Values in the filter bubble
Ethics of Personalization Algorithms in Cloud Computing

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Abstract. Cloud services such as Facebook and Google search started to use personalization algorithms in order to deal with growing amount of data online. This is often done in order to reduce the "information overload". User's interaction with the system is recorded in a single identity, and the information is personalized for the user using this identity. However, as we argue, such filters often ignore the context of information and they are never value neutral. These algorithms operate without the control and knowledge of the user, leading to a "filter bubble". In this paper, by building on existing philosophical work, we discuss three human values implicated in personalized filtering: autonomy, identity, and transparency.

Keywords: value sensitive design, personalization, filtering, computer ethics, cloud computing, software as a service

1 Introduction

Emerging web technologies such as Cloud Computing allow users to outsource their computing and storage needs to data centers managed by a third party [12]. This transforms the computing world rapidly towards developing software for millions to consume as a service, rather than to run on their individual computers [4]. One of the most important ethical implications of this technological development is the shift of control from users to software providers [18]. Not only do users lose control of their personal data, but computation as well. Cloud service providers can change features and the algorithms of an application "on-the-fly", without the control of the user.

Cloud services, such as Facebook and Google Search inherit these ethical problems and often deal with large amounts of user generated data. The availability of immense computing power and storage offered by the cloud leads to a fast increase in the generated and stored data.[1] The amount of data makes it very difficult for the user to select and process relevant information. In order to overcome this "information overload", cloud services started developing personalization algorithms.

[1] According to Cisco's latest research, in 2015, consumer generated data on the Internet will be 4 times more than what it is in 2010 [5].

Web personalization is the process of changing the content and structure of a web application to adapt it to the specific needs, goals, interests and preferences of each user [7]. By building a user model, the beliefs and knowledge that the system has about the user is captured [7]. This way the system can predict what will be relevant for the user, filtering out the irrelevant ones, increasing its personal relevance to an individual [2].

For instance, according to Pariser [14], Google uses various "signals" (previous search keywords, location, status updates of contacts in social networking sites, etc.) in order to customize search results per user. Facebook on the other hand checks a user's interactions with other users, and filters certain users' posts. This means user activities (click history) are translated into a single identity, and on the basis of this identity certain information is filtered out. Further, photos and videos receive a higher ranking than regular status posts. Facebook therefore determines the importance of the information on behalf of the user.

The problem with this sort of algorithmic filtering is that information is filtered before reaching the user, and this occurs silently. The criteria on which filtering occurs are unknown; the personalization algorithms are not transparent. The user's previous interaction with the system is the basis of future personalization. However, as we later will argue, we have different identities, depending on the context, which is ignored by the current personalization algorithms.

Personalized filtering is gaining importance and it is used by many cloud services. Considering the increase of popularity of cloud services, we can expect to see personalization more often in the future. This, therefore, requires a good analysis of the implicated values in the design of such algorithms.

In this paper we use Value Sensitive Design methodology [6] to identify the values and value assumptions implicated in personalization algorithms. In Section 2, we start a conceptual investigation by clarifying the (moral) value of information and the necessity of filtering in the information age. In Section 3, the concept of 'personalized filtering' is investigated by relating it to a theory of filtering. Next, in Section 4, building on existing philosophical work, we discuss three human values implicated in personalized filtering: autonomy, identity, and transparency. Finally, in Section 5, we conclude with a list of guidelines to consider when designing personalization algorithms.

2 Value of Information and the Need for Filtering

In his book *A Theory of Justice* [16], John Rawls introduces the concept 'primary goods': goods that are supposedly useful (or at least not harmful) to anyone, irrespective of their conception of the good. By applying Thomas Pogge's widely accepted interpretation and extension of the Rawlsian idea of justice [15], Van den Hoven and Rooksby [10] argue that information should be accepted as a primary good within Rawls's theory. Information online is vital for people to plan their lives rationally and to participate adequately in the common life of their societies [10].

Thus, having access to information affects the worth of liberty felt by an individual. We therefore argue that personalizing algorithms affect the moral value of information as they facilitate an individual's access to information. Contrary to earlier stages of the Internet-era, when the problem information access boiled down to

having access to hardware, nowadays the problem of access to information concerns the ability of intentionally finding the right information, or unintentionally stumbling on upon relevant information. We rely more and more on technology to find relevant information. In the cloud, relevance is determined to a large extent by algorithms.

