Social Media Influence Analyzer

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# Introduction

Upon the rise of the still ongoing digital revolution, many digital platforms had a series of success stories in transforming the way society members interacts with each other on the daily basis. People around the world are no longer limited by distance or time to be able to reach out for one another and participate in social activities or events. Because of this increase of socializing on multiple popular digital platforms, a big amount of digital data is exchanged and recorded about each activity a certain user performs on those digital platforms.

Such data has a great potential in revealing the strengths of influences between network users, just like in real life every action a user commit and how society members react to this action can serve as an object for analysis which helps in drawing a big but rather detailed picture of how users influence each other across many societies and fields.

The aim of this research is establishing a ground foundation for extracting information about user activities on social media and use such information to detect social influence between network users. Such foundation is desired to make up the core of a future technical solution that enables social media analyzers with little or no technical experience in data processing and visualization to perform social media analysis on regular periods with a continuous timeline.

To serve this purpose, we start by determining the common characteristics in available functionalities between the most popular social media platforms, then produce a data model based on similarity between them. This data model is crucial to guarantee the reliability and flexibility of algorithms and technical systems that builds on top of this research; both reliability and flexibility are two sides of the same coin, as when basing the data model of the system on similarities between data provided by as many social media platforms as possible, we naturally widen the range of analysis potentials of any applying digital platform, making the solution more flexible and highly reliable and adaptable for social media analyzers.

After establishing an agreement on the data model to be used for collecting and storing crawled data from social media, we dive into the main core functionality of detecting social influence between network users. Multiple techniques of detecting such influences will be implemented to fit the different needs and purposes of the final application of analysis, regardless if the purposes are independent or can be tighten together in combinations. The desired result is a user influence graph where each node represents a participating user, while each edge between two given users representing the influence between these two users with respect to direction of influence and holding the strength and area of the influence whether it is in sport, politic, economy etc.

Following the previous effort, we evaluate the performance of the user graph model and go through test results from both dummy and real-life data using crawled data from a rising social media platform called “Reddit”. We will try to highlight the most interesting and useful features of the produced user graph and push its power of detecting influencers and their area of influence to the limit. The final test and evaluation process is a vital and necessary step to rely on the quality of the produced user graph model in any future analysis and technical solution.

This was a brief introduction of the upcoming research in a nutshell, but first let’s go through some interesting attempts in revealing user influence from social media.

# Related Works

Among the community of computer science, a wide variety of studies has focused on extracting information from the available social media platforms, and a big amount of effort has been dedicated to reveal influences between users to better understand the behaviour of individuals for many both commercial and non-commercial purposes. Research of social influence takes different forms and vary in size and scope, while some researchers take on the very fundamentals of detecting social influence others dive through to reveal specific influences and hidden behaviour patterns on different levels.

## Detecting and measuring user influence in social media

A good fundamental approach is described by a social network analysis carried out by Y. Guo, J. Cao & W. Lin. The fellow researchers are dividing the influence evaluation models into 2 main categories; the first category is based on network topology which measure social influence of a certain user by considering his degree, shortest path, and random walk characteristics, while the second category bases the influence between users on their interactions through different activities organized in tree-like structures like submissions and multilevel comments. However, and despite the reasonably good classification and overview these researchers offers, their paper lacks some proven results of an experimental approach [1].

## Data-driven Influence Learning

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A short but rather interesting experimental and mathematical approach is introduced by a paper on Data-driven Influence Learning in Social Networks published by F. Wang, W. Jiang, G. Wang & D. Xie. In this paper, the process of influence diffusion is divided into two parts: the launcher (influence strength) and the receiver (influence threshold) which can generate an accurate and finer grained influence diffusion model according to this research. Furthermore, the researchers highlight the importance of having a solid criterium when scoring the strength and threshold properties of social influences. Another important acknowledgment is the difficulty and complexity associated with detecting influence relationships between users as a by-product of big datasets that usually include a considerable amount of noisy or less important datapoints, making it essential for any algorithm used in learning and testing the influence models to perform a minimal scan over the data in the most efficient way possible. [2]

## Gathering data and Crawling alternatives

Most well-known providers of social media platforms offer

developers and data scientist multiple endpoints and ways to extract data from their platforms for development or analysis. Some research spots the light on this initial aspect of gathering data from social media platforms. One significant research is one that mainly describe the alternative of Pushshift Reddit Dataset by J. Baumgartner, S. Zannettou, B. Keegan, M. Squire and J. Blackburn. [3] The research paper offers an undirected but also claimed to be a more efficient and flexible way to gather data from the “Reddit” social platform than by using the official Reddit API endpoint.

It also gives an excellent brief description of the FAIR data principles which is highly relevant when choosing the source of data especially when it comes to accessibility and findability.

Another advantage of this research is its extension in discussing a series of the other major alternatives for gathering data from Reddit, highlighting their strengths and weaknesses in a constructive manner.

## Classification of topics in social media platforms

As mentioned in the introduction, we are set to determine

the category of a detected influence between users, this opens up for the use of artificial intelligence for the purpose of classification between different topics where a certain user activity might fit in. In a research about annotating and detecting topics in social media forum and modelling the annotation to derive directions carried out by B. Athira, J. Jones, S. M. Idicula, A. Kulanthaivel and E. Zhang, a practical case study from an online health community was represented to give a good introduction of data pre-processing and cleaning, preceding to construct a reasonable mathematical approach for training and testing of a produced classification machine learning model.

