



Human Computer Interaction

The Feed Machine

Final Report
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Contents

1	General Information	4
2	Problem and Solution Overview	4
3	Need-finding	5
3.1	Initial Domain of Interest	5
3.1.1	Digital Wellbeing Beyond Screen Time	5
3.2	First round of interviews	5
3.2.1	Methodology.....	5
3.2.2	Results:.....	9
3.3	Initial synthesis.....	14
3.3.1	List of initial needs mentioned	14
3.3.2	Most important user needs:.....	15
3.3.3	Most Focused Domain of interest.....	16
3.4	Second round of interviews	16
3.4.1	Methodology.....	16
3.4.2	Interviewees.....	16
3.4.3	Results.....	18
3.5	Synthesis	18
3.5.1	List of brainstormed user needs:	18
3.5.2	Deep user needs:.....	19
3.6	Solutions	19
3.6.1	List of solutions and the ideation process.....	19
3.6.2	The Top Solution	20
4	Tasks and Storyboard	21
4.1	List of the Tasks	21
4.2	Storyboard	21
5	Low-fidelity Prototype	24
5.1	Modalities exploration	24
5.2	Paper prototypes.....	24
5.3	Selection rationale.....	28
6	Medium-fidelity Prototype	29

7	Heuristic Evaluation	33
7.1	Received Heuristic Evaluation.....	33
7.2	Heuristic Violations with Severity level 3 and 4.....	33
7.3	Other Heuristic Violations.....	37
8	High-fidelity Prototype	41
8.1	General Information	41
8.2	GitHub Repository	42
8.3	Architecture and Screens	43
8.3.1	Screen Navigation.....	43
8.3.2	Important Screens	44
8.4	Limitations.....	49
8.4.1	Pre-initialized components	49
8.4.2	Hardcoded Components	50
9	Usability testing	51
9.1	Preparation and run.....	51
9.1.1	Evaluation	51
9.2	Results.....	60
9.2.1	Analysis of Error Rate.....	60
9.2.2	System Usability Scale Scores.....	61
9.2.3	Learnings from Test	61
10	Conclusions.....	65
10.1	Learnings	65
10.2	Group Work.....	66

1 General Information

The final project name is **The Feed Machine**. Our project is essentially an extensive, modular AI-powered social media topic filter that re-organizes/re-engineers one's feed to perfectly allow one to see exactly what they want to see when they want to see it. For instance, a user can block out distracting political posts from their social feed early in the morning but bring it back during a lunch break or later in the day, bringing about a positive effect to users' digital wellbeing.

Team Members:

1. Erfan Gholami
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Group Name: EESI

2 Problem and Solution Overview

Interviewees complained about being bombarded with unpredictable content on their social media feeds, having adverse effects on the mental and emotional health of users. As a result, a common social media paradigm is the self-engineering of social media feeds, where users tend to create multiple social media accounts just to view different types of content at times of their choosing.

To overcome this workaround, we decide to implement feed re-engineering directly into a single social media feed, as a layer on top of existing social media platforms such as Facebook. This solution allows users to filter a list of pre-defined social media topics, create custom topics and adjust the times they want these topics to be filtered out of their feeds. Essentially, our solution fights the inherent feed algorithm and allows users a greater amount of control over the content they see.

3 Need-finding

3.1 Initial Domain of Interest

The initial domain of interest was the **relationship between one's mental well-being, feelings, and general productivity and daily social media usage** among young adults.

Social media has quickly become an **integral part of our daily lives** and it seems like this change is going to continue. When many of our human basic needs transform to online environments such as social media, the focus on how that affects our mental state has increased in recent years.

As we ourselves belong to the target group, we're interested in finding other people's opinions on the topic and how social media affects their mental wellbeing and productivity. The goal for us is to analyse and comprehend other people's insights and hopefully design and implement an application that corresponds to the user needs that we present in this document.

At this point, our area of interest was broad, as we did not fully understand the concept of digital wellbeing.

3.1.1 Digital Wellbeing Beyond Screen Time

After a discussion with Professor Alberto, we decided to **focus on improving the general experience and address the pain points invoked by social media** rather than hinder/control its use.

With the widespread influence of social platforms, it may be true that a digital **ointment > prevention**.

3.2 First round of interviews

3.2.1 Methodology

The interviews were carried out both online and in person. Virtual ones were through video calls (Google meet), and the only in-person interview was held in Politecnico campus in a friendly and comfortable space. Some interviews had more than one person in the group, to observe and take notes.