The lowering of cost of communication and production of informational goods enabled by the Internet, has led to an enormous increase in information available to the public both in quantity and diversity [1, 17]. The declining influence of traditional news media as filters to the flood of information that is unleashed every day, the threat of information overload arises. '*Having too much information with no real way of separating the wheat from the chaff*' is what Benkler [1] calls Babel objection: '*individuals must have access to some mechanism that sifts through the universe of information, knowledge, and cultural moves in order to whittle them down into manageable and usable scope.*'

The question then arises whether the service providers currently active on the Internet are able to fulfill the 'human need for filtration'. Although the fulfillment does not hinge on proprietary services alone as there are cooperative peer-production alternatives that operate as filters as well, the filtering market is dominated by commercial cloud services like Google and Facebook[2].

3 Filtering

In this section we first give a theory of filtering based on Goldman [8]. We later describe the characteristics of personalized filtering done by algorithms.

3.1 A theory of filtering

According to Goldman [8], filtering involves a designated channel of communication and a system of people with three kinds of roles (Figure 1): senders, receivers and the filterer (or gatekeeper), an individual or group with the power to select which of the proffered messages are sent via the designated channel. When a gatekeeper disallows a message, this is filtering. According to Goldman, not every form of filtering is censorship. Filtering occurs for instance in peer-review process in scientific journals where the reviewers are the gatekeepers, or in the system of trial procedure, where the judges are the gatekeepers. Certain filtering practices are commonly rationalized in terms of helping the relevant audience to determine the truth.

Goldman identifies 3 doxastic stages, processes that ultimately produce belief (See Figure 2). In order for people to believe truths and avoid believing falsehoods, some selections must be made at one or more stages. If filtering happens at the reporting stage, the gatekeeper filters some of the sources or certain types of information to be sent to the receiver. If filtering happens at the reception stage, all the information is sent to the receiver, and the receiver himself can choose which messages he wishes to receive, that is, read, and digest. The receiver does this by first

[2] In 2010 in the UK for instance, Google and Facebook dominate as gateways to the wider Internet [9].

selecting which channels to tune in to and then selecting which messages aired or displayed on those channels to 'consume' (read or listen to). Finally, in the acceptance stage, the receiver, having read a certain number of messages on a particular topic, must decide which of these messages to believe. According to Goldman, if the gatekeepers, for instance newspaper editors, are not competent enough, filtering done at the reporting level might not be reliable.

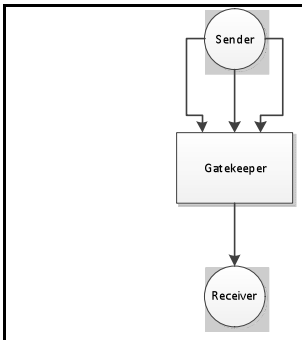

Figure 1. Roles of filtering

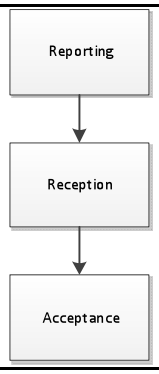

Figure 2. Doxastic stages

3.2 Personalized filtering

In Cloud Computing, algorithms practice the role of the gatekeeper, reducing the volume of information reaching their users (receivers) during the reporting stage (Figure 2). Depending on certain criteria, the information is personalized per individual user. Because of this, the information is filtered before reaching the user, and it occurs silently. If important and diverse information is already filtered out by the system, the user might come into a different belief. User also cannot customize the filtering. If he is aware of it, opting out is possible. However, as we have argued in Section 2, the filtering is needed; an option to turn it on or off is not enough.

Since the outcome of personalized algorithms depend on many factors (number of users who are using it, differences in languages, variability of the user input, etc.) the outcome and reliability of the algorithms are very difficult to predict, even for the engineers who developed them. According to Pariser [14], complex systems such as Google search engine have reached a level of complexity at which even their programmers cannot fully explain any given output.

4 Values in Personalized Filtering

In their article on the politics of search engines, Introna and Nissenbaum [11] claim that the design of search engines is 'not only a technical matter but also a political one.' (p.31) Building on the Rawlsian notion of information as a primary good, they argue that the design of technical mechanisms behind search engines should transcend commercial needs as dictated by the marketplace and involve political choices concerning social justice such as equality and inclusiveness. This boils down to design challenges such as the incorporation of 'human values', e.g. "relevancy", into

the search algorithm. Introna and Nissenbaum thus argue that these algorithms must be considered as value-laden or non-neutral.

The main mechanism behind search engines is filtering; these systems filter at the "reporting" stage (Figure 2.) Personalization algorithms, just like search algorithms also contain embedded values. In this section we discuss three human values implicated in personalized filtering: autonomy, identity, and transparency[3].

4.1 Autonomy

In section 2 we discussed the Babel objection to stress the necessity of filtering. This objection, Benkler [1] argues, can only be answered when it is accepted that filtering is vital to an autonomous individual (p.174). The ability of filtering of informational goods thus is closely related to autonomy.

