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REVIEW ARTICLE

A Review on Customizable Content-Based Message Filtering from OSN User Wall

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Abstract—Online Social Networks enables its users to keep in touch with friends by exchanging several type of content including text, audio and video data. Users of these sites do not have much control to avoid unwanted content to be displayed on their own private space called in general wall. Therefore a major task of today's online social network is information filtering. Using machine learning approach and a rule based system, text classification and customization of filtering criteria to be applied on user's wall is to be achieved. From this survey, we will be able to see the challenges in short text classification and filtering criteria that should be considered while publishing messages on user wall.

Index Terms—On-line Social Network; Information filtering; short text classification

I. INTRODUCTION

Social networks are the hottest online trend of the last few years to meet people and share information with them. Users of these online networking sites form a social network, which provides a powerful means of organizing and finding useful information. This communication involves exchange of several types of content including text, image, audio and video data. Therefore in Online Social Networks (OSN), there is a chance of posting unwanted content on particular public/private areas, called in general walls. Information filtering has been greatly explored for what concerns textual documents and, more recently, web content. It can be used to give users the ability to automatically control the messages written on their own walls, by filtering out unwanted messages. In this paper, our main aim is to survey the classification technique and to study the design of system to filter the undesired messages from OSN user wall.

In this paper Section 2 explains the related work, section 3 explains the main approaches used for the machine learning methods section 4 discuss about the feature selection and text representation section 5 explains the evaluation metrics.

II. RELATED WORK

The main goal of information filtering system is to filter unwanted content from input data before its presentation to the end user. It takes into account user profile and compares it with referred characteristics or properties. Recommender systems have become popular in recent years. It is a type of information filtering system that predicts the preference that user might give to an item or to the social element. It takes into account user interest and recommends an item. Recommender systems works in one of two ways

- Content based filtering
- Collaborative filtering

A. Content-based filtering

Content based filtering selects an item based on user interest. It uses items previously preferred by the user and then suggests the best matched item. Each user acts independently in content based system. This kind of system chooses item depending on relation between item content and user recommendations against collaborative system that selects item based on relation between people with similar preferences [7].The content based system creates a content based profile of a user based on rated items of a user. Items features are weighted based on features preferred by the user and recommendations are given by the system accordingly. In content based filtering, the main issue is whether the system is able to learn from user's actions related to a particular content source and use them for other content types. Text classification is similar to content based filtering as documents processed in such type of system are mostly textual. In online social network user's social profile has to be taken into account and this makes content based filtering system difficult to apply in OSN domain as a standalone system.

B. Collaborative filtering

Collaborative filtering system selects information item based on user's preferences, actions and predicts what users will like based on his similarities to other users. Items are rated on the basis of user likes and dislikes [4]. Collaborative filtering involves collaboration of multiple agents while filtering information. Collaborative filtering system often requires large dataset.Amazon.com uses item to item collaborative filtering for its Recommendation system. The collaborative approach is suitable for popular items but effective content information is not much gained as opposed to content based approach which is more suitable for unpopular items and effective content information is easily available.

C. Policy-based personalization

Policy based personalization is applicable in many different contexts. It adapts a service in specific context according user defined policies. In online social networking sites user oriented policies can define how communication between two parties or more can be handled. The policy based personalization system in [3] focuses on Twitter2. It assigns a category to each tweet and shows only those tweet to the user which are of his interest. In this scenario, policy based personalization represent the ability of the user to filter wall messages according to filtering criteria suggested by him.

III. MACHINE LEARNING TECHNIQUES

A Machine learning approach learns from training data and creates classifiers for the classification of new dataset. The main task of text classification is to assign a predefined category with each text. Text classification is accomplished on the basis of endogenous collection of data. The machine learning, based classifier learns how to classify the categories of incoming data on the basis of features extracted from the set of training data. Below are the key methods which are commonly used for text classification.

- Neural network classifiers
- Support vector machines
- Naive Bayes classifier
- Decision tree

A. Naive Bayes classifier

Naive Bayes classifier is a probabilistic classifier based on Bayes theorem with independence assumption [4]. Given a class variable, it assumes the presence or absence of specific feature is unrelated to the presence or absence of any other feature. For instance a fruit is considered to be cherry if it is red, round and small in size. Bayes classifier considers each of these features independently to the probability that the fruit is cherry regardless of the presence or absence of any other feature. The main advantage of this classifier is that it requires a small amount of training data to estimate the parameters required for classification.

B. Neural Network Classifier

Neural network classifiers consist of neurons arranged in layers converting an input vector into output. The most commonly used neural network is multilayer feed forward network in which a unit feeds its output to all the units of the next layer but there is no feedback to the previous layer. Radial basis function network is an artificial neural network which uses radial basis function as an activation function. The output of this network is a linear combination of radial basis functions of the inputs and neuron parameters. It is robust to outliers [5] and therefore more suitable in this context.

C. Support Vector Machines

The support vector machine classifiers analyze data and recognize pattern in it. They are based on supervised learning model and are able to perform nonlinear classification in addition to linear classification. The support vector machine classifier is suitable for large amount of unlabeled data and small amount of labeled data [4]. The high dimensional input space, irrelevant features, sparse document vectors and linearly separable text classification makes support vector machine classifier suitable for text categorization [4].

D. Decision Trees

Decision trees classifiers are used for a hierarchical decomposition of the data space. It determines the predicate or a condition depending on attribute value. Class labels in the leaf node are used for classification. In order to reduce the over fitting data pruning is required in decision tree. This classifier requires iterative training procedure and is oversensitive to training data [5].

IV. SHORT TEXT CLASSIFIER

A hierarchical two level classification is advantageous to short text classification as per the suggestion in [1]. The first level of a classifier labels the message into neutral and non-neutral. In second level non neutral messages are estimated into one or more of the conceived categories.

