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A Novel Approach of Deep Learning Using Sentiment Analysis in Python

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Abstract: This paper focused on Sentiment Analysis is the task of categorize the division of a given text. For instance, a text-based tweet can be categorize into either "positive", "negative", or "neutral". Given the text and accompanying labels, a model can be trained to predict the correct sentiment. Sentiment Analysis techniques can be categorized into Deep Learning approaches, lexicon-based approaches, and even hybrid methods. Some subcategories of research in sentiment analysis include: multimodal sentiment analysis, aspect-based sentiment analysis, fine-grained opinion analysis, language specific sentiment analysis. Sentiment analysis (SA) is a process of extensive exploration of data stored on the Web to identify and categorize the views expressed in a part of the text. The intended outcome of this process is to assess the author attitude toward a particular topic, movie, product, etc. The result is positive, negative, or neutral These study illustrated different techniques in SA approach for extracting and analytics sentiments associated with the polarity of positive, negative, or neutral on the topic selected. Social networks SA can be a useful source of information and data. SA acquires important in many areas of business, politics, and thought.. The main aim of this study is to provide full concept about SA techniques and its classification and methods used it. Also, we give a brief overview of big data techniques and its relation and use in SA field. Because the recent period has witnessed a remarkable development in the use of Big Data (Hadoop) in the process collection of data and reviews from social networks for analysis.

Keywords: Deep Learning, Sentiment Analysis**,** coding, Python

1. Introduction

In present days, most of the people are articulate their feelings, opinions, and sharing their experiences, using the Internet and the social networks. This more often than not leads to converse massive amount of data using the Internet. But most of these data are useful when analyzed; for example, most Industrial Corporation and election campaigns rely on knowing the opinions of people through communication sites and see whether they are positive, negative, or neutral. The Sentiment Analysis has emerged because of the huge information exchange on the Internet.

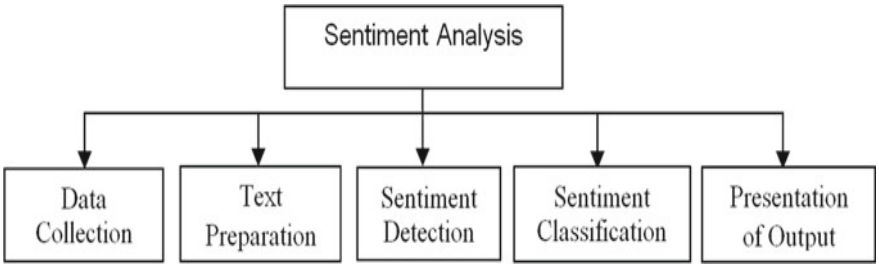


Fig 1: Sentiment analysis process steps

2. Literature Review

It is easiest to appreciate deep learning with some historical context. Rather than providing a detailed history of deep learning, we identify a few key trends:

Deep learning have a long and rich history, but has gone by many names reflecting different philosophical viewpoints, and has waxed and waned in popularity. (2018)

Deep learning has become more useful as the amount of available training data has increased.(2019)

Deep learning models have grown in size over time as computer hardware and software infrastructure for deep learning has improved. (2020)

Deep learning has solved increasingly complicated applications with increasing accuracy over time. (2021)

3. Research on Sentiment Analysis

Sentiment analysis is becoming very important to study growing opinions faster and faster within social media and other sites, The huge explosion in information in recent years in the sites of communication, air traffic and alternative markets, all this huge amount of information cannot be controlled and analyzed used the traditional way, so the scientists and researchers developed a high-efficiency techniques to deal with this data. This requires the SA to process data and know its polarity to determine the right decision. SA involves five steps to process data; those are data collection, text preparation, sentiment detection, sentiment classification.

