International Journal for Modern Trends in Science and Technology, 8(09): 158-161, 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0809033
Available online at: http://www.ijmtst.com/vol8issue09.html

Social Media Analysis with Active Online Learning to Support Crisis Management

Ch. Surekha [1] | B. N. Srinivasa Gupta [2]

[1]Master of Computer Applications (MCA), SVKP &Dr K S Raju Arts & Science College(A), Penugonda, W.G.Dt., A.P, India
[2]Associate Professor in Computer science, SVKP &Dr K S Raju Arts & Science College(A), Penugonda, W.G.Dt., A.P, India

To Cite this Article
Ch. Surekha and B. N. Srinivasa Gupta. Social Media Analysis with Active Online Learning to Support Crisis Management. International Journal for Modern Trends in Science and Technology 2022, 8(09), pp. 158-161. https://doi.org/10.46501/IJMTST0809033

Article Info
Received: 22 August 2022; Accepted: 12 September 2022; Published: 17 September 2022.

ABSTRACT

People express and discuss various circumstances they are involved in, such as crises, on social media (SM). Therefore, it makes sense to employ SM contents to aid crisis management, particularly by disseminating important and little-known information about the crises in real-time. As a result, we suggest the AOMPC, a brand-new active online multiple-prototype classifier. It finds pertinent information about a crisis. AOMPC is a data stream-operating online learning algorithm that has active learning mechanisms to actively query the label of ambiguous unlabeled data. A fixed budget technique is employed to limit the number of queries. AOMPC often accepts data streams with partial labelling. Two types of data were used to evaluate AOMPC: (1) synthetic data, and (2) SM data from Twitter-related sources

1. INTRODUCTION

Identification of precise activities that must be taken prior to (prevention, preparedness), during (response), and after (recovery and mitigation) a crisis is the main responsibility of crisis management. Utilizing information from a variety of sources, including the general public's observations of emergency situations, is beneficial for carrying out these jobs efficiently. Emergency operations centres could act and plan the rescue and reaction with the help of such data. In recent years, several studies have looked into how social media can be used as a source of information for effective crisis management. Several of these investigations, includes Attacks in Norway, the collapse of the Minneapolis Bridge, a wildfire in California, floods in Colorado, and bushfires in Australia People's widespread use of SM compels (re)evaluation of public interaction.

Utilizing user-generated material from social media serves the primary purpose of separating relevant information from worthwhile data. As a means of discrimination, classification is what we suggest. The classifier functions as filtering equipment. It recognises significant SM items (like tweets) connected to the event of interest with the user's assistance. To detect sub events, the chosen items are employed as triggers. Keep in mind that a crisis is an event, whereas sub-events are the subjects that are frequently addressed (such as hotspots like flooding, bridge collapses, etc. in a particular section of a city) during a crisis. By combining the messages sent on SM networks that discuss the same

exact subject, these sub-events can be found [48], [51]. A Learning Vector is what we suggest.

Initiated by Kohonen [32], self-organizing maps (SOM) are an unsupervised variation of prototype-based categorization, commonly referred to as LVQ. Prototypes are initialised and modified in this situation (e.g., randomised). In order to pinpoint crucial hotspots in the context of crisis management, SOM was also applied [50].

Robotics, pattern recognition, image processing, text classification, and other fields have all seen the use of LVQ [20], [32], [62]. LVQ - in the situation Hammer et al. [25] investigate the use of similarity representation as opposed to vector-based representation. An technique to learning metrics for various LVQ classification tasks is described by Mokbel et al. [40]. To automatically adapt metric parameters, they propose a metric adaptation approach.

LVQ, fuzzy LVQ, and other offline multiple prototype classifiers are reviewed by Bezdek et al. in their review in [6].

In Biehl et al. [7], a summary of various prototype-based learning strategies is provided. We deal with online real-time classification in this paper and provide a multi-prototype quantization approach, where the winning prototype is modified based on the input. The algorithm particularly depends on online learning and active learning.

