

A Survey on the Machine Learning Techniques for the News Classification

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Abstract

Data mining proceeds with large amount of data. Data mining has popularly treated as synonym of knowledge discovery in database, although some researchers view data mining as an essential step of knowledge discovery. Online news classification is vast area of data mining. As large numbers of articles are published it is time consuming task to select the interesting one. There have been a lot of work for the outer classification but there has been a very less amount of work for inner classification of news. The paper here deals with the existed studies surveyed on the news classification using various machine learning methods.

Keywords

Data Mining, Machine Learning, News Classification, Classifiers

I. Introduction

Data mining is process of discovering interesting knowledge such as patterns, associations, changes, anomalies and significant structures, from large amounts of data stored in database, data warehouse, or other information repositories. Data to the wide availability of huge amount of data in electronic form, and imminent need for turning such data into useful information and knowledge for broad application including market analysis, business management and decision support, data mining has attracted a great deal of attention in information industry in recent year. Data mining is also treated as Knowledge discovery process which consists of iterative sequence of steps as- Data cleaning, Data integration, Data selection, Data mining, Pattern evaluation, Knowledge presentation. The construction of a data warehouse, which involves data cleaning and data integration, can be viewed as an important pre-processing step for data mining. However, a data warehouse is not a requirement for data mining. A data warehouse is a repository of information collected from multiple sources, stored under a unified schema, and which usually resides at a single site. Data mining uses the data warehouse as the source of information for knowledge data discovery (KDD) systems. Data warehouse is a subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management's decision making process.

Mostly the information store in the form of text like e mails, web pages, newspaper article, market research reports, complaint letter from customer and internally generated reports. As for as online newspapers provide news under various categories like national, international, politics, finance, sports, entertainment etc. text classification is also an important part of text mining. Text classification based on expert knowledge how to classify the document under the given set of categories. Data mining classification start with training set of document that is already label with class. Advances in technology triggered a research boom in applications of textual analysis in social sciences with sentiment analysis being particularly popular. Sentiment analysis extracts text's attitude by identifying words that are correlated with a variable of interest, such as stock return and aggregates it

in a single number called text sentiment. The literature interprets text sentiment in three ways: psychological sentiment, pure soft information and omitted quantitative information. The World Wide Web is a prominent, intuitive and tremendous medium to get data today. The well-known web crawler Google as of late reported that its files traverse a surprising eight billion records. The aggregate incorporates a couple of billion Web pages, couple of countless pictures and photographs and around one billion of newsgroup messages. Google says that acquiring a comparative file by hand would take a human searcher 15180 years, expecting somebody could be found to file one archive each moment, for twenty-four hours for each day. In a couple short years, the Web has turned into our most convincing mechanical achievement. It is the world's biggest library and phone system. It is worldwide, and in the meantime flawlessly nearby. For organizations working together on the Web, it is the quickest developing venture and additionally the world's biggest money enlist, an improvement that will just quicken as we find better approaches to mine quality from the enormous substance put there by both people and establishments. What's more, the late prologue to the Web applications, stages and situations, which encourage intuitive data sharing, interoperability and cooperation, all things considered known by Web 2.0 and the Social Web, has made data distributed on the Web no more the area of a little number of tip top researchers. With long range informal communication sites, for example, Facebook1 and MySpace and also free client distributed situations, for example, the client Blogs, nearly anybody today who has something to say can distribute it on the Web, including extra and significant data resources for this glorious overall information store. Web is exceptionally ingenious spot with contrasted with assessment data. Makes client's point of view; individuals can post their own particular substance on different online networking sites. Building the smart Web is acknowledged utilizing a moderately new Artificial Intelligence procedure, Web Mining, which can be characterized as the utilization of data mining systems to web information. The significant issue with Web Usage Mining is the way of the information they manage. With the development of web, Web Data has gotten to be enormous in nature and a great deal of exchanges is occurring in seconds.

There are various machine learning methods that are used for the classification of data. Machine learning is closely related to (and often overlaps with) computational statistics, which also focuses on prediction-making through the use of computers. It has strong ties to mathematical optimization, which delivers methods, theory and application domains to the field. Machine learning is sometimes conflated with data mining. In the terminology of machine learning, classification is considered an instance of supervised learning, i.e. learning where a training set of correctly identified observations is available.

The paper is summarized as follows: Section I consists of Introduction, Section II involves the Literature Survey, Section III is composed of Classification Approaches and Section IV comprises of the Conclusion.

