

Exploitation of Social Media for Open-Source Intelligence

Akilu Rilwan Muhammad^{1,#}, Yazid Ado Ibrahim², Aminu Muhammad Abubakar³

¹*Dept. of Computer Science, Federal University Dutse, Nigeria*

²*Dept. of Computer Science, Kano University of Science & Technology, Wudil, Kano, Nigeria*

³*ICT Directorate, Federal University Dutse, Nigeria*

[#]Corresponding Author, Email: a.rilwan@fud.edu.ng

Abstract—The emergence of social media and development of smart devices put together promote personal contributions (posts, tweets and blogs) online which are readily accessible to anyone including the Law Enforcement Agencies (LEAs). By smartly monitoring, capturing, processing and analysing these data automatically through the use of social media application programming interfaces (APIs), data mining techniques and natural language processing and visualisation, information shared on social media platforms can be leaned and utilised as open-source intelligence by the LEAs. We investigate the widespread use of social media platforms as the prime means for information sharing and consumption, and highlight the need to develop suitable and efficient analytical techniques to scrutinise and exploit such open-source data for security-relevant intelligence gathering.

Keywords— Information Sharing, Social Media Analytics, Social Networks, Open-Source Intelligence

1. INTRODUCTION

Technological advancement has shaped the way we interact and conduct businesses in almost every aspect of our daily affairs, from commerce to healthcare services and security issues as well. News and information dissemination and consumption equally witnessed the transition from traditional communication media (radio, television and press) to social media platforms, the likes of Facebook, Twitter and LinkedIn. In a recent study [1], it is observed that the number of people relying on social media as source of news

across 36 countries surpass that of traditional communication media by nearly 54%, indicating that 1 out of 10 of the respondents uses social media as primary source of information.

In itself, the social media refers to a way in which people interact, and share information via virtual communities. Researchers offer varying notions defining social media such as [2] define social media as “*conventional, distributed mode of content generation dissemination and communication among communities*” (p.4) and [3] technically describes it as “*network of interactions or relationships*” among participating actors and their interactions. The definition presented in [4] however sounds comprehensive, and states “*social media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content.*”(p.61) The term Web 2.0 refers to an approach through which applications developers and end-users utilise the World Wide Web as a platform whose applications and content are not restricted by individual create-and-publish, rather are modified by all users.

An important characteristic distinguishing social media from traditional communication media is interactivity, eliminating two significant barriers to

communications: *distance* and *time*. Thus, a text post on social media may serve the starting point to trigger reactions among users in near real-time. Understanding the content people shared, by the Law Enforcement Agencies is therefore of paramount importance to safeguard community and respond accordingly to emerging crises before incidences grow out of control.

In this paper, we explore the emergence and rapid growth in the adoption of social media platforms as primary source of news, and review instances and possible consequences of using such platforms. We also suggest and present approaches to using social media platforms as source for security-relevant intelligence gathering. Section 5 presents related work reported in literature and Section 6 concludes the paper.

2. THE EXPLOSION OF SOCIAL MEDIA

The emergence of social media dates back to nearly two decades ago. Since then social network has been rapidly growing over the past years, as people begin to adopt it as valuable source of information. Social media become widely accepted by people beyond 2003 [5]. Suddenly, social media created a means through which people accesses information on every aspect of human life [6-7] facilitating sharing of ideas, opinion, and interests among others increasingly comfortable with the world at large more than ever.

This advent and outburst adoption of social media platforms is to a large extent facilitated as a result of advances in technology and the Internet. Consumer computing devices –sensor-enriched mobile and wearable devices provided the enabling environment for people to access and share information [8] at the press of a button (Table 1 depicts some regularly used sites by purpose). Consequently, as [7] note, social media has changed to source of information in recent years.

People use and are fairly comfortable with social interactions through online communities and forums. Such online communities are often characterised with freedom of speech much higher than traditional media, thus described as loose community having weak social relatives, and imposing little pressure to accept ‘fake news’ and information with unclear sources. Typically, these social networking sites are extremely rich in data of different forms (texts, images, audios and videos), thus, reaching several audiences in quite different ways and means. Today, the number of monthly active users of most popular social network sites ranges from hundreds of millions to billions (Figure 1), interacting with peers worldwide.

