

Developing a Model for Sentiment Analysis Technique in the field of Tourism using Deep Learning

Harsh Arora, Mamta Bansal

Abstract— This paper provides a platform for analyzing and summarizing the sentiments expressed by users or customers in the field of online tourism. The objective of this research is to analyze online reviews of all the users to propose a new optimized business model to improve present services of business organization to enhance profit and customer satisfaction. The proposed system filters tourism online reviews and classifies them using sentimental technique with the help of deep learning technique. Deep learning technique will not only identify the polarity of online reviews but also recognizes relevant patterns deeply to find the hidden reviews details. After applying the deep learning technique, the results will be generated through which we can find the inferences. These inferences would provide a great help for improvisation of the subject. In this research a new optimized business model will be implemented using deep learning technique so that we would be able to compare new business model with the present system [1]. The relevance of this research lies in helping tourism industries to understand the social sentiment of their brand, product or service while monitoring online conversations. It helps in enhancing business profits by running online websites throughout by giving best services to the online users or customers.

Keywords—machine learning, deep learning, sentimental analysis, online tourism

I. INTRODUCTION

Innovation and the Internet have changed how travel is reserved, the connection among voyagers and the travel industry, and how vacationers share their movement encounters. Because of this assortment of choices, mass the travel industry markets have been scattering. Be that as it may, the worldwide interest has not fallen; a remarkable opposite, it has expanded. Another fundamental factor, the propelled change, is getting hold to accomplish new client profiles, especially the alleged third time of the movement business purchasers, automated local people who simply appreciate the world through their online closeness and who exploit the majority of its focal points. In this unique situation, the advanced stages where clients distribute their impressions of the travel industry encounters are beginning to convey more weight than the corporate substance made by organizations and brands. Tourism for several native cities is one in all the foremost necessary key industries. The activation of tourism results in the activation of the native industries and communities.

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Individuals accept the opinions of friends and family and use them as a reference for booking hotels, designing their journeys and to make purchase choices. Researches shows sixty fifth of leisure travelers searches on-line before preferring a travel destination, and sixty-nine of their plans are determined by on-line travel reviews. Role of client engagement ways for managing customer-brand relationships is currently essential within the tourism trade. Social Network Sites (SNS) became a basic part for each customers and business promotion to extend the scope of already established relations. SNS like Facebook, LinkedIn, Twitter have attracted scores of users that at the same time share data with an outsized range of individuals. the planet of business enterprise is dynamical isn't news. There are a lot of and a lot of knowledge, each structured and unstructured, being generated at ever higher rates, that once reworked into data, which give a tangible price to businesses. As huge knowledge is quickly increasing in each space, thus is that the case of business enterprise trade or the other field further wherever huge quantity of knowledge is to be handled, extracted and managed so as to run e-commerce sites or business a lot of swimmingly. The utilization of programmed devices in interpersonal organizations for the travel industry division has produced sufficient writing because of the significance impacting the purchaser's cooperation and influencing the manner by which vacationers see their experience. This can be conceivable by knowing the audits of online clients that might be available in any type of information. To investigate such a major measure of information we will utilize assessment examination or feeling mining utilizing AI method with the goal that we can help being developed of plans of action. Consequently, for a travel industry organization to develop, it is basic that its specialties figures to enhance its promoting efforts and execution of its corporate site so as to improve the criticism from its clients[2].

II. LITERATURE OVERVIEW

Duan [3] implemented a comprehensive view of online user generated content beyond the quantitative summary. The author has used the sentiment analysis technique to decompose user reviews into five dimensions to measure hotel service quality. Econometric models have been used to examine the effect in shaping users overall evaluation and content generating behavior. Hemalatha [4] expressed and implemented the sentiment classification in online reviews using frn algorithm. The author has emerged blogs or social networks as a method for mining opinions.