II. Literature Survey

The existing studies surveyed provide the overview of data warehousing and OLAP technologies, with an emphasis on their new requirements. It describe back end tools for extracting, cleaning and loading data into a data warehouse ,multidimensional data models typical of OLAP, front end client tools for querying and data analysis, server extensions for efficient query processing and tools for metadata management and for managing the warehouse [26]. Thorsten Joachims introduces support vector machines for text categorization. It provides both theoretical and empirical evidence that SVMs are very well suited for text categorization [30]. Susain Dumais compares the effectiveness of five different automatic learning algorithms for text categorization in terms of learning speed, real time classification speed, and classification accuracy. It also examines training set size, and alternative document representations [27]. Chee Hong experimented an automated approach to classify online news using the SVM (Support Vector Machine) classification method. SVM has been shown to give good classification results when ample training documents are given [2]. Hyeran Byun presented a brief introduction on SVMs and several applications of SVMs in pattern recognition problems. SVMs have been successfully applied to a number of applications ranging from face detection and recognition, object detection and recognition, handwritten character and digit recognition, speaker and speech recognition, information and image retrieval, prediction and etc. because they have yielded excellent generalization performance on many statistical problems without any prior knowledge and when the dimension of input space is very high [10]. Daniel I Morariu investigated three approaches to build an efficient meta-classifier. In order to increase the classification accuracy. In this select 8 different SVM classifiers. For each of the classified we modified the kernel, the degree of the kernel and the input data representation [6]. Xindong wu presents the top 10 data mining algorithms. C4.5, k-Means, SVM, Apriori, EM, PageRank, AdaBoost, kNN, Naive Bayes, and CART. These top 10 algorithms are among the most influential data mining algorithms in the research community [41]. Shri Zhong compared generative models based on the multivariate Bernoulli and multinomial distributions have been widely used for text classification. Recently, the spherical k-means algorithm, which has desirable properties for text clustering, has been shown to be a special case of a generative model based on a mixture of von Mises-Fisher (vMF) distributions [25]. David B Bracewell presented algorithms for category classification and topic discovery and classification of news articles. The news domain presents challenges that other domains do not. Dealing with online news demands online classification, topic discovery and classification with sparse training data [7]. In [4] building up on the meta-classifier presented, based on 8 SVM components, they add to these a new Bayes type classifier which leads to a significant improvement of the upper limit that the meta- classifier can reach. Krishanalal developed the intelligent News Classifier and experimented with online news from web for the category Sports, Finance and Politics. The novel approach combining two powerful algorithms, Hidden Markov Model and Support Vector Machine, in the online news classification domain provides extremely good result compared to existing methodologies. By the introduction of several preprocessing techniques and the application of filters they reduced the noise to a great extent, which in turn improved the classification accuracy [12]. S.P.Deshpande represents overview of data mining system and some of its application. Information play important role in every sphere of human life. It

is very important to gather data from different data sources, store and maintain the data. Generate the information. , generate knowledge and disseminate data, information and knowledge to every stakeholder. Due to vast use of computers and electronics devices and tremendous growth in computing power and storage capacity, there is explosive growth in data collection. The storing of the data in data warehouse enables entire enterprise to access a reliable current database [18]. Mita K. Dalal worked on text classification and feature extraction phases. Text classification can be automated successfully using machine learning techniques, however pre-processing and feature selection steps play a crucial role in the size and quality of training input given to the classifier, which in turn affects the classifier accuracy [17]. Yiming Yang reported a controlled study with statistical significance tests on five text categorization methods: the Support Vector Machines (SVM), a k-Nearest Neighbor (kNN) classifier, a neural network (NNet) approach, the Linear Least- squares Fit (LLSF) mapping and a Naive Bayes (NB) classifier. They focus on the robustness of these methods in dealing with a skewed category distribution, and their performance as function of the training-set category frequency [35]. Rama Bharath Kumar developed stock market prediction tool. Stock market prediction is an attractive research problem to be investigated. News contents are one of the most important factors that have influence on market. Considering the news impact in analyzing the stock market behavior, leads to more precise predictions and as a result more profitable trades. So far various prototypes have been developed which consider the impact of news in stock market prediction. In this paper, the main components of such forecasting systems have been introduced. The main objective is to predict the Classify the Financial News based on the contents of relevant news articles which can be accomplished by building a prediction model which is able to classify the news as either rise or drop [21]. Vandana Korde focused on the existing literature and explored the documents representation and an analysis of feature selection methods and classification algorithms. The growing use of the textual data needs text mining, machine learning and natural language processing techniques and methodologies to organize and extract pattern and knowledge from the documents. It was verified from the study that information Gain and Chi square statistics are the most commonly used and well performed methods for feature selection, however many other feature selection methods are proposed. Different algorithms perform differently depending on data collection. However, to the certain extent SVM with term weighted VSM representation scheme performs well in many text classification tasks [32]. Michael Scharkow introduced the conceptual foundations of machine learning approaches to text classification and discusses their application in social science research. They then evaluate their potential in an experimental study in which German online news was coded with established thematic categories [16]. Liang-Chih Yu proposed a contextual entropy model to expand a set of seed words by discovering similar emotion words and their corresponding intensities from online stock market news articles. This was accomplished by calculating the similarity between the seed words and candidate words from their contextual distributions using an entropy measure. Once the seed words have been expanded, both the seed words and expanded words are used to classify the sentiment of the news articles [14]. Yang Hui Rao proposed an efficient algorithm and three pruning strategies to automatically build a word-level emotional dictionary for social emotion detection. In the dictionary, each word is associated with the distribution on a series of human emotions.

