

The 5th International Conference on Economics and Social Sciences
Fostering recovery through metaverse business modelling
June 16-17, 2022
Bucharest University of Economic Studies, Romania

Artificial Intelligence Algorithms and the Facebook Bubble

Emanuel SANDA¹

DOI: 10.24789788367405072-051

Abstract

Products and services incorporating Artificial Intelligence are an ever-increasing presence in consumers' lives. Simply by browsing one's social media feeds, calling the bank, or asking one's smartphone to create a calendar appointment, individuals interact with AI daily, conscientiously, or unconscientiously. AI is not without controversy, starting with the basic task of defining it. Usually, a broader definition is adopted, leading to several categories representing current AI applications: recommender algorithms, intelligent digital assistants, chatbots, and intelligent robots. These have many things in common, but none like their dependency on being able to feed on enormous amounts of user data. This opens the door to how this data, largely personal in nature, is used, and the underlying privacy issues. Compounding the problem, some promote the idea that AI could evolve into what is called Artificial General Intelligence (i.e. independent, self-reliant robots), with all the threats this presents to the very future of humanity. Meanwhile, the recommender algorithms, most prominently employed for curating users' feeds by social media platforms, represent the most impactful form of AI at present with a high potential for creating bubbles, which can trap users in their own thoughts, biases, but also product usage and discovery. This paper presents the results of a survey conducted in 2021 among Romanian Facebook users to understand their perceptions, experiences, and desired level of control over their news feed. It identifies both current states and attitudes, as well as risks and concerns they might have in this regard. It opens the door for further research and discussion on the balance between the benefits of AI-driven algorithms in helping users navigate the deluge of information at their disposal, and the kinds of levers and controls those companies and authorities could allow consumers in order to escape the risk of a closed-in bubble.

Keywords: Artificial Intelligence, algorithms, Facebook, filter bubbles, consumer behaviour.

JEL Classification: M30, M31, M39.

¹ Bucharest University of Economic Studies, Bucharest, Romania, sandaemanuel20@stud.ase.ro.

1. Introduction

Artificial Intelligence is one of the most debated topics today, both by academics and the general public. The term AI is used liberally, most frequently in relation to products and services developed by using recent technological advancements, which consumers rely upon on a daily basis. To some extent, AI is also used to refer to potential evolutions which could affect such change that our future might bear little resemblance to our present. It is the paradox of our times that while basic needs are yet to be fully satisfied for large proportions of our fellow humans (such as clean water or basic sanitation), those same people own a phone with an Internet connection and capable of running AI-based applications, such as face and speech recognition, to name the most common ones.

Because the concept of AI is seeing such broad use, one of the first questions one may ask is what AI actually is. What do people mean by AI when bringing the topic up in casual conversations, academic papers, or news reports? Is there a red thread connecting these conversations or are we dealing with various understandings of the phrase?

This paper focuses on presenting a summary of the current chatter around AI, looking at some of the definitions, and then assessing the current state of AI development, with emphasis on AI algorithms, how they are implemented in social media platforms news feeds, and the potential bubble effect they may create. Finally, we present a series of findings from a survey aimed at capturing the attitudes, perceptions, and concerns of Romanian users related to their experience with Facebook's algorithmically driven news feeds.

2. Artificial Intelligence – Definition, Implementation, Challenges

2.1 Defining AI

While Artificial Intelligence is defined in various ways by various parties, whether people in the academic field, technology writers, engineers, as well as laymen, common elements could be identified and a unified vision could be gained in this regard. (De Bruyn et. al., 2020) The challenge comes from the second half of the phrase – what is and how do we define intelligence itself? Depending on who is asking the question, whether a psychologist, a neurologist, or maybe even a philosopher, the definitions of intelligence itself could be many (Legg, Hutter, 2007).

One of the most accepted definitions of AI is “intelligence demonstrated by machines which would otherwise be observable only in humans” (Shieber, 2004). It follows that, like human intelligence, artificial intelligence should be able to learn, understand, reason, apply logic, solve problems, and be able to make decisions, while the next level would be self-awareness. The latter could lead to an even greater debate, as human consciousness itself still seems to be intensely debated among experts.

When we look at the different features of intelligence as mentioned above, we can conclude that much of what is nowadays called AI is actually Machine Learning

(ML), which could be most easily understood as the intersection between statistics and computational techniques, the result being software programs capable of making certain predictions, based on certain inputs, leading to specific actions or decisions (Jordan, 2019). ML is not new and could be considered the forerunner of Artificial Intelligence, representing the first efforts in the field of computer use to analyse data and find models based on which certain predictions could be made, which in turn would trigger specific decisions. ML dates back several decades, ever since engineers began manifesting a preoccupation for automating industrial processes.