2. LITERATURE SURVEY

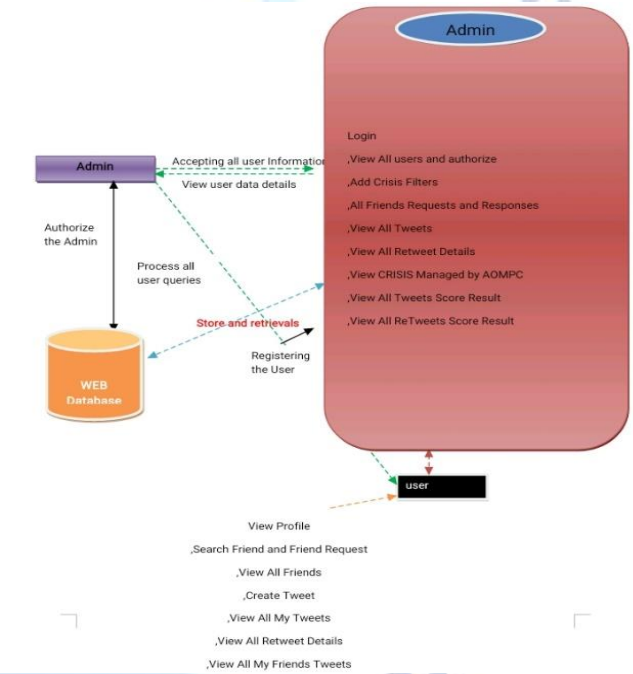
Multiple Prototype Classification and LVQ Classification

A prototype-based classification approach operates on data items mapped to a vector representation (e.g., vector space model for text data). Data points are classified via prototypes considering similarity measures. Prototypes are adapted based on items related/similar to them. A Rocchio classifier [37] is an example of a single prototype-based classifier. It distinguishes between two classes, e.g., "relevant" and "irrelevant".

In real world-scenarios, due to the nature of the data, it is often not possible to describe the data with a single prototype-based classifier. Multiple prototype classifiers (i.e., several prototypes) are needed. Self organizing maps (SOM) introduced by Kohonen [32] are an unsupervised version of prototypebased classification, also known as LVQ.

In this case, prototypes are initialized (e.g., randomized) and adapted. SOM was also used for SM analysis in the context of crisis management to identify important hotspots [50]. LVQ has been applied to several areas, e.g., robotics, pattern recognition, image processing, text classification etc. [20], [32], [62]. LVQ - in the context of similarity representation, rather then vector-based representation - is analyzed by Hammer et al. [25]. Mokbel et al. [40] describe an approach to learn metrics for different LVQ classification tasks. They suggest a metric adaptation strategy to automatically adapt metric parameters. Bezdek et al. [6] review several offline multiple prototype classifiers, e.g., LVQ, fuzzy LVQ, and the deterministic Dog-Rabbit (DR) model. The latter limits the movement of prototypes and is similar to our approach.

3. ARCHITECTURE:



5. RESULTS

6. CONCLUSION

The streaming analysis for identifying relevant and irrelevant data items is presented in this study. By taking into account the active learning mechanism, it involves the user in the learning process. We assessed the framework using various datasets, settings, and active learning techniques. In order to understand the behaviour of the algorithm, we took into account both synthetic datasets and real-world social media datasets pertaining to emergencies. To demonstrate the proposed algorithm's strong performance with various parameter settings, we compared it to a number of already-existing methods. As stated in Section 4.6, the technique can be expanded to address a variety of problems, such as non-contiguous class distribution, dynamic budget, and dynamic deletion of stale clusters.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] F. Abel, C. Hauff, G.-J. Houben, R. Stronkman, and K. Tao, "Semantics+ Filtering + Search = Twitcident. Exploring Informationin Social Web Streams," in Proc. of the 23rdACMConf. on Hypertext and Social Media. ACM, 2012, pp. 285–294.

[2] U. Ahmad, A. Zahid, M. Shoaib, and A. AlAmri, "Harvis: An integrated social media content analysis framework for youtube platform," Information Systems, vol. 69, pp. 25 – 39, 2017.

[3] G. Backfried, J. Gollner, G. Qirchmayr, K. Rainer, G. Kienast, G. Thallinger, C. Schmidt, and A. Peer, "Integration of Media Sources for Situation Analysis in the Different Phases of Disaster Management: The QuOIMA Project," in Eur. Intel. and Security Informatics Conf., Aug 2013, pp. 143–146.

