"The algorithm knows too much about me!" Public understanding of content recommendation algorithms on Chinese social media platform

Keywords: Recommendation algorithm, information and communication technologies, Chinese Internet, social media, Natural Language Processing

Introduction

The development of mobile Internet and algorithms such as content recommendation and personalisation has increasingly embedded information and communication technologies in all walks of everyday life. Digital platforms in China, equipped with cutting-edge algorithmic innovations, have profoundly shaped digital culture, online shopping, food delivery, and ride-hailing industries within China but also beyond China. Meanwhile, Chinese digital platforms have posed new challenges for internet regulators around the world; for example, information polarisation resulted from content recommendation algorithms, pricing biases on e-commerce platforms, the manipulation of social media trending topics, and algorithmic controls of online labours.

In view of the increasingly profound influence of algorithmic content moderation, policymakers around the world have tightened internet regulations on tech giants to prevent the manipulation of user attention economy by commercial interests or political powers. The release of data protection laws such as GDPR (General Data Protection Regulation) in Europe signifies the beginning of digital regulations. The Chinese government, in recent years, have also reinforced strict regulations on tech giants such as Didi, TikTok (Douyin in Mainland China), WeChat, etc. China released the new Internet Information Service Algorithmic Recommendation Management Regulation in 2021. The new regulation is one of China's first attempts to tame algorithms developed by tech giants.

Research questions and research objectives

Nevertheless, the current debate around regulating recommendation algorithms misses the vital perspective of social media users: **RQ1** How do social media users perceive the impact of content recommendation algorithms in everyday life? **RQ2** Which platforms are associated with the pragmatic use of algorithmic power according to users' experiences? **RQ3** What are social media users' creative and strategic use of algorithms to counterbalance the power of algorithmic recommendation services?

The study aims to address these research questions about content recommendation algorithms via social media mining and cutting-edge Natural Language Processing (NLP) methods. Using web scraping tools and voice transcription APIs, we collected over 30,000 public discourses on algorithmic recommendation services on three social media platforms: Weibo (a micro-blogging social media platform in China), BiliBili (a video platform in China, with functions such as real-time comments), and TikTok (a short-video social media platform in China, also known as Douyin in Mainland China). We applied a machine learning model to classify the discourse corpus into different topics. We also used a dictionary-based approach to identify discussions on distinct algorithmic platforms and coded social media accounts into different types of social media agencies or users. Results from the research suggest main concerns about content recommendation algorithms in the Chinese public sphere.

Methods

We collected three datasets from Weibo, BiliBili and TikTok, respectively, in June 2022. The data set ranges between Jan 1, 2013, and Jun 9, 2022. Web scraping toolkits such as Request (https://pypi.org/project/requests/) and Selenium-Wire (https://pypi.org/project/selenium-wire/) were used to crawl user-generated content that contains the keyword "recommendation algorithm" in social media posts or video titles. Data collection from video-formatted social media is more complex than micro-blogging social media. We searched the real-time responses from Selenium-Wire to find video URL addresses and removed any duplicates. In addition to collecting

metadata from the video URLs, we also downloaded videos, converted videos into audios, and then used Baidu voice transcription API to automatically transcribe audios into raw text of videos. We removed video text that showed repetitive use of single characters (characters repeated more than four times), as such transcriptions might contain errors. The raw dataset for each platform contains 39394 for Weibo, 865 for BiliBili, and 360 for TikTok.

Data cleaning and coding training dataset

To clean text data for future Natural Language Processing, we first removed duplicated posts, and then cleaned the text dataset by removing empty spaces, empty lines, non-Chinese characters, alphabet or numbers. Social media posts that contain less than 15 characters were removed from the dataset to ensure the best result in document classification process using the machine learning approach.