According to Brey [3], to be autonomous is to be a self-governing agent. Autonomy can thus be defined as *'self-governance, that is, the ability to construct one's own goals and values, and to have the freedom to make choices and plans and act in ways that are believed by one to help achieve these goals and promote these values.'* [3]. Autonomy is therefore essential for a life to be meaningful and fulfilling.

In order to be self-governing and make choices one needs to be properly informed. The unprecedented availability of information offered by the Internet can be regarded as an increase in the degree of autonomy of individuals. The quantity of information available makes filtering inevitable, however. The reliance of individuals on web services supporting their quest for relevant information, without providing insight on the filtering process, can decrease user autonomy.

Although it is impossible to sift through all sources of information ourselves, in order for us to employ our capacity for choice, it seems that we at least need to be able to assess and influence the mechanisms that are doing the filtering for us. The value of autonomy thus implies more influence and control of users over the filtering process in order to align it to their personal preferences. The promise held by the Internet of an increase in the degree of autonomy due to a wider availability of information can therefore only be fulfilled when there is proper filtering in place.

The filter bubble is a phenomenon that is closely related to what Sunstein have called "echo chambers" [17]. Sunstein worried that citizens would use technological tools to over-customize their information sources, leading to what he calls "echo chambers" or "information cocoons" [17]. However, there is a major difference; filter bubble occurs without the autonomy of the user.

It should further be noted that the value of autonomy is potentially in conflict with a defining feature of Cloud Computing: the shifting of control from users to third party service providers. Because of this control shift, the service providers can add features to the existing software, such as personalization, without notifying their users. Thus, while autonomy entails controlling the filtering service, the technological properties of the underlying architecture and software make it more difficult to realize this value.

4.2 Transparency

[3] Due to limited space and time available we focus on only three values. Further analysis is needed to identify other values and value assumptions, such as trust, anonymity, etc.

Transparency is closely related to autonomy. A user cannot assert control in an opaque system, since he will not be well informed how the system works. If the user has prior knowledge to the information requested when he uses the cloud service, he can assess the quality of the delivered information. However if the user does not know what he wants, then he cannot assess if he is receiving relevant information. For instance, a query for "Ajax", intending the mythological Greek hero, is returned by Google with a first page filled with results about Amsterdam's football team (which is also called Ajax), because I live in the Netherlands. Since I know which result is relevant to me, I can check other pages or revise my keyword to find the information I am looking for. However, if I am searching for "best digital camera", and Google assumes that the price is the most important criterion for me (because of my previous search keywords), then I will not be able to assess the quality of this information.

According to Introna and Nissenbaum [11], users have the right to demand full and truthful disclosure of the underlying rules or algorithms governing indexing, searching, and prioritizing, stated in a way that is meaningful to the majority of Web users. Even though this helps spammers, authors argue that this will lead to a clearer grasp of what is at stake in selecting among the various services. Pariser [14] argues that for the users to control the services they are using, users must know what information is used for personalization and how their data are used.

We are not so sure whether full disclosure of the underlying algorithm will lead to full transparency and better user experience. Not only because of possible misuses such as spam and conflicts with trade secrets, but it will be very difficult for an average user to comprehend the algorithm. Instead, the implications of such algorithms must be shown to the user. When a personalized filtering takes place, the user should be notified of this filtering activity and also on what basis the system is filtering. This way he will know that he might be missing some information..

4.3 Identity

In personalization, by tracking the online activity associated with the user a profile is created that represents traits of the user's identity. Personalized filtering is thus based on an interpretation of a user's identity. Identity refers to people's understanding of who they are over time, embracing both continuity and discontinuity [13]. To a certain extent there is also a discontinuity of identity when a person moves from one context to the other. In her account of privacy as contextual integrity, Nissenbaum [13] argues that the kind of privacy needed depends on the particular context personal information is flowing to. In each context individuals have different expectations of what kinds of information are appropriate and inappropriate and how that information should be distributed. When these information norms are violated, an individual's privacy is infringed. According to Nissenbaum, privacy thus involves a person's ability to control the flux of his/her personal data being distributed for each particular context.

The idea that a person has different expectations per context about what information she wants to share can be useful in explaining filtering needs. Just like sharing, as a person has expectations about what information she holds as appropriate or suiting to receive in a particular context. In a social context, such as being amongst friends, sustaining relationships might be more important than realizing professional ambitions (although these goals sometimes do coincide).

When contextual expectations are taken into account, autonomy is not just dependent on filtering as such, but more specifically on filtering according to particular contextual requirements. These requirements are related to traits of one's identity materialized in a profile used by algorithms to personalize filtering. Currently personalized filters used by most cloud services often do not take the context of a person into account. As a result all information is filtered to a generic identity or profile of the user. For instance, in Facebook, if I do not show interests in the pictures of a contact, the system will assume that I have no interest in this contact at all. However, I might be interested in his status updates about work related links.