[4] BBC News Europe. (2012, Aug.) England Riots: Maps and Timeline. [Online]. Available: http://www.bbc.co.uk/news/ uk-14436499

[5] H. Becker, M. Naaman, and L. Gravano, "Learning Similarity Metrics for Event Identification in Social Media," in Proc. of the Third ACM Int'l Conf. on Web Search and Data Mining, ser. WSDM '10. NY, USA: ACM, 2010, pp. 291–300.

[6] J. Bezdek, T. Reichherzer, G. Lim, and Y. Attikiouzel, "Multiple-Prototype Classifier Design," IEEE Trans. on Systems, Man, and Cybernetics, Part C: Applications and Reviews, vol. 28, no. 1, pp. 67–79, Feb 1998.

[7] M. Biehl, B. Hammer, and T. Villmann, "Prototype-based Models in Machine Learning," Wiley Interdisciplinary Reviews: Cognitive Science, vol. 7, no. 2, pp. 92–111, 2016.

[8] A. Bouchachia, "Learning with Incrementality," in Proc. of the Int'l Conf. on Neural Information Processing, 2006, pp. 137–146.

[9] "Incremental Learning with Multi-Level Adaptation," Neurocomputing, vol. 74, no. 11, pp. 1785–1799, 2011.

[10] A. Bouchachia and C. Vanaret, "Incremental Learning Based on Growing Gaussian Mixture Models," in 10th Int'l Conf. on Machine Learning and Applications and Workshops (ICMLA), vol. 2, Dec 2011, pp. 47–52.

[11] ——, "GT2FC: An Online Growing Interval Type-2 Self-Learning Fuzzy Classifier," IEEE Transactions on Fuzzy Systems, vol. 22, no. 4, pp. 999–1018, 2014.

[12] M.-R. Bouguelia, Y. Bela¨ıd, and A. Bela¨ıd, "An Adaptive Streaming Active Learning Strategy based on Instance Weighting," Pattern Recognition Letters, vol. 70, pp. 38 – 44, 2016.

[13] M. B¨ uscher and M. Liegl, "Connected Communities in Crises," in Social Media Analysis for Crisis Management, H. Hellwagner, D. Pohl, and R. Kaiser, Eds. IEEE Computer Society Special Technical Community on Social Networking E-Letter, March 2014, vol. 2, no. 1.

[14] G. Cavallanti, N. Cesa-Bianchi, and C. Gentile, "Tracking the best Hyperplane with a simple Budget Perceptron," Machine Learning, vol. 69, no. 2-3, pp. 143–167, 2007.

[15] L. Chen, K. S. M. Tozammel Hossain, P. Butler, N. Ramakrishnan, and B. A. Prakash, "Syndromic Surveillance of Flu on Twitter UsingWeakly Supervised Temporal Topic Models," Data Mining and Knowledge Discovery, vol. 0, no. 3, pp. 681–710, May 2016.

[16] T. M. Cover and J. A. Thomas, "Entropy, Relative Entropy and Mutual Information," in Elements of Information Theory. New Jersey: A JohnWiley& Sons, 2006.

[17] K. Crammer, O. Dekel, J. Keshet, S. Shalev-Shwartz, and Y. Singer, "Online Passive-Aggressive Algorithms," J. Mach. Learn. Res., vol. 7, pp. 551–585, Dec. 2006.

[18] S. Dashti, L. Palen, M. P. Heris, K. M. Anderson, S. Anderson, and S. Anderson, "Supporting Disaster Reconnaissance with Social Media Data: A Design-Oriented Case Study of the 2013 Colorado Floods," in Proc. of the 11th Int'l Conference on Information Systems for Crisis Response and Management, University Park, Pennsylvania, USA, 2014.

[19] O. Dekel, S. Shalev-Shwartz, and Y. Singer, "The Forgetron: A Kernel Based Perceptron on a Fixed Budget," in NIPS. MIT Press, 2005, pp. 259–266.

