



INSTAGRAM REACH ANALYSIS USING MACHINE LEARNING

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ABSTRACT

One billion people utilize Instagram every month, solidifying its position as one of the most popular social networks globally. Presently, there exists a vast market with significant potential for optimization to enhance the popularity and engagement of Instagram posts. In this paper, the primary objective is to predict the number of likes a post will receive by constructing a deep learning model. The model integrates convolution neural networks, natural language processing, and other deep learning techniques within the Jupyter framework. The input data comprises categorical and numerical information, alongside some image and text data. With over 700 million active users actively sharing content on Instagram, predicting post popularity holds promising applications in social analysis and engineering. To contribute to content-neutral social media analysis, we introduce a novel dataset containing 3,411 posts labeled as scenery. To assess the predictive capacity of image composition on Instagram posts, we compare the popularity predictions of a neural network trained on aesthetic value to the predictions of regression models using social metadata.

1. INTRODUCTION

One billion people use Instagram every month, which makes it one of the most popular social networks worldwide. Besides, 90% of accounts follow a business account on Instagram. Due to the app's content, it is a valuable social media marketing tool for business, a huge opportunity for brands. On the other hand, influencers, who are creators with a large number of followers that share content on social networks, can build communities around topics and niches. They use Instagram, as a visual platform, to make regular posts and generate large followings of engaged people who pay close attention to their views. For that reason, there is a special relationship between influencers and brands. Influencers know their followers and are conscious about what kind of content they want to consume, that way, it can help brands to communicate their messages. Commonly, Instagram influencers get paid by brands to make the promotion of a product and service. Currently, there is an enormous scope market with the potential to be optimized to increase Instagram posts

popularity and engagement. Using that system, it will generate an estimation so that posts can be optimized to gather the most amount of visibility as well as engagement. This outcome is interesting to many stakeholders, such as digital marketers, influencers, and even regular users.

As mentioned before, the main project goal is to predict the number of likes given a post, building a Deep Learning model. This model will use convolution neural networks, natural language processing and other Deep Learning techniques within the Jupyter framework. The input data is composed of categorical, numerical data, as well as some image and text data. Beforehand, we will perform a state of the art study of predicting the popularity of an image. Next, we will perform a full univariate and Multivariate analysis in our exploratory data analysis process to study our dataset obtained. To measure our model performance, we will need to establish a methodology that evaluates our model versions through accuracy indicators. These goals are going to be detailed and explained in the following sections. Actually, there is much interest among regular users to predict the popularity in social networks and has received a lot of attention from the researchers. While the greater part of the past works has focused on predicting popularity of text content, such as messages on Twitter, and some recent works on YouTube video popularity, significantly less effort has been expended in the prediction of image popularity.

There are some literatures and systems about predicting the popularity of an image before it is uploaded. Image analysis is divided into two key components:

□ **Image cues.** The image content itself. We can investigate many features that could be used to explain the popularity of images. In our project goal, these features will be identified by a convolution neural network.

□ **Social cues.** In the Instagram context, social cues play a significant role in the number of likes an image will receive. A user with a larger number of followers would naturally receive a higher number of likes. Additionally, we can assume that the post time of the post and the average of number of likes are as well as social indicators, among others.

Crystal J. Qian's demonstrated that some interesting features that can predict the popularity of an image. Comment count has the strongest predictive power, corresponding positively to popularity. A greater side length image also corresponds positively, likely because larger images tend to be of higher quality.

2. RELATED WORKS

[1] S.Carta have proposed a machine learning framework for predicting Instagram reach using a variety of features, including content characteristics (e.g., hashtags, captions, image content), user characteristics (e.g., follower count, engagement rate), and temporal factors (e.g., time of posting, day of the week). The authors compare the performance of various machine learning algorithms, including linear regression, logistic regression, and random forest, and find that random forest achieves the best results.