When dimensions such as self-learning, self-awareness, sentient machines are added to ML, we move to a level where AI morphs into AGI (Artificial General Intelligence) which some researchers consider to be the only level at which we could truly speak of AI - the only one that bears a genuine appearance of human intelligence (Goertzel, 2015; Haenlein, Kaplan, 2019). By contrast, the forms and implementations of AI of today would be more appropriately called narrow AI – AI which is good at performing only very specific tasks well, without scalability to other tasks.

Consequently, along the broad spectrum of definitions, as well as expectations from AI, either everything could be called AI (i.e. any statistical model, no matter how simple, any algorithm processed by a machine and producing a certain result), or nothing could (as long as we are still far from generating a form of AGI, as defined above) (De Bruyn et al., 2020).

In addition to the way in which the scientific and technological communities position themselves towards AI and what it means, greater concern should be manifested towards how the general public, the millions and billions of users of products and services powered by AI, perceives and relates to AI as an emerging and potentially disruptive technology for our times.

2.2 Implementations of AI – Present State and Prospects

Opting for a broader definition of AI, we now look at the current implementations, incarnations, and applications of Artificial Intelligence that the general public is most likely to encounter on a day-to-day basis. Following is a review of the most common services and products which espouse some form of AI, with no claim of exhaustiveness or comprehensiveness.

Recommender Algorithms: perhaps the most common form of applied AI and one that is present in the lives of individuals at every step. Today, from the moment we wake up in the morning, the first thing most of us do is look at our phones. The screen can display information such as the current weather conditions and forecast for the day, traffic status from home to school or work, and future calendar appointments. An algorithm running on the phone corroborated this data from various sources residing on the phone to assemble the most relevant image of our day.

As the day progresses, we may find ourselves in need of writing a message or e-mail, at which point the predictive keyboard will try to guess and recommend words or phrases that might fit what we are trying to do or say. Opening your

favourite search engine from your web browser and typing only the first few letters of a search will trigger a list of suggestions relevant to our needs at that time and the location we find ourselves in.

As we place our next order online, whether for groceries, or routinely used products, or perhaps the rarer purchase of an expensive item, all e-commerce platforms will be ready to assist us with recommendations based on our own socio-demographic profile, past purchases, as well as those of millions of other buyers that an AI algorithm deemed similar to us (Smith, Linden, 2017).

At the end of the day, we sit in front of the TV for a few moments of relaxation and entertainment, when Netflix or YouTube will be ready to serve us the next episode of a series we watched, or a movie or video that has a high probability of providing us with maximum pleasure and satisfaction (Haenlein, Kaplan, 2019).

All of the above are powered by algorithms that are sometimes simpler, sometimes more complex, but all abundantly fed with a multitude of data points, sometimes in huge quantities. All algorithms aim to guess, predict, anticipate what should follow – based on our varied experience as individual consumers, based on our personal history and that of million other users “like us”.

According to some sources, AI-powered recommender algorithms have become critical for Amazon (accounting for about 35% of its revenue) (Forbes, 2018) or Netflix, where 80% of subscriber content is influenced by its revenue-generating recommendation system, to the tune of \$1billion per year (Gomez-Uribe, Hunt, 2016).

Intelligent Personal Assistants: Growing in popularity (and ubiquity), these personal assistants (e.g. Apple's Siri or Amazon's Alexa) can help with simple tasks, such as finding quick answers to specific questions, scheduling calendar appointments, setting reminders, texting, or placing orders online. Largely based on algorithmic logic, fuelled by large amounts of data, and augmented with natural language processing (NLP) skills, these assistants are becoming a growing presence in our lives, an opportunity for the general public to experience and assess the current progress in the field of AI, but also its most obvious limitations: along with artificial intelligence comes a respectable amount of “artificial stupidity” (Lo, 2019).

Chatbots: An increasing number of customer support centers are equipped with software robots capable of having simple conversations with customers. Whether we call the bank for basic information (e.g., how to open an account, check our balance), or go online to the help or customer contact page of a company or brand, most likely a robot using NLP will meet us - another variety of technology-based algorithms and predictive models that try to anticipate and answer a variety of questions we might have while at the same time trying to “sound” as human as possible (Luo et al., 2019).

