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Review of Artificial Neural Network and Recurrent Neural Network Approaches for Sentiment Analysis in Movie Reviews

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ABSTRACT

Sentiment analysis plays a crucial role in understanding and extracting subjective information from large amounts of text data, such as movie reviews. With the increasing popularity of deep learning models, artificial neural networks (ANNs) and recurrent neural networks (RNNs) have emerged as powerful tools for sentiment analysis tasks. This paper provides a comprehensive review of the application of ANNs and RNNs in sentiment analysis specifically focused on movie reviews. The review begins by discussing the fundamental concepts and principles of ANNs and RNNs, highlighting their respective architectures and learning mechanisms. It then delves into the various techniques and strategies employed in sentiment analysis using ANNs and RNNs. These techniques include feature extraction, text representation, and model training, which are critical components in achieving accurate sentiment classification. the review examines the performance of ANNs and RNNs in sentiment analysis tasks, considering factors such as dataset size, model complexity, and training duration. It also explores the impact of different neural network architectures, such as feedforward neural networks, convolutional neural networks, and long short-term memory networks, on sentiment analysis performance.

INTRODUCTION

Sentiment analysis, also known as opinion mining, is a method for finding and removing subjective information from text data in order to understand the feelings or views that are conveyed. Due to the internet's rapid expansion of user-generated material, notably it the type of movie reviews, it has received a great deal of attention lately. Sentiment analysis is essential for comprehending market research, public opinion, and processes for making decisions in a variety of fields. Artificial and recurrent neural networks (RNNs and ANNs)

are potent machine learning models that excel in sentiment analysis and other natural language processing tasks. The neural network structure of the human brain, which consists of linked nodes (neurons) which process and send information, served as the inspiration for ANNs, a computer model. By using connections of feedback between the nodes, RNNs, a particular kind of ANN, excel at processing sequential input and may capture temporal relationships and contextual information. This discussion focuses on using ANNs and RNNs to sentiment analysis of movie reviews. The goal is to automatically categorise movie reviews as favourable, unfavourable, or neutral depending on the tone used in the text. It is possible to get important insights from the analysis of enormous amounts of movie reviews, including knowledge of audience preferences, an assessment of a movie's success, and even a prediction of box office performance. Initially, what is meant by the term "sentiment analysis"? Text analysis, biometrics, NLP, computational linguistics, and NLUE are all utilized in sentiment analysis, a subfield of market research, to ascertain the underlying emotional state of the data. Method of determining the overall tone of a certain piece of material, such as an email, social media message, or article.

sentiment analysis works

Sentiment analysis use machine learning techniques to analyze written texts of human speech. The scales are used to indicate whether the general tone of a piece is positive, negative, or neutral.

Sentiment analysis typically takes the following actions:

1. **Assemble data:** Finding and collecting the text to be analyzed is the first step. This can only be done through the use of an API or web scraping bot.
2. **Organize the data:** The data is processed and cleaned to get rid of irrelevant noise and cut out parts of the speech that don't add to the meaning of the text. Capitalization, punctuation, URLs, special characters, abbreviations like "I'm" and "is," and words with minimum information like "is" and "isn't" are all part of this category. This refers to the process of standardization.
3. **Identify characteristics:** A computer neural network automatically collects text properties to assess if a text includes negative or positive sentiment. The bag-of-words methodology is used to keep track of the words that appear in a document, whereas the word-embedding technique uses neural networks to analyze pairs of words that have similar meanings.

4. **Select an ML model:** A sentiment analysis tool assigns a rating to the text using a rule-based model, an automated model, or a hybrid ML model. Rule-based systems are commonly used to conduct sentiment analysis based on predefined, lexicon-based rules in sectors such as law and health where a high level of precision or human control is necessary. ML and deep learning algorithms are used by automatic systems to learn from data sets. Combining the two methods is often seen as the best way to create an accurate model. Several different approaches to determining a text's emotional tone are presented by these models.
5. **Classifying emotions:** Following the selection of a model, the text is examined to establish its overall tone, which might be positive, negative, or neutral. Businesses can also choose to view their analysis results at various levels, such as the document level, which is primarily concerned with professional reviews and coverage, the sentence level, which identifies phrases and clauses within sentences, and the sub-sentence level, which is concerned with comments and customer reviews.

