Embracing Seamfulness and Uncertainty in Designing around Hidden Algorithms

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Abstract
While algorithms play an influential role in users' online everyday life, they are usually housed in black-boxes. Users' lack of awareness of algorithms' operation (and even existence) and the potential biases these algorithms might introduce to users' experience call for adding transparency into algorithmic interfaces. We describe a design style which advocates for seamfulness and uncertainty in the design of algorithmic interfaces. This design incorporates seams into an algorithmic system and prompts users to actively engage with the algorithm to gain some overall, but not necessarily certain, understanding of an algorithm. We further discuss the benefits and challenges of the uncertainty that this design brings to users' experience.

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Algorithms; Uncertainty; Seamful Design

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

Figure 1: Eyelet design. An eyelet fabric embraces seamfulness by having clear holes in the eyelet part, and adds uncertainty and abstraction via the diaphanous cotton.

Introduction

Algorithms shape users' online experience by selecting what information to present in sociotechnical systems. These algorithms, however, are often hidden behind the walls of intellectual property, leaving users unaware of these algorithms' operation (and even existence). In addition, algorithms' opaqueness, along with their power, might result in potential biases in users' experiences such as racial and gender discrimination [1,2]. These together have resulted in a call for "transparency" in algorithmic systems' design [3,4]. But how much transparency is enough, too much, or even achievable in algorithmic interfaces?

The probabilistic and complex nature of algorithms makes it difficult, even for their developers, to follow how an algorithm transforms a large corpus of data to a new output set (particularly in the presence of dynamic user interactions with the system). Even if a designer has the necessary technical literacy to understand an algorithm, it is difficult or even impossible to recreate an algorithm's internal processes in design [10]. And even if this were possible, this re-creation would violate the principle of direct manipulation in design, making users' interaction with the system complicated and even cumbersome. Therefore, providing a precise and certain representation of an algorithm in interface is neither possible nor desired.

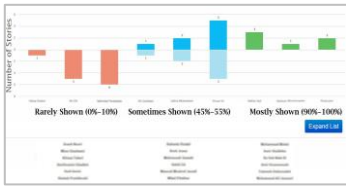
The need for transparency in algorithmic systems, along with the lack of ability (and desire) to build a fully transparent algorithmic interface, calls for new design alternatives. Here, we present "eyelet design," which combines the concept of seamfulness and the idea of embracing uncertainty or abstraction in the design of the interface (Figure 1).

A seamful design adds visibility to the system by incorporating seams to help users understand and modify the system [7]. However, given that we cannot (and do not want to) provide users with an exact understanding of the algorithms in algorithmic systems, we decided to integrate this uncertainty with seamful design. While there is rich literature that addresses designing around uncertainty [11] and embracing abstraction [12], it is challenging to balance the confusion and understanding introduced by this approach. Here, we describe a design that adds transparency to an algorithmic social feed by embracing both seamfulness and uncertainty. We further discuss the benefits and challenges of uncertainty in algorithmic interfaces.

Eyelet Design: Uncertain but Engaging

Discovering the lack of users' awareness of the existence of the Facebook News Feed curation algorithm (let alone to its operation), we added visibility to Facebook's News Feed via a seamful design [5]. In this design, FeedVis, we incorporated seams into some features of Facebook's News Feed (emphasizing variables such as stories and friends) so that users see alternate outcomes via comparison. We, however, were not aware of the certain effects of the algorithm on these features. That is why we used a "comparative visualization," a technique that is used for uncertainty visualization by comparing different data sets or results of different methods [11]. Here, we built a side-by-side comparison for a user's stories, as well as a user's friends, to show how the presence or the lack thereof of the algorithm affects a user's News Feed. We particularly highlighted the difference between the stories and friends that the algorithm chose to show or not to show in a user's News Feed in

(a) The FeedVis Content View. This view shows the user their friends' stories that the algorithm showed or hid from their News Feed. Shown stories (in blue) occur across both columns, while the hidden stories (in white) appear only in the left column as "holes" in News Feed.



