Machine Learning Based Users’ Recommendation Algorithm and Echo Chamber

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Machine Learning has proven to be a powerful algorithm in data analysis and classifications. Due to its self-adjusting model that allows the user to feed an immense amount of data and have the computer analyze and make data-driven recommendations and decisions based on only the input data, it greatly automated the process of data analysis and enable computer to automatically handle and analyze a huge amount of data without much human intervention.

Machine Learning algorithm has been widely used in user recommendation system such as YouTube, Google Search, and many other software. As the way Machine Learning algorithm work in user recommendation, it’s safe to conclude that Machine Learning algorithm is deciding what user see in their frontpage in a daily basis, moreover, deciding what kind of information they get. According to the static from Domo Data Never Sleeps analysis [1], 2.5 quintillion data bytes was created daily in 2020, which is impossible for any user to read or even comprehend the amount of information generated. In the Information Age, information is no longer a scare resource like it used to be in the most of human history. The information generated today can easily oversaturate user’s perceptions, and the selection of user recommendation will basically filter out the information that user “dislike”. As a result, despite the machine learning algorithm doing its work of recommending users prefer information as intended, it created a “echo chamber” based on users’ preference, refers to situations in which beliefs are amplified or reinforced by communication and repetition inside a closed system and insulated from rebuttal, polarizing users’ opinions as a result.

Many interesting case studies has been submitted on the “echo chamber” phenomenon. Many of these studies has verified that the echo chamber phenomenon is widely exist in many online social networks. From the research on *Echo chambers, gatekeepers, and the price of bipartisanship* by Garimella, K el. [2] that focus on analyzing the echo chamber effect on Twitter, the research of Garimella, K el conclude that when applied to discussions about politically contentious topics, their results support the existence of political echo chambers. In particular, the distribution of production and consumption polarities of users is clearly bi-modal, and the production and consumption polarities are highly correlated. Conversely, the phenomenon does not manifest itself when the topic of discussion is not contentious. This result reinforces the validity of the proposed measures, where retweet networks exhibit higher polarization for political topics.

Same phenomenon can be observed in Facebook as well. The analysis on Facebook echo chamber effect by Quattrociocchi, W. el. in *Echo Chambers on Facebook* [3] conclude Facebook users are highly polarized. Their polarization creates largely closed, mostly non-interacting communities centered on different narratives. The echo chambers are statistically similar in terms of how communities interact with posts. For both scientific information and conspiracy theories, the more active a user is within an echo chamber, the more that user will interact with others with similar beliefs.

However, a different conclusion was drawn from Morini V. el in the *Toward a Standard Approach for Echo Chamber Detection: Reddit Case Study* [4]*.* Morini V. el proposed an approach that’s based on a four-step pipeline that involves (i) the identification of a controversial issue, Since opinion polarization generally arises in the presence of topics that trigger a significant difference of opinions; (ii) the inference of users’ ideology on the controversy, because an Echo Chamber’s key feature is the homogeneous group thinking; (iii) the construction of users’ debate network by retrieving all posts ‘comments and labeling users with their leaning on the controversy; and (iv) the detection of homogeneous meso-scale communities. In other words, Morini V. el look for areas of the network that are homogeneous from an ideological and topological point of view. Interestingly, in this research Morini V. el found that regarding echo chambers, for GUN CONTROL, MINORITIES DISCRIMINATION, and POLITICAL SPHERE only 6.7%, 53.8%, 23.3% of total users fall in polarized communities. In other words, the polarization issue and echo chamber effect are much less intense than traditional online social network such as Facebook and Twitter.

What might be the cause of such difference? From our observations, the user recommendation algorithm difference between Facebook/Twitter and Reddit might be the main factor contribute to the echo chamber effect. Facebook/Twitter’s recommendation system mainly focus on pushing current users’ preferred topic on to the frontpage of the users based on users’ preference analyzed by machine learning algorithm. While Reddit in the other hand, is a forum-like online platform, mainly push recommendation based on number of other users’ upvotes and comments, entailing that the user recommendation system has more inputs from other users in the Reddit platform. Based on the researches above, out assumption is that more varied inputs (From different users and sources etc.) the users’ recommendation algorithm accept, the less likely for echo chamber to form. While Facebook/Twitter is more “accurate” at predicting what users’ preferred contents are, it will also result in a stronger echo chamber effect.

In conclusion, the echo chamber effect has become a non-neglectable social issue in our modern-day society. As the echo chamber effect led to more political polarization and even physical conflict [5], how to regulate Machine Learning based Users’ Recommendation Algorithm to mitigate the echo chamber effect has become a moral and social duty that the designers and users of Machine Learning based algorithm must consider about. Therefore, we propose a more in-depth study on our assumption that discuss the correlation between the variety of Users’ Recommendation Algorithm inputs and the echo chamber effect in the future to better understand the formation of echo chamber.

Reference:

[1] <https://www.domo.com/learn/infographic/data-never-sleeps-8>

[2] Garimella, K.; De Francisci Morales, G.; Gionis, A.; Mathioudakis, M. Political discourse on social media: Echo chambers, gatekeepers, and the price of bipartisanship. In Proceedings of the 2018 World Wide Web Conference, Lyon, France, 23–27 April 2018; pp. 913–922.

[3] Quattrociocchi, W.; Scala, A.; Sunstein, C.R. Echo Chambers on Facebook. Available online: <https://ssrn.com/abstract=2795110> (accessed on 24 Nov. 2021).

[4] Morini, V.; Pollacci, L.; Rossetti, G. Toward a Standard Approach for Echo Chamber Detection: Reddit Case Study. Appl. Sci. 2021, 11, 5390.

[5] Gary R.; Phil D. Pro-Trump and anti-fascist demonstrators clash in Pacific Beach in San Diego, <https://www.latimes.com/california/story/2021-01-09/pro-trump-and-anti-fascist-protesters-clash-in-pacific-beach> (accessed on 25 Nov. 2021).