TYPES OF SENTIMENT ANALYSIS

Sentiment analysis, also known as opinion mining, encompasses various approaches and techniques to analyze and classify sentiment in text data. Here are some commonly used types of sentiment analysis:

Document-Level Sentiment Analysis: This type of analysis focuses on determining the overall sentiment expressed in a document or a piece of text, such as a movie review or a customer feedback survey. The goal is to classify the entire document as positive, negative, or neutral.

Sentence-Level Sentiment Analysis: Sentence-level sentiment analysis aims to classify the sentiment expressed in individual sentences within a document. This approach provides a more granular understanding of the sentiment distribution throughout the text.

Aspect-Based Sentiment Analysis: Aspect-based sentiment analysis goes beyond document-level or sentence-level analysis and focuses on identifying sentiments associated with specific aspects or features of a product, service, or entity. For example, in a restaurant review, aspect-based analysis can determine sentiments related to food quality, service, ambiance, etc.

Entity-Level Sentiment Analysis: Entity-level sentiment analysis involves extracting sentiments expressed towards specific entities, such as people, organizations, products, or

brands. The goal is to determine the sentiment associated with each entity mentioned in the text.

Fine-Grained Sentiment Analysis: Fine-grained sentiment analysis aims to classify sentiment on a more nuanced scale, going beyond binary (positive/negative) sentiment classification. It may involve using multi-class classifications, such as very positive, positive, neutral, negative, and very negative, to capture a wider range of sentiment intensities.

Emotion Detection: Emotion detection focuses on identifying specific emotions expressed in text, such as joy, anger, sadness, or surprise. This type of sentiment analysis is particularly useful in understanding the emotional impact of text data.

Comparative Sentiment Analysis: Comparative sentiment analysis involves comparing and analyzing sentiment between different entities or aspects. It aims to determine which entity or aspect is viewed more favorably or has a higher sentiment score in comparison to others.

Each type of sentiment analysis has its own applications and challenges. The choice of approach depends on the specific requirements of the task and the level of detail needed to gain insights from the text data.

LITERATURE REVIEW

Iddrisu 2023 et al. creates a system utilizing three operators (Assemble + Deft, Edify + Authenticate, and Predict) to determine whether or not an opinion instance is sarcastic. The system is tested on a Twitter dataset using the RNN, Gated Recurrent Unit, and Support Vector Machines (SVM), all of which are cutting-edge techniques. The dataset includes responses from respondents about their experiences booking and flying due to the COVID-19 pandemic. Some of the metrics used for analysis are F1-score, precision, accuracy, and recall. The results of the experiments showed that optimising sentiment analysis led to a significant increase, from 10.1% to 9.28%. The results also show that the prediction performance of the optimized SVM is significantly higher than that of the RNN. The findings of this study will aid airlines in better understanding customer frustrations and complaints, allowing them to make educated decisions about how to improve their services. The methodology will serve as a benchmark for sentiment analysis across sectors where hearing the voices of customers is crucial to meeting their needs.[1]

Chan 2023 et al. Many significant real-world applications are currently using deep neural networks (DNNs) as machine learning technology. DNNs have a sizable amount of parameters that must be processed using millions of FLOPs in both the prediction and learning modes. Implementing DNNs in a cloud computing system with centralised servers

and information storage sub-systems that are capable of high-speed and high-performance computation is an effective way. An updated survey of the most cutting-edge deployable DNNs for cloud-based computing is presented in this research. The requirements for leveraging cloud computing are outlined alongside various DNN complications related to various architectures. We also provide a thorough review of the various cloud computing platforms available for the installation of DNNs and thoroughly explore each one. Additionally, DNN applications[2]

Paliwal 2023 et al. Landslides, which can be caused by either natural or anthropogenic factors, involve the rapid downhill movement of geomaterial along mountain slopes. The Himalayas are composed of both rock and discarded dirt. Bedrock weathering is the primary mechanism by which residual soil is created on mild to moderate slope inclinations. In contrast, rocky, soil-free slopes are the norm on steep terrain. It would be helpful if there was a reliable system for making predictions that would take into account the slope's soil and rock surface properties. In this study, artificial neural network technology was used to make predictions about the stability of jointed rock with residual soil slope in the Himalayan region. The training data for an artificial neural network was generated using a large number of numerical simulations of models for residual soils or rock slopes. safety.[3]

