**BABEŞ-BOLYAI UNIVERSITY**

**Faculty of Economics and Business Administration**

**Economics and Computer Science**

**Graduation Thesis**

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Coordonator ştiinţific,

Conf. univ. dr. Ioan PETRI

**2022**

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**Analysis of Data from Social Networks for Smart City Management**

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**Abbreviations**

(rând liber, 12pt, spaţiere 1,5, fără spaţii înainte şi după paragraf)

SQL - Structured Query Language (Microsoft SQL Server)

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**Summary**

Smart cities are increasingly eager to engage in meaningful dialogue with their inhabitants in order to better understand their requirements and create virtual platforms for encouraging co-creation processes between government and users, all with the goal of improving quality of life and well-being. Social media platforms enable dialogic communication by allowing a huge amount of information to attract a big audience to be posted and shared in real-time for a relatively cheap cost, hence fostering citizen participation. This research is based on a social media monitoring strategy that used Twitter data mining to disentangle distinct aspects of public participation (popularity, dedication, and viral marketing) for the city of Cluj-Napoca, Romania.

Furthermore, it was conducted a thorough examination of the kinds of communication objects exchanged, and it was identified the main topics of interest in the social media dialogues by analyzing the text of tweets produced by a certain amount of accounts.

The findings are based on an examination of internet discussions held by followers of Cluj-Napoca or the residents of the city within a radius of 15km. Governments frequently use their Twitter accounts to communicate with the public about a wide range of topics, including transportation and public works.

+++++ more about the results

1. **Introduction**

In recent decades, there has been an unprecedented trend toward living in urban areas, as cities are quickening time by compressing space [1]. The year 2008 marked a milestone in which, for the first time, the urban population outperformed the rural population; it is anticipated that until 2050, two-thirds of the worldwide populace will be metropolitan inhabitants [2,3]. This tendency of people to move to cities brings tremendous pressure to bear on the city's infrastructure [4]. From the first built cities, they were counting on the technology to be sustained and to fabricate modern technologies and tools. Cities have a behavior similar to living organisms, always evolving.

The smart city is a transformation of a concrete city with high mergers of the latest monitoring, communication, and control tools, targeting to deliver real-time and intelligent services to citizens. For the sake of enhancing the city services, it is imperative to deduce and research citizen behavior [5] because a smart city should prioritize the necessities of its inhabitants.

Social media could be considered a set of tools, such as program applications or websites that work on devices like computers, tablets, smartphones, etc. These assets have been built to encourage the interaction between Internet users and sharing of content between members of online groups.

One of the purposes of the social media environments is to facilitate both access to information and to contribute to making a mirror of reality.

1. Social media for companies

Social networks are used by Romanian companies for communication, recruitment, competitive research, marketing, and analysis.

In this respect, it can be utilized for creating profiles, and managing and optimizing them which can make people interested in what they offer. With these, a company presents the possibility for the user or a possible customer to provide direct feedback.

1. Social media for entertainment

With the assistance of social networks, individuals throughout the world can connect with each other by disseminating. It could be a very nice method to unwind.

1. Social media as a developing tool in a smart city

Apart from the more obvious uses of social media, where users interact and share their opinions, using the information from social networking, can be used to spot the zones in which the resources need to be allocated.

The notion of smart cities is built on urban development by incorporating technologies and systems to govern the city supplies efficiently and securely, with the purpose of boosting citizens’ well-being, community development, and keeping the environment safe. The objective of a Smart City is to make public life better, promote technical innovation, and improve the efficiency of urban management [7].

**1.1 Motivation**

It is estimated that three million people around the world are moving to cities every week [6] and cities have to prepare for that. So, they must become more and more efficient and sustainable, but better said, they must become more intelligent or in other words „smart”. That is why the following question comes up: How can data from the social network(s) be analyzed and processed to influence the growth of the process?

The topic „Analysis of data from social networks for smart city management”, the particular case for Cluj-Napoca was chosen for me and it interests me in helping to provide analysis to help develop technology for future needs.

Data

The research is based on Twitter data mining.

As an extra step, each account’s behavior was analyzed before the web scrapping process. Only accounts with at least one tweet in the last year were chosen. Another requirement was added to existing rules and it is that each Twitter account had to have sent at least 100 tweets since joining the platform. These limits were set with the intention to eliminate prejudices caused by inactive users or bogus accounts that would have influenced the findings.