Intelligent Robots: In this field of AI manifestation, many harbour views of a distant and sometimes dystopian future (recent example could be the robot Sophia or the Boston Dynamics robo-dog).

Meanwhile, the most tangible form of intelligent robot is represented by the autonomous vehicle - from delivery drones, to driverless trucks, to electric cars replete with autopilot functions. Although a crowded field, with dozens of different

players involved and fierce competitors in this potentially huge market, autonomous vehicles seem to be making slow and modest progress, not least due to intense scrutiny from authorities, but also the general public. As an example, a fatal accident in April 2021 in Texas, involving a Tesla car in which two passengers were riding on autopilot, received wide media coverage, while hundreds of fatal accidents in the same geographical area, but involving traditional cars and drivers, go largely unnoticed and unreported.

Add to potential consumer scepticism disclaimers subtly propagated by some of the players themselves, to understand that autonomous vehicles still have a way to go. For example, Waymo, one of the more prominent players in the field, admits that autonomy will always have some constraints, despite the fact that the way they try to position their service is “driving anywhere, anytime, in all conditions” (Tennant, Stilgoe, 2021).

2.3 Risks and Challenges in AI

Although the growth of AI has been exponential and will continue at the same pace for the foreseeable future, penetrating every facet of our lives, there is more and more talk about the challenges and threats posed by this technology and the impact it will have on individuals and companies alike. Increasingly, academics, business people, and regulators are getting involved and shaping what is now a new field – AI ethics.

Following the line of AI applications detailed above, some of the biggest concerns related to AI are dealing with (Du, Xie, 2020):

- algorithmic biases and the incorporation of ethical values of target consumers - from the perspective of the product itself (Howard, Borenstein, 2018);
- control over personal data and privacy, as well as cyber security threats and concerns - from a consumer / user perspective (Gwebu et al., 2018);
- the impact on the social fabric and human interactions, the potential loss of jobs, unemployment, and the rise of the so-called useless class – from a broader social perspective (Harari, 2019).

In terms of direct interaction with AI, individuals (as consumers) seem to have ambivalent feelings about these technologies: while most seem to receive and enjoy the benefits, novelty, or excitement when using products and services based on even partially developed forms of AI, at the same time many nurture feelings of fear and anxiety resulting from the potentially evil manifestations of such technologies (Mick, Fournier, 1998).

2.4 AI-Driven Recommender Algorithms – the Facebook News Feed

Algorithms may be viewed in a variety of ways: from a purely technical perspective, they are a set of instructions written in computer code (Knuth, 1998), but when that piece of software meets the human user, it turns into something that has the potential to impact our own existence (Kitchin, Dodge, 2011). This usually

happens largely without the users' participation or awareness of the presence, influence, and impact of the algorithm, particularly given the hidden and elusive nature of this particular piece of technology (Bucher, 2016). With Facebook adoption and usage levels at their highest among individuals of all profiles, compared to any other social media platform in existence today, it follows that the likelihood of people encountering, interacting (unknowingly), and being influenced by the algorithmic news feed of the platform is by far the most common and likely experience in this regard.

A common occurrence of late to which only some seem to be alert is this: a user might be talking to others about a particular product or brand or entity or idea, or might perform a search, or read a particular article, all outside Facebook's not-so-walled garden, and next time they open their FB news feed, an ad about exactly the same product or brand pops up. Is Facebook eavesdropping on us? Is it reading our entire activity on (and off) the web? This is perhaps the most glaring touchpoint where users might become aware of the existence of an invisible force guiding the content tailored just for them, and a constant presence in our everyday lives (Eslami et al., 2015).

The pervasive presence of algorithms in our lives today is an uncontested reality, and obtaining an understanding of the impact on people's emotional responses should be the focus of researchers' endeavours. As algorithms impact in our lives is only deemed to continue to intensify with every day that passes, our preoccupations should be related to learning to live, understand, and use these hidden forces for good. As a technology based on AI where explainability is quite elusive, it is equally important to strive to understand the inner workings of algorithms, how they "perceive" their users, and the extent to which they influence even their own sense of self (Bucher, 2016).