3. SOCIAL MEDIA AND SOCIAL UNREST

The inherent nature of social media –as loose community greatly makes it vulnerable to the spread of rumours and information with unclear sources. The result of such misuse turn-out to make social media a playground for the creation of political and social unrest. The study by authors in [9] clearly demonstrate the extent to which people lean to believe information from who they know, not minding its sources ambiguity. A central theme of their work was the investigation of two key issues about intelligence gathering: social reporting as means for information processing to combat crises and the deterioration of social reporting into rumour spreading tools.

Furthermore, the author in [6] studied use of social media and the roles it played in stimulating the propagation of political protests in Arab countries: the Facebook/Twitter Revolutions leading to social unrest. His work vividly explored the extent to which social media platforms facilitated political upheaval and social unrest in countries like Iran (the President Ahmadinejad re-election in 2009), the protest in Tunisia (that following the spread

of images/video of self-immolation of a 26-year old Tunis in 2010) leading to the overthrow of Ben Ali's regime, and that of Egypt (which resulted to President Mubarak's resignation in 2011).

Although events like these are monitored to ensure public safety and total control by security personnel and law enforcement agencies, they grow out of hand and end-up in severe social unrest, partly because the incidences only get the attention they deserved from law enforcement agencies when it is too late to arrest and restore peace. It therefore becomes necessary for law enforcement agencies to engage open-source information gathered from social media platforms as invaluable source of security-relevant information. Research findings such as [12] recognise the Web as valuable source of security-relevant intelligence of which computational analytics could serve an important tool for gathering and analysing social media generated data. Recently, report [13] had it that the US Government approved a plan that will require visa applicant to provide their history of social media usage going back 5 years, US consular officials confirmed the plan which may lead to visa denial for applicants failing to provide the information, especially when "more rigorous national security vetting" is needed.

4. SOCIAL MEDIA ANALYTICS

Social media analytics represents one of a number of tools available and is generally concern with the development of tools [2] used to effectively capture, analyse and visualise social media data (both structured, semi-structured and unstructured data types) with the objective of extracting insights from the huge amount of data the –so-called Big data [14], generated online to prosper evidence-based decision making. This type of analytics dates back to around year 2000 and arises with the emergence of Web 2.0, an important aspect of it is that it

is data-centric because of the massive amount of data involved.

However, social media analytics applies to two fundamental categories of online generated data: linkage and structure-based analysis and content-based analysis [3]. Whereas the linkage and structure-based analysis is concern with the study of attributes' structures and their relationship with other participating entities (linkage behaviour) on social network thereby gathering intelligent information [14], the content-based analysis relates to the data disseminated by users (posts, tweets, customer review or feedback, etc) on social media platforms . This type of data ranges from structured to unstructured and is generally characterised to have emerged in different formats: textual, images, audio as well as video. Charu CA. [3] argues combining both categories offer even more powerful results. Currently, a good number of approaches surface for uncovering the behaviour of actors in a social network. We concisely describe some of these approaches as reported in literature below.

4.1 Community Discovery

Similar to many real-world problems, social networks are also modelled as complex network relationship where the nodes represent the actors (users) and their interactions represented as edges. Thus, a community [15] here represent sub-network of a larger network explicitly showing interactions of actors [16] within the sub-network region. Community discovery therefore facilitates the partitioning of large network into sub-networks to quickly uncover behavioural attitudes among community actors and visualise evolving nature of their interactions based on their behavioural patterns.

4.2 Link Prediction

The key idea behind this technique as illustrated in [17] implies tackling that

dynamic nature of social networks -in which new nodes (actors) are added and edges inserted (establishing relationship). Link prediction technique examines and monitors important link parameters to uncover their association patterns and determines sort of factors responsible for change or effect. It is extensively applicable in several areas including e-commerce, bioinformatics and web science [17]. Amir G and Murtaza H [14] claim link prediction is effective in forecasting potential teamwork between terrorists over social network.