(b) The FeedVis Friend View. "Rarely shown": friends whose stories were mostly hidden (0%-10%) from the user. "Sometimes shown": friends who had around half of their posts (45%-55%) shown to the user. "Mostly shown": friends whose stories were almost never filtered out (90%-100%) for the user.

two views (Fig 2). These views, however, did not provide an exact explanation about why and how the algorithm made such decisions. Rather, we left this inference process to the users via the comparison provided by the seamful but abstract design.

Uncertainty for Good

We walked 40 Facebook users through FeedVis to evaluate how our design would affect users' understanding of their News Feed curation process. Users started to make sense of the algorithm by developing theories about how it works. However, confronted by inconsistent outputs, many were not certain about their theories. For example, working with the design led some to first propose a theory stating that interacting with a Facebook friend would trigger the algorithm to show more stories from that friend. They, however, found it confusing when they saw many filtered stories from friends with whom they had interacted frequently. But this uncertainty did not stop them from attempting to understand the algorithm; it instead prompted them to reflect on the algorithm's operation and its outputs more carefully [8].

A follow-up with users two to six months after the study showed that exposing them to some seams led users to more active engagement with Facebook [5]. Users even tried to act on those theories that they developed and felt control over [8]. All these changes happened despite the fact that we could not provide any certain information about how the algorithm works. These findings suggest a promising step in the design of algorithmic systems through providing seams, even when uncertain of the exact process of a system, into an algorithmic process and helping users build more adaptive and intelligent interactions with the system.

Uncertainty and Detecting Algorithmic Bias

One of the main reasons for calls for transparency in algorithmic systems is the potential biases that algorithms might bring to users' experience. We have studied whether and how users become and are aware of such algorithmic biases and how they behave or perform around them. In doing so, we focused on a hotel rating platform (Booking.com). An initial study suggested a potential bias in its algorithm that inflated users' review scores to result in increased hotel ratings.

Our investigation showed that many users became aware of this bias during their regular use of the system. And one of the main paths to find out about this bias was a form of uncertainty. Users rated different evaluation criteria (such as location, staff, and cleanliness) of a hotel, and Booking.com's rating algorithm generates a final aggregated review score. Some, however, noticed that their final calculated review score did not match their subscores for evaluation criteria. This observation made many users uncertain about how the rating algorithm works. Their uncertainty led them to look into the algorithm's black-box, detect the bias, try to correct it, and make other users aware of it [9]. These findings suggest that being uncertain about how an algorithm works, while challenging, can help raise users' awareness not only of the existence and operation of an algorithmic process, but also of the potential impact and biases it might introduce to users' experience. This suggests the potential of "bias-aware design" that adds intentional seams to an algorithmic system. These seams can trigger users' uncertainty about how an algorithm works, leading them to detect potential algorithmic biases and to have a more informed interaction with the system.

What's Next?

During our studies examining algorithmic systems, uncertainty became an opportunity, rather than a limitation. Exposing users to seams into an algorithm, even abstractly, can nudge users' curiosity, leading them to "deeper thinking and even more creative and innovative use of the system" [8]. Furthermore, our study on algorithmic bias showed that users' uncertainty about how an algorithm works can help them detect potential algorithmic biases. We, therefore, advocate for uncertainty in algorithmic interfaces rather than leaving users totally unaware of what is going on behind the scenes.

We, however, note that while users' uncertainty about algorithms can prompt them to a more intelligent use of the system, it might also confuse them. Therefore, choosing the right seams to communicate uncertainty to users without confusing them is of great importance. Future work is needed to explore different types of seams in algorithmic interfaces and to identify the ones that prompt user uncertainty for good. We believe the "Designing around Uncertainty" workshop is a great place for us to get feedback on our work in progress and build more intelligent and engaging interaction between users and algorithmic systems.

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