Dead Angles of Personalization, Integrating Curation Algorithms in the Fabric of Design

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ABSTRACT

The amount of information available on the web is too vast for individuals to be able to process it all. To cope with this issue, digital platforms started relying on algorithms to curate, filter and recommend content to their users. This problem has generally been envisioned from a technical perspective, as an optimization issue and has been mostly untouched by design considerations. Through 16 interviews with daily users of platforms, we analyze how curation algorithms influence their daily experience and the strategies they use to try to adapt them to their own needs. Based on these empirical findings, we propose a set of four speculative design alternatives to explore how we can integrate curation algorithms as part of the larger fabric of design on the web. By exploring interactions to counter the binary nature of curation algorithms, their uniqueness, their anti-historicity and their implicit data collection, we provide tools to bridge the current divide between curation algorithms and people.

Author Keywords

Curation algorithms; folk theories; interaction design; algorithmic experience; design alternatives; personalization; customization.

ACM Classification Keywords

• Human-centered computing~Empirical studies in interaction design

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INTRODUCTION

There is a lot of information on the web. In fact, there is too much information. And as we cannot possibly process it all, many of the digital platforms we spend time in daily started to create algorithms that curate the content being served to us. These curation algorithms can take the form of recommendation algorithms, as can be found on YouTube

for example, or they can select and order information as in Facebook NewsFeed or Instagram Feed. The reliance on curation algorithms to tailor the content to individuals is part of a larger trend towards personalization.

Personalization is defined by Blom as "a process that changes the functionality, the interface, information content, or distinctiveness of a system to increase its personal relevance" [8]. While customization is performed directly by the person, personalization is performed indirectly by the system using inferences. In this paper, we focus on personalization performed by the system, more specifically by curation algorithms. With the rise of automated personalization, curation algorithms have gradually become public objects and scandals have emerged. They have been accused of creating "filter bubbles" [30], increasing political polarity and being biased against minorities [9].

Curation algorithms thus started to face stronger scrutiny from researchers. Coming from different fields, they try to better understand algorithms' impact on people and how individuals perceive or deal with them on a daily basis. HCI researchers also started to call for opening the black-box of algorithms, asking for accountability and transparency. Following Dourish, we ask the question "in what way are algorithms invoked, identified, traded, performed, produced, boasted of, denigrated, and elided? [13]". In fact, algorithms are generally treated as independent, separate artefacts. With this paper, we want to reintegrate algorithms into the larger fabric of design. We want to explore what happens when we start considering curation algorithms as one of the elements that compose our interaction online and how this can help us rethink the way we consume, produce, share and discover content.

We interviewed 16 participants of diverse backgrounds to understand how they interact with curation algorithms on multiple platforms: How do they understand and perceive this phenomenon; how do they engage with it? Based on their stories as well previous works' reports of practices, we propose and investigate four speculative design proposals that use interaction and graphic design to explore other ways of envisioning a partnership with the algorithms that impact our lives.

RELATED WORK

Curation Algorithms from a technical perspective

Curation algorithms have first been an object of investigation by computer science and became a well identified research area as early as the mid-1990s ([34], [40]) with its dedicated ACM conference (RecSys).

To implement personalization through curation algorithms, engineers need to know what people might want or not. Therefore, the main mechanism through which personalization is performed is through inferences of people's behavior and interests (see for example [6]). Based on Adomavicius & Tuzhilin's work [2], we can categorize recommendation algorithms in three categories: Content-based recommendations were "the user is recommended items similar to the ones the user preferred in the past"; Collaborative recommendations where "the user is recommended items that people with similar tastes and preferences liked in the past" as well as Hybrid approaches that combine the two.

Yet, early on, researchers realized that people were not satisfied with curation algorithms and that they needed to include them more actively [36] in the design of algorithms. In their 2006 article "Being Accurate is Not Enough", authors demonstrated how metrics used for testing recommendation systems leave important aspects out [25] and many different approaches have since been proposed to fill this gap. Among them, the use of explicit or implicit feedback has been debated [45] as well as mechanisms for providing more context-aware algorithms [1]. Other approaches include helping people better understand the choices made by the algorithm [27] or facilitating discovery [46].

Curation Algorithms from a person perspective

As curation algorithms gradually became public objects, researchers in media studies and HCI started to investigate them from their ow perspective. Diagnosing the mechanisms of personalization [17], Feuz et al. suggest that Google personal search, for example, does not provide great benefits to people but more likely "serves the interest of advertisers in providing more relevant audiences to them". Zuboff [47] also demonstrated how these algorithms were deliberately tuned to facilitate the collection and exploitation of people's data. For Schou & Farkas, this type of curated media introduces potential challenges to our perception of the world [37].

Researchers also try to understand how people perceive and understand algorithms in their daily lives. Because algorithms are thought of as black boxes, they documented folk theories people develop to interpret their actions. This research is especially relevant as "these patterns of belief may have tangible consequences for the system as a whole" [33]. Using alternative displays of Facebook's News Feed curation algorithm, Eslami et al. helped people elicit their folk theories of how the algorithm work [16] and found

how they echoed notions such as popularity and personal engagement, among others. Bucher [10] showed how algorithms sometimes create "cruel connections" and even "ruined friendships".