4.3 Link Prediction

Social influence analysis refers to the modelling and assessing of behavioural transformation of actors in a social network due to the perceived association with other actors, or the community such actor belongs to [18]. It has been observed [14] that actor's behaviour in social network tends to be influenced by other actors or organization an actor participates in. Monitoring such behavioural transformation can help explore perceived potential terrorists activities via social media.

5. RELATED WORK

It has been observed that the adoption of social media platforms as primary source of information continue to grow exponentially, particularly among the youth. Maral M. et al. [7] observe that the scope, audience and influence of social media is on the rise, their work suggest monitoring the extent of information shared on social media becomes imperative. Daqing Z. et al. [8] studied social and community intelligence and argued collecting and analysing the digital footprints people leave interacting with cyber-physical spaces could be leveraged to explore individuals and group behavioural attitude, social interactions and community dynamics. Their work noted how analysts benefit from advances in computing technologies utilising the

TABLE I
SOME COMMONLY USED SOCIAL MEDIA BY TYPE

Site	Year Launched	Type/Purpose	Alexa Rank (Global, June 2017) [10]
Facebook	4 February 2004	Social Networking Service(SNS)	3
Twitter	21 March 2006	News& Microblogging	11
Google+	15 June 2011	Social Networking Service	1 (google.com)
LinkedIn	28 December 2002	Social Networking Service	25
Facebook Messenger	9 August 2011	Instant messaging, VoIP	209
Instagram	6 October 2010	Photos/images hosting	18
Flickr	10 February 2004	Photos/video hosting	320
WordPress	27 May 2003	Blogging, content management system	44
Skype	29 August 2003	Video conferencing, instant messaging	306
WhatsApp	24 February 2009	Instant messaging, VoIP	72

internet content as premier sources of data for understanding large-scale human interactions.

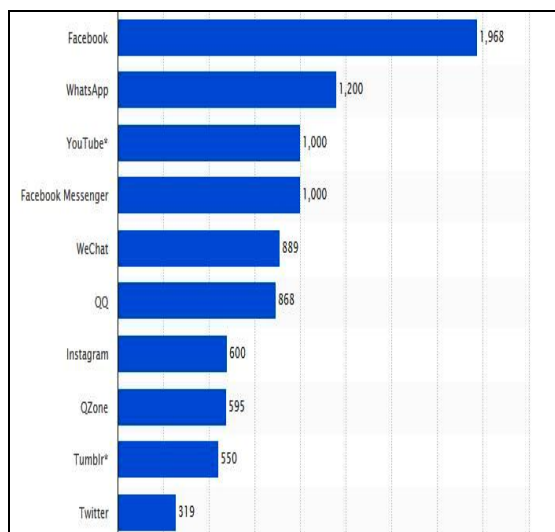


Fig. 1: Top 10 famous social network sites worldwide by numbers of Monthly Active Users – MAU (in millions) as at April 2017 [11].

The authors in [19] recommend the importance of social media monitoring for crises management for both emergent cases and situation reports of on-going incidences. The authors however caution the use of open-source intelligence as primary source, partly because large percentages of such sources are unclear and unreliable. The key idea brought forth by the work of David S.O et al. [20] suggest it necessary for law enforcement agencies to admit the emergence of this type of intelligence called Social Media Intelligence (SOCMINT) be an integral part of national security structure.

Onook O. et al [9] acknowledged social media as potential tool for social reporting however, rumour mill. A central theme of their findings based on rumour theory and social crises revealed information without clear sources as leading factors of importance to social unrest, citing anxiety being the least. Furthermore, Ruth N.B et al. [5] examine the use of social media among Generation Y individual implication and the society at large. Their findings illustrate social media users aged 18-34 prefer spending time on social media platforms to interaction with family.

6. CONCLUSION

The rate of the adoption of social media as primary source of news and information is certainly alarming. Whereas it is inappropriate to restrict people from accessing and sharing contents on social media, it is mandatory to investigate users approach to use the platform so as to safeguard the society. In this paper, we review the widespread use of social media platforms as fundamental source of information as enabled by advances in technology and mobile devices and reflect upon how incidences transmitted over social media generated social unrest. We also review and suggest using the platforms by the Law Enforcement Agencies as open-source of intelligence data gathering, and acknowledge the approach into the national security framework.