From the cleaned dataset, 10% of the social media posts or video transcriptions were selected to be manually coded into different themes related to recommendation algorithms. To ensure the validity of the coding scheme, we tested the codebook in at least two rounds of manual coding and adjusted the codebook if the intercoder-reliability score did not reach a satisfactory level (Cohen Kappa value below 0.5). In the final round of coding, six coders independently labelled the training sets into seven categories: technical discussions of algorithms, comparisons of different algorithmic platforms, the impact of algorithms on everyday life, the impact of algorithms on Chinese society, internet policies of algorithms, the manipulation of algorithms, and irrelevant content.

Preliminary result

We then used RoBERTa (https://github.com/brightmart/roberta_zh, a variant of BERT (Bidirectional Encoder Representations from Transformers) to classify the corpus into six themes. The workflow is shown in Figure 1.

The distribution of each category in the corpus is visualised in Figure 2. It shows that the most commonly discussed topic on Chinese social media platforms regarding recommendation algorithms is user's comparison of different algorithmic platforms, which indicates a strong public awareness of the similarities and differences between distinct algorithmic platforms. Nevertheless, we also found that the manipulation or strategic use of algorithms, which suggest a higher level of user autonomy, is, in fact, the least common topic in the public discussion.

Figure 3 shows a normalized co-occurrence score of different topics, which is computed using the equation below:

$$\text{Cooccur\_score}(A, B) = \text{Intersection\_num}(A, B) \div \text{Union\_num}(A, B)$$

It suggests that the strongest association between topics is content focuses on how users compare the functionality of different algorithmic platforms and content, where users reflect how algorithms influenced their everyday information diet and social media news feed.

Interestingly, when examining the distribution of topics across time, we noticed that despite recent public interest in regulating and governing algorithms, there has been a growing public concern in issues related to how content recommendation algorithms shaped users' information world, as well as its impact on personal wellbeing and diversity of information diet (See Figure 4).

We then use word cloud to visualise each category to take a closer look at these categories. Although "推荐算法" (Recommendation algorithm) is a common high-frequency term across all categories, the focus of each category is different, which is shown in Figure 5. What is interesting is that the manipulation of algorithm occurs mostly on short video platforms like Douyin. People seem to have a deeper understanding of how to get exposure and draw attention compared to blog era.

Next steps

Our next steps of data analysis will aim to address RQ2 on cross-platform comparison and RQ3 qualitative interpretation of user strategies. For RQ2, we will use a novel approach of mapping the co-mentioning of any pair of algorithmic platforms using social network analysis (SNA). For RQ3, we combine qualitative content interpretation to showcase the complex dynamics across digital platforms, regulators, and ordinary users.