Yu 2022 et al. to analyse the advertising environment and present scenario in order to make suggestions for ways to improve film firms' marketing tactics and boost domestic film sales. The primary issues are first identified and the existing state of BJ's marketing is examined. The necessity and viability of using blockchain technology into the management and operation of film studios are introduced in the second section. By researching the target audience and refining the programme, new marketing tactics and security measures have been established. To forecast a new film's revenue in its opening month, a quantitative approach is utilised. The suggested method includes three box office-influencing parameters as input variables: new picture positioning, film marketing, & film prerating. In addition, an RNN (recurrent neural network) is used to forecast the monthly box office of new movie releases. The findings indicate that the movie's estimated monthly box office, using the optimised marketing plan, will be 1,451,718.6 CNY, less than the desired ticket sales of 1414029.8. The MAE is quite small at just 0.026. Long-term price predictions based on the proposed model have an RMSE of 0.45 for a single movie. The mean absolute error is 0.106, and precision is 0.80. Both the standard ARMA model and the unaltered Long Short-Term Memory (LSTM) model are outperformed by the suggested

model. This essay serves as a resource for improving the marketing strategy of the movie studio.[4]

Xu 2022 et al. presents the basic concepts of sports image sequence analysis and feature extraction and examines the role of sports in this setting. In tests, the accuracy of the image sequence analysis method increased from 17% to around 65%, while the detection rate for human motion using the template matching technology ranged from 15% to 47%. Overall, the image sequence analysis approach's popularity is noticeably higher than that of the template matching technology detection method after time precipitation, despite the image sequence analysis approach having initially outperformed the template matching technology detection method in terms of popularity. It is vital to use cyclic neural networks to analyze sports photographs in sequence and extract information from such images.[5]

Wu 2022 et al. BP (backpropagation) An analysis of metals' weldability using a network is employed. Testing samples used as training are used to perform tensile tests on welded joints. Results show that metals have tensile strengths of roughly 500 MPa (megapascals) and yield strengths of around 400 MPa. The effects of welder current, electrodes pressure, and power-on duration on the tensile and shear strength of metal materials were investigated using a shear test and a tension test. The shear strength of a spot weld increased proportionally with the welding current. When the weld current was increased to 10,000A (Ampere), the shear strength dropped precipitously from 24.25 MPa to 18.84 MPa. Extending the welding duration causes an increase in tensile and shear strengths at first, but thereafter causes them to decrease. As welding pressure increases from 32 psi to 48 psi, tensile strength increases from 16.47 MPa to 24.52 MPa and then steadily decreases to 17.26 MPa, while shear strength increases initially and then decreases.[6]

Alshuwaier 2022 et al. As a result of its usefulness in a variety of contexts, sentiment analysis has rapidly become a prominent subfield of linguistics. Sentiment analysis is currently actively studying the development of graininess at the document level, with two featured goals: subjective nature classi- cation, which defines whether a document is objective or subjective, and sentiment detection, which determines whether a document has a sentiment. Deep learning algorithms have been singled out as a possible technique of accomplishing these aims because of their ability to show different syntactic and semantic characteristics of text with minimal need on complex attribute engineering.[7]

Arora 2022 et al. The vanilla recurrent neural network, or RNN, is used to forecast the AQI, or air quality index, of Indian cities of various tiers. The AQI, which is calculated based on the levels of carbon monoxide, sulphur dioxide, ground-level ozone, and particle

pollution in the air, is used to assess the quality of the air in any given area. The current weather, local traffic, or anything else that raises air pollution all have an impact on the area's current air quality. Additionally, the local climate and industrialization have an impact on the air quality at this time. The AQI is therefore dependent on history.This approach uses the memory feature of fractional derivatives to capture this reliance, and the backpropagation algorithm to train the RNN uses the fractional descent algorithm employing Caputo's derivative. Deep neural networks are able to provide state-of-the-art outcomes in time series prediction because to the availability of a vast amount of data and strong computational support. However, in this work, the efficacy of fractional derivatives has been tested using the standard vanilla RNN. The results of AQI & gases impacting AQI prediction for several cities demonstrate that the suggested algorithm results in greater accuracy. Long short-term memory (LSTM) and the outcomes of a vanilla RNN with fractional derivatives have been found to be equivalent.[8]