In principle, FB's algorithmic news feeds should serve two main purposes: one is to display whatever content is deemed appropriate for every single user, so that important stories are not somehow overlooked, while at the same time prioritizing those posts which have the potential to generate the highest user engagement (Owens et. al., 2016). Given the design choices behind a recommender algorithm such as the one employed by Facebook, an area of concern remains the extent to which these tend to create a closed-loop (or "bubble") in which users find themselves trapped in, with all the consequences deriving from this phenomenon. After all, the Facebook feed is where individuals spend a good part of their day, a true space of their daily reality, which cannot remain without impact on all other facets and dimensions of their lives. The identification and even avoidance of the potential negative outcomes of this phenomenon by trying to better understand the underlying workings of algorithms and design choices should be a real preoccupation of both researchers and engineers alike (Rader et al., 2015). It seems that the manner in which Facebook's algorithms are supposed to work - powerfully addictive to users, irresistible to advertisers - is by design, as illustrated in the numerous patents developed and registered by the company throughout its existence, patents aimed at

creating almost the equivalent of a rabbit hole for users' experience on the platform (Harris, 2021).

The concept of online bubbles, understood to mean the prioritisation by algorithms of that content which would seem of interest to users, while securing engagement on the platform, while at the same time hiding the content that may diverge or challenge existing views (Pariser, 2011) has become a growing concern in recent years as a real threat to contemporary society. This reality is mostly brought up in the socio-political context, accompanied by concepts such as polarization, misinformation and the hotly debated topic of 'fake news' (Solon, 2016). While bubbles mainly encapsulate users in a particular thought and idea universe, by extension, the same user could be viewed as a consumer entrapped in a finite universe of brands, products, services, experiences where choices are obvious and exposure to "new" or "different" rather limited. Filters tailored to a user's preference, past history, or connections can, at the same time, limit the variety of things to which we are exposed, thus affecting the way we think and learn. This reading of the bubbles presents us with a world dominated by an algorithmic will and suggests that there is very little left for us to do. At the same time, because algorithms are self-feeding animals incorporating newer and more data generated from past recommendations and user behaviour, there is a risk of creating a common experience across users where items and content benefiting from more data will be prioritized over less popular ones. In a sense, while some things may look new to individual users, the same things will be fewer and narrower in scope for all users combined (Fleder, Hosanagar, 2009).

In theory, the Internet, as a gigantic repository of data, should increase the possibilities of access to the most diverse data, as well as lead to an increase in the amount of information for all. Yet, our network interaction modes today have shown some restrictions in this universe of possibilities. Online bubbles are a real phenomenon which show how certain modes of interaction on the internet can lead us to be closed in very restricted and familiar universes instead of providing us with the experience of the unknown in order to discover it. At the same time, although algorithms are powerful tools in guiding interactions and choices, it is possible to affirm that the reception and appropriation of products is a complex social process, involving a continuous activity of interpretation and assimilation of significant content by individuals and groups. Thus, despite playing a key role in limiting exposure to different points of view, we can affirm that algorithms are not the only element with a role in filtering content and affecting individual agencies (Franco et. al., 2017).

3. Aims of the Research

We will now look at the results of a survey conducted in 2021 among Romanian Facebook users. The objective of this research was to uncover some of the attitudes, perceptions, and concerns that FB users might have in relation to their experience of browsing the daily Facebook news feed.

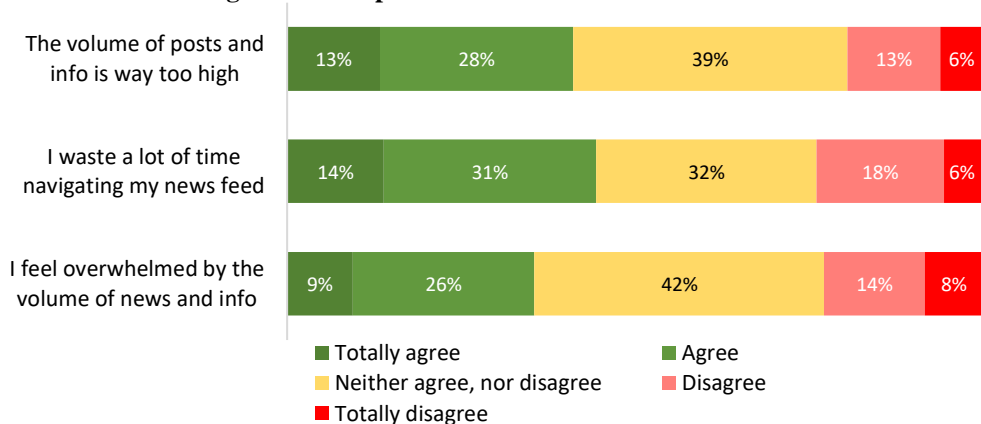
4. Research Method

For this research, 180 individuals were interviewed in Bucharest, arguably the most forward-looking and digitalized area in Romania. The sample was designed to be representative, taking into account the socio-demographic structure of the city's dwellers aged 20-65 years old. Given Facebook's penetration of 93% in urban areas in Romania (Spark Foundry, 2021), the sample ensures a margin of error of 3.73% at a 95% confidence level. Probabilistic sampling was applied with respondents being randomly selected in a multistratified approach, to account for the city's population structure in terms of age and gender groups. The survey was conducted using online structured interviews. Data collection was performed in July 2021.