REFERENCES

- [1] Nic N, Richard F, Antonis K, David ALL, Rasmus KN. Reuters Institute Digital News Report. Oxford: Reuters Institute for the Study of Journalism, 2017.
- [2] Daniel Z, Hsinchun C, Robert L, Shu-Hsing L. Social Media Analytics and Intelligence. IEEE Computer Society, 2010, pp.1541-1672.
- [3] Charu CA. An Introduction to Social Network Data. in: Social Network Data Analytics, Springer, New York USA, 2011, pp. 1-15.
- [4] Andreas MK, Micheal H. Users of the world, unite! The challenges and opportunities of Social Media. Business Horizon, 53 (2010), 59-68.
- [5] Ruth NB, Parasuraman A, Ankie H, Nanne M, Sertan K, Thorsten G, YuliyaU KL, David S. Understanding Generation Y and their use of social media: a review and research agenda. Journal of Service Management, 2013, 24(3), pp.245-267.
- [6] Andrew NP. The Challenges of Social Media for the Intelligence Community. Journal of Mediterranean and Balkan Intelligence, 2013, 1(1), pp. 5-14.
- [7] Maral M, Rens S, Micheal V. Understanding the Role of Social Media Monitoring in Generating External Intelligence, in: 23rd Australasian Conference on Information Systems, ACIS. (2012), pp. 1-10.
- [8] Daqing Z, Bin G, Zhiwen Y. The Emergence of Social and Community Intelligence. Computer 2011, 44(7), pp.21-28.

- [9] Onook O, Manish A, Raghav HR. Community Intelligence and Social Media Services: A Rumor Theoretic Analysis of Tweets during Social Crises. *MIS Quarterly*, 2013, 37(2), pp.407-426.
- [10] Alexa Internet, Inc. Available from: <https://www.alexa.com/siteinfo> [Accessed 2nd July 2017].
- [11] Statista. Available from: <https://www.statista.com/> [Accessed 3rd July 2017].
- [12] Richard C, Kristin G. Estimating Sentiment Orientation in Social media for Intelligence Monitoring and Analysis, in 2010 IEEE International Conference on Intelligence and Security Informatics. *IEEE Xplore*, 2010, pp.135-137.
- [13] BBC News.US can ask Visa Applicants for Social Media History. Available from: <http://www.bbc.com/news/technology-40132506> [Accessed 9th June 2017].
- [14] Amir G, Murtaza H. Beyond the hype: Big Data Concepts, Methods and Analytics. *International Journal of Information management*. 35, (2015), pp. 137-144.
- [15] Parathasarathy S, Satuluri YR. Community Discovery in Social Networks: Application, Methods, and Emerging Trends, in: *Social Network Data Analytics*, Charu CA (ed.). Springer, London. 2011, pp.79-133.
- [16] Fatih O, Zeki E, Chris B. Prediction of Unsolved Terrorist Attacks Using group Detection Algorithms, in: *Lecture Notes in Computer Science*. Springer, Berlin-Verlag. (2009), 5477, pp.25-30.
- [17] Mohammad A, Mohammed JZ. A Survey of Link Prediction in Social Networks, in: *Social Network Data Analytics*, Charu CA (ed.). Springer, London. 2011, pp. 234-275.
- [18] Jimeng S, Jie T. A Survey of Models and Algorithms for Social Influence Analysis, in: *Social Network Data Analytics*, Charu CA (ed.). Springer, London. 2011, pp.177-214.
- [19] Fredrik J, Joel B, Narganes MQ. Estimating Citizen Alertness in Crises using Social Media Monitoring and Analysis, in: *European Intelligence and Security Informatics Conference*. IEEE Computer Society, 2012, pp.189-196.
- [20] David SO, Jamie B, Carl M. Introducing Social Media Intelligence (SOCMINT). *Intelligence and National Security*, 2012, 27(6), pp.801-823.