Machine learning methods combined with linguistic features in order to identify among other things the sentiment polarity. Taylor [5] said in his research about aspect based opinion mining approach called Bing Liu's aspect based approach for opinion mining particularly applicable in tourism and hospitality domain. Although this approach can be applied to any other area of sentiment analysis domain of online data. The author has proposed the use of new and more complex NLP based rules for the tasks of subjective and sentiment classification at the aspect level. Hopken [6] has researched the knowledge infrastructure using big data analytics which has recently been implemented as a genuine novelty at leading Swedish mountain tourism destination. His research is about pre trip and post trip phases with analysis of big data based on tourism domain. Selvi [7] has thrown light on supervised learning algorithm in order to extract the aspects and mining opinions in reviews of products. Phrase level opinion mining has been described in his research. He has identified sentiment orientation of each aspect by supervised learning algorithms in customer reviews that gives good accuracy. The focus has been given on the analysis of customers interesting aspects on products. Tripathy [8] explored the idea of sentimental reviews classification using machine learning techniques. The results have been obtained by applying Naïve Bayes algorithm and Support Vector Machine classification algorithm. He has used dataset considered for training and testing of model which is labeled based on polarity movie dataset and results are compared for critical examination. Fang [9] has presented negative binomial regression model at a review level to explore the effects of actual reviews. But here fixed effect model approach was not described by him to retrieve more data in different periods. His study is based on two findings, one is about perceived helpfulness of reviews and second about the value of reviews expressing extreme sentiment. Bangare [10] discussed product reviews online for e-commerce recommendation using sentiment analysis. The author has elaborated the experiences regarding a particular product to make the availability of this information in systematic manner. Efficient methodology has been showcased in his research work to highlight the importance of Naïve Bayes classifier over other classification algorithms. Musabah[11] predicted the sentiment Saas online reviews using supervised machine learning techniques. He has examined how consumers evaluate their experience of using cloud computing products. He has focused on investigating consumers feedback on software as a service(SaaS) products by developing models to predict the sentiment of SaaS consumer's reviews. Five algorithms were proposed in his research that are support vector machine algorithm, Naïve Bayes algorithm, Navie Bayes(kernel) algorithm, k-nearest neighbors algorithm and the decision tree algorithm to predict the attitude of SaaS reviews. Upadhyay[12] said and discussed about online reviews of customers on Twitter regarding electronic products like mobiles, laptops etc. by using machine learning techniques. The author has put efforts to estimate the twitter posts and collected the tweets of mobile from twitter and preprocess the tweets. Naive Bayes and SVM have been used to estimate the probability of positive tweets. Geetha[13] has found the relationship between customer sentiment and online customer ratings for hotels. An analysis has been done to find the consistency between customer ratings and actual customer feelings

across hotels belonging to the two categories of premium and budget. The author has explored the results when compared with premium hotels, staff performance and hotel services should improve and other factors like customer review length and review title sentiment can be analysed. Singla[14] proposed Naïve bayes and Decision Tree algorithm through sentimental analysis of flipkart reviews of users. The main focus has been put on product reviews comments and about the retailers from flipkart which shows the negative and positive attitude of buyer. An empirical study has been done to classify product reviews by semantic meaning. The author has proposed completely different approaches to classify the comments using hybrid algorithm combining decision tree and naïve bayes algorithm. Xiang[15] has discussed the research problems in the area of hospitality and tourism data with sentiment analysis. He has represented huge discrepancies in the representation of hotel industry. His study offers a basis for understanding the methodological challenges and identifies several research directions for social media analytics. Kim[16] in his research said about analysis of online reviews of tourists specifically negative feedback and opinion about tourism. He has discussed about specific transportation category out of 14 categories he described and reported relatively low level of service quality for post hoc analysis to reveal why tourists feel negative about transportation service. Singhla[17] said about rating for hotels done by the customers online by sentimental analysis. An empirical analysis has been done to establish a relationship between customer sentiments in online reviews and customer ratings for hotels. Two categories are defined as premium and budget on the basis of that customer sentiment polarity has been checked because this polarity explains significant variation in customer ratings. Naive Bayes algorithm used in his research is not able to find hidden sentiment. Sharma[18] discussed in his research about study of sentiment analysis techniques and tools. He has identified positive and negative opinion, emotions and evaluation in text available over social networking websites and www. Machine learning approaches and vocabulary oriented semantic algorithms have been used. Hence a cognitive study of various techniques and tools have been used in sentiment analysis process. Araque[19] said about enhancement of deep learning sentiment analysis with ensemble techniques in social applications. He has discussed how to improve the performance of deep learning techniques integrating them with traditional surface approaches based on manually extracted features. Bag[20] has given details of attribute level analysis for predicting the consumers purchase intention of durable goods. He has developed an attribute level decision support prediction model for providing the best e-commerce platform to the customers. The author has identified an appropriate regression analysis for each attribute to predict the appropriate product attributes. His study says that this analysis can be beneficial to e-commerce retailers and would give a platform for the customer to obtain the desired durable goods in an adorable form. Birjali[21] expressed the suicidal sentimental prediction in social networks using machine learning and semantic sentimental analysis based algorithms.