Researchers also identified and analyzed the rejection sometimes faced by algorithms. De Vito et al. analyzed the folk theories formulated by people on twitter as the platform introduced its own curated timeline [12]. They distinguish between abstract theories and operational ones based on the perceived intentions from the platform. Personalization has also raised concerns about how curation algorithms invade privacy [11] and can hinge trust [7]. For example, Grewal et al. showed the personalization-privacy paradox and how it can diminish people engagement [21]. Beyond the rejection of curation algorithms, some researchers have started documenting some of the strategies used to oppose algorithms and subvert them [44]. One of the main concern of these researchers has been to call for opening the black box [37] and for holding algorithms accountable [29].

Curation Algorithms from a design perspective

Despite this focused attention from media scholars, curation algorithms have started to be considered as an object of research by design researchers more recently.

Design researchers' first focus has been on facilitating feedback or increasing transparency. For example, using probes in their lab study with 181 participants, Muhammad et al. explored the reaction to different types of recommendation [28] and showed that people appreciated multiple explanations over simple ones. However, the question of designing curation algorithms has proven to be challenging as some of the traditional solutions seem to prove inefficient: Vaccaro and colleagues [43] showed how control settings could have a placebo effect and provide an illusion of control.

Hamilton and colleagues [22] proposed the notion of "design of algorithmic interfaces" while Rodrigez asked how designers can "improve the user experience with algorithms?" [35]. Baumer asks for human-centered approach of algorithm design and designed a system with "interpretive flexibility at the heart" [4] to go beyond traditional approaches of curation algorithms. Recently, Alvarado & Waern [3] proposed algorithmic experience (AX) as a framework to make the interaction and experience with algorithms explicit. They explored several re-designed probes and advocate for algorithmic profiling transparency and management, algorithmic user-control and selective algorithmic memory.

MOTIVATION

Our work is grounded in these pioneering approaches and attempts to further explore what designing algorithmic interfaces or experiences can mean. Treating algorithms as a design material can be extremely challenging [14]. However, following Dourish, we think that algorithms

should not be fetishized [13] as it would prevent us from fully questioning them.

In this paper, we want to investigate algorithms by taking into account the fact that they live within the larger fabric of the interface they are hidden behind. We want to use design to reveal and explore this relationship by proposing design alternatives: conceptual design proposals [18] that allow us to follow a more speculative approach [42] and provide an interesting open interpretability [31].

The goal is not to provide definite answers, but instead to question the current isolation of algorithms. We want to open the debate on how relatively simple design decisions strongly shape the qualities and limitations of current curation algorithms.

METHODOLOGY

To inform the alternatives, we first need to understand current practices. Complementing the existing research literature on the topic, we are interested in the different ways people interact or not with curation or recommendation algorithms on a daily basis. We used participants stories as the starting point for creating speculative design proposals that challenge and critically reflect, from an interaction design perspective, on the possibilities of interacting with curation algorithms.

Participants: We interviewed 16 participants (9 women, 7 men), both in Tokyo and via Skype. We used purposive sampling to gather a relatively varied sample in terms of continents and usage of online platforms (from beginner to expert). Participants' ages ranged from 23 to 40. Nationalities included French, Dutch, Italian, Chinese, Japanese; and occupations included literature student, teacher, physicist, UX designer, marketing, electronics engineer, surgeon, technician, IT director, community manager, translator and retail manager. 5 participants considered themselves as experts on the web, 6 as average and 5 as having basic knowledge.

Procedure: In a first phase, we conducted semi-structured interviews, each lasting from 1h to 1h30, at a location chosen by participants or via Skype. We started with questions about their perception and interactions with curation algorithms on the different platforms and social media they use on a regular basis. We also asked them how they discover information, how they deal with "information overload" and we asked them to compare how the different curation system impacted them. We asked for specific details about both positive and negative stories related to curation algorithms.

In this study, we chose not to focus on one specific system, but instead to focus on how different curation algorithms and different contexts might trigger different reactions and strategies from the same person. Platforms discussed included: Youtube, Spotify, Facebook, Twitter, Instagram, Pinterest, Netflix, Deezer, Goodreads, YouPorn, and Tinder. We also discussed some curation tools such as RSS feed readers that did not incorporate curation algorithms but were generally mentioned by participants as counter-examples.

Data Collection: We audio-recorded the interview and took hand-written notes that we later transcribed for analysis.

Data analysis: We first analyzed the interviews using thematic analysis [3]. We identified categories in an inductive manner. We analyzed the stories focusing on how they might inspire alternative interaction, either to support some identified needs, or to reuse some ad hoc strategies performed by participants. We then grouped codes into categories and went back to the interviews to apply these emerging categories and to check for consistency. As our goal is to inform design proposals, we do not present counts for strategy or behaviour occurrences, as we agree with Braun and Clarke that "frequency does not determine value" [3]. In a critical design context, dissonant stories and unique perspective can be as valuable as the most common ones.

Design Approach: When we observe the current platforms, it is as if designers had first created the interface and interactions, before adding curation algorithms as an afterthought. Curation algorithms are a separate layer with no visual existence. Instead, they reuse and repurpose existing functionalities to extract the data they then use to generate inferences. Their literal invisibility also explains the very strong feeling of "black-box" that these algorithms evoke. The traditional approach to solving this black-box problem has been mainly to improve the algorithm by using more data or gathering richer feedback. It was centered on the algorithm but it did not include the algorithm's surroundings [13]. Current approaches still maintain people in a position where the only meaningful interactions they can have with algorithms are reactions. In this paper and through our design alternatives, we want to question the design choices made around the algorithms.

