

# Survey paper on Rumor Detection in Real-Time Twitter Data

Divya M. Patel<sup>1</sup>, Dr. Dinesh B. Vaghela<sup>2</sup>

<sup>1</sup>Student, Information Technology, ShantilalShal Engineering College, Bhavnagar, India

<sup>2</sup>Assistant Professor, Information Technology, ShantilalShal Engineering College, Bhavnagar, India

<sup>1</sup>divya.patel0025@gmail.com, <sup>2</sup>dineshvaghela28@gmail.com

---

**Abstract:** Online Social Media (OSM) sites like Twitter has become one of the most popular platforms for people to sharing information with other peoples. However, the quality of information does not always become better. All kinds of false information, fake news especially rumors, have spread on social networks. So, in online social media such as twitter, verifying and validating the information is becoming important and quite challenging. So, we are going to detect such rumors which are spread on Twitter. First, we are going to present literature review on Rumor detection on Real-Time Twitter data. Then after, it includes our proposed method. We are going to classify content-level features and using sentiment polarity of tweets for detecting rumors. Also we are comparing different supervised learning techniques/methods for getting better and accurate detection of rumors.

**Keywords:** Twitter, Rumor detection, Knowledge-Base Dictionary (KBD), Sentiment analysis, Rumor Analysis.

---

## Introduction

Online Social Media (OSM) has grown and obtained popularity increasingly, over last few years. OSM is a platform, which spreads across country, region, religion, society and language. Dissimilar to conventional news media, online web-based social networking, for example, Twitter are a bidirectional media, in which general people have an immediate stage to share data and to share their opinions about the day by day life news occasions and some other data. Twitter is a micro-blogging service, which has gained popularity as a major news source and information spreading agent over most recent couple of years [1].

Users on Twitter, make their open/private profile and post messages (also called as tweets or statuses) through the profile. The most extreme length of the tweet can be 140 characters. Each post on Twitter is described by two primary parts: the tweet (content and related its metadata) and the user (source) who posted the tweet[1].

People sign on to online networking sites to check for updates and furthermore to share data to others. Via a large volume of content is posted on Twitter, no one can say that notwhole information is right or useful in providing information about the occurrence of news to other people. Hence, there is need to evaluate, measure, identify and filter out right contents from Twitter. Separating right and exact data is one of the biggest challenges in utilizing information from Twitter [1].

## What is Rumor?

Before we proceed further, first we need to understand the definition of Rumor. Rumors are the unverified and untrusted events which harms the people's emotions. We define a rumor to an unverified statement that starts from one or more sources and spreads over time [2].

A rumor can end in three ways: it can be resolved as either true, false or remain unresolved [2].

The rest of the paper organized as follow: Section II describes the previous related work carried out by different researchers which is useful for this paper. Section III describes the comparative analysis of literature we have referred in section II. Section IV describes proposed method to detect the rumors on Twitter by us. Section V and VI provide the conclusion and the future work of our paper respectively.

## Related Work

A lot of work has been done in the research field to detect the rumors on Twitter. In this section, we provide the review of the latest literature developments on rumors detection on Twitter.

SardarHamidian et al. [6] focus on the problem of detecting rumors in Twitter data. They proposed a totally label-independent method for feature generation that relies on the tweet content. Their experiment is based on two condition: Single step Rumor Detection and classification (SRDC) and Two step (TRDC). In both SRDC and TRDC, features are divided into classes and according to that classes tweets it apply for classification. In the experiment they used WEKA platform for training and testing their proposed method using the J48 classifier.

Suchita Jain et al. [7] focus on the issue by giving a way to deal with rumors on Twitter in real-time. Their approach depends on the supposition that checked News Channel accounts on Twitter give more trustworthy data when contrasted with the general public account of user. Also they proposed a way to deal with distinguish rumors from that data using sentiment and semantic analysis.

SahanaV P et al. [8] focus on automatically detect the rumors spreading on Twitter and identify its source. They took topic “London Riots in 2011” and used some of the rumored tweets posted and some non-rumored tweets. They used Weka tool for classification. They achieves best accuracy for J48 classification algorithm. They also propose an algorithm to find the origin of the rumored tweets i.e. obtain the account information of the user who first started spreading rumors on Twitter.

ZhiweiJin et al. [9] focus on the 2016 U.S. presidential election which play the great role of Twitter in the most important political occasion. They introduce an analysis of rumor tweets from the followers of two presidential competitors: Hillary Clinton and Donald Trump. They detect rumor tweets by matching large amount of tweets related to president election with verified rumor articles. For classification they use different word matching method i.eTF-IDF, BM25, Word2Vec and Doc2Vec.