Research is based on some difficult context that is on the sentiments that could thinking of suicide. Experimental results demonstrate that this method based on machine learning algorithm and semantic sentiment analysis can extract predictions of suicidal ideations using Twitter data. Elmurngi[22] said about the reputations system and factors that negatively influence the sight of the customers and vendors in terms of reputation system. The study has been done on detecting fake reviews using machine learning techniques. The author has studied online movies reviews using sentiment analysis methods in order to detect fake reviews. Pingfan [23] completely explored the idea of product sales forecasting using on line reviews and historical sales data. The method he has used for this purpose is Bass model and sentiment analysis. Sales data and online reviews data is developed for product sales forecasting. Soumya[24] has discussed the opinions of customers online by using product feedback data using Hadoop framework. Data has been collected from amazon.com and composed of both text and emoticon but sentiment analysis considers only text but in this paper the author has used both. Wankhede[25] has given the overview of various opinions related to the online products and entities. He has discussed about the performance accuracy by doing the online survey of getting sentiments and opinions of users and also he has thrown some light on sentiment analysis in today's networking and social sectors. Wase[26] discussed about NLP problems to identify the positive and negative review of users for online market products and services. Opinions are judged and analyzed on the basis of polarity that is either positive or negative reviews of customers .He has also focused on how negative sentiment products can be used for evidence generation for cyber crime cases. Also experiments have done to filter the negative sentiment products. Graziotin[27]discussed about the evolution of sentiment analysis in recent years. The focus is on the fact that sentiment analysis has shifted from analyzing online product reviews to social media text from twitter and facebook. Other topics beyond product reviews like stock market, elections, disasters, medicine, software engineering, cyber bullying extend the utilization of sentiment analysis. Moro[28] said about gamification features related to hotel online reviews given by the customers. Idea is about to attract travelers and motivates them to contribute to their websites. Focus is on badge features like passport badges and explorer badges providing evidence of a relation between gamification features and travelers behavior when writing reviews. Liu[29] has innovately applied sentiment analysis model to capture Chinese tourist evolution of destinations in Australia and compare those evolutions with evolutions produced by international tourists. Tourists online reviews have been collected to draw conclusions which lead to find the market features and preferences of Chinese tourists remain distinguished from international tourists. Fang[30]has thrown light on opinions of consumers based on semantic fuzziness. The opinion of consumers are expressed in sentiments Chinese phrases. But because of fuzziness of Chinese characters, traditional machine learning techniques can not represent the opinions of products. Hence multi strategy sentiment analysis method with semantic fuzziness has been used to solve the problem. Redhu[31]said every aspect of sentiment analysis using text mining. The discussion has been done to extract information

using text mining and sentiment analysis that include data acquisition ,data preprocessing and normalization, feature extraction and representation, labeling and finally the application of various natural language processing and machine learning algorithms. Kavarsi[32] has proposed and analyzed the text of reviews to evaluate and predict the rating. He has discussed the lexical features generated from text as well as sentimental words on the accuracy of rating prediction. He has explored the best number of features for predicting the rating of the reviews.