Starting with the themes that emerged from analyzing the interviews, we identified a set of four recurrent concerns and appropriation practices. We used these themes and the stories that compose them as starting points for our design work. We adopted a speculative design practice to proposing speculative design alternatives [20], [32]. We think about these design proposals as tools that can help us "creatively challenge status quo thinking" and that can be reused and further elaborated upon [19] [23].

The design alternatives do not aim at providing definite answers but, instead, they attempt to open the doors of what can be considered as "interacting with algorithms". We followed one specific constraint: only creating proposals that could be easily implemented with existing technologies, in order to explore how even simple design changes can impact the way digital curation work. Through this work, we also want to question and extend the goals of

curation algorithms beyond the corporate-set ones. We therefore deliberately maintained a low-fidelity approach in our design to allow for ambiguity and multiple interpretations [38]. By staying open to interpretation we can engage with the multiple meanings in the design [39]. Through this work, we want to "highlight how interpretations of the same data can lead to radically different design responses" [15].

RESULTS: DESIGN ALTERNATIVES

From the interviews, we identified four different recurring themes: the binary aspect of curation algorithms, the idea that a unique curation algorithm is not enough, the need to materialize history and the possibility of explicit data sharing with the algorithm. In the following paragraphs, we first present participants' accounts for each theme and we then explore how a design alternative might respond to their concerns and existing practices.

1) Beyond binary algorithms

Beyond the binary nature of curation algorithms

One of the concerns identified by participants was the binary aspect of curation algorithms, the fact that they could hide some content from them as much as they highlight other. As P3 explained, he was reluctant to interact with Netflix algorithm because "I wouldn't know what I might be missing if I use thumb down". Three participants (P1, P3 & P13) reported that they often manually visited friends' profiles on platforms in order to make sure that they had not missed any content from that person, because they knew the algorithm was hiding content from them. P1, for example, realized after a few months, that there was a friend from whom the algorithms had not shown any posts in a long while and that she had missed important content as a result.

The main approach to counter the binary side-effect of curation algorithm has been to provide better explanation about how choices are being made in order to help people understand why certain content is selected. However, explaining why algorithms hide content is also an issue in itself. We think that this limitation is not only due to the nature or the quality of the algorithm, but also in how content is currently displayed in most platforms. In mainstream platforms, pieces of information, be them tweets, Facebook posts or Instagram photos, are all displayed in the same format: in lists of items (the NewsFeed of Facebook or timeline of Twitter), grids of items (Amazon, Instagram) or a mixture of the two approaches.

Questioning the wall as a metaphor

We created this alternative to question the feed as the ubiquitous means of displaying content. Previous work developed the notion of graphical substrates for documenting web designers' strategies for creating rich layouts even when content is not known beforehand [24]. Following this approach, in this alternative we propose to display the content that is not chosen in the margin using a smaller font or even only the person's avatar. On the

contrary, the selected content occupies the larger part of the screen, highlighting what is chosen. This type of layout may feel familiar. In fact, this alternative simply recreates a "traditional" layout that can be found in printed newspapers. The process of editorialization means prioritizing some information over other, and this can be done in many different ways. The most relevant content can be enhanced by adding an image or increasing the font size, while the content judged as less relevant *a priori* can be minimized and displayed in the margin. Therefore, by not doing a binary choice, all the information is eventually displayed, preventing what P1 referred to as "the perverse side of social networks… because you never know what you are not seeing".
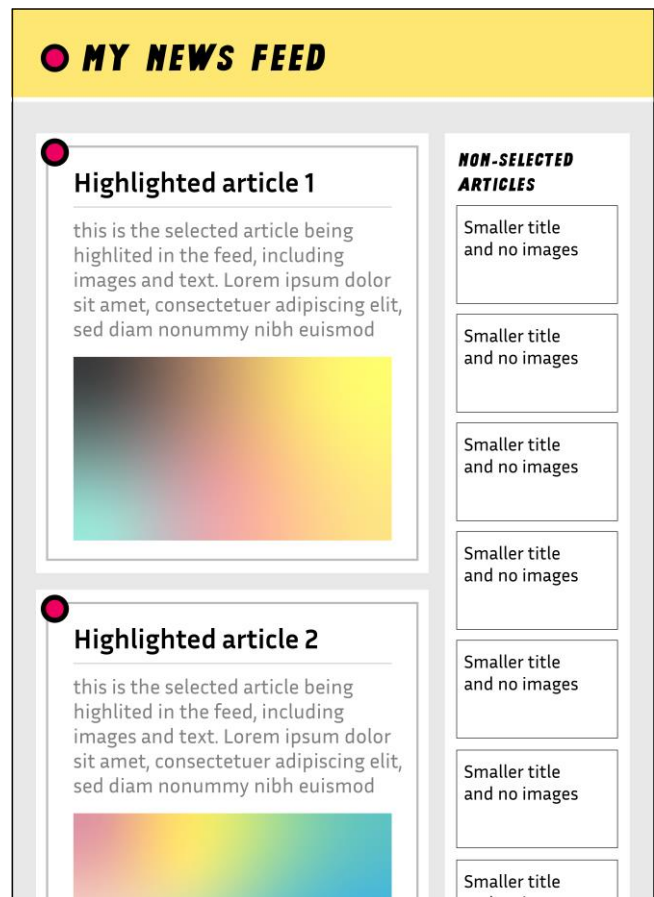

Figure 1. The Beyond binary algorithm design alternative. By exploring other layout opportunities, algorithm can provide more nuanced ways of displaying selected or unselected content.

