my ...	0.999981
8	18008219390203733	2024-05-04T12:52:00+0000	66\nKeeping a lot to\nmyself, because\nit is h...	0.447418
9	18008219390203733	2024-05-04T12:52:00+0000	What started as a game turned into something d...	1.000000
10	18014434958096049	2024-05-04T12:50:31+0000	Ie everything changes aro\nne	stay forever t...	1.000000
11	18014434958096049	2024-05-04T12:50:31+0000	When you find out she thought you were playing...	0.000051
12	18019842629009943	2024-05-04T12:48:04+0000	"Behind every\nsweet smile, there\nis a bitter...	0.927666
13	18019842629009943	2024-05-04T12:48:04+0000	Dreams are like fragile threads, easily broken...	0.378408
14	18049687408639342	2024-05-04T10:29:34+0000	Everyday it gets harder.\n\n\nEveryday it's like...	1.000000
15	18049687408639342	2024-05-04T10:29:34+0000	It gets tougher everyday	0.198893

Conclusion

In conclusion, our project addresses the intricate relationship between mental health and social media through a comprehensive computational framework. By harnessing advanced NLP and deep learning techniques, we aim to detect subtle indicators of depression within online discourse, fostering early intervention and support. Our model integrates empathetic messaging capabilities to bridge the gap between algorithmic analysis and human empathy, paving the way for a more compassionate digital community. Through awareness, advocacy, and innovative technology, we aspire to illuminate the complexities of mental health in online spaces and promote a healthier, more inclusive digital environment.

References

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