In addition, a method based on topic modeling is proposed to construct a topic-level dictionary, where each topic is correlated with social emotions [34]. S.Lauren combined simple moving average and news classification to predict stock trend more responsively. They use machine learning using artificial neural network to combine the two aspects [22]. L.Cui proposed a hierarchy method based on LDA and SVM. They first introduce the significance of news classification. Then, the concepts of topic model and SVM are introduced. They also did algorithm parameter adjusting [13].Z.Li Juan introduces the characteristics of Vietnamese news, on which the trigger words are selected; next, determine the event type based on the title, keywords and trigger words; finally, achieve the classification of Vietnamese news events through the event template and combining with the maximum entropy model [38]. W.Weng explored a combination of softmax regression model and the structured data of stocks to develop a structure-based classification model for stock news, which weights the probability output by the softmax regression model and the structured data to get the final probability values, and finally classifies the news by the classification selection algorithm [33]. Dadgar proposed an approach to classify news texts. This approach was comprised of three different steps: 1) text preprocessing, 2) feature extraction based on TF-IDF, and 3) classification based on SVM. They trained the approach through the SVM classifier which was selected because it could support data with high dimensions [23].Ivana Clairine proposed hierarchical multilevel classification, which is used to decide the class and subclass of every single news using problem transformation approach [43]. Jinyan Li compares the performance of different filters and classification algorithms for the task of sentiment analysis [11]. Toon De Pessemier investigates whether users utilize a mobile news service in different contextual situations and whether the context has an influence on their consumption behavior. Furthermore, the importance of context for the recommendation process is investigated by comparing the user satisfaction with recommendations based on an explicit static profile, content-based recommendations using the actual user behavior but ignoring the context, and context aware content-based recommendations incorporating user behavior as well as context [31]. Yongsung Kim proposed a platform called TNIE that utilizes Twitter in the NIE environment. TNIE consists of three main components: PNE, NV, and SCLT. TNIE demonstrated many advantages compared to traditional NIE: (1) it provided an automatic classification of the latest news based on the topics, (2) it provided a hierarchical visualization for the classified news content, and (3) it provided an easy tool for creating collaboration groups and generating a report based on the collaboration [36]. Yu-Chen Wi constructed an Aggregate News Sentiment Index ANSI with the incorporation of public news relating to each of the individually listed firms. They propose appropriate hypotheses to facilitate our investigation of the relationships between the ANSI, market returns, trading value, turnover ratio and Taiwan volatility index [37]. Sreenath G Anavatti presented a new paradigm of web news mining using an evolving algorithm, namely the eT2Class. In the work, the efficacy of the eT2Class has been demonstrated and has been proven to be very effective in comparison to state-of-the art algorithms [3]. In the previous research work the manual system were into action as the people were used to extract the news manually. If talk about sports then there is no classification of e-sports into its type like cricket, hockey, football etc. Same way news about e-entertainment there is no classification about type of e-entertainment like Hollywood,

Bollywood can be possible.

III. Classification Approaches

An algorithm that implements classification, especially in a concrete implementation, is known as a classifier. There are various types of classification algorithms that are widely used for the classification of the data that includes- Linear classifiers, SVM(Support Vector Machine), Quadratic classifier, Kernel estimation, Boosting (meta-data), Decision trees, Neural Networks, Learning vector quantization. Classifier performance depends greatly on the characteristics of the data to be classified. There is no single classifier that works best on all given problems. Various empirical tests have been performed to compare classifier performance and to find the characteristics of data that determine classifier performance. In the existing studies SVM classifier approach is implemented to support the data with high dimensions. A controlled study with statistical significance is reported which involves SVM, KNN classifiers and other approaches. But the SVM classifier has limited speed and size, both in training and testing. Discrete data presents another problem. The most serious problem with SVMs is the high algorithmic complexity and extensive memory requirements of the required quadratic programming in large-scale tasks. In case of KNN classifier distance based learning is not clear which type of distance is to use and which attribute is used to produce better results. Computation cost for KNN classifier is high because we need to compute distance of each query instance to training samples. To overcome the limitations of existing studies ANN algorithm can be used as it is requiring less formal statistical training, ability to implicitly detect complex nonlinear relationships between dependent and independent variables, ability to detect all possible interactions between predictor variables, and the availability of multiple training algorithms. Furthermore, while neural networks are excellent and crunching large amounts of data, this advantage lessens relative to the size of a data sample. Neural networks have the ability to learn (in a limited sense), making them the closest model available to a human operator.

IV. Conclusion

As data mining is widely used in all the fields to store the records and also for online transactions. It has a tremendous use in online news classification. Various approaches are used for the news classification that provides interesting results. There have been a lot of work for the outer classification but there has been a very less amount of work for inner classification of news. Inner classification of news is required to obtain the information quickly. There is need to modify the current evaluation techniques of the classification of the online news and to make the inner classification so that a better efficient model can be generated to reduce the burden of the manual system of data entry of the online news classification.

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