QiaoZhang et al. [10] focus on an automatic rumor detection method based on the combination of new proposed implicit features and shallow features of the messages. Shallow features is the features that cannot distinguish between rumor messages and normal messages in many cases. A large amount of supervised model they use such as Support Vector Machine, Random Forest.

Yan Zhang et al. [11] focus on autoencoder to perform rumor detection. They used SinaWeibo which is the most popular microblog in China. They use several self-adapting thresholds which are calculated based on the property of each recent Weibo set, which can help in rumor detection. In addition, they also discuss how the different number of hidden layers of autoencoder can affect the detection performance.

### Comparative Analysis

Following table shows summary of papers which are referred for literature review:

Table 1: Comparative Analysis of Literature

Sr. No.	Title	Algorithm/Technique Used	Observations
1.	Rumor Detection and Classification for Twitter Data [6]	J48 decision tree Classifier with SRDC and TRDC	Achieved F-Measure more than 0.82 and 0.85 on a mixed and Obama rumor data sets which is one of the rumor topic they selected, respectively.
2.	Towards Automated Real-Time Detection of Misinformation on Twitter [7]	sentiment and semantic analysis	Used some example of rumors and according to verified news channel and general public tweets and detect rumors from that data using sentiment and semantic analysis.
3.	Automatic detection of Rumored Tweets and finding its Origin [8]	J48 decision tree Classifier	Recall rate is given high accuracy 0.877

4.	Detection and Analysis of 2016 US Presidential Election Related Rumors on Twitter [9]	TF-IDF and BM25, Word2Vec and Doc2Vec, Lexicon matching	<ul style="list-style-type: none"> <li>◦ For rumor classification task: F1-measures BM25 achieved best accuracy of 0.82.</li> <li>◦ For rumor identification task: BM25 algorithm achieves the best accuracy of 0.799.</li> </ul>
5.	Automatic Detection of Rumor on Social Network [10]	Support vector machine	<ul style="list-style-type: none"> <li>◦ First, they used content-based, user-based, content-user-based features and the method combined with content and user features is better than others, with 7.1% in precision and 6.3% in recall rate.</li> <li>◦ Second, they used Shallow-Content-Based, Implicit-Content-Based, Shallow-User-Based and implicit-User-Based features and Implicit-Content-Based method had improvement compared to Shallow-Content-Based method with 10.5% in precision and 4.7% in recall rate.</li> </ul>
6.	Detecting Rumors on Online Social Networks Using Multi-layer Autoencoder [11]	Autoencoder (Artificial Neural Network)	<ul style="list-style-type: none"> <li>◦ They used some threshold based on their original dataset and among those threshold, the threshold <math>med+1.5(Q3 - Q1)</math> achieve the accuracy of 88%, f1 of 82% and FPR of 7%.</li> </ul>

### Proposed Methodology

From inspiring with the among research papers, we thought that the rumors are spreading so fast and easy. The people connected on social media might not get that the information are shared on the social platform is true or not. From this, we proposed a method for detecting rumors on one of the social media i.e. Twitter. The proposed method for the Rumor Detection on Twitter is shown as below:

