*COVID-19 Tweets: Exploratory Data Analysis and Text Analysis*

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*Abstract*— In this paper, COVID-19 tweets will be reviewed by machine learning and deep learning techniques (like sentiment analysis), to allow us to understand what its being said around the globe about the current crisis we are all facing. The data used for this study, was retrieved using the Twitter API for Python, the data collected was filtered by tweets containing the “COVID-19”, “COVID” and “coronavirus” hashtag.

Keywords—COVID-19, coronavirus, sentiment analysis, twitter, social media, Python, Deep Learning

# Introduction

Twitter is with no doubt one of the biggest social networks in the world, every day 500 million tweets are sent, with over 330 million monthly active users. Data Scientist started working with twitter data because they noticed that companies would be very interested in knowing what their customers think. This is why social listening (monitoring social media platforms) has become a key strategy in social media marketing.

In our case, monitoring what people and organizations are saying about COVID-19 could be of great interest for many statistical analysis companies. If a real-time sentiment analysis system were implemented, this could create incredible charts for monitoring how people is feeling about the pandemic in real time.

# Related work

As commented before, there are a lot of Data Scientists nowadays focusing on social data. Sentiment analysis is the automated process of analyzing text data and sorting it into sentiments positive, negative or neutral. Using these tools can help companies understand how people are talking about their interests.

Since the start of the pandemic, COVID related topics had been trend for a while. Many researchers had worked on sentiment analysis to understand how people has being reacting to this crisis. Akash Dutt wrote a paper about sentiment analysis and how people react during COVID-19 outbreak [1]. Yasin Kabir and Sanjay Madria from the CS department of Missouri University wrote a paper about a real time COVID-19 tweets data analyzer [2]. This was a very interest topic during the outbreak, even in the CS department of the University of Raparin, Iraq. They also wrote a paper on Twitter sentiment analysis during the COVID-19 outbreak [3].

# Data preprocessing

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*a**b* 

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* There is no period after the “et” in the Latin abbreviation “et al.”.
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1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
6. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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