The one-filter for all interactions principle can be omitted when discontinuity of identity in different contexts is taken into account. When different personalized filters can be deployed in different settings, conflicting context specific requirements are no longer in each other's way.

5 Conclusion and Recommendations

To recapitulate, building on the work of Van den Hoven [10], we showed that access to information should be viewed as a primary good in terms of Rawls theory of justice. Then we argued that due to enormous increase in information supply this good can only be obtained by individuals if they rely on filtering technology. Next, we showed by extrapolating on the work of Introna and Nissenbaum [11] on search engines that filtering is not a value neutral process. We then dicussed three values in design of personalization systems: autonomy, identity and transparency.

We argue that implicated values should be taken into account during the design of personalized algorithms. In order to do that, it would be useful to come up with a list of guidelines to consider when designing such algorithms. Accordingly, we have a tentative suggestion of what such a list could look like. This list is intended to be a first proposal, not as the final and only possible list.

Our analysis of the cloud services is based on personal interactions with these systems and the work of Pariser [14]. More empirical study is needed in order to understand full implications of these algorithms. Further, even if the service providers design personalization filters that respect the identified values, the user can still trap himself in his own "echo chamber"[17]. This brings the question whether information intermediaries such as Google and Facebook have a social responsibility to expose the user to public values, in order to increase diversity of information. This will allow the user to encounter information he did not know and that was not available through his friend network. However, questions such as which public values should be included remain open. More debate is needed to answer these questions.

Table 1. Guidelines for Designing Personalization Filter Algorithms

1. Make sure different identities are allowed per user, which might differ per context.
2. Design for autonomy, so that the user can customize the filter, and change the identity that is formed on basis of his previous interactions.
3. Design for transparency, so that the user is aware that a filter is taking place. The user must be able to see which criteria is used for filtering, and which identity the system has of the user.

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References

1. Benkler, Y. (2006). The Wealth of Networks: How Social Production Transforms Markets and Freedom (Yale Press).
2. Blom, J. (2000). Personalization - A Taxonomy. CHI 2000. April (2000).
3. Brey, P. (2000). Disclosive computer ethics. SIGCAS Comput. Soc. 30, 4.
4. Buyya, R., Yeo, C. S., Venugopal, S., Broberg, J., & Brandic, I. (2009). Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. Future Generation Computer Systems 25 (6) , 599–616
5. Cisco Systems (2011). Cisco Visual Networking Index: Forecast and Methodology, 2010–2015, whitepaper.
6. Friedman, B., Kahn, P. H., & Borning, A. (2006). Value Sensitive Design and Information Systems. Technology, 3(6), 1-27. ME Sharpe.
7. Garrigós, I,. Gomez, J., and Houben., G. (2010). Specification of personalization in web application design. Information and Software Technology, 991- 1010.
8. Goldman, A. (2008). The Social Epistemology of Blogging. Information Technology and Moral Philosophy. Cambridge University Press.
9. Hitwise (2010) Social networks now more popular than search engines in the UK. Available at http://www.hitwise.com/index.php/uk/press-centre/press-releases/2010/social-media-alert-june-2010/ (Accessed:27 July 2011)
10. Hoven, MJ van den & Rooksby, E (2008). Distributive justice and the value of information: a (broadly) Rawlsian approach. Information technology and moral philosophy (pp. 376-396). Cambridge, New York
11. Introna, L.D. and Nissenbaum, H. (2000). Shaping the Web: Why the Politics of Search Engines Matters. *The Information Society,* 16, 169-185
12. Jaeger, P. T., Lin, J., & Grimes, J. M. (2008). Cloud Computing and Information Policy. Journal of Information Technology and Politics 5 (3).
13. Nissenbaum, H. (2004). Privacy as Contextual Integrity. *Washington Law Review* Vol 79, No. 1, February 2004: 119-158
14. Pariser, E. (2011), The Filter Bubble: What the Internet Is Hiding from You. Penguin Group USA
15. Pogge, T. (1989). Realizing Rawls. Ithaca: Cornell University Press
16. Rawls, J., A Theory of Justice, Cambridge Mass., Belknap Press of Harvard University Press, 1971
17. Sunstein, C. (2007) Republic.com 2.0, Princeton University Press

18. Timmermans, J., Stahl, B.C., Ikonen V., and Bozdag, E. (2010). The Ethics of Cloud Computing:A Conceptual Review. Cloud Computing, HCI, & Design: Sustainability and Social Impacts, 2nd IEEE International Conference on Cloud Computing Technology and Science, Indianapolis, USA.