III. PIONEERING TECHNOLOGIES

A. Turning inside out in the field of Deep Learning

The term 'AI' is frequently, mistakenly, traded with Artificial Intelligence, yet AI is really a sub field/sort of AI. AI is likewise regularly alluded to as prescient investigation, or prescient demonstrating. At its most essential, AI utilizes customized calculations that get and investigations input information to anticipate yield esteems inside a worthy range. As new information is nourished to these calculations, they learn and streamline their tasks to improve execution, creating 'knowledge' after some time. There are four kinds of AI calculations: administered, semi-regulated, unsupervised and fortification[33].

AI can be utilized in numerous territories to break down enormous information present identified with any field on the system. NLP, Naïve Bayes calculation and other AI strategies have been utilized in before research[34]. Profound learning is one of the most recent systems that separates information or audits from web or cloud anyplace present online fastly and auspicious. Profound learning is an AI strategy that instructs PCs to do what falls into place without any issues for people: learn by precedent. Significant learning is a key advancement behind driverless cars, enabling them to see a stop sign, or to perceive an individual by walking from a lamppost.

B. Proficiency of Deep Learning

In a word, precision. Profound learning accomplishes acknowledgment precision at more elevated amounts than any time in recent memory. This enables purchaser hardware to meet client desires, and it is significant for security basic applications like driverless autos. Late advances in profound learning have improved to the point where profound learning beats people in certain errands like ordering objects in pictures.

1. Deep learning requires a lot of marked information. For example, driverless vehicle progression requires an extensive number of pictures and countless times of video.
2. Deep learning requires considerable figuring power. Superior GPUs have a parallel design that is productive for profound learning. At the point when joined with groups or distributed computing, this empowers advancement groups to diminish preparing time for a profound taking in system from weeks to hours or less.

C. Correlating Machine learning with Deep learning

AI offers an assortment of systems and models you can pick dependent on your application, the measure of information you're handling, and the sort of issue you need to comprehend.

An effective profound learning application requires a lot of information (a great many pictures) to prepare the model, just as GPUs, or illustrations handling units, to quickly process your information. While picking between AI and profound learning, think about whether you have an elite GPU and bunches of marked information. On the off chance that you don't have both of those things, it might bode well to utilize AI rather than profound learning. Profound learning is commonly increasingly intricate, so you'll require no less than a couple of thousand pictures to get solid outcomes. Having an elite GPU implies the model will set aside less effort to break down every one of those pictures.

IV. PATHWAY FOR IMPLEMENTING SENTIMENTAL ANALYSIS IN ONLINE TOURISM

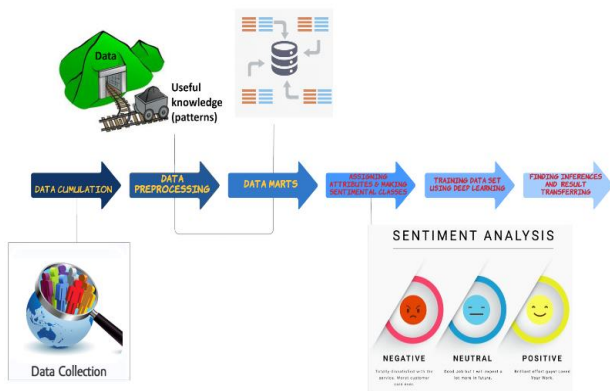


Fig 1. Steps followed for implementing sentimental analysis in online tourism

A. Data Cumulation

Data in online tourism systems is collected by continuous process specification, collection, analysis and interpretation of data about the environment in which the entity is located, to better understand the traveler's area of interest and how to grow online tourism in an advantageous way. Market analysis is a technique used for collecting and evaluating information from the various sources i.e. of people's preferences, desires and likings about a particular place. It focuses on consumer behavior.

To analyze the customer sentiments or opinions, we will first collect the related data from different sources. The data can be primary data and secondary data. Primary tourism data would be collected through questionnaires or personal interviews. Secondary data will include various statistical reports taken from ministry of tourism in India and some important annual reports of world Tourism organization. In secondary data, the study will include world Tourism scenario, Tourists arrivals in India, Approved Hotels, Restaurants, Travel and Tourism agencies. It's of utmost importance to collect the right data at right time and from the relevant and reliable sources to predict the outcomes of customer sentiments in the area of current study that is online Tourism [35].