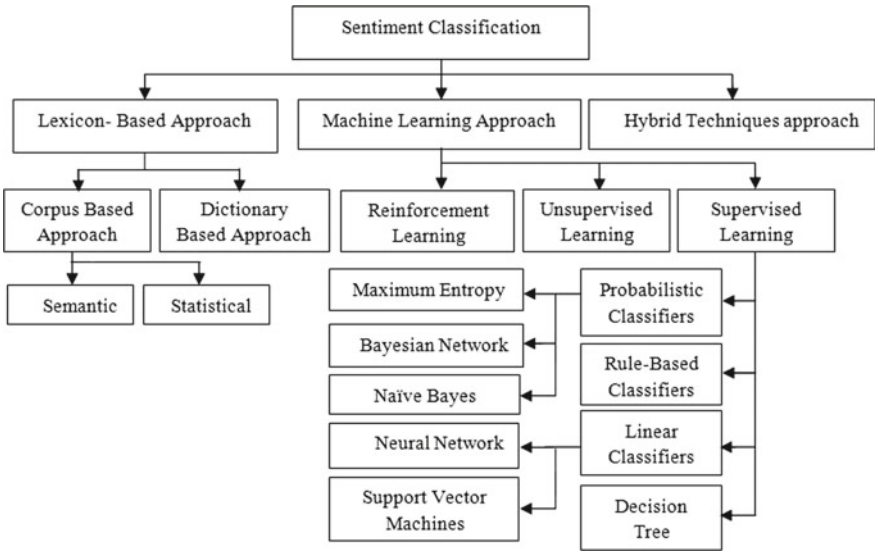


Fig 2: Sentiment classification techniques

3.1 Data Collection

The data collection is the first step in sentiment analysis. The collection of data from sources like user groups, Twitter, Facebook, blogs and commercial website such as amazon.com and alibaba.com, etc. This data cannot be analyzed using traditional methods like scanning, text analysis, and language processing.

3.2 Text Preparation

Text preparation examines the data before analyzing it. Some reviews and conversa- tions in the communication sites contain offensive and inappropriate words, so they are examined and preparation to be the result more reliable analysis. This process selects the contents that are not related to the analysis and then removes it. Objective of the process is the removal of spam and inappropriate reviews before sent to automated analysis.

3.3 Sentiment Detection

Sentiment detection is the process of finding the sentiment newline expressed in a review by using

machine learning technique or NLP technique; these are also called opinion mining (OM) new line and sentiment analysis. Sentiment detection consists of the examination of phrases and sentences extracted from reviews and ideas. All the sentences containing self-expressions like beliefs, opinions, and abuse are retained.

3.4 Sentiment Classification

Sentiment Classification is a task to extraction and classification the text whose objective to classify according to a polarity of the opinion it contains e.g. positive or negative, good or bad, like or dislike. Sentiment classification contains multiple techniques, and it is classified into three main techniques, namely machine learning approach, hybrid techniques approach, and lexicon-based approach.

4. Tools used in Deep Learning

Tools makes Deep learning swift and rapid. Deep learning tools provides interface to the Deep learning programming language. They provide best practices for process and implementation [23]. Deep learning tools contains platforms which provides capabilities to run a module or project. Examples of platforms of Deep learning are:

- **H2O.ai.**
- **TensorFlow.**
- **Keras.**
- **Caffe.**
- **DeepLearningKit.**
- **Torch.**
- **Theano.**

5. Types of Problems Solved Using Deep Learning

1. ***Classification:*** used to identify the category to which an object belongs. For example, is it spam? Or is it cancerous?
2. ***Regression:*** used to predict a continuous numeric-valued aspect associated with an object. For example, the probability that a user would click on an ad or stock price prediction.
3. ***Similarity/ Anomaly:*** used to retrieve similar objects or to find anomalies in behavior. For example, searching for similar images or detecting deception inuser behavior.
4. ***Ranking:*** used to sort relevant data according to a particular input. For example, Google Page Rank
5. ***Sequence Prediction:*** used to predict the next element in a series of data. For example, predicting the next word in a sentence.

