Efficiency comparative analysis of techniques in misinformation detection in healthcare data*

Alžbeta Žiarovská

Slovak University of Technology in Bratislava

Faculty of Informatics and Information Technologies

xziarovska@stuba.sk

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Abstract

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1 Introduction

In this article I am going to discuss the current situation regarding spread of misinformation in the medical field. This topic is very important in the aftermath of the global COVID-19 pandemic. More specifically I am going to make an analysis and comparison of different misinformation detection methods and their efficiency. During the pandemic we have seen a great rise of misinformation on the Internet, which provide danger to our society or even lives. [War18] The main problem in my perception is, that the easy access to all the information on the Internet, which does not necessarily has to be true, can increase fear and anxiety and ultimately lead to the delay of diagnosis and receiving the effective healthcare in case the information are not perceived correctly.[WMTS19] The paradox is, that the machines might actually be the solution, as I am going to discuss various methods to recognize misinformation using technology. [Cha22]

I am focusing on comparing fact-checking and machine learning models as s way to find the medical misinformation. The fact-checking can be done manually or automatically which I am going to introduce more deeply in Section 4.1.[BS21] The other side I am going to take a closer look at are machine learning techniques including Naïve Bayes, Support Vector Machine and BERT-based model called Disease Myth Buster.[BS21][Cha22] I want to introduce these techniques and compare their efficiency in order to establish which one is the most suitable for a specific situation in healthcare.

In the first Section 2 I am giving a quick introduction into the terminology used later in the article, so it is easily understandable and could easily be found if necessary. In the Section 3 I describe the term misinformation, how it differs from disinformation [GL20]. Also I am going to give a brief summary of historical development of misinformation spread. [PM18] It is important as well to mention affect that medical fake news might have on our lives, which I would like to address as well. [W$^+$22] In the last one of the main sections, in Section 4, I am taking a closer look at some of the methods used for misinformation recognition. I going

to introduce them in a way, that would be easily understandable for all readers and state some of their outputs, so I can compare their effectiveness and possible impact in the future in Conclusion. 5

2 Terminology

Natural language processing (NLP) is a way for programs to understand language used by humans on daily basis by using various algorithms an limitations. It was originally closely related to information retrieval from written documents, however, over the time, their paths have divided and they no longer have such a vast crossing. [NOMC11][Lid01]

Term frequency–inverse document frequency (TF-IDF) represents a numeric value of how relevant is the specific word for the document in the set of documents. This technique finds its application both in text mining and information retrieval. [CAS16]

Transfer learning is a concept of dedicating a new and unusual task where already known knowledge and tools are used for its solution. It is a part of the machine learning, where source tasks are being relocated in order to satisfactorily complete the given task. [Cha22][TS10]

3 Misinformation in healthcare

Difference between misinformation and disinformation The terms *misinformation* and *disinformation* are much the same, however, a petite difference can be distinguished. The main difference between the two is a intention with which the false information is made accessible to the public and spread. Whilst the misinformation is usually created without direct intention of misleading and spreading false, meaning the person who put the information into the world might not actually know

it is not true. On the other hand, disinformation is essentially created to spread false information. An example of such activity can be political propaganda.[GL20] [CEL15]

Historical development of concept of misinformation Humankind has shown its resourcefulness throughout the whole timeline by various inventions alternating from practical inventions to theoretical laws of psychics. Nonetheless, the creativity does not only apply to useful and true creations. The yearn for spreading not true information, either for amusement or with a goal of hurting someone, is old as a humanity itself. [Bur17]

The very first use of misconception was spoken, whereas the printing was not found yet. The emperors used to control the information generally believed in order to strengthen their reign and power over the people. [Bur17] Later, with Gutenberg's invention of press a lot has changed. Accessibility of knowledge has become easier and so did the spread of misinformation. [PM18] In the 16th century the writers have started to create completely false stories and plays in order to offer entertainment, but the drive was not only positive. During the French Revolution a rumor (in France called *canard*) was used to discredit the queen Marie Antoinette, which doubtlessly did not help her in the later events of the French Revolution. [Bur17]

Later, when the mass media took their place, the misleading was often used in order to change the opinion of the public during the times of war. For example during the World War II the Nazi propaganda was reaching the peaks of political propaganda ever. [PM18] Afterwards the Cold War has started and a important part of it was public point of view, which again resolved in race of misleading the public. [PM18]

As we have entered the era of the internet, everybody can contribute to the chain of communication and share their own truth, whether with or without the intention of doing harm. The rise of the *hoax* is enormous and numerous fake websites were

created.[Bur17]

General Misinformation [GL20]

Health care misinformation

Societal context [CEL15] [W+22]

4 Misinformation recognition techniques

4.1 Fact-checking technique

4.1.1 Manual fact-checking

Technology and people

4.1.2 Automatic fact-checking

4.2 Machine learning technique

Definition

Text processing

4.2.1 Naïve Bayes

4.2.2 Support vector machine

4.2.3 Disease Myth Buster

Ethics and sustainability

5 Conclusion

Je nejaké riešenie a aké? Je vaše riešenie podobné iným (hoci aj z inej oblasti a len v z určitého hľadiska)? O čom je článok, k čomu ste ním prispeli a čo zostáva

otvorené?

Z obr. 1 je všetko jasné.

Aj text môže byť prezentovaný ako obrázok. Stane sa z neho označný plávajúci objekt. Po vytvorení diagramu zrušte znak `%` pred príkazom `\includegraphics` označte tento riadok ako komentár (tiež pomocou znaku `%`).

Figure 1: Rozhodujuci argument.

6 Iná časť

Základným problémom je teda... Najprv sa pozrieme na nejaké vysvetlenie (časť 7.1), a potom na ešte nejaké (časť 7.1).[1]

Môže sa zdať, že problém vlastne nejestvuje[BS21], ale bolo dokázané, že to tak nie je [BS21]. Napriek tomu, aj dnes na webe narazíme na všelijaké pochybné názory[BS21]. Dôležité veci možno *zdôraznit' kurzívou*.

7 Ďalšia časť

Toto je ďalšia časť, v ktorej idem urobiť odsek.

Toto je odsek. haha.

7.1 Nejaké vysvetlenie

Niekedy treba uviesť zoznam:

- jedna vec
- druhá vec
  - x
  - y

[1] Niekedy môžete potrebovať aj poznámku pod čiarou.

Ten istý zoznam, len číslovaný:

1. jedna vec
2. druhá vec
   (a) x
   (b) y

7.2 Ešte nejaké vysvetlenie

Veľmi dôležitá poznámka. Niekedy je potrebné nadpisom označiť odsek. Text pokračuje hneď za nadpisom.

8 Dôležitá časť

9 Ešte dôležitejšia časť

10 Záver

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