B. Data Preprocessing

Tourism data collected in the previous step would be processed to analyze the data in such a way that only correct, relevant and reliable data is extracted. This task is done by using big data technique such as Hadoop, HBase

and others. These techniques are used because of existing large volume of tourism data available from different sources online. These big data technologies will be used for data processing in support of data mining sentiment analysis technique. Once the data which is actually big data is processed, a significant level of change occurs in terms of relevancy, correction, gaps, etc.

Financial analyst Prasanna Tambe of New York University's Stern school has analyzed the degree to which the usage of enormous information advances appears to support associations. He finds that, subsequent to controlling for different conceivable frustrating elements, the utilization of enormous information innovations relates with noteworthy extra efficiency development [36].

C. Data Marts

When the information is prepared, it ends up helpful for the momentum look into. Just prepared information accessible could be put away in information stores. Gigantic measure of information is accessible in various the travel industry goals or places however these important data survives from no utilization until it is extricated, broke down, refined and prepared in right manner to channelize appropriate way of research. This issue is tackled first by preprocessing strategy and after that by conceptualizing, executing and testing information by applying BI and information warehousing strategies. Information distribution center and OLAP functionalities would channel and store the correct information of clients for further examination in research.

Multidimensional data show concepts are used to stay up the non uniformity of accessible data. flat model is employed to examine business forms and connected data to try to the simplest potential exchanges. The whole idea of using Data warehouse or Data mart having processed data is to reduce the inconsistencies present in available data and storage of only powerful data taken from multiple tourism destinations.

D. Assigning attributes and making classes of sentiments

Once the data in form of customer sentiments or opinions, views, feedback and suggestions is collected, after that it becomes very important and essential to explore, analyze and organize their views for better decision making in future. As data available on web is structured, semi-structured and unstructured, hence sentiment classification is utmost important and efficient task to make our gathered data aligned in best possible understandable forms so that by going through it deeply we would be able to conclude better out of it. Here we will make different classes for all kinds of user sentiments and will assign the attributes accordingly.

Wistful characterization comprehensively alludes to paired arrangement, multi-class classification, relapse and positioning. Sentiment classification mainly consists of two important tasks, including sentiment polarity assignment and sentiment intensity assignment. Sentiment polarity assignment deals with analyzing, whether a text has a positive, negative or neutral semantic orientation. Sentiment intensity deals with analyzing whether the positive or negative sentiments are mild or strong.

There are several tasks in order to achieve the goals of sentiment-analysis. These tasks include sentiment or opinion detection, polarity classification and discovery of the opinion's target. The various methodologies used in order to achieve sentiment classification are:

- Classification with respect to term frequency, n-grams, negations or parts of speech.
- Identification of the semantic orientation of words using lexicon, statistical techniques and training documents.
- Identification of the semantic orientation of the sentences and phrases.
- Identification of the semantic orientation of the documents.
- Object feature extraction
- Comparative sentence identification[37].

E. Training the data set by using deep learning technique

Once we have relevant collected data, data sets are created and a machine learning technique called deep learning would be applied. Although many machine learning techniques are available that could be implemented on these bags of words but here in this research, we will implement deep learning technique that will work deeply and analyze the data words one by one in depth. By doing this we would be able to find the sentiments not only in the form of polarity i.e. positive, negative or neutral as done by other machine learning techniques [38]. But also, the probability of occurrence of positive or negative feedback given by customer by providing huge data sets to the machine, it will analyze the data based on its previous training. We will create a deep learning model where we will give input data set that computes the sentiments with proper reasoning to provide an accurate solution to the problem at hand. This training process will be repeated several times with millions of sentimental inputs.

We follow a multi-step process to train the deep learning model to achieve desirable accuracy.

- Collect and acquire sentimental data set
- Train the deep learning model
- Evaluating errors and issues contributing to errors
- Refining the data set and return to step b
- Repeat until desirable accuracy is achieved.



