AUTOMATED PROCESSING FOR SOCIAL MEDIA DATA IN A MASS EMERGENCY

18-007

Component – Validating Accuracy of Posts

Final (Draft) Report

Madushani S.D.S

Bachelor of Science in Information Technology Specialized in Software Engineering

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

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DECLARATION

I hereby declare that the submitted project Software Requirements Specification document for "Automated processing for Social Media data in a Mass Emergency" is an original work done by Madushani S. D. S. This document is proprietary and an exclusive property of the SLIIT project group 18-007. List of references I referred for the preparation of this document are given as references at the end of the document.

Member: IT15028310 – Madushani S. D. S.

Signature: …………………………………….

ABSTRACT

The world is full of emergencies caused by natural disasters. In such situations, vast amount of information exchange through social media like Facebook, Twitter, official websites and applications that are dedicated to natural disaster management. In countries where natural disasters are frequent, the disaster management centers have employed teams to monitor and analyze information to get a closer insight into the situation. It may be helpful to identify areas that have suffered the most in an emergency, the type of emergency, and the value of the information that has been trusted. Manually analyzing the overwhelming amount of information is difficult, error prone, and tedious. Real-time disaster information is critical for rapid decision-making in response to emergencies. This research work aims to introduce an effective and productive automated tool for analyze the information generated on social media using modern concepts such as, Semantic Analysis, Natural Language Processing, Machine Learning and Artificial Intelligence.

It is important to measure accuracy of the entries (posts) which are generated through social media. During such disaster it is impossible to stop spreading false information and rumors. Accuracy measuring is a feature that is completely missing or limited characteristic of existing system since it is hard to achieve.

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1 INTRODUCTION

1.1. BACKGROUND LITERATURE

Social media has become a vital role in current society. It is the streamline communication medium to share not only textual but also pictorial and vocal information. Researchers have found a burst of information generated during and aftermath of a mass emergency through social media platforms as a useful resource to get an insight into the situation which is also known as situational awareness. In an emergency such as earthquake there can be entries which contain facts related to the extent of the affect, infrastructure damages, casualties, donations available or requested, the kinds of necessities required, for instance food or water. Trustworthiness and reliability of incoming or extracted information is a matter that is yet to be solved.

Social media have changed the ways in which the public can participate in disaster and other mass emergencies. For instance, users of social media have demonstrated how broad and ready access to other people during a disaster event enables new forms of information seeking and sharing, as well as exchanges of assistance (Hughes, Palen, Sutton, Liu, & Vieweg, 2008; Palen & Liu, 2007). Through social media, a growing number of eyewitness texts, photos, videos, maps, and other information are available around disaster events, information that was hard to access before social media. Meanwhile, emergency management organizations seek to respond to the new content and these new communication platforms: the initial focus on developing and executing best practices for outward communications is now giving way to discussions about augmenting response efforts with inclusion of data from the public (Hughes & Palen, 2012; Latonero & Shklovski, 2011; Ludwig, Reuter, & Pipek, 2015). The research field of crisis informatics (Hagar & Haythornthwaite, 2005; Palen, Vieweg, Liu, & Hughes, 2009) has arisen in response. Researchers of crisis informatics investigate the nature of socio-behavioral phenomena in mass emergency mediated by social media environments and devise new methods for its investigation (Foot & Schneider, 2004; Foot, Warnick, & Schneider, 2005).

There are existing system for process social media data in mass emergency. But many of the does not consider about validating accuracy of entries (posts). Here is a comparison of existing systems extracted from [2].

System name Data; example capabilities	Reference and URL
Twitris	[Sheth et al. 2010; Purohit and Sheth 2013]
Twitter; semantic enrichment, classify automatically, geotag	http://twitris.knoesis.org/
SensePlace2	[MacEachren et al. 2011]
Twitter; geotag, visualize heat-maps based on geotags	http://www.geovista.psu.edu/SensePlace2/
EMERSE: Enhanced Messaging for the Emergency Response Sector	[Caragea et al. 2011] http://emerse.ist.psu.edu/
Twitter and SMS; machine-translate, classify automatically, alerts	
ESA: Emergency Situation Awareness	[Yin et al. 2012; Power et al. 2014]
Twitter; detect bursts, classify, cluster, geotag	https://esa.csiro.au/
Twitcident	[Abel et al. 2012]
Twitter and TwitPic; semantic enrichment, classify	http://wis.ewi.tudelft.nl/twitcident/
CrisisTracker	[Rogstadius et al. 2013]
Twitter; cluster, annotate manually	https://github.com/jakobrogstadius/crisistracker
Tweedr	[Ashktorab et al. 2014]
Twitter; classify automatically, extract information, geotag	https://github.com/dssg/tweedr
AIDR: Artificial Intelligence for Disaster Response	[Imran et al. 2014a]
Twitter; annotate manually, classify automatically	http://aidr.qcri.org/

Table 1.1 **Available Systems and where to find them Source [2]**

It is important to notice almost all of the existing systems are based on popular microblogging social networking platform called Twitter which allows users to publish entries with a maximum length of 140 characters.

System/tool	Approach	Event types	Real-time	Query type	Spatio-temporal	Sub-events	Reference
Twitter Monitor	burst detection	open domain	yes	open	no	no	[Mathioudakis and Koudas 2010]
TwitInfo	burst detection	earthquakes+	yes	kw	spatial	yes	[Marcus et al. 2011]
Twevent	burst segment detection	open domain	yes	open	no	no	[Li et al. 2012b]
TEDAS	supervised classification	crime/disasters	no	kw	yes	no	[Li et al. 2012a]
LeadLine	burst detection	open domain	no	kw	yes	no	[Dou et al. 2012]
TwiCal	supervised classification	conflicts/politics	no	open	temporal	no	[Ritter et al. 2012]
Tweet4act	dictionaries	disasters	yes	kw	no	no	[Chowdhury et al. 2013]
ESA	burst detection	open domain	yes	kw	spatial	no	[Robinson et al. 2013a]

The table includes the types of events for which the tool is built (open domain or specific), Whether detection is performed in real time, the type of query (open or “kw” = keyword-based), and whether it has spatio-temporal or subevent detection capabilities. Sorted by publication year.