A. Text Representation

Text representation of a given document is important task strongly affecting the performance of classification process. It is done by extracting features for a given document. The investigation from [7, 35, 36] suggest three types of features important for text representation. They are Bag of Words, Document properties (Dp) and Contextual Features (CF). The first two types of features are entirely derived from the information contained within the text of the message [7] whereas contextual features are exogenous. Text representation using endogenous. In Bag of Words representation terms are identified with words. It is also important to use Feature which is extracted from outside the message content but related to message itself. A contextual feature is introduced in [8] that characterize the environment where the user is posting. According to [6]. It determines the semantics of message [6]. Vector space Model is the model of text representation by which a text document is represented as a vector of binary or real weights. These three features are experimentally evaluated for short text classification in [8] for their appropriateness.

B. Machine Learning-based Classification

As short text classification is hierarchical two level tasks and it should be robust to outliers hence RBFN is used for short text classification. An RBFN model is chosen as per the experimental evaluation in [14] [11] among the other classifiers.

V. FILTERED WALL ARCHITECTURE

The architecture of OSN services is a three-tier structure of three layers (Figure 1) [7]. These three layers are

- Social Network Manager (SNM)
- Social Network Application (SNA)
- Graphical User Interface (GUI)

The main task of Social network management layer is profile and relationship management. It maintains the data related to user profile and provides the data to the second layer for applying filtering rules (FR) and blacklists (BL). Second layer composed of Content Base Message Filtering (CBMF) and a short text classifier is most important layer. The classifier categorizes each message according to its content and CBMF filters the message according to filtering criteria and blacklist provided by the user. Third layer consist of graphical user interface by which user provide his input and is able to see published wall messages. Additionally GUI provides user the facility to apply filtering rules for his wall messages and helps to provide list of BL user who are temporally prevented to publish messages on user's wall. The GUI also consists of Filtered Wall (FW) where the user is able to see his desirable messages.

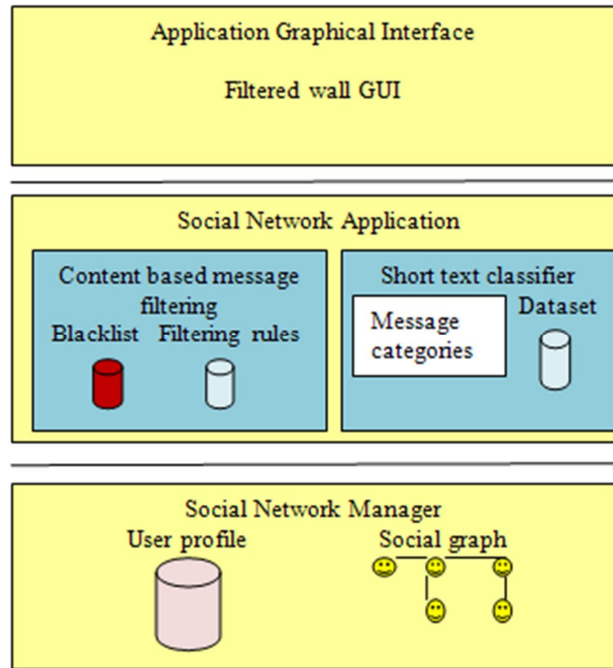


Figure 1 Filtered wall conceptual architecture

As per the filtered wall architecture, when the user tries to post a message on a private wall of his or her contact it is intercepted by the filtered wall. Then a short text classifier categories a message according to its content and CBMF applies FR and BL as per the data provided by the third layer.

Based on the result of above step the message is published or filtered by FW.

VI. FILTERING RULES AND BLACKLIST MANAGEMENT

A. Filtering rules

User can state what contents should be blocked or displayed on filtered wall by means of Filtering rules. Filtering rules are specified on the basis of user profile as well as user social relationship. FR is dependent on following factors

- Author
- Creator Spec
- Content Spec
- Action

An author is a person who defines the rules. Creator Spec denotes the set of OSN user and Content Spec is a Boolean expression defined on content. Action denotes the action to be performed by the system on the messages matching content Spec and created by users identified by creator Spec [8].

B. Blacklists

BL users are those users whose messages are prevented independent from their contents. BL rules enable the wall owner to determine users to be blocked on the basis of their profiles and relationship with wall owner. This banning can be done for a specified period or forever according wall owner's desire. Like FR, BL is also dependent on author, creator specification and creator behavior.

VII. EVALUATION METRICS

First level of classification is evaluated by means of contingency table approach. The Overall Accuracy index giving the percentage between truth and classification results is complimented with Cohen's KAPPA (K) coefficient. The Cohen's KAPPA (K) coefficient is more robust measure [13]. The second level of classification is evaluated on the basis of Precision and Recall. Precision gives the number of false positive and Recall gives the number of false negative of classification. The overall metric F- is then computed by the harmonic mean between Precision and Recall [12].

VIII. INVESTIGATIONAL OUTCOME

Existing technique works well for long text classification but suffers when the text is short. Short text does not have multiple occurrences of words therefore classification of short text is a challenging task. Short text classification is a hierarchical two level task consisting of hard and soft classification. Among the variety of Machine Learning models for text classification, RBFN model is well suited. RBFN's main advantages are that classification function is non-linear and the model can generate confidence. It is also robust to outliers and this makes this model well suited in this context.

IX. CONCLUSION

This survey paper presents approach of short text classification and design of a system to filter undesired messages from OSN walls. Additionally the flexibility of a system can be enhanced through filtering rules and blacklist management. In this context, since the underlying domain is dynamic, the collection of pre-classified data provided for training purpose may not valid for longer time.

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