[20] A. Denecke, H. Wersing, J. Steil, and E. K¨orner, "Online figureground
segmentation with adaptive metrics in generalized LVQ," Neurocomputing, vol. 72, no. 7-9, pp. 1470 – 1482, 2009.

[21] S. Denef, P. S. Bayerl, and N. Kaptein, "Social Media and the Police - Tweeting Practices of British Police Forces during the August 2011 Riots," in Proc. of the SIGCHI Conf. on Human Factors in Computing Systems (CHI), Paris, France, May 2013.

[22] N. Dufty, "Using Social Media to build Community Disaster Resilience,"
The Australian Journal of Emergency Management, vol. 27, no. 1, pp. 40–45, 2012.
[23] M. Freeman and A. Freeman, "Bonding over Bushfires: Social Networks in Action," in IEEE International Symposium on Technology and Society (ISTAS), June 2010, pp. 419–426.
[24] J. a. Gama, I. Z˘ liobaite˙ , A. Bifet, M. Pechenizkiy, and A. Bouchachia,
"A Survey on Concept Drift Adaptation," ACM Comput. Surv., vol. 46, no. 4, pp. 44:1–44:37, 2014.
[25] B. Hammer, D. Hofmann, F.-M. Schleif, and X. Zhu, "Learning Vector Quantization for (dis-)similarities," Neurocomputing, vol. 131, pp. 43 – 51, 2014.
[26] S. Hao, J. Lu, P. Zhao, C. Zhang, S. C. H. Hoi, and C. Miao, "Second-Order Online Active Learning and Its Applications," IEEE Transactions on Knowledge and Data Engineering, vol. 30, no. 7, pp. 1338–1351, July 2018.
[27] S. Hao, P. Hu, P. Zhao, S. C. H. Hoi, and C. Miao, "Online Active Learning with Expert Advice," ACM Trans. Knowl. Discov. Data, vol. 12, no. 5, pp. 58:1–58:22, 2018.
[28] S. R. Hiltz, B. van de Walle, and M. Turoff, "The Domain of Emergency Management Information," in Information Systems for Emergency Management. Armonk, New York: B. van de Walle, M. Truoff and S. R. Hiltz, 2010, vol. 16, pp. 3–19.
[29] D. Ienco, A. Bifet, I. Z˘ liobaite˙ , and B. Pfahringer, "Clustering Based Active Learning for Evolving Data Streams," in Discovery Science, ser. Lecture Notes in Computer Science, J. F¨ urnkranz, asE.H¨ ullermeier, and T. Higuchi, Eds. Springer Berlin Heidelberg,
2013, vol. 8140, pp. 79–93.
[30] M. Imran, C. Castillo, J. Lucas, P. Meier, and S. Vieweg, "AIDR: Artificial Intelligence for Disaster Response," in Proc. of the Companion Publication of the 23rd Int'l Conf. on World Wide Web, ser. WWW Companion '14, April 2014, pp. 159–162.
[31] Y. Ishikawa, Y. Chen, and H. Kitagawa, "An On-Line Document Clustering Method Based on Forgetting Factors," in Research and Advanced Technology for Digital Libraries, ser. Lecture Notes in Computer Science, P. Constantopoulos and I. T. Solvberg, Eds. Springer, 2001, vol. 2163, pp. 325–339.
[32] T. Kohonen, "The Self-Organizing Map," Proc. of the IEEE, vol. 78, no. 9, pp. 1464 –1480, Sep 1990.
[33] V. I. Levenshtein, "Binary Codes Capable of Correcting Deletions,

Authors Biography

Ch. Surekha currently pursuing MCA in SVKP & Dr K.S Raju Arts & Science College affiliated to Adikavi Nannaya University, Rajamahendravaram. His research interests include Data Structures, WebTechnologies, Operating Systems and Artificial Inteligence.

B.N.Srinivasa Gupta is working as Associate Professor in SVKP &Dr K S Raju Arts & Science College, Penugonda, A.P. He received Masters Degree in Computer Applications from Andhra University and Computer Science & Engineering from Jawaharlal Nehru Technological University Kakinada (JNTUK),Kakinada, India. His research interests include Data Mining, Cyber Security, Artificial Intelligence