5. Findings

The first piece of information we look at is users' perceptions towards their news feed. As shown, more individuals agree that their Facebook news feed is overwhelming and that they waste a lot of time navigating all of it. This could be interpreted as a shortcoming of the algorithms behind these news feeds, the purpose of which is to curate, select, simplify, and focus the user experience.

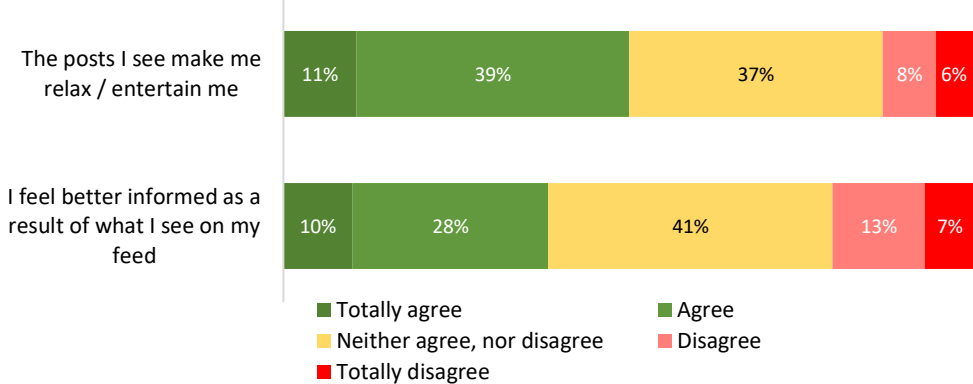
Figure 1. Perceptions towards volume of news feed



Source: author's own research and data processing.

When it comes to some of the benefits perceived by Facebook users, such as making them entertained or better informed (Chart 2), we see quite a few differences: opinions are rather split between those who agree and those who are rather neutral in terms of the news feed providing a means to relax and feel entertained. The percentages of agreement drop when it comes to obtaining a sense of being better informed as a result of browsing the news feed regularly.

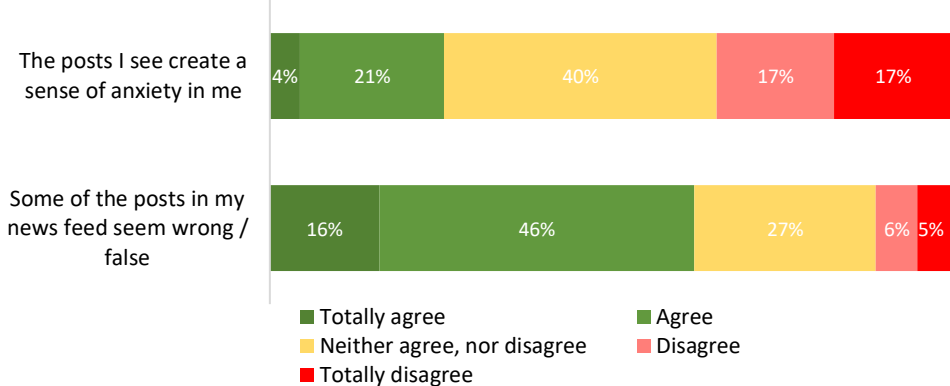
Figure 2. Facebook feed - the positives



Source: author's own research and data processing.

At the other end of the spectrum, when probing for the potential negative experiences generated by their news feed (Chart 3), only a minority of respondents agree that their news feed creates a sense of anxiety in them, while most are rather undecided. However, in terms of the feeling that some of what they see in their news feed is rather false or wrong, a clear majority agrees that that is the case.