Fig 2. Steps followed for achieving accuracy in data set

F. Finding inferences and transferring results to the tourism industries for the subject improvisation

By training the data set, new capabilities are added to the trained data model by using various inferencing techniques for optimized performance of tourism system and to encounter the issues faced till date. This deep learning model will convert untrained data set into trained data set with optimized performance that will provide the required services to the tourism organizations which would be used and implemented by them on the current system so that gaps in the earlier system would be figured out and current system will be improved from commercial point of view and from the point of view of customer satisfaction that would lead to enhancement in profit in business organizations in future.

V. RESULT AND DISCUSSION

With the survey performed on the latest tourism research in this paper, this can be identified that there is huge scope of the technology in this research area. Deep Learning & statistical analysis will be implemented on the standard datasets to infer more scope in this area.

In this paper, machine learning techniques has been correlated with deep learning techniques to compare the efficiency of both which leads to the inclination completely towards deep learning technique rather than classical techniques of machine learning used or implemented by authors in past few years as mentioned in the literature review. After analyzing the proficiency of deep learning by turning towards the same from machine learning that is moving from machine learning to deep learning and analysis of various conclusions given by many authors mentioned in this paper gives results that implementation of sentiment analysis in the field of tourism using latest neural network based technique called deep learning will be highly efficient and useful technique with big scope in future.

Classical techniques of Machine learning like SVM, KNN, RF, Classifiers discussed in literature review used by various authors. But results out of it has been observed on standard data set of tourism with different level of efficiency and deep inferences with more clarity could not come which can come through using neural network based algorithm of deep learning like RNN,LSTM ,Attention Mechanism etc. and that is the purpose of this research.

In future also to solve the existent problems in the field of tourism ,further implementation would be done through neural network algorithm based technique that is deep learning rather than using classical algorithms of machine learning.

In the following proposed flow diagram it has been shown that first on big data of tourism reviews, preprocessing and extraction is done and the data would be taken through tour and travel sites. After that the required feature extraction and pattern finding is done .Further the data is trained and tested and feed to deep learning algorithm to develop a model by applying hidden layer and embedded word mechanism to get evaluation index. The evaluation index will decide the efficiency of results and future action will be taken to improve the current existing model.

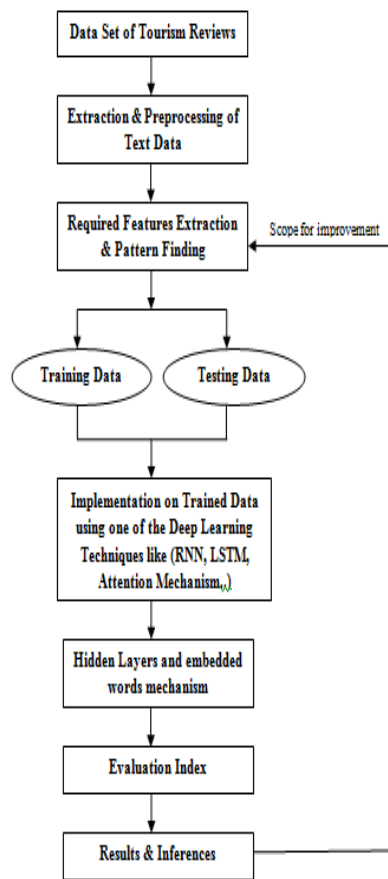


Fig.3, Proposed Flow Diagram of Tourism Sentiments Analysis through Deep Learning Techniques

VI. CONCLUSION

In order to run the business sites or E-commerce sites more smoothly, it is required to handle big data or enormous amount of data of tourism industry and for that we need to extract relevant data from different tourism sites to find out the hidden details of customer reviews towards tourism services and what more expectations are done by customers in this field so that the current system can be improvised in form of a software that would help different tourism industries to enhance their business models with better efficiency that would help in customer satisfaction in future .In other words ,the future direction would be towards improving the performance of present online tourism domain that would be successful by proposing an architecture and algorithm that will act as a useful background tool for summarizing and deeply understanding the opinions of users in tourism oriented web platforms.

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