The time frame in which the data collection took place is between the 1st of January 2021 and the 1st of January 2022 using Twint. Twint is a Python library that allows you to scrape Twitter. It is a sophisticated Twitter scraping tool built-in Python that does not rely on Twitter's API. It allows you to scrape a user's followers, followers, tweets, and much more while avoiding most API limitations. It scrapes tweets from specified users using Twitter's search operators. The tweets are then automatically scraped in csv format and saved in various folders.

Python is a dynamically semantic, interpreted, object-oriented high-level programming language [10], which with its dynamic ...

A total of x tweets were collected within a range of 4.5km of Cluj-Napoca’s city center and a range of 1.7km of Someseni’s center. It was used the Python software to scrape every tweet from each account, and Matplotlib software to analyze them. Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python [11].

+++ adding the types of data analysis!!

Methodology

The rise of social media platforms like Twitter has opened up new and different measurement options. In this article, we investigated all tweets from a various range of content types using topic and text mining techniques to better understand the rate of citizen involvement between the populace and their town. Three steps make up the content analysis process: 1) data collection and sampling, 2) coding and 3) content analysis.

+++ provide the Flowchart of the content analysis process.

**1.2 Definition of task**

//

**Part 1: Theoretical research**

**//**

**Part 2: Development**

**//**

**1.3 Structure**

**//**

* 1. **Technologies used**

**Python – twint, pandas, matplotlib, numpy**

**SQL**

**1.5 Literature analysis**

As a first example, they analyzed the tweets (based on Italy) which managed the subject of a keen city in 2012. To do that, it was utilized the social media checking and investigation arrangement Dark red Hexagon. The Cohen's Smart Cities Wheel Model (Boyd Cohen, 2011) [3] is an all-encompassing system for considering all of the vital parts of what makes a city smart (Figure 1). It was involved as a standard to group Twitter's remarks.

Chart, sunburst chart

Description automatically generated

**Figure 1**

Examining the Social Network structure within the field of Smart City, it was displayed their significance and classifications. In reality, Smart City is an intriguing concept that covers different aspects. For illustration, there's a broad consideration in what is called the “School of Future”, where the objective is to present understudies to the state-of-the-art to oversee methods for smart cities.

Urban areas are generally the actual appearance of the large powers at play: financial, natural, and social powers. Milan Expo 2015, the Universal Exposition planned from May 1 to October 3 in Italy, is a kind of little world visit. To that end, we zeroed in the examination on Italian shrewd urban areas.

Furthermore, and really striking, it divulged individuals that can impact patterns. These individuals are frequently in the "primary hubs" of the organization, a kind of advantaged way that permits their thoughts to spread quickly.

Obvious, concentrating on the elements of the correspondence through Social networks could assume a critical part in the improvement of the urban communities of things to come, alongside the other IT Service Management.

Social Media can be viewed as a source of knowledge for urban planning and management [8]. In the last years, people have modified how they utilize the technology available and urban planners can manipulate the data that people are sharing on online platforms.

What is more, modern cities are topic to regular or unplanned critical events, which may cause economic losses or even endanger the masses [9]. In Smart Cities, various individuals post details about a specific event that is being noted and such information can be extracted and handled to ascertain and classify serious occasions.

**References**

1. Townsend, A.M. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia; W.W. Norton & Company: New York, NY, USA, 2013.

2. Le-Dang, Q.; Le-Ngog, T. Internet of Things (IoT) Infrastructures for Smart Cities. In Handbook of Smart Cities: Software Services and Cyber Infrastructure; Springer: Cham, Switzerland, 2018; pp. 1–30.

3. Bermudez-Edo, M.; Barnaghi, P.; Moessner, K. Analysing Real World Data Streams with Spatio-temporal Correlations: Entropy vs. Pearson Correlation. Autom. Constr. 2018, 88, 87–100. 4. Anatharam, P.; Barnaghi, P.; Thirunarayan, K.; Sheth, A. Extracting City Traffic Events from Social Streams. ACM Trans. Intell.Syst. Technol. 2015, 6, 1–27.

5. Bellini, P.; Cenni, D.; Nesi, P.; Paoli, I. Wi-Fi Based City Users’ Behaviour Analysis for Smart City. J. Vis. Lang. Comput. 2017, 42, 31–45.

6. UN Habitat, 2009.

7. Suciu et al., 2018.

8. Ciuccarelli et al., 2015

9. Costa et al., 2018

10. https://en.wikipedia.org/wiki/Python\_(programming\_language)

11. https://matplotlib.org