1.2. **RESEARCH GAP**

Most researches conducted in social media usage related to disasters or in other words emergencies have used the popular microblogging platform Twitter (Figure 2.2) which provides a streaming API to collect publicly available entries (Posts) each maximum length of 140 characters in real time. There is so much information generated elsewhere other than Twitter. For instance, forums blogs dedicated channels for disaster response. Among the techniques used to filter the entries that are related to some specific event provided hashtags (for example #flood) keyword filtering are more common. When identifying a trend (Trend analysis through social media) some systems use word count mechanisms and give the most repeated words as an output. Limitations in streaming API (Maximum number of requests per minute) slows down the process increasing the Latency.

Although mechanisms have provided to filter out entries for a given event, the ability for the existing systems to evaluate the accuracy or the dependability of an entry is limited. Systems that use mix of human interaction and computation power are called "Hybrid systems". They use crowdsourcing to create a model to filter the future entries.

1.3. **RESEARCH PROBLEM**

Tough social media is practically and widely used in financial business-oriented scenarios applications for other purposes are scarce Increasing widespread use, popularity and large user base of social media had lead the way for researchers to identify various other uses of social media platforms. In fact, there is a lot of work to be done for the context of social media usage in an emergency.

Some organizations and government agencies have identified the use of social media as an important role in emergency response.

The lacking feature of most current systems available is the accuracy and the dependability of a given entry. Hybrid systems highly depend on crowdsourcing which requires volunteers so called digital volunteers. This affects the latency of the process. Existing systems are highly dependent on the Twitter. Extracting data from numerous sources other than Twitter streaming API is a challenging task to be completed. The unstructured data needs to be cleaned in order to be used in other stages. Identifying ways of calculating accuracy levels for entries covered throughout the research project.

1.4 **RESEARCH OBJECTIVES**

Social media is a key source of people's help and information in disaster situations. We cannot trust everything on the internet. There will be the same false information as the correct information. It is important to communicate accurate and up-to-date information in crisis situations. Sharing false information can have catastrophic consequences if you switch resources from where you actually need them. Therefore, the accuracy of validation should be high despite the delay in response time.

In structure of social media post, there are follow-up comments for the main entry (root post) which are published by the viewers of main entry (root post). Viewers put “Likes” for those comments when they agreed with the comment. To give validation for the root post those comments and user behaviors going to be use.

In the process of validating accuracy first, separate comments as relevant (relevant to the current disaster situation) and irrelevant. User behaviors for the comments will get as the entry data to the filtering. Give rate for the comment as output of filtering to find relevant/irrelevant status. Relevant comments further analyze to understand text in context to takeout valuable disaster situation information to make validation. As a result of validation give positive or negative state to the main entry (root post).

- Objectives of the validating accuracy module

- Identify relevant comments to disaster situation
- Extract relevant comments to get valuable information regarding disaster situation
- Give accuracy for the root post using extracted information

2 METHODOLOGY

2.1 METHODOLOGY

Algorithm Used – Bayesian classification

Bayesian probability is an interpretation of the concept of probability, in which, instead of frequency or propensity of some phenomenon, probability is interpreted as reasonable expectation representing a state of knowledge or as quantification of a personal belief. The Bayesian interpretation of probability can be seen as an extension of propositional logic that enables reasoning with hypotheses, i.e., the propositions whose truth or falsity is uncertain. In the Bayesian view, a probability is assigned to a hypothesis, whereas under frequents inference, a hypothesis is typically tested without being assigned a probability. Bayesian probability belongs to the category of evidential probabilities; to evaluate the probability of a hypothesis, the Bayesian probabilistic specifies some prior probability, which is then updated to a posterior probability in the light of new, relevant data(evidence).The Bayesian interpretation provides a standard set of procedures and formulae to perform this calculation. The term *Bayesian* derives from the 18th century mathematician and theologian Thomas Bayes, who provided the first mathematical treatment of a non-trivial problem of statistical data analysis using what is now known as Bayesian inference. Mathematician Pierre-Simon Laplace pioneered and popularized what is now called Bayesian probability. [1]

Tools

PyCharm, Jupyter notebook are Integrated Development Environments for Python programming language.

NLTK (Natural language tool kit) is a leading platform for building Python programs to work with human language data. It provides easy-to-use interfaces to over 50 corpora and lexical resources such as WordNet, along with a suite of text processing libraries for classification, tokenization, stemming, tagging, parsing, and semantic reasoning, wrappers for industrial-strength NLP libraries, and an active discussion forum.

Technologies

Python is an interpreter, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms and can be freely distributed.

Scikit-learn is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms including support vector machines, random forests, gradient boosting, *k*-means and DBSCAN, and is designed to interoperate with the Python numerical and scientific libraries NumPy and SciPy.[2]

2.2 COMMERCIALIZATION ASPECTS OF THE PRODUCT

2.3 TESING AND IMPLEMENTATION

(Testing and implementation will be added once it's done completely. In here I'll add testing plan where I can compare accrual result with expected result)

3 RESULTS AND DISCUSSION

(Results and discussion will added after implementation completed)

3.1 RESULTS

3.2 RESERCH FINDINGS

3.3 DISCUSSION

4 CONCLUTION

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