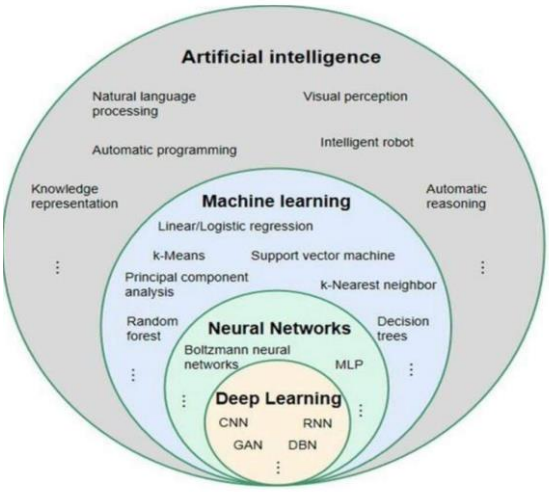


Fig 3: Machine Learning Enhancement

6. Deep Learning Workflow

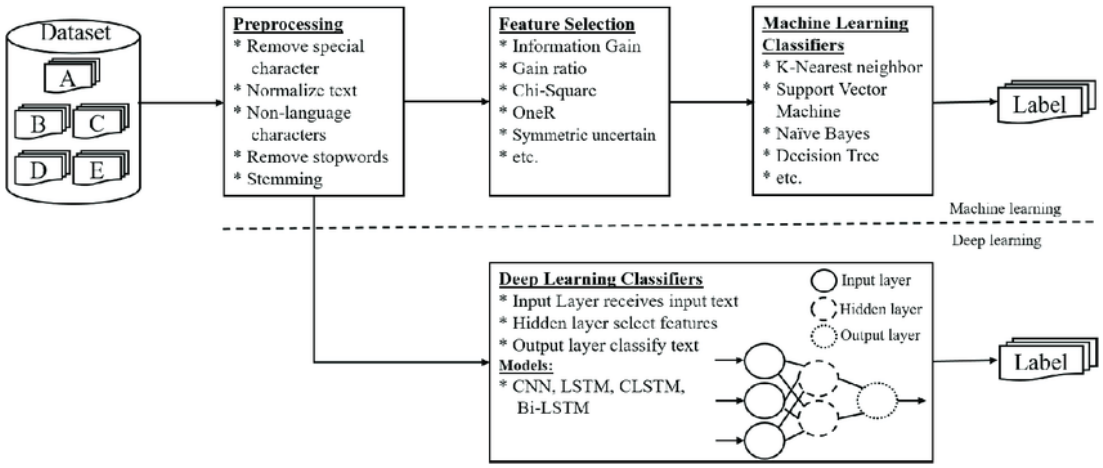


Fig 4: Deep Learning Workflow

7. Sentiment Analysis Algorithms

There are two major Sentiment Analysis methods.

7.1 Rule-based approach

Rule-based sentiment analysis is based on an algorithm with a clearly defined description of an opinion to identify. Includes identify subjectivity, polarity, or the subject of opinion.

The rule-based approach involves a basic Natural Language Processing routine. It involves the following operations with the text corpus:

- Stemming
- Tokenization
- Part of speech tagging
- Parsing
- Lexicon analysis (depending on the relevant context)

7.2 Automatic Sentiment Analysis

While the rule-based approach is more of a toy than a real tool, automated sentiment analysis is the real deal. It is the one approach that truly digs into the text and delivers the goods. Instead of clearly defined rules – this type of sentiment analysis uses machine learning to figure out the gist of the message.

Because of that, the precision and accuracy of the operation drastically increase and you can process the information on numerous criteria without getting too complicated.

In essence, the automatic approach involves supervised machine learning classification algorithms. In fact, sentiment analysis is one of the more sophisticated examples of how to use classification to maximum effect. In addition to that, unsupervised machine learning algorithms are used to explore data.

Overall, Sentiment analysis may involve the following types of classification algorithms:

- Linear Regression
- Naive Bayes
- Support Vector Machines
- RNN derivatives LSTM and GRU.