Of course, one limitation of such design is its accessibility. We don't advocate for making such layout mandatory, but it can nevertheless help us to consider layout and all the tools of graphic design as means to provide more nuanced editorialization of the content. In books too for example, we have trained our eyes to automatically discriminate footnotes, allowing us to present secondary content that can

be easily discarded by busy readers. We can also imagine how this type of layout allows richer types of feedback. One could for example drag the content from the center to the margin to indicate that they want less of it, but, more importantly, they can also drag content from the margin to the center to indicate its importance.

Multiple reading contexts for multiple types of content
This alternative also echoes P15 personal strategy. Instead of using mainstream platforms to browse content, he created his own RSS feed reader for which he developed two distinct flux, one with only textual headlines, dedicated to news and blog posts, and the other one only with photos, dedicated to the photography blogs he is following. As he wanted to directly enjoy the picture in his feed, he adapted the context of reception to the type of content to facilitate his browsing.

P1 also explained her frustration about Pinterest's algorithm which cannot distinguish between content that she refers to as "pragmatic", like recipes and yoga poses; and "the more inspirational" one like furniture or textures. Whereas she enjoyed having the algorithm always recommending inspirational content, she wished she could have prevented it from recommending pragmatic ones she had already found. P3 also mentioned that on the different platforms he is using "there is a lot of content that serve absolutely no purpose, I don't do anything with it, but it's part of the decoration of the digital environment, it needs to be there because otherwise it doesn't feel like mine". This design alternative can help us develop this kind of more nuanced environments that don't discard content but instead might use it as "decoration" and give it visually adequate weight.

2) One is not Enough
One of the most pervasive tension we observed was how participants sometimes really wanted to be "in control" while, at other times or in other contexts, they were perfectly fine when the algorithm was choosing the content for them. In P12's case, he was always welcoming Youtube recommendations in terms of videos but was extremely annoyed when Spotify was choosing the next song for him. This tension has long been identified, but answers to this issue focused again on improving the algorithm by complexifying the model and the inferences to make it more context-aware [1].

The one size fits all issue
However, trying to create a single algorithm that could deal with always divergent and contradicting desires from people can be a daunting task. Participants' stories led us to think that there is not one correct algorithm but that, instead, there should be many that correspond to different moments in people lives, to their current situation and mood. If we accept the idea of separating algorithms into simpler ones dedicated to respond to different desires and situations, we could simplify their design and provide better control.

Discovery opportunities
Similarly to this first tension, another well identified issue emerged in participants stories: the tension between comfort and discovery. P12 for example told the story of a song she had discovered recently thanks to her cousin. She explained that Spotify could not have recommended it to her because it is "some kind of 30's-inspired music" and she doesn't listen to this style at all. P6 also complained that Youtube's algorithm was always only suggesting West-African music to her, despite her current attraction for French music. She felt that it was a vicious circle as she tended to click on the recommendations, therefore further convincing Youtube's algorithm that she was only interested in African music.
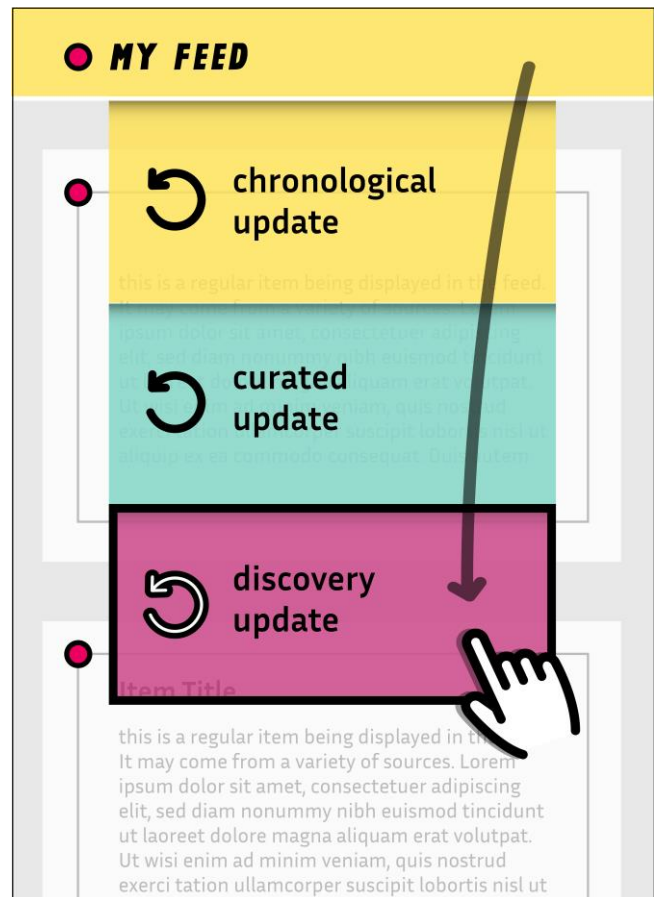

Figure 2. The one is not enough design alternative. When performing a pull to refresh gesture, people can choose to trigger no algorithm, the current one or even an algorithm dedicated to helping them discover content.

Following this approach, in this design alternative we redesigned the pull to refresh interaction. Pulling to refresh is currently one of the key interaction for triggering algorithms, as people are explicitly asking for more content. We turned the single pull to refresh interaction into a multiple trigger one to call different types of curation algorithms. Pulling only a little triggers no algorithm but

simply loads newly created content and displays it in chronological order.

