**A transformer-based approach to irony and sarcasm detection**

**What’s the research question?**

Figurative language, such as irony, sarcasm, and metaphor, has been proven to be prevailing in all sorts of social media platforms, ranging from discussion forums to daily conversation. In the field of computational natural language processing, the identification and detection of figurative language still remains as a challenging task due to its contradictory and metaphorical meaning content. In this research paper, the authors firstly reviewed the evolution progresses of figurative language detection, and then posed several questions.

1.How do computers identify and comprehend figurative language?

2.Why are researchers gradually perceiving the original methods, including statistical summaries and machine learning models, as an inefficient way to classify the subtle emotion?

3.Could the proposed method show the authentication of the performance of deep learning?

**Why does it matter?**

The reasons why researchers put such an effort to tackle this technical issue is that, in some specific scenarios such as:

1.Review of social media comments, failing to identify ambiguous figurative languages affects the performance of sentiment analysis since the sentiment inclination conveyed through literal expression might change completely in different contexts.

2.The lack of facial expression and voice tone makes the interpretation processes more complicated.

Therefore, methodologies that are able to detect, identify, and classify figurative languages contributes to the construction of sentiment analysis systems which have the capability to provide full-spectrum emotion analysis of natural language. Another benefit of solving this problem is that, considering sentiment analysis is an essential part of computational linguistics study, finding a new method which solves issues more efficiently could not only enhance the performance of current sentiment analysis system but also is beneficial for the further development of computational linguistics systems as well as the establishment of text analysis methodology.

**What research method is used to find the answer?**

The research method of this paper is the architecture built by RoBERTa and followed by a Bi-LSTM layer. The reason why authors came up with this architecture is based on the idea that as pre-trained networks are beneﬁcial for several down-streaming tasks, their outputs could be further enhanced if processed properly by other networks. For the RoBERTa part, RoBERTa is built by multiple Transformer architecture. Transformer mainly includes three parts, which are Positional Encoding, Multi-head attention and ADD & Norm. Positional encoding added global sequential information to the Transformer instead of recurrence techniques. It provides every word location information to the transformer, so the model can detect the sequence relationship in context. Multi-head attention was built by attention mechanism, which inspired by human's attention. It helps models to recognize important context from long source text. The author in this paper used 12 head attention. add & norm refers to layer normalization and residuals connection. Dealing with specific problems in models, like used normalization can help models to increase the training speed and let gradient descent optimize faster. To integrate more sequential information of context, authors also add a Bi-LSTM layer to enhance the ability of models to detect hidden messages.

**What’s the answer to those Research Questions?**

To answer the first research question, the evolution progress and current enhancement of natural language processing needs to be briefly introduced. In the past decades, various approaches have been investigated, ranging from the content and context-based approaches, such as N-gram patterns, adverbs, statistical and semantic features, to the state-of-the-art deep learning methods, such as BERT, XLnet, ELMo and USE. Before 2017, machine learning has been reckoned as the most efficient way with highly accurate solutions.

Given the rising of deep learning techniques, those traditional machine learning methods are gradually being considered as inappropriate when things come to real-world natural language processing applications. The limitations are majorly three types, which are the complicated feature extraction and exhaustive preprocessing strategies, time consuming operation, deficiency qualified annotated datasets, and the high cost of data collection. As the computational power develops rapidly, researchers commenced to utilize more sophisticated algorithms in nlp model development. Pre-trained embeddings representations (such as GloVe and Word2Vec) and transfer learning methods sprang up and became prevailing in various tasks recently. The impact of attention-based models, such as transformers, seems to outperform all previous methods by a large margin since it narrows down the range of engineered features, shortens the computational time, and emancipates researchers from the drudgery of dataset annotation works.

Results prove that the proposed transformer method achieves a satisfactory performance under all benchmark datasets, outperforming all other methodologies and published studies with a 0.82, 0.79 and 0.91 accuracy rate on the SemEval-2018 dataset, Reddit Politics dataset, and Sarcastic Rillof’s dataset respectively. Specifically, the RCNN-RoBERTa model outperforms all the other prevailing deep learning approaches. The RCNN-RoBERTa model outperforms all other state-of-the-art approaches including BERT, XLnet, ELMo and use under all metric, some by a large factor.

**How trustworthy is the evidence?**

1.The researchers deep-dived into all various possibilities of using different approaches involving a variety of algorithms and all kinds of datasets i.e. unbalanced, large and sentiments dataset.

2.The performance of the devised hybrid neural network architecture is tested on four benchmark datasets, and contrasted with other relevant state-of-the-art methodologies and systems. In addition, it aims to minimize preprocessing and engineered feature extraction steps, which are unnecessary for transformers based deep learning methods.

All kinds of experimentation support their theory and produce the results accordingly so it is trustworthy.

**Team members roles:**

Akshay - Worked on the presentation slides

Nishitha - Focused on research evidence and worked on the report

Raj - Focused on the answers for research questions

Wanyue - Focused on the research questions and introduction

Zhengyang - Focused on various research methods