1. We introduced ourselves in the beginning, then describe the study we are conducting and why we chose them as a candidate, and then ask for permission of using their interviewed data and some information about them such as their names, occupation and etc. and then start asking questions based on the list we had in a way that they do not feel stressful.
2. We generally kept to the list of questions listed below but we also came up with some follow-up questions on the spot whenever it felt necessary or interesting. We were taking some notes on physical and digital paper.
3. Team members' roles were different in different interviews, sometimes asking questions and sometimes taking notes and mentioning some points that were missing.

3.2.1.1 User Classification:

In our study, we consider:

(a) Normal Users

Someone that is using social media on a daily basis one or more hours a day to either: (i) socialize, (ii) be productive or (iii) simply spend time on apps/tools.

They are considered to be familiar with the platforms they're using. They are chosen to represent your average user (Pew Research reports that 72% of Americans use social media).

(b) Extreme Users

An extreme user as one whose career depends on social media. Their social media use is entirely motivated by a professional need. Posts and content released and viewed must have a direct correlation to some monetary or professional gain. Potential extreme users include:

- Influencer working using Instagram/Facebook/TikTok as their primary source of income
 - Linkedin Recruiters that use the platform to hunt for job candidates.
- They are chosen as extreme users since their **motivation behind social media use is different** from the leisurely incentives that drive regular users.

3.2.1.2 User Profiles

All interviewed users are within the age range 20–25, with 1 extreme user and 3 normal users. Only interviewee (4) is a Politecnico student. Each interviewee is in a different part of the world, lending a global authenticity to the results of our study.

1. Ajunee (20-year-old) – *Extreme user*
 - Location: Kuala Lumpur, Malaysia
 - Uses social media for work
 - Influencer
 - Runner-up to Miss Universe Malaysia 2022
 - Chosen because she is a model and the runner-up for Miss Universe Malaysia 2022. A professional user of Instagram in particular who uses the platform to contact sponsors and get gigs. Since the use of Instagram is part of her job, she is considered an extreme user
2. Ibrahim (21-year-old)
 - Location: Melbourne, Australia
 - Normal user
 - Management student
 - A project management student at Australia and a part-time photographer with a decent Instagram following. An active user of Instagram, Reddit and Twitter by his own admission for its' social and political elements, considered a regular user.
3. Måns (25-year-old)
 - Location: Stockholm, Sweden
 - Normal user
 - Economics student
 - Måns was chosen since he's a regular user and someone that we know are good at expressing his thoughts during an interview. He mainly using social media for pleasure and social reasons.
4. Teresa (25-year-old)
 - Location: Torino, Italy
 - Normal user
 - Engineering student
 - Chosen because she is a Polito student and she uses TikTok and Instagram for fun. As she is not in the computer science field and does not know anything about its algorithms, she seems to be a normal user that can provide a purely non-technical perspective to the entire social media dilemma.

3.2.1.3 List of questions:

While we have a pre-defined list of questions, we actively depend on follow-up questions to build a more engaged understanding of the interviewee's perspective. For instance, if a user talks about a particular defining social media incident, we drill down.

1. How often do you use social media?
2. Which types of social media do you use? Which apps? Why?
3. Which would you say is the social media platform that you use most frequently?
Follow-up:
 - i. Why do you feel that this is your go-to platform?
4. Have you tried removing/deleting/deactivating social media accounts before?
Follow-up:
 - i. What was the outcome of this effort?
 - ii. Productivity vs. Social Aspect
5. When you have a lot of pending tasks to do, social media helps you procrastinate.
6. How do you feel on the days your social media use is higher than usual?
7. Have you tried "phone off day"?
Follow-up:
 - i. If yes, how was that? If not, have you thought about doing it?
8. What factors do you think affect your general mood?
Follow-up if social media is mentioned:
9. How do you in general feel when you are using social media?
Follow-up:
 - i. Can you give some examples on platforms and how you feel when using them?
10. Do you like spending time on social media? In what way?

11. How would you describe your current general mental well-being?
12. Is there anything you would like to change about your social media usage?
13. Have there been times when social media has either positively or negatively impacted your productivity?