Furthermore, the research offers a solution for a much-needed ability to minimize the amount of training data and dealing with the negative effects of label imbalance in a training dataset.

Another contribution of this research is the use of various deep learning algorithms to classify posted content such as CNN, LSTM and BiLSTM, all in which enable the researchers to achieve a promising F1-score of about 0.75 to 0.80 in topic classification.

The research has an excellent and well-performed evaluation and testing phase, where metrics of evaluation are carefully examined and explained in a good scientific approach [4].

## Choosing a study case social media platform

Determining which social media platform to crawl for testing and evaluation purposes is an important choice in the path to producing a user influence model that is flexible and useable in as many social media platforms as possible, this is why it is desirable to base the real life study case on actual real life datasets from a digital media platform that shares common user functionalities with as many popular social media platforms as possible, examples of such functionalities are post, submissions, comments, and upvotes or commonly known as likes.

A social media platform that satisfies all these user functionalities is “Reddit” which is examined by the research called “Information and Social Analysis” carried out by T. Steinbauer at the University of California, Santa Barbara. [5] Steinbauer starts off with a brief but very constructive comparison between the most popular social news sites with Reddit included. The core of Steinbauer’s research lays in his analysis of subreddits, submissions and comments on Reddit which can serve as a foundation prove for why Reddit should be used in evaluating the performance of a user influence graph model and its ability to view the most influencing users in a social media platform, the reason behind this is that Steinbauer gives a detailed analysis on which subreddits seems to have the most of activity and also precedes in building into constructing a user graph model that helps showing which user has the highest influence based on users interactions through comments.

However, submission authors are not included in the dataset of the constructed user graph, making the user graph less reliable when ignoring the often-significant role of posters in generating discussions on social media. Another downside of Steinbauer’s user graph model is not using any other criteria than user interaction through comments, such as the upvote score or number of thread comments to a certain comment or submission.

Although Steinbauer has introduced a detailed overview of his evaluations and analysis’s results, there is still a big question mark on the technical details as no algorithms for constructing the user graph has been presented in detail.

# Chossing a case study social media platform to crawl for test and evaluation

There exist a wide variety of popular social media platforms that all constantly gaining popularity among users from all over the world, and although many of them tends to specialize in a certain area or field of social activities such as LinkedIn for professional life, and Facebook on the other hand for private personal activity, some digital platforms combine aspects from both areas such as so-called digital news platforms that offers its users an opportunity to interact with each other in many aspects of social life like professional and personal life together. Reddit is considered as one those digital news platforms which is still gaining popularity and increasing in content since its launch in 2005.

A user on Reddit can create or join a group, make a submission on any group and comment on submission or comments of other users. Groups are optional to join to be active in them and tends to specialize in a certain topic of interest in society and for many users it is seen in a way that is somehow like reading the newspapers which is often divided into pages for multiple areas of concern for society members such as politics, economy, and sports.

Many other social media platforms share a lot of common user functionalities with Reddit. However, unlike Reddit they are primarily attracting users based on their social affiliation and not their interest in topics and events happening in social environments. Reddit offers a solution by motivating the groups moderators to put a clear definition for what this group is about, and which topics can be discussed on the group page. Because of the high similarity between Reddit and most popular social media platforms and its separation of social environments, Reddit is very suitable as an evaluation study case for this research as common functionality increases the algorithms flexibility for future use on other social media platforms, and its separation of social environments in groups serves the purpose of comparing the predicted social influence between users to the actual definition of the group where the interaction between users has occurred to give us an idea of how well our model is classifying topics of social influence.

Another good reason for choosing Reddit as study case is the highly developed endpoint crawling API which is very object-oriented and offers a wrapper library for the Python language that takes off users the bother of dealing with http requests and latency issues as all of this is taken care off in the background of the Python Reddit API Wrapper. The Wrapper is free to use but it requires a registration which once done offers no restrictions on how often Reddit is crawled unlike crawling by adding “.json” to the URL which have many downsides such as limitation for 100 submissions at a time, and the blockage of multiple requests from the same IP address as a prevention measure from Reddit for stopping the denial of service attacks. All of these downsides are escaped by using the Python Reddit API Wrapper which increases the reliability and stability of data streams from reddit. In other word the PRAW python module satisfies the following FAIR data principles:

* Findability:

Once using PRAW, it is easy to find and retrieve data from Reddit no matter how detailed the data is.

* Accessibility:

As mentioned earlier a programmer does not have to deal with http request and latency issues as when using a traditional API endpoint, this makes the programming experience much easier allowing programmers to focus on the objective of their works.

* Interoperability:

A good documentation and maintaining history of the PRAW module along with its popularity between programmers who are crawling Reddit gives it an excellent record of ability to integrate with different products and systems that uses it.

* Reusability:

PRAW is very object-oriented in both query language and retrieval results. This is very helpful for the usability for integration in different projects and technical solution both in present and future technologies.

Based on the above four FAIR data principles and the user habits analysis between the most popular social media platforms, Reddit makes a good case study in the testing and evaluation process for our seek to detect user influence and their area of influence, we shall than design our ground data structure to adapt for the common functionality between Reddit and the most popular social media platforms as we will go through in the upcoming section on data structures.

# Definiing a ground data structure

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

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##### Acknowledgment *(Heading 5)*

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