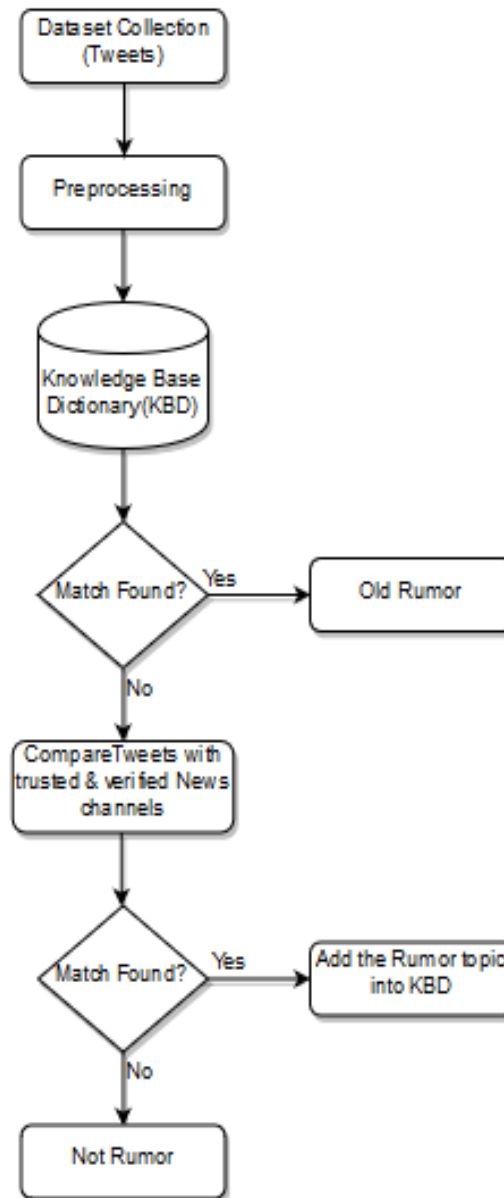


Figure 1: Flowchart of Proposed Method

Our detection approach is based on Knowledge-Base Dictionary (KBD) is one kind of repository in which the pre-verified rumor's topic is already there. Our approach is divided into three step: 1) Pre-processing, 2) Classification 3) Calculation.

- In first step, we are going to preprocess on the real-time tweets to determine the topic about which the given input tweet is posted.
- In second step, we are using this topic based on the tweets as keyword and lookup on the KBD that this topic is belongs any rumor topic or not. If a match is found, then this tweet's sentiment polarity is determined by comparing it with similar tweets already in KBD.
- In last step, if match is not found then we are going to compare or examine this topic on trusted and verified news channels. A tweet which is found similar in this step is added to the KBD for future reference.

For dataset collection, we are going to collect tweets from twitter using Twitter streaming API. Also we are going to create one dictionary which contain the old rumor topic and related tweets. This dictionary will be created using JavaScript. We are preprocessing on tweets and going to decide the features for classification. For feature classification, we are going to use Weka tool with different classifier and compare result among them. So, we are trying to get better result than the existing one.

## Conclusion

After the study of different research paper on rumor detection, different methods to are used to detect rumors. There are many classifiers available for detecting rumors. After referring the literature in section 2, we can't say that which classifier give the best result among them, it is depend upon the features selected for the classification. This research work can be useful to detect rumors on Twitter platform efficiently and accurately.

## Future Work

The future work is to be implemented proposed work. The dataset is to be created for this research work. Preprocessing is required before giving input to system. Feature selection is also important stage to detect rumors. By our proposed work we will try to give better and accurate result than the literature we have studied.

## References

- [1] Anubrata Das, Moumita Roy, Soumi Dutta, Saptarshi Ghosh, Asit Kumar Das. "Predicting Trends in the Twitter Social Network: A Machine Learning Approach", Springer International Publishing Switzerland, 2015.
- [2] Soroush Vosoughi, PhD Thesis, "Automatic Detection and Verification of Rumors on Twitter", June 2015.
- [3] Palash Sharma, Aishwarya Agrawal, Lalit Alai, Akshay Garg. "Challenges and Techniques in Preprocessing for Twitter Data", International Journal of Engineering Science and Computing, April 2017.
- [4] Aditi Gupta, PhD Thesis, "A survey on Analyzing and Measuring Trustworthiness of User-Generated Content on Twitter during High-Impact Events", April 2013.
- [5] Jiawei Han, Micheline Kamber. Data Mining: Concepts and Techniques, Second Edition.
- [6] Sardar Hamidian and Mona Diab. "Rumor Detection and Classification for Twitter Data", The Fifth International Conference on Social Media Technologies, Communication, and Informatics, SOTICS 2015.
- [7] Suchita Jain, Vanya Sharma and Rishabh Kaushal. "Towards Automated Real-Time Detection of Misinformation on Twitter", Intl. Conference on Advances in Computing, Communications and Informatics (ICACCI), IEEE 2016.
- [8] Sahana V P, Alwyn R Pias, Richa Shastri, and Shweta Mandloi. "Automatic detection of Rumoured Tweets and finding its Origin", Intl. Conference on Computing and Network Communications (CoCoNet'15), IEEE 2015.
- [9] Zhiwei Jin, Juan Cao, Han Guo, Yongdong Zhang, Yu Wang, and Jiebo Luo. "Detection and Analysis of 2016 US Presidential Election Related Rumors on Twitter", Springer International Publishing AG 2017, Springer 2017.
- [10] Qiao Zhang, Shuiyuan Zhang, Jian Dong, Jinhua Xiong, and Xueqi Cheng. "Automatic Detection of Rumor on Social Network", Springer International Publishing Switzerland 2015, Springer 2017.
- [11] Yan Zhang, Weiling Chen, Chai Kiat Yeo, Chiew Tong Lau, Bu Sung Lee, "Detecting Rumors on Online Social Networks Using Multi-layer Autoencoder", IEEE Technology & Engineering Management Conference (TEMSCON), IEEE 2017