Pulling to the next stage triggers the current algorithm that tries to prioritize content based on the inferred user preference and past behaviour. Pulling even more triggers another type of curation algorithm that focuses on providing serendipitous discovery by displaying content from previously unknown sources.

This approach doesn't try to solve curation algorithms' issues directly, but it gives power to people to use algorithms or not depending on their context and desire at the time. This approach is different from changing settings to perfectly adjust a single algorithm. Instead, it provides a way to change the algorithm settings on the go, surfacing the actions behind the scene and reinforcing individuals' sense of agency.

Being able to trigger different algorithms according to the context would help accommodate the very diverse contexts of use revealed by participants. For example, for P14, her RSS reader interface is very reassuring sometimes as she knows that "there is no 'you will maybe like this', nobody is going to be pushing content to me". On the contrary, P4 is extremely satisfied that Instagram is recommending content to her. She thinks that it has allowed her to detach herself from the app because it shows her what she likes first and "she doesn't want to scroll infinitely anymore". Similarly, P1 and P3 mentioned how they sometimes indulgently "let the algorithm win" and click on recommended content that they did not originally want: "Ok, I guess today is a George Michael day…" (P3).

3) Materializing the history
The issue of context sensitivity of the algorithm also appeared in the context of history. P15 recalls how one of her former colleagues made her discover a few songs from a new genre she had never explored before. At that moment, and thanks to the Youtube's recommendation, she felt that she had started to discover a whole new world. However, she then went back for a while to her more traditional songs and realized afterwards that: "as soon as I listen to something else, it doesn't suggest the same things anymore and I lose what it had been suggesting me before". P6 explained how she constantly tried to keep on listening certain types of song periodically in order to force the algorithm to recommend more of this type of content. P12 was also very disappointed by the fact that even when using Youtube for playing "party music", the algorithm would always bring back the typical songs that she listens to, even though they were not matching the party's mood. Finally, P14 also explained how this issue drove her to stop using Pinterest because, even five years after her wedding, it was still suggesting wedding dresses even though she did not have any interest in them anymore.

Based on these stories, we developed a design alternative that focuses on interacting with history. We present an example in the context of music. As mentioned by most of the participants, music is highly contextual and, for most of them, happens in phases, alternating between moments of re-listening, moments of social sharing and moments of discovery. All those moments require the algorithm to be able to selectively perform recommendation based on past and specific moments.

We reified the history [5], turning it into an interactive visualization that can be manipulated. People can selectively remove some of the songs from being considered for the algorithm's recommendation. In doing so, we allow people to revisit their past by selecting songs from a previous period that they had forgotten about and start a recommendation thread from there.
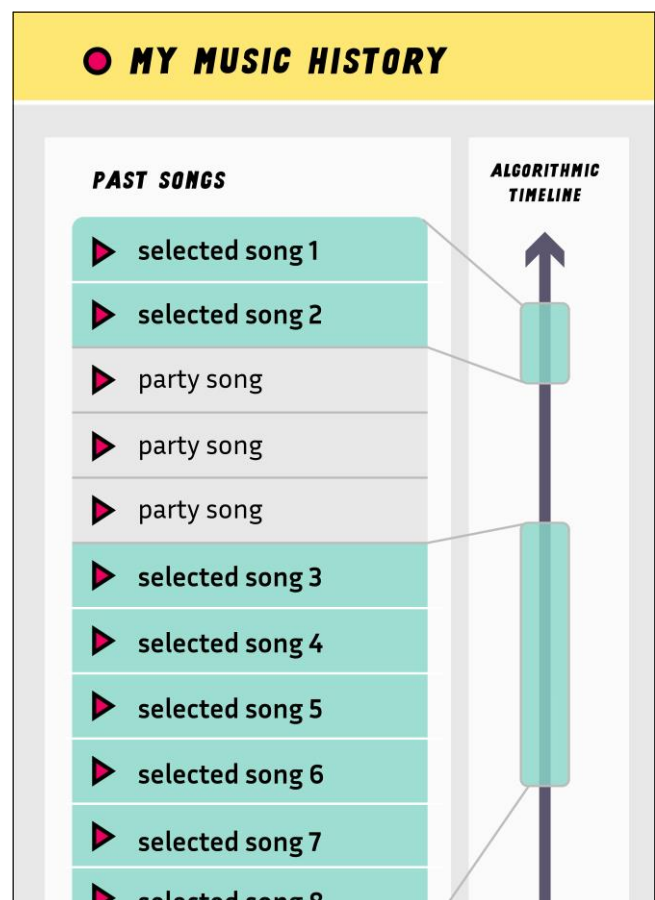

Figure 3. The history alternative. Users can discard or select specific songs that they want the algorithm to use for recommending new songs.

This design alternative complements the previous one as in both cases, they try to provide ways for people to select algorithms or manipulate them in context. Being able to constantly adjust the algorithm to the context was extremely important. As P10 explained, in the context of music the general curation algorithm "did not work at all for [him] because [he] listens to many different genres of music".

Contrary to playlists that offer him a specific atmosphere, the general curation algorithm from Deezer would mix hard rock with very calm music, preventing him to keep a certain mood.