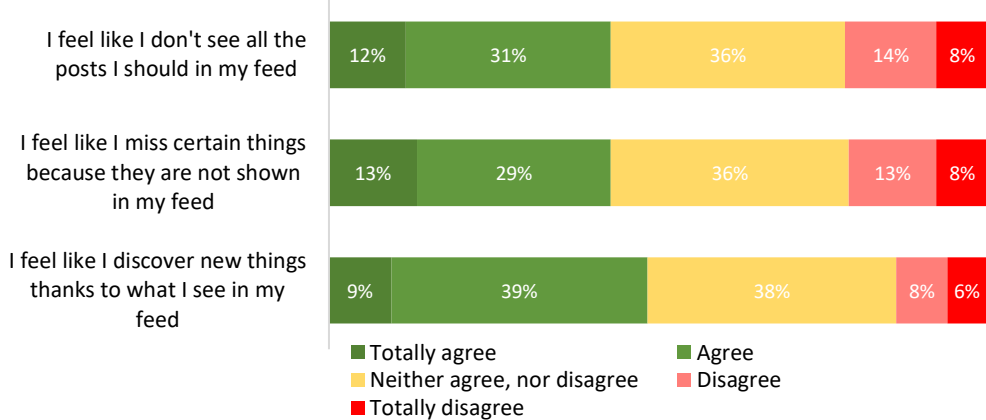
Figure 3. Facebook feed - the negatives



Source: author's own research and data processing.

On the topic of what kind of bubble effect the Facebook feed may create (Chart 4), users' opinions are both split and conflicted. A significant percentage cannot appreciate whether they miss or discover new products, things, or experiences thanks to what they see in their news feed. A similarly large percentage both agree that their news feed is keeping things away from them (the proverbial 'FOMO – fear of missing out') and at the same time allows them to discover new things – broadening their horizons.

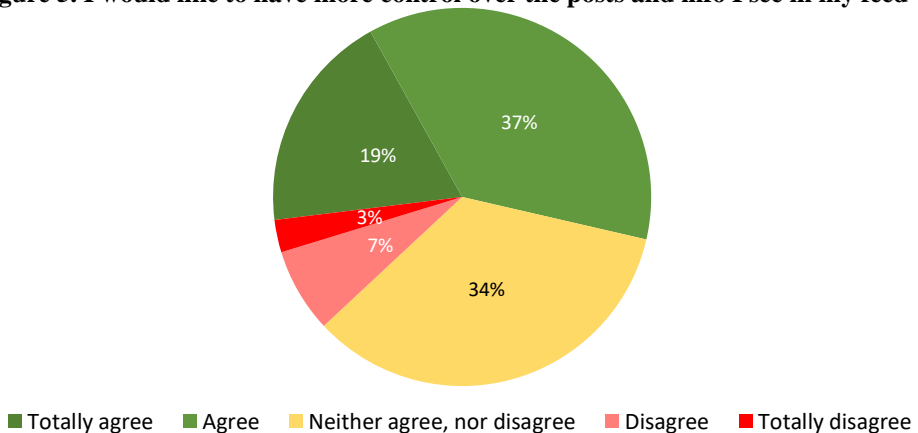
Figure 4. Facebook feed – the bubble effect



Source: author's own research and data processing.

Finally, on the topic of taking back control over their news feed (Chart 5), a clear majority across all age groups agree that they would like to have a higher degree of control over what their news feed displays. Surprisingly, it is the very youngest users who seem to be less inclined in having the option to exert some control over their feed.

Figure 5. I would like to have more control over the posts and info I see in my feed



Source: author's own research and data processing.

6. Conclusions

In this paper, we looked at the current state of AI development, starting from the ongoing debate about how we define AI, followed by an overview of some of the most common current AI implementations with which individuals and consumers experience increasing levels of interaction, then looking at some of the challenges posed by AI at present and potential emerging threats in the future.

We then looked specifically at the most common form of AI-driven technology that individuals experience perhaps on a daily basis – the recommender algorithm – with a focus on its implementation in the Facebook news feed and the potential risk it poses for creating bubbles and encapsulating users in an echo chamber of their own thoughts, biases, experiences, but also product usage and discovery.

In the end, we looked at some of the findings of a 2021 survey among Romanian Facebook users to understand their perceptions toward, positive and negative experiences with, and the level of control they would like to have over their FB newsfeed.

The paper calls for further empirical research aimed at identifying and measuring the correlation and level of influence that the above-present dimensions of the user experience have on their cognitive states and the extent to which the filter bubbles and echo chambers that feed people's confirmation bias predispositions affect their ability to continue to learn and develop by opening their horizons and universes in which they manifest themselves as users, consumers, politically and socially active citizens. Such research and potential findings would be useful for both marketers, companies, advertisers, as well as authorities, in their efforts to create a better digital future for all.

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