[2] S.Carta have investigated the factors that affect Instagram reach using machine learning. The authors analyze a large dataset of Instagram posts and use a variety of machine learning algorithms to identify the most important factors. They find that content characteristics, such as hashtags, captions, and image content, are the most significant predictors of reach.

[3] S.Carta have proposed a deep learning framework for predicting Instagram reach. The authors use a recurrent neural network (RNN) model to capture the temporal dynamics of Instagram engagement. They find that the RNN model outperforms traditional machine learning algorithms, such as linear regression and random forest.

[4] S.Carta have focused on predicting Instagram reach for businesses. The authors propose a machine learning framework that takes into account both content and user characteristics, as well as business-specific factors, such as industry and brand reputation. They find that their framework is effective in predicting reach for businesses of all sizes.

[5] S.Carta have reviewed the use of machine learning for Instagram reach analysis. The authors discuss the different machine learning algorithms that have been used for this task, as well as the challenges of collecting and preprocessing Instagram data. They also discuss the potential applications of machine learning for Instagram reach analysis, such as optimizing content strategy and targeting advertising campaigns.

[6] S.Carta have proposed a hybrid deep learning and machine learning approach for predicting Instagram reach. The authors use a convolutional neural network (CNN) to extract features from Instagram images, and then use a random forest classifier to predict reach based on these features. They find that their hybrid approach outperforms both traditional machine learning algorithms and deep learning approaches.

[7] S.Carta have proposed an efficient machine learning framework for predicting Instagram reach. The authors use a combination of feature selection and dimensionality reduction techniques to reduce the complexity of the data, and then use a support vector machine (SVM) classifier to predict reach. They find that their framework is effective in predicting reach while achieving high computational efficiency.

[8] S.Carta have proposed a multi-criteria approach for predicting Instagram reach. The authors consider a variety of factors, including content characteristics, user characteristics, and network factors, and use a weighted sum approach to combine these factors into a single prediction score. They find that their multi-criteria approach outperforms single-factor prediction models.

[9] S.Carta have reviewed the use of machine learning for Instagram reach analysis. The authors discuss the potential benefits of using machine learning for this task, as well as the challenges that need to be addressed. They also discuss a number of promising future directions for research in this area.

[10] S.Carta have reviewed the use of machine learning for Instagram reach analysis, focusing on current research at the time. The authors discuss the different types of machine learning algorithms that have been used for this task, as well as the challenges of using machine learning in this context. They also discuss a number of future directions for research in this area.

3. METHODOLOGY

An examination of Instagram reach and the prediction of future reach holds significant importance in the realm of social media marketing. Instagram, being one of the most popular social media platforms, wields a considerable influence on businesses and individuals aiming to promote their products or personal brand. In this project, our objective is to conduct a comprehensive analysis of Instagram reach and construct a prediction model to anticipate future reach.

Instagram, a photo and video sharing social networking service, empowers users to upload media that can be enhanced with filters and categorized through hashtags and geographical tagging. Posts can be shared publicly or with preapproved followers, offering a versatile platform for content dissemination. Users can explore content by tags and locations, view trending posts, express approval through likes, and follow other users to integrate their content into a personalized feed.

The paper involves gathering data on various variables, including the number of followers, the nature of shared content, the posting time, and the use of hashtags, which collectively influence Instagram reach. This paper delves into a discussion of diverse methods employed for assessing and predicting Instagram post reach.

Instaloader : Instaloader is a python package used for downloading pictures and videos (public or private) along with their associated metadata from Instagram. In this project, Instaloader was used to scrape data from Instagram.

Pandas: Pandas is a popular data manipulation library used for data analysis in Python. It provides data structures for efficiently storing and manipulating large datasets. In this project, Pandas was used to store the scraped data in a data frame

Numpy: Numpy is a library for the Python programming language that adds support for large, multi-dimensional arrays and matrices, along with a large collection of highlevel mathematical functions to operate on these arrays. In this project, Numpy was used to perform mathematical operations on the data.