4) Explicit sharing
Because of the separation of the algorithm and interaction layers, participants struggled to communicate with the algorithm. P11 explained: "I spend my time trying to control what I see and it's very frustrating because I cannot do it with the nuance I want".
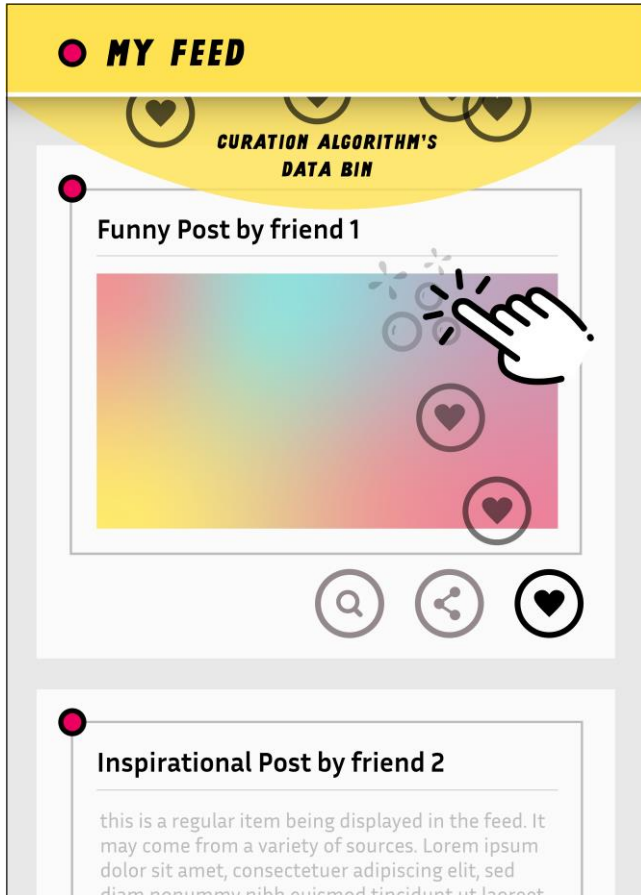

Figure 4. The explicit communication design alternative. Every action being recorded by the curation algorithm is first being displayed to let people discard it in situ.

Miscommunications
Participants reported collisions between the original purpose of some functionalities and how they are used to inform the algorithms. Each action has the same weight, even though participants put many different meanings to it. In Pinterest for example, P1 explained that she "just wanted to save that one sequence of Yoga to keep the link, but when I came back, it started to display plenty of yoga-related stuff". Her pin only meant saving to her while it meant "give me more" to the algorithm. P12 explained how Youtube's algorithm started to recommend always the same two songs, because "for a moment I was listening to the

first one every day, but the other it's only because it happened to be the following one [...] but the algorithm thinks that it's also my favourite".

Repurposing interaction to interact with the algorithm
On their end, participants also reported how they tried to influence the algorithm by repurposing some of the functionalities. P1 explained that she had a friend from whom she didn't see the posts for a while, and only after visiting her page on purpose, she realized that she had missed a lot of her posts. She therefore decided to not use the like on Instagram as a way to say, "I like", but instead "because I really want to make sure that I see their posts"

Participants changed the way they interact online for the sole purpose of sending the right message to the algorithm. For example, P3 explained how: "[he] was just skipping songs, even if on the radio it wouldn't have bothered [him], but this is not exactly what [he is] looking for, because [he] hopes that the algorithm will read that as: less of that type of thing". He also explained that he did not know if this behaviour worked.

In this design proposal, we reveal the collection of information by the algorithm. Using reification, we turn a previously invisible actions into actionable object. As we click on the like button, a ghost version is being slowly sent to the top of a screen, as a metaphor of being sent to the algorithm. People can become aware of which ones of their actions are being used to feed the algorithm. Because the information transmission is now slowed down, it allows people to tap any of their actions in order to prevent the algorithm to use it. This also questions the notion of privacy as, in the context of this design proposal, consent to sharing data with the system becomes always revocable.

Developing sharing possibilities
Participants also express their desire for more diverse types of recommendation. For example, P3 uses a VPN to be able to localize his Spotify to France, because music is editorialized differently there. This strategy was not well accepted by the system as he was constantly disconnected by it and needed to reconnect his account. To enrich the design alternative, we suggest letting people explicitly share data to the algorithm by directly dragging it. In that context, dragging the avatar could mean "I want more of this person" whereas dragging the content could signify "I want more of this topic".

DISCUSSION
With these fictional design proposals, we only started to scratch the surface of how, by integrating algorithms within a richer interactive environment, we can re-envision their significance and potential as a real partner.

Integrating curation algorithms in the fabric of design
While creating these different proposals, we realized that curation algorithms have co-evolved with the simplification of interfaces, making themselves necessary to counter the impoverishment of information visualization on the web.

We argue that it is not a coincidence that curation algorithms have first appeared on platforms like Amazon and Facebook, that have too much content and are displaying it on grids or lists. Information architecture and layout are key components of how the algorithm works. By refusing to use the discrimination tools offered by graphic design or interaction design, we restrict ourselves to relying on extremely limited ways to use and interact with curation algorithms. These design proposals showed how the role of the interface and the interaction is crucial in shaping up the possible ways algorithms can be interacted with. As Möller and colleague argued, we should not blame current issues on the algorithms only [26]. Instead this paper shows that we also need to blame it on design.

To take an old external example, a paper by Strausfeld [41] explored how navigating a 3-dimensional informational space allowed people to choose a point of view. We are not advocating for this specific approach, but the fact that it forces people to choose a point of view might participate in making people more conscious about their own bias online. In that context, rethinking how we display information appears to be crucial.

Limitations
The proposed design proposals are not intended to be developed as is. They are in themselves extremely limited and potentially trigger their own biases because they only minimally modify the existing platforms' architectures. We deliberately chose to limit ourselves to minimal design changes to show how they could already profoundly impact the user experience. However, we are well aware that most of the design space remains unexplored and we plan to continue on investigating more radical design alternatives.