3.2.2 Results:

3.2.2.1 Interview Summaries:

- I. Ajunee:
 - a. Spends a lot of time on social media for work related reasons.
 - b. Can get distracted from doing work on social media by just scrolling on social media.
 - c. Receives many toxic comments, cyberbullying.
 - d. Most wanted feature: Ability to filter out hate comments.
 - e. Spends a lot of time on social media but does not find this to be a problem since it is necessary for her career.
 - f. Uses separate accounts for personal and professional use.
 - g. Started with TikTok for personal use and later switched to Instagram when her professional career took off.
 - h. Pain points in social media do exist, but not drastic enough to hinder her use.
 - i. Relates that models such as herself have to focus on growing their Instagram followings to obtain modeling gigs.

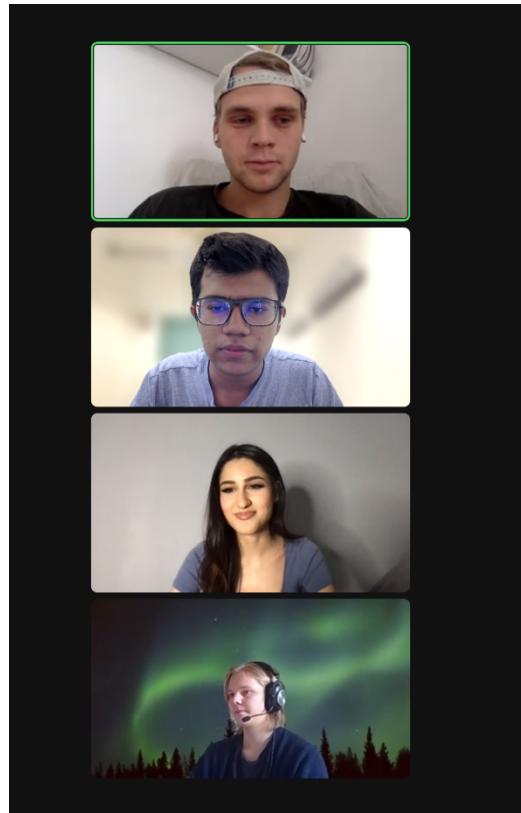


Figure 1 Interview with Ajunee

II. Måns

- a. When using social media, a lot, he feels both less productive and less relaxed.
- b. Likes being able to keep up with friends but does not feel that you get anything from just scrolling.
- c. Feels like “on autopilot” when scrolling.
- d. Wants to use it less especially in the evenings, to improve sleep.
- e. Wants apps to bring back chronological feeds instead of suggested content. Thinks the suggested content is often irrelevant.

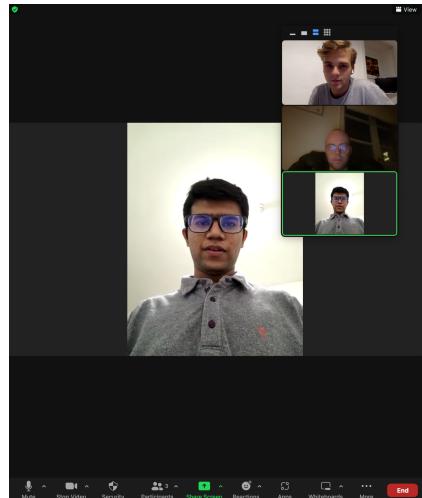


Figure 2 Interview with Måns

III. Ibrahim

- a. Tried to stop using social media (described as a “good break”) but found it problematic because of the resulting lack of connection to family and friends.
- b. Feels bad/guilty when using it too much, such as endlessly scrolling on TikTok.
- c. The constant flow of world news is stressful. Does not like waking up in the morning and immediately be greeted by negative news on apps like Twitter.
- d. Wants to be able to customize or filter out stressful content.
- e. Suggests being able to automatically lock an app after scrolling for too long.



Figure 3 Interview with Ibrahim

IV. Teresa

- a. Has experience with deleting social media before.
- b. Use some other applications (Forest) for preventing overuse of social media apps such as TikTok and Instagram.
- c. Wanted to stop sometimes using social media to focus on herself (both private life and career).
- d. When gets sad about something, social media is a good way for her to ignore or forget the reason for her sadness.
- e. Some apps such as TikTok have algorithms which she could not stop scrolling.
- f. Wanted to have more control over the time of using social media and stop scrolling.

3.2.2.2 Key quotes:

We collate key quotes from the fundamental pain points of social media.