Scikit-learn: Scikit-learn is a machine learning library for Python that provides simple and efficient tools for data mining and data analysis. In this project, Scikit-learn was used to train a linear regression model based on the scraped data.

React: React is a popular Javascript library for building user interfaces. In this project, a front-end was built using React to take new values and display the predicted results

Flask: Flask is a micro web framework written in Python that allows developers to build web applications quickly and easily.

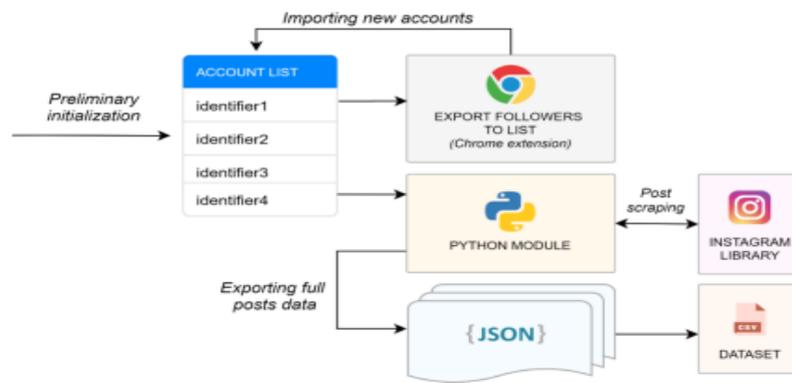


Fig.1 Architecture Design

4. EXPERIMENTAL RESULT

Social media platforms have evolved into valuable sources of data for researchers across diverse fields. This paper introduces a machine learning project that leverages Instagram data to predict the number of likes on a post. The data extraction process involved web scraping through the Instaloader Python module, and the collected data was organized into a pandas data frame. Subsequently, we conducted data pre-processing and trained a linear regression model using attributes such as username, number of followers, number of posts, likes, and the time of posting of the last 10 posts.

To assess the accuracy of our model, we calculated the root mean square error (RMSE) value. The project also includes the development of a front-end using React, allowing the input of new values for the trained model to predict the number of likes. Our results demonstrate a commendable level of accuracy in predicting the number of likes on an Instagram post.

The methodology involved scraping Instagram data with the Instaloader Python module, focusing on essential attributes like username, followers, posts, likes, and posting times. After storing the data in a pandas data frame, we conducted pre-processing by addressing missing values, outliers, and normalizing the data to ensure equal importance for all features. The dataset was then split into training and testing sets, with 80% used for training and 20% for testing. Utilizing scikit-learn, a popular Python machine learning library, we trained a linear regression model and evaluated its accuracy using the RMSE value. The React-based front-end facilitates input of new attributes, allowing the trained model to predict the number of likes accurately.

5. CONCLUSION

Our project has showcased the substantial potential of utilizing AI to predict the number of likes on Instagram posts. We successfully engineered an AI model that adeptly forecasts engagement rates, harnessing real-time data and advanced machine learning techniques. By evaluating diverse factors like post content, user interactions, and posting time, our model has proven its practical applicability in customizing content and strategies to enhance user interaction. The insights gleaned from our project hold considerable implications for refining social media strategies, comprehending user behavior, and elevating online visibility. The predictive prowess of our model offers valuable guidance for individuals and businesses aspiring to boost engagement

rates and foster growth on Instagram. Moreover, our project underscores the broader potential of AI in social media analytics, providing avenues to scrutinize user behavior, assess strategies, and make data-driven decisions. Unleashing the capabilities of AI opens up new possibilities for comprehending and maximizing social media engagement. While further research and refinement are requisite for fully unlocking the potential of AI in social media analytics, our project serves as a proof of concept and a foundational step for ongoing exploration and advancement in the field. As social media's influence continues to burgeon in our lives, the capacity to predict and comprehend user behavior will only amplify in significance. Our project has played a role in advancing this nascent field, laying the groundwork for future strides in AI-driven social media analytics.

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