We would also like to mention that we developed this project with the assumption that there can be such a thing as a partnership between algorithms and humans. Like Alvarado and Waern in their work on Algorithmic Experience [3], we deliberately left aside the fact that algorithms don't always align with people's interest and can, instead, deliberately try to alienate them [47]. When we are to think about how this research can be deployed in real scenarios, we can't avoid questioning the business model and corporate interests of most of the platforms those curation algorithms are being developed for. Despite this situation, we believe that the lessons learned from our design proposal can apply in a wide variety of cases beyond the mainstream curation algorithms.

This research also leaves open many questions to be explored in future research. For example, we think that implementing the design proposals to use them as cultural probes would better help us understand individuals' relationship with algorithms.

CONCLUSION
In this paper, we proposed to reintegrate curation algorithms in the larger fabric of the design in our online environments. We interviewed 16 participants about their relationship with curation algorithms and, based on their stories, we proposed four different design alternatives. We explored some of the limits of current curation algorithms, including: binary curation algorithms and their relationship with the layout of the content they are displaying; the quest for a single perfect algorithm and proposed instead mechanisms for triggering different ones on the go; the lack of history of the algorithms; as well as the lack of explicit communication channels that include both positive and negative data sharing. In this paper, we explored and interpreted these different design alternatives with the aim of bringing back the algorithm as only one aspect of the larger design space for information curation.

REFERENCES
[1] Adomavicius, G. and Tuzhilin, A. 2011. Context-Aware Recommender Systems. *Recommender Systems Handbook*. F. Ricci et al., eds. Springer US. 217–253.
[2] Adomavicius, G. and Tuzhilin, A. Towards the Next Generation of Recommender Systems: A Survey of the State-of-the-Art and Possible Extensions. 43.
[3] Alvarado, O. and Waern, A. 2018. Towards Algorithmic Experience: Initial Efforts for Social Media Contexts. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2018), 286:1–286:12.
[4] Baumer, E.P. 2017. Toward human-centered algorithm design. *Big Data & Society*. 4, 2 (Dec. 2017), 205395171771885. DOI:https://doi.org/10.1177/2053951717718854.
[5] Beaudouin-Lafon, M. and Mackay, W.E. Reification, Polymorphism and Reuse: Three Principles for Designing Visual Interfaces. 8.
[6] Bhattacharya, P. et al. 2014. Inferring User Interests in the Twitter Social Network. *Proceedings of the 8th ACM Conference on Recommender Systems* (New York, NY, USA, 2014), 357–360.
[7] Bleier, A. and Eisenbeiss, M. 2015. The Importance of Trust for Personalized Online Advertising. *Journal of Retailing*. 91, 3 (Sep. 2015), 390–409. DOI:https://doi.org/10.1016/j.jretai.2015.04.001.
[8] Blom, J. 2000. Personalization: A Taxonomy. *CHI '00 Extended Abstracts on Human Factors in Computing Systems* (New York, NY, USA, 2000), 313–314.
[9] Bozdag, E. 2013. Bias in algorithmic filtering and personalization. *Ethics and Information Technology*. 15, 3 (Sep. 2013), 209–227. DOI:https://doi.org/10.1007/s10676-013-9321-6.

[10] Bucher, T. 2017. The algorithmic imaginary: exploring the ordinary affects of Facebook algorithms. *Information, Communication & Society*. 20, 1 (Jan. 2017), 30–44. DOI:https://doi.org/10.1080/1369118X.2016.1154086.

[11] Davies, N. et al. 2014. Personalisation and Privacy in Future Pervasive Display Networks. *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems* (New York, NY, USA, 2014), 2357–2366.

[12] DeVito, M.A. et al. 2017. "Algorithms ruin everything": #RIPTwitter, Folk Theories, and Resistance to Algorithmic Change in Social Media. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17* (Denver, Colorado, USA, 2017), 3163–3174.

[13] Dourish, P. 2016. Algorithms and their others: Algorithmic culture in context. *Big Data & Society*. 3, 2 (Dec. 2016), 2053951716665128. DOI:https://doi.org/10.1177/2053951716665128.

[14] Dove, G. et al. 2017. UX Design Innovation: Challenges for Working with Machine Learning as a Design Material. (Feb. 2017), 278–288.

[15] Encinas, E. et al. 2018. Making Problems in Design Research: The Case of Teen Shoplifters on Tumblr. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2018), 72:1–72:12.

[16] Eslami, M. et al. 2016. First I "like" it, then I hide it: Folk Theories of Social Feeds. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16* (Santa Clara, California, USA, 2016), 2371–2382.

[17] Feuz, M. et al. 2011. Personal Web searching in the age of semantic capitalism: Diagnosing the mechanisms of personalisation. *First Monday*. 16, 2 (Feb. 2011). DOI:https://doi.org/10.5210/fm.v16i2.3344.

[18] Gaver, B. and Martin, H. 2000. Alternatives: exploring information appliances through conceptual design proposals. *Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '00* (The Hague, The Netherlands, 2000), 209–216.

[19] Gaver, W. 2011. Making spaces: how design workbooks work. (Jul. 2011), 1551–1560.

[20] Gaver, W. 2012. What should we expect from research through design? *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12* (Austin, Texas, USA, 2012), 937.