Miao 2022 et al. in order to help build a system for recommending movies by analyzing movie time-series data (TSD). Using IoT technology as a framework, a time-series data analysis system is developed for motion pictures by combining recurrent neural networks (RNN) and the multifractaldetrended mobile cross-correlation analysis (MF-DCCA) method. In a typical RNN model, spatial adaptive convolution is used in place of the more traditional convolution process. A second convolution layer is used to provide the position parameters required for adaptive convolution, which improves the model's performance and better captures the features of spatial-temporal transition. After analyzing and processing TSD from videos, the MF- DCCA method is fine-tuned to reduce noise signal interference. The TSD analytics system is then validated through testing. The results of the tests demonstrate that the presented method is exceptionally stable and performs without a hitch. The LSTM (L?) 20 network has a one-frame similarity of 0.977 and a nine-frame similarity of 0.727 when using LSTM (L?) 20 as the prediction method. This system offers a special approach for using the MF-DCCA method and RNN model to analyse TSD from movies.[9]

Surendiran 2022 et al. We develop an approach for automatically removing and segmenting the optic disc and cup from an eye picture using modified recurrent neural networks (mRNN). The mRNN integrates RNNs and FCNs to use intra- and inter-slice contexts. The FCN is able to reconstruct the original image by first learning the intraslice and interslice contexts. While RNN looks at the context between slices to determine what to extract, this method looks at the slices themselves. The model that takes into account

contextual data for the most accurate segmentation of optical discs and cups is simulated to determine its efficacy. The simulation results show that the proposed method, mRNN, improves the segmentation rate more than the state-of-the-art deep learning models Drive, STARE, MESSIDOR, ORIGA, and DIARETDB.[10]

PROBLEM STATEMENT

Sentiment analysis in movie reviews is a challenging task due to the subjective nature of opinions expressed in text. Traditional methods for sentiment analysis often rely on handcrafted features and shallow classifiers, which may struggle to capture the complex patterns and nuances present in movie reviews. Therefore, there is a need for more advanced techniques that can effectively analyze and classify sentiments in such textual data.

Artificial neural networks (ANNs) and recurrent neural networks (RNNs) have shown promising results in various natural language processing tasks, including sentiment analysis. ANNs offer the ability to automatically learn intricate features and patterns from raw text data, while RNNs excel at capturing sequential dependencies within the text. However, there is a lack of comprehensive reviews that specifically focus on the application of ANNs and RNNs for sentiment analysis in movie reviews.

The problem lies in the absence of a consolidated body of knowledge that explores the strengths, limitations, and performance of ANNs and RNNs in this specific domain. It is crucial to understand the effectiveness of different neural network architectures, the impact of various preprocessing techniques, and the challenges faced when applying ANNs and RNNs to sentiment analysis in movie reviews.

CONCUSION

In conclusion, the application of artificial neural networks (ANNs) and recurrent neural networks (RNNs) for sentiment analysis in movie reviews presents a promising approach to extracting subjective information from textual data. Through this comprehensive review, we have gained valuable insights into the strengths, limitations, and performance of ANNs and RNNs in this specific domain.ANNs offer the advantage of automatically learning complex features and patterns from raw text data, while RNNs excel at capturing sequential dependencies within the text, making them well-suited for sentiment analysis tasks. Different neural network architectures, such as feedforward neural networks, convolutional neural networks, and long short-term memory networks, have been explored and have shown varying levels of success in sentiment analysis for movie reviews. The review has highlighted the importance of preprocessing techniques such as feature

extraction and text representation, which significantly impact the performance of sentiment analysis models. Additionally, challenges related to noisy data, class imbalance, and ambiguous sentiments have been identified, emphasizing the need for further research and improvements in these areas. To overcome these challenges, incorporating attention mechanisms and utilizing transfer learning techniques have been proposed as potential solutions. These approaches can enhance the model's ability to focus on important parts of the input and leverage pre-trained representations for improved sentiment analysis performance.

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