- **Pain Points**

I like being able to customize what I see on my social feed. I don't want random news shoved at me (Twitter)

- **Frequency of Use**

"Social media is 50% of my job."

- **Screen Time**

"I check my screen time and of course, I feel bad if I haven't been productive that day."

- **Recommendation Algorithm**

"It is strange that TikTok knows exactly what I want, and it makes stop scrolling difficult."

- **Screen Time**

- "My screen time doesn't affect my mood, as using Instagram is part of my job. Likes on my posts affect my mood more."

- "I don't think I spend too much time on social media. But I feel like a lot of the time I spend is only because of old habits."

- **Pain Points**

"I want to see a version of the Instagram feed with only posts from close friends. Like an extension of close friends, as "close friends feed".

- **Productivity**

"Social media helps you procrastinate when you have a lot of things to do and check your phone many times. It's easy to just pick up your phone and get a quick stimulus."

- **Chronological vs Intelligently Organized Feed**

"The chronological feed makes your feed only about the things you chose to follow, but at the same time it reduces the quality of the content so it's not really worth it for me."

- **Phone-off day**

"Difficult. Thought about the phone a lot during the phone off-day and that I was missing out on a lot of stuff during that time. When I turned the phone on again nothing had happened"

- **Screen Time**

"Days when my screen time is higher than normal, I don't really feel anything. More tired without having achieved anything. Mostly days when I'm bored, I don't think these days are good for your mental state."

- **Blocking Notifications**

"Yes, but that made it worse because you pick your phone up even more times to try find notifications and then you start thinking of notifications a lot instead"

3.2.2.3 Notable Finding

We find direct contradictory evidence in our extreme user's interview, where no relationship could be drawn between screen time and productivity. Ajunee mentioned in her interview that using social media is 50% of her modelling job and her presence on the platform has an impact on whether she gets gigs. Hence, if she spends a lot of time on Instagram, she mentions that she is achieving either a short-term (making a post, increasing her following) or long-term (growing her influence/popularity).

We can infer from here that screen time may have no relationship with productivity for **professional users of Instagram**. Digital wellbeing needs to move beyond just

screen time.

3.2.2.4 General Finding

Before the interviews, we primarily took a broad emotional and productivity perspective. We were also under the impression that screen time has a direct correlation to productivity, and users that use the platform less or actively try to block it out would have a much more positive experience.

However, from the interviews, we found that active initiatives taken to block out social media often did not have successful outcomes; 3 of 4 users tried the “phone-off” day initiative and all had to abandon it during the day because of either a social or professional reason. A key point that kept recurring was the impact of content seen and ingested on one’s wellbeing; this seemed to be far more impactful than the time spent on the platform. Consequently, interviewees related that the “infinite scroll” on social media feeds and the post recommendation algorithm kept them on the platform for longer than they expected.

Since the content recommended and subsequently ingested has direct connotations to screen time, some users take matters into their own hands and create multiple social media accounts to more closely control the content shown on their feeds. By only viewing a specific type of content, they ensure that they will not get carried away while scrolling.

As users are not interested in actively limiting their screen time, we decide to focus on the one fundamental element that defines their social media experience: content. If what one sees on social media is aligned to one’s expectations, we believe that we can address both the screen time and content unpredictability dilemma.

3.3 Initial synthesis

3.3.1 List of initial needs mentioned

The user needs:

- a. To see fewer irrelevant/uninteresting posts

Interviewees reported being victims of the social media recommendation algorithm, that churns out an endless amount of content to keep the user on the platform.

- b. To see the desired content at the right times

Interviewees often create multiple accounts and switch between them to change the types of content they see. This goes beyond simple spam accounts, to the extent of creating one account for political affairs and another for friends and family.

- c. To avoid procrastination.

Without doubt, the interviews were testament to the procrastinating factor of social media platforms.

- d. To increase productivity without going out of one's way to control/limit social media use

Interviewees reported unsuccessful attempts to actively block out social media use in an increasingly digital world, so the average user wants the best parts of social media without its adverse components.

- e. To avoid toxic comments and content

Our extreme user reported a vast amount of toxic content on her social media feed, that has a direct, ongoing impact on her mental and emotional health.

