**AN OPTIMIZED TWEET SENTIMENT ANALYSIS USING TRANSFER LEARNING AND ASSEMBLY APPROACH**

**A TRANSFER LEARNING BASED TWEET SENTIMENT ANALYSIS MODEL USING BIDIRECTIONAL LSTM AND GRU**

**Introduction**

* 1. **Introduction**

Artificial intelligent is a broad research domain that tries to mimic the intelligent of humans and animal in artificially created entities, purposely for solving computational problems (Machuca et al., 2021). The artificial intelligent approach adopted for communicating with the machine is term Natural Language Processing (NLP). One of the most widely used of Natural Language processing include performing sentiment analysis task on social media platforms such as twitter, Instagram and Facebook. The use of chatbot, spell checking, keyword searching, speech recognition, advert matching and information extraction (Gandhi et al., 2021). With NLP it’s possible to develop tweet application capable of comprehending human understandable languages, and manage enormous amount of data, by carrying out basic task and give solution to next level natural language processing task. (Zhang & Lu, 2021) present artificial intelligent as a broad term denoting the use of computers to mimic human intelligent characteristics. This attribute involves learning, making judgement, and decision making based on input data. Processing of Natural languages indicate the capability of a computer or machine to identify and comprehend human understandable text language.(Zhang & Lu, 2021). The NLP task also describe the interdisciplinary field between human natural language (linguistics) and computer science. The NLP process is basically divided into two steps this includes; accepting sound signal as input and converting of sound input into textual representation.

The Sentiment analysis task is a sub field in the field of Natural Language processing, it encompasses tweet analysis for twitter data, and biological data for automating the extraction of sentiment or personal feeling from tweet data. Various previous work on sentiment analysis are purposely developed to classify user opinion into positive, negative or neutral sentiment (Sujan & Devi, 2015). Sentiment analysis is essential to decode or comprehend every aspect of human feeling through textual document (Indulkar, 2021). Emotional feeling are presents in every type of human communication. This frequently influence how an individual feel about a situation, subject, and activities via numerous means (reviewing, commenting and messaging). Sentiment analysis can also be views as the extraction of user opinion from the classification of data such as photo, text and the likes, it can also be adopted in classifying the review of users and their opinion on a particular service, product or even an event (Minaee et al., 2019).

Deep learning is a branch of machine learning approach which is basically based on artificial neural networks. This network of neurons comprises of many layers stack on each other for extracting features from the raw dataset. Deep Learning (DL) has been adopted in many field such as image processing, video processing, text processing and the likes. In deep learning feature are automatically extracted unlike the machine learning algorithm ( Priyan et al., 2021). Recurrent Neural Network is mostly adopted in solving Natural Language Processing task or problems, the cutting-edge success of Recurrent Neural Network begins when Long Sort Term Memory (LSTM) and Gated Recurrent Unit Architecture is developed. The two developed architecture solves the issues of vanishing gradient by introducing a more direct approach to backpropagate gradient. Moreover, the networks adaptability attributes enable LSTM and GRU to address many issues (Gillioz et al., 2020). The Long Short Term Memory (LSTM) is an advance deep learning artificial neural network algorithm specifically developed to extract and capture long time information between input from different time stamp. (Torfi et al., 2020).

* 1. **Problem Statement**

Twitter Sentiment analysis is adopted in comprehending the attitude, emotion and opinion of user, its considered has the most challenging aspect in text classification problem faced by researchers in recent year. Its identify in the research work of (Nazeer et al., 2020) that the analysis of sentiment on twitter is the most challenging task, this includes the use of high level unstructured data language, non-grammatical language composition and out of words vocabulary (character level grammars). However, (Priyadarshini & Cotton, 2021) stated that the number of users on the social media blog is growing exponentially every day, and user generated content is extremely growing. Hence, the comprehension of hidden intention, sentiments, and emotion on various social media blog is difficult. In consequences, its challenging to monitor social media activities. Additionally, the adoption of machine learning algorithm or lexicon dictionaries will minimize the capability to efficiently analyze or classify large amount of data (Model et al., 2021).

* 1. **Aim and Objectives**

The primary aim of this thesis is to design a transfer learning-based sentiment analysis model, that is capable of encoding knowledge at word and character (slangs) level using Bidirectional Long Short-Term Memory (LSTM) and Gated Recurrent Neural Network (GRU). To actualize this, the following objective as to be strictly followed.

1. To Collection or Gathering of (1.6 million) Tweet data sample from Kaggle Repository
2. To prepare, explore and preprocess data (using various NLP toolkit)
3. To Generate word embeddings (encoding contextual information) using Skip-Gram and Fast Text approach
4. To Design Transfer learning model for twitter sentiment analysis using LSTM and GRU
5. To Evaluate the proposed model using standard metrics such as Accuracy, Precision, Recall, and F1-score
   1. **Motivation of Sturdy**

The opinion or perspective of people on either a product, event, or awareness is one of the key factors that drive many organization or sector decision making in today’s word. However, developing a highly accurate model for efficient sentiment analysis on organization product or services is of high demands, due to the great impact in market strategy decision making. Social media blogs (such as Facebook, Instagram and twitter) has become a trending platform for social media user to showcase or advertise event, talent, product and services. As a result, user tends to feel more comfortable issuing complains, expressing opinion and given comment on social media about a product, services, health related issues and the likes. Moreover, the frequent use of out of vocab slang words on social blog tends to make user comment (tweets) difficult to process and understand. This motivate the development of the proposed model.

* 1. **Significant of Sturdy**

The proposed sentiment model can be adopted by any social media blog, for the purpose of revealing their user’s intension or opinion on any topic, events, or projects. For Instance, the marketing and financial fields, where backing sectors or other financial entity could utilize the proposed model in analyzing the opinion of people about the services they provided (either negatively or positively). Furthermore, in the field of politics large amount of tweet can be gathered about political leaders and government activities for the purpose of projecting their performance either negatively or positively. Considering the health sector where it’s require to keep track of health-related issues (such as COVID-19 pandemics crisis), people concern about the epidemics could be analyze for appropriate decision making. Generally, sentiment analysis can easily help in identifying trading opportunity, customers opinion of a specific product, identifying the satisfactory level of user or customers on a particular product, monitoring and identifying how people perceive certain pandemic situation either positively or negatively

* 1. **Organization of thesis**

The thesis work is organized in five chapters, this includes chapter one, two, three, four and five. chapter one includes basic introduction to social blogging (twitter), artificial intelligent, machine learning, deep learning and sentiment analysis. Additionally, chapter one includes the research problem, aim and objectives, motivation of sturdy, and significant of this sturdy. The chapter two of the research present elaborate expansion on the introductory part in chapter one, the summary of related works, and finally the summary table of the paper reviewed. Chapter three generally includes the research approach or methodology adopted, architecture of LSTM and Gated Recurrent Neural network, dataset gathering and collection, model development tools, propose architecture frameworks. Then in chapter four, the developed model will be tested and evaluated using various performance metrics. And finally, the last chapter including the collusion part of the entire thesis, summary of research work and future work recommendation will be also specified.

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