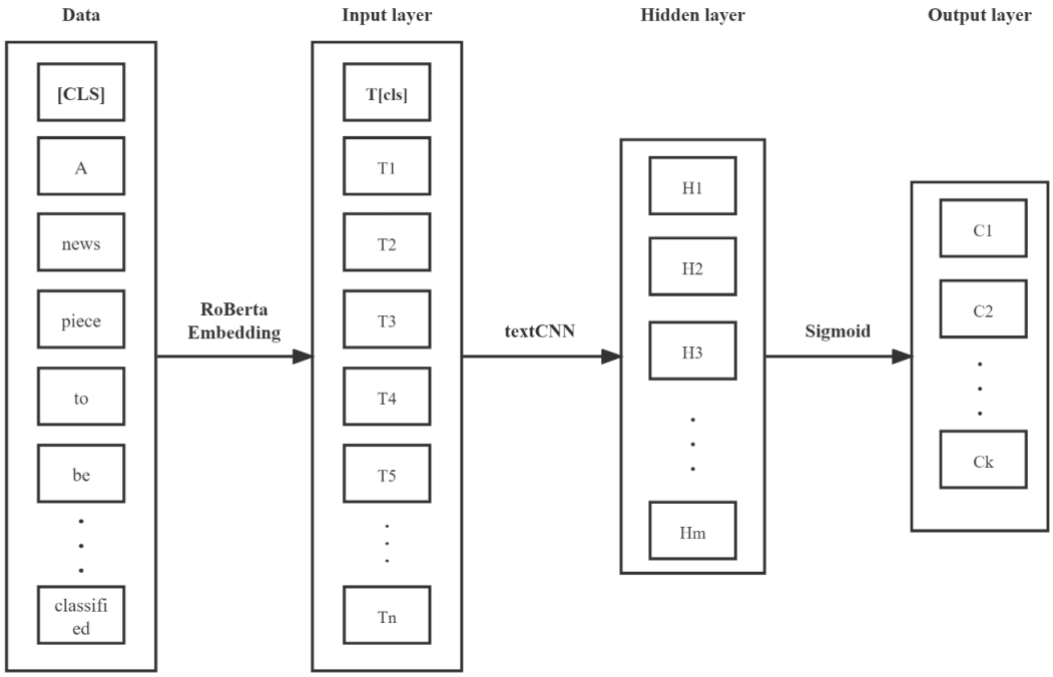

Figure 1. News classification workflow

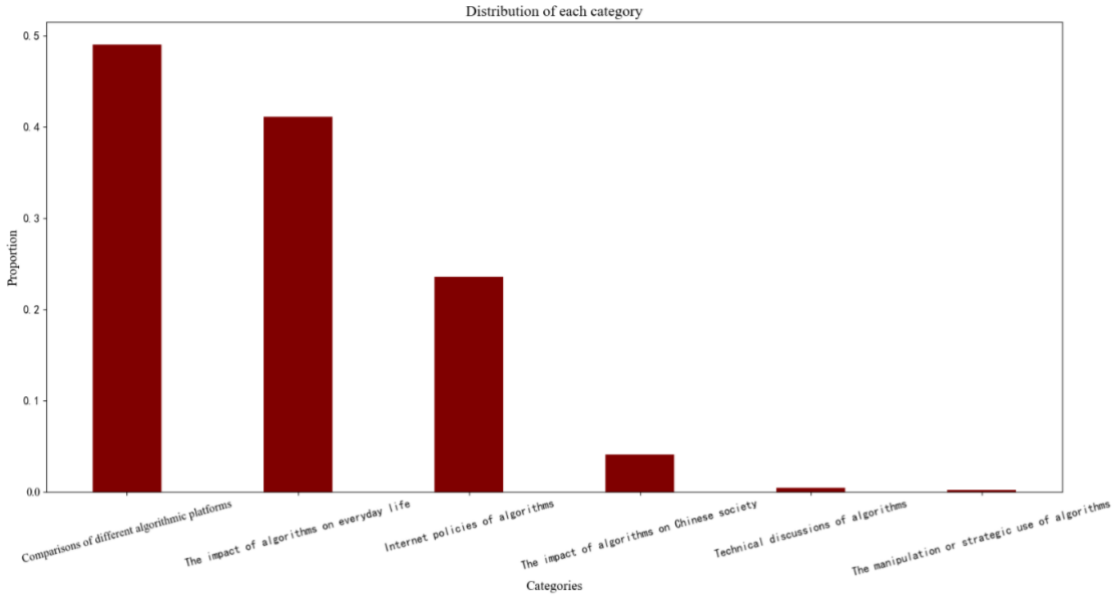

Figure 2. Distribution of seven topic themes in the corpus, using RoBERTa to classify the corpus based on the training set.