3.3.2 Most important user needs:

- a. See the desired content from the right accounts at good time.
- b. Avoid procrastination
- c. To increase productivity without going out of one's way to control/limit social media use

Reasons:

These needs are chosen because they are close to the status quo, such that the user still stays on the social media platform, but simply expects to have a more positive and efficient experience. As mentioned earlier, we realise that hindering use is not effective and a fundamental user wants to instead improve their experience while on these platforms, by tackling typical pain points like scrolling/ingested

content. For instance, a user that scrolls less will naturally spend less time on the platform.

3.3.3 Most Focused Domain of interest

From these interviews, we decided to shift our domain of interest to focus on productivity, and specifically being productive while not cutting off social media completely.

This was because our interviewees expressed that they do enjoy using social media but that sometimes it can distract them too much which leads to wasted time. (User needs b, c)

Furthermore, some of them said that they still want/need to use social media in their work, but that they dislike being distracted by aspects of it that are unproductive. (User needs a, b, c)

3.4 Second round of interviews

3.4.1 Methodology

For the second round of interviews, we basically used the exact same procedure as before but with new questions based on the new domain of interest. The interviews were carried out online.

We conduct one contextual inquiry and one normal interview, both particularly focused on social media content, scrolling and distractions. In the contextual inquiry, we ask the participant to take out their phone and walk through a typical day of use, asking questions as they bring up different elements.

3.4.2 Interviewees

Advait (21-year-old)- Contextual Inquiry

- Recent CS Graduate
- Chosen because this user has 2 Instagram and 3 Twitter accounts but is **not a professional user**
- Walked through "a day of social media use" and which app you open at what time.

- Then focused specifically on the types of content he likes to see at different times of day, and questions were asked relating to how he feels when he comes across certain types of content.

Vedad (23-year-old)

- Uses social media about 2 hours a day (5-6 h) if you count YouTube).
- Not a professional user.

3.4.2.1 List of questions:

General Questions

1. How do you decide to stop scrolling?
2. What's your goal when you open an app that has a Feed?
3. What do you like about the apps that you use?
4. What do you dislike about the apps that you use?
5. How much time do you spend on social media?
6. What would you change on the interface of your app to improve your overall experience?
7. When you're using something, what do you dislike about it? Pet peeve?
8. Is there anything you think could improve it?
9. Do you feel like you're wasting time? If so, what could improve that?
10. When do you feel productive/unproductive?
11. How does being productive affect your average mood?
12. Does social media affect your productivity? If so, how?

Productivity

1. When do you feel productive/unproductive?
2. How does being productive affect your average mood?
3. Does social media affect your productivity? If so, how?

Contextual Inquiry Questions

Take me through a day of social media use:

1. What do you open first?
2. What do you see?
3. How do you feel when you see (x) and (y)?
4. What would you like to see instead?
5. When do you close the app? Why did you choose to close it at this time?

3.4.3 Results

3.4.3.1 Contextual Inquiry

From the contextual inquiry, the user already had multiple Twitter and Instagram accounts. One to read about world news, one to follow friends and family. When asked why, a clean feed was mentioned.

When opening the personal account and seeing a news article, he won't open it because he's not there for that purpose.

When opening the "news" account, will deeply engage with worldly content/disturbing news.

Basically, he's already fighting the algorithm by using different accounts to separate his time. Now why is it necessary that he takes the effort to register for multiple accounts? Why can't he better organize the content on a single account?

3.4.3.2 Key Points and Corresponding Synthesis

"I probably won't ever stop using the app. I tried to leave it but had to come back. I felt left out"

Both interviewees tried to deactivate or leave, but eventually came back for different reasons:

- Left out from world news
- Needed to pass time (for fun)

"I don't want to not use it, but I also want to use it less"

"I hate the algorithms: too much nonsense, I don't want to see this."

Being bombarded with different content is not helping the mental health of any of the interviewed users. Some make the effort to organize the content themselves using multiple accounts, others just complain about it.

"Social media makes you lose focus, it's more fun than doing work"

3.5 Synthesis

3.5.1 List of brainstormed user needs:

1. Decrease amount of time spent on app / social media feed
2. Stay happy when scrolling

3. Need to stay productive
4. Stay connected with friends/family
5. Stay connected with world without spending too much time on the platform
6. Show less useless/soulless irrelevant (not enjoyable) content
7. Better/moderated communities on the platforms.
8. Choose what they want to see
9. See less repetitive content
10. Limit times when getting distracted, to improve productivity

3.5.2 Deep user needs:

1. Limit time spent on the app

No-brainer, everyone mentioned this and wasn't surprising when compared to our original hypothesis

2. Stay happy when scrolling

Scrolling through feeds invokes "a rollercoaster of emotions" besides just consuming time. Users are bombarded with very diverse content that isn't always to their liking.