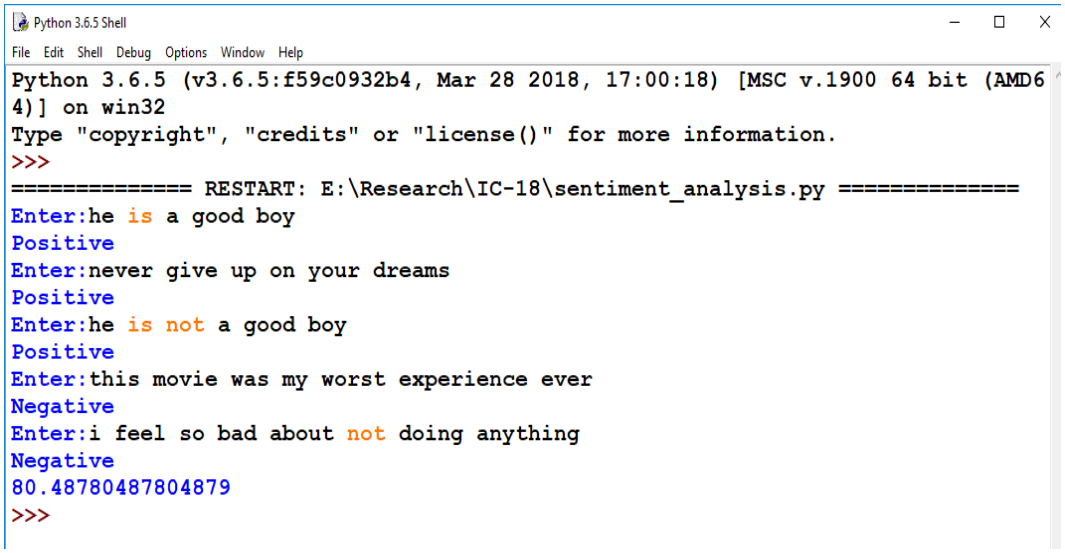
8. Sentiment Analysis Using Python

- What? A Deep learning application built in python to check polarity of given piece of text.
- Why? As the name suggests, this application is used for computationally identifying and categorizing opinions expressed in a piece of text.
- Where? This application is currently being used by Twitter (Twitter Sentiment Analysis) for analyzing the polarity of a particular tweet.
- Implementation using Python? TextBlob library was used for importing the required model; NLTK was used for word-net which provided the initial training data. The new data was labeled and stored in a list by the researchers. This list was then given to the model as new training data. Then the message provided as input by the user was given to the model for predicting whether it was positive or negative.
- Model Used: NaiveBayes Classifier from TextBlob, accuracy_score from sklearn

9. Code Implementation & Result in Python

```
from customdata import datada=data ()
te = test ()
cl = NaiveBayesClassifier(da)predicted = []
label = []
inp = input("Enter:") result =
        (cl.classify(inp))if result==
        "pos":
print("Positive")else:
print("Negative")for i in te:
pred = cl.classify(i[0]) predicted.append(pred)
        label. append(i[1])
sc = accuracy_score(label,predicted)print(sc*100)
```

Results:



Description:

The model was provided with a previously defined, customized and preprocessed dataset of approximately 3000 positive and negative sentences and then the model was asked to classify between the two of them. The inputs were then arbitrarily given to the model and the outputs were as per expectations around

80% of the times. The accuracy of this model could be improved by increasing the amount of good quality data for its training.

10. Future Scope and Conclusion

The concept of Deep Learning is being adopted and implemented in a wide variety of applications in this new tech savvy age of technocrats. Its understanding and use has accomplished the unthinkable. People can literally talk to their smart devices and get an answer in their own language. They are being used to distinguish between objects and also identify various objects based on their features. The machine has already started behaving like a human being. This plethora of opportunities was the actual motivation behind conducting this study.

In this research paper, the researchers tried to establish an elementary understanding of supervised machine learning algorithms and related concepts by building a few fundamental applications using python. Coding these algorithms in Python for this research became simple because of Python's vast set of APIs and modules that came as a handy tool for a programmer and helped to focus more on creating logic. Moreover, Python's syntax was also very easy to code and implement. Thus, Python was chosen as a preferable development platform.

Sentiment Analyzer were found to be accurate enough to be deployed in real world applications. Moreover, their accuracy could be improved further by training them on more amounts of data and adjusting their parameters accordingly for example, learning rate, optimizers, etc.

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