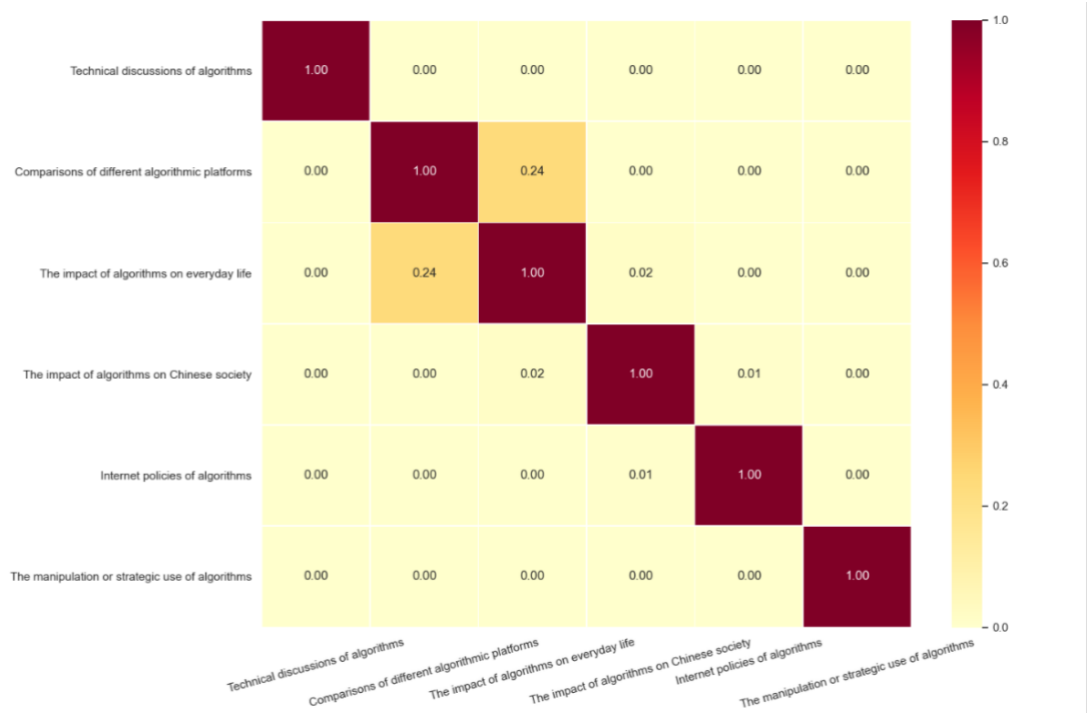

Figure 3. Topic co-occurrence scores

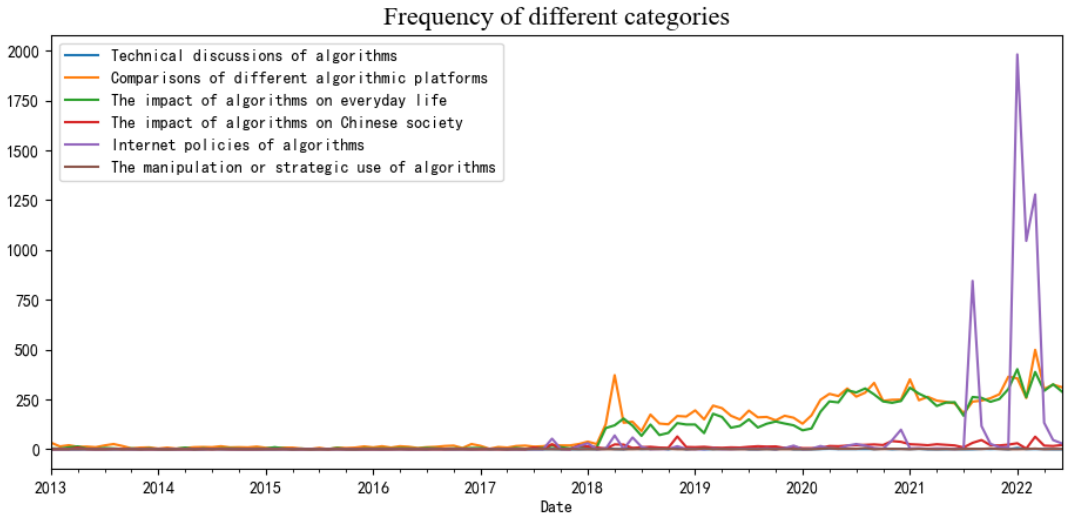

Figure 4. Frequency of different categories

Figure 5. Word clouds of different categories