[21] Grewal, D. et al. 2016. The personalization-privacy paradox: implications for new media. *Journal of Consumer Marketing*. 33, 2 (Mar. 2016), 98–110. DOI:https://doi.org/10.1108/JCM-06-2015-1458.

[22] Hamilton, K. et al. 2014. A path to understanding the effects of algorithm awareness. *CHI EA 2014: One of a CHInd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems: One of a ChiNd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems* (Jan. 2014), 631–640.

[23] Khovanskaya, V. et al. 2016. The Case of the Strangerationist: Re-interpreting Critical Technical Practice. *Proceedings of the 2016 ACM Conference on Designing Interactive Systems* (New York, NY, USA, 2016), 134–145.

[24] Maudet, N. et al. 2017. Beyond Grids: Interactive Graphical Substrates to Structure Digital Layout. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2017), 5053–5064.

[25] McNee, S.M. et al. 2006. Being Accurate is Not Enough: How Accuracy Metrics Have Hurt Recommender Systems. *CHI '06 Extended Abstracts on Human Factors in Computing Systems* (New York, NY, USA, 2006), 1097–1101.

[26] Möller, J. et al. 2018. Do not blame it on the algorithm: an empirical assessment of multiple recommender systems and their impact on content diversity. *Information, Communication & Society*. 21, 7 (Jul. 2018), 959–977. DOI:https://doi.org/10.1080/1369118X.2018.1444076.

[27] Muhammad, K. et al. 2017. On the Pros and Cons of Explanation-Based Ranking. *Case-Based Reasoning Research and Development* (2017), 227–241.

[28] Muhammad, K.I. et al. 2016. A Live-User Study of Opinionated Explanations for Recommender Systems. *Proceedings of the 21st International Conference on Intelligent User Interfaces* (New York, NY, USA, 2016), 256–260.

[29] Neyland, D. 2016. Bearing Account-able Witness to the Ethical Algorithmic System. *Science, Technology, & Human Values*. 41, 1 (Jan. 2016), 50–76. DOI:https://doi.org/10.1177/0162243915598056.

[30] Pariser, E. 2011. *The filter bubble: What the Internet is hiding from you*. Penguin UK.

[31] Pierce, J. and DiSalvo, C. 2018. Addressing Network Anxieties with Alternative Design Metaphors. (Apr. 2018), 549.

[32] Pierce, J. and DiSalvo, C. 2017. Dark Clouds, Io&#!+, and [Crystal Ball Emoji]: Projecting Network Anxieties with Alternative Design Metaphors. (2017), 1383–1393.

[33] Rader, E. and Gray, R. 2015. Understanding User Beliefs About Algorithmic Curation in the Facebook News Feed. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15* (Seoul, Republic of Korea, 2015), 173–182.

[34] Resnick, P. et al. 1994. GroupLens: an open architecture for collaborative filtering of netnews. *Proceedings of the 1994 ACM conference on Computer supported cooperative work - CSCW '94* (Chapel Hill, North Carolina, United States, 1994), 175–186.

[35] Rodríguez, O.L.A. Towards Algorithmic Experience. 94.

[36] Said, A. et al. 2013. A Month in the Life of a Production News Recommender System. *Proceedings of the 2013 Workshop on Living Labs for Information Retrieval Evaluation* (New York, NY, USA, 2013), 7–10.

[37] Schou, J. and Farkas, J. 2016. Algorithms, Interfaces, and the Circulation of Information: Interrogating the Epistemological Challenges of Facebook. *KOME*. 4, 1 (2016). DOI:https://doi.org/10.17646/KOME.2016.13.

[38] Sengers, P. et al. 2005. Reflective design. (Aug. 2005), 49–58.

[39] Sengers, P. and Gaver, B. 2006. Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation. *Proceedings of the 6th Conference on Designing Interactive Systems* (New York, NY, USA, 2006), 99–108.

[40] Shardanand, U. and Maes, P. 1995. Social Information Filtering: Algorithms for Automating "Word of Mouth." *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 1995), 210–217.

[41] Strausfeld, L. 1995. Financial Viewpoints: Using Point-of-view to Enable Understanding of Information. *Conference Companion on Human Factors in Computing Systems* (New York, NY, USA, 1995), 208–209.

[42] Tanenbaum, J. 2014. Design Fictional Interactions: Why HCI Should Care About Stories. *interactions*. 21, 5 (Sep. 2014), 22–23. DOI:https://doi.org/10.1145/2648414.

[43] Vaccaro, K. et al. 2018. The Illusion of Control: Placebo Effects of Control Settings. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 2018), 16:1–16:13.

[44] Witzenberger, K. 2018. The Hyperdodge: How Users Resist Algorithmic Objects in Everyday Life. *Media Theory*. 2, 2 (Dec. 2018), 29–51.

[45] Zhao, Q. et al. 2018. Explicit or Implicit Feedback? Engagement or Satisfaction?: A Field Experiment on Machine-learning-based Recommender Systems. *Proceedings of the 33rd Annual ACM Symposium on Applied Computing* (New York, NY, USA, 2018), 1331–1340.

[46] Zhao, Q. et al. 2017. Toward Better Interactions in Recommender Systems: Cycling and Serpentining Approaches for Top-N Item Lists. *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing - CSCW '17* (Portland, Oregon, USA, 2017), 1444–1453.

[47] Zuboff, S. 2015. Big other: Surveillance Capitalism and the Prospects of an Information Civilization. *Journal of Information Technology*. 30, 1 (Mar. 2015), 75–89. DOI:https://doi.org/10.1057/jit.2015.5.