3. Stay productive outside of social media usage

Almost all interviewees had some social/professional use for social media so none considered use to be a complete waste of time. However, all admitted that it starts to feel unproductive after "it goes too far"

4. Stay connected with friends/family

Cannot cut out social media completely as it serves so many positive social needs.

3.6 Solutions

3.6.1 List of solutions and the ideation process

1. Limit time spent on app / social media feed
 - a. Add time limit
 - b. Make it easier to stop scrolling
 - c. Add reminders
 - d. Gamify it. Earn points by limiting social media usage
 - e. Limited content
 - f. *Most of the ideas are cliched and come from existing implemented apps that are typical in the human computer interaction and digital wellbeing domains.*
2. Stay happy when scrolling
 - a. Able to customize their own social media feed

- b. Needs to be able to limit feeds to only close friends/family
 - c. Need to be shown more relevant posts, and less irrelevant posts
 - d. Limit toxic comments
 - e. Sort posts into topics using NLP and adjust topics shown based on time of day
 - f. Ability to find like-minded communities
 - g. Removing Ads
 - h. Changing page style
 - i. *Ideas all relate to re-engineering the feed*
3. Need to stay productive
- a. Customize nature and frequency of notifications
 - b. Filter out unproductive/irrelevant stuff (for professional usage of social media)
 - c. Use gamification
 - d. Track and organize short-term and long-term goals digitally
 - e. More time management settings
4. Stay connected with friends/family
- a. Prioritize posts made by friends and family
 - b. Having different feeds with same account
 - c. Automatically suggest physical meetings with friends/family

3.6.2 The Top Solution

Re-engineering your feed

Stay happy when scrolling – solution 1, 2, 4. Organize content in social media feeds into topics and interact with content from different topics at different times of the day. This solves the following needs:

- Stay happy when scrolling– Not bombarded with content that is too diverse. Allows users to choose what they want to see, without having to create multiple accounts.
- Stay productive– When you limit what you can see, you don't spend too much time scrolling, which in turn improves your productivity.
- Stay connected– If you just need to see content from friends and family, you can choose to do exactly that without being bombarded/interrupted

Value Proposition

See only what you want to see and nothing more

How we chose this solution

Based on what we have discussed with our interviewers and their needs, we came to the conclusion that limiting users' spent time on social media is not a good idea, but we can limit what they want to see. In this way they are not under the control and oversight of social media algorithms, and they have the possibility to customise it based on their personal preferences.

When looking over the solutions from the brainstorming session, we found that the solutions 1 2 and 4 listed under "stay happy when scrolling" can be collectively achieved with this solution.

4 Tasks and Storyboard

4.1 List of the Tasks

Tasks:

1. Simple task: "*Filter content on your social media feed.*" This is the main purpose of the solution idea. The point is to filter out content on social media that is either uninteresting or causes procrastination.
2. Moderate task: "*Choose different filter topics for different times of the day*" Users may want to filter out topics that distract them during work hours but that they still want to see in their free time.
3. Complex: "*Manually personalize filtering into custom topics/categories.*". Users might want to group together topics to filter out at the same time without having to enable/disable them one by one. They also might want to create new topics to filter that are not listed by the developers.

Reason

We chose these three tasks because we think they cover the most basic and important core of this solution in three levels of difficulties for performing.

4.2 Storyboard

The initial version (rough photograph) of the storyboard is shown below:

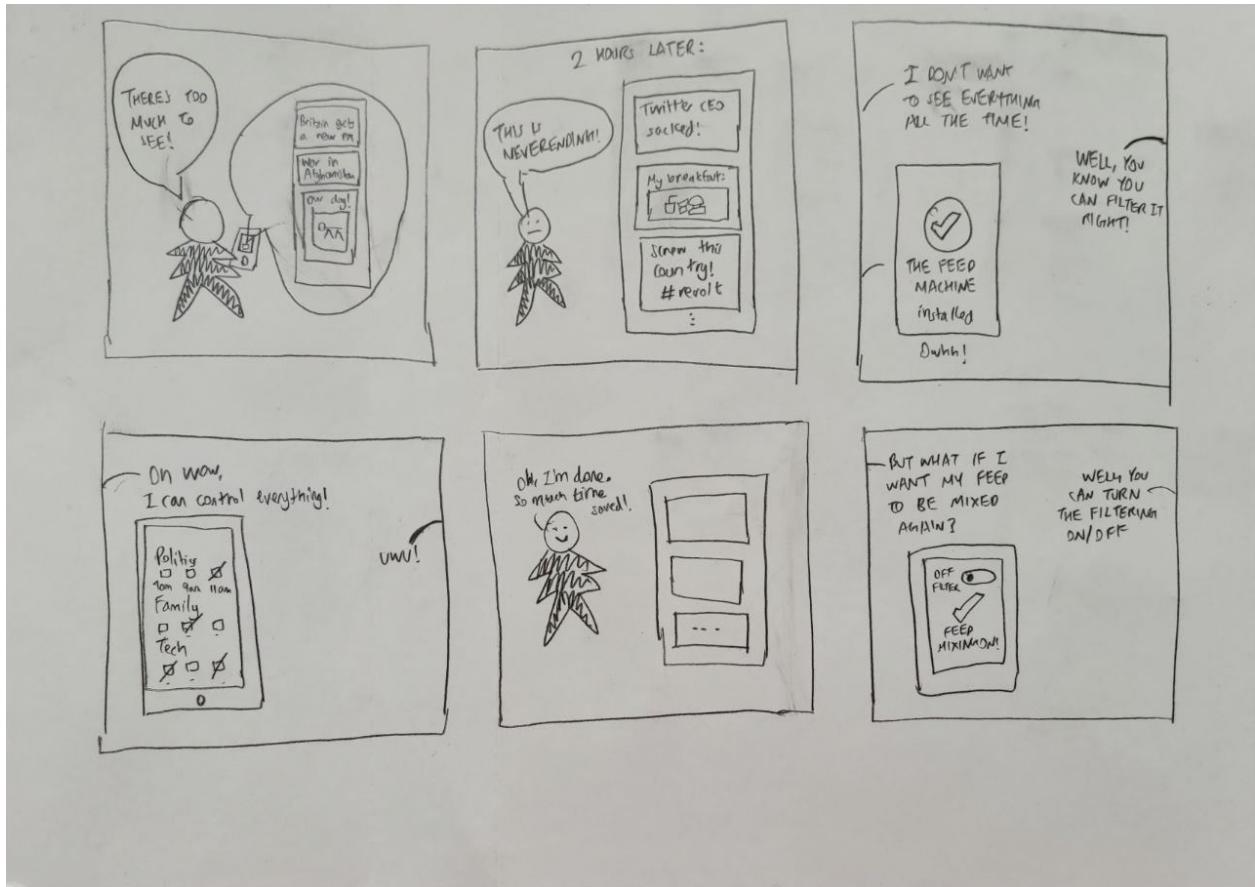


Figure 4 Rough draft of the storyboard

The professor's feedback:

"Yes, the storyboard is reasonable, although some sketches show a too detailed view of the application, in my opinion (see the fourth one). An alternative here could be the user with the smartphone in his hand saying "wow, I can now personalize what I want to see in the feed". Also, remember that the storyboard should represent at least 2 of the 3 tasks that you defined."

Final Version of the Storyboard



Figure 5 Storyboard drawn by hand

The storyboard shows users completing our 3 tasks. For the first task we can see the user being annoyed about the number of irrelevant/uninteresting posts on their feed. The user realizes they can use the app to filter out all the uninteresting content. In the following, the situation is extended to sometime during the day and shows the need of the user to apply the topic filters at different times of the day. This explains the process of the moderate task and shows the potential value it can have. Finally, the user is experiencing our complex task by finding out that he can customize the filters to his liking. He can group together topics and customize them in order to have more control over the filtering.

5 Low-fidelity Prototype

5.1 Modalities exploration

Our two alternatives were a mobile-based app and a desktop browser extension. In both cases, we have some features to cover the three main tasks mentioned. The difference is mostly because of the platform users use for exploring social media. Since the mobile modality is extensive, we prepare 2 separate versions and merge the best parts.

5.2 Paper prototypes

1. Desktop browser extension:
 - a. A browser extension that modifies the browsing experience
 - b. Can be used to affect all types of different websites
 - c. Shows current filters
 - d. Allows users to customize filters based on time of day and day of the week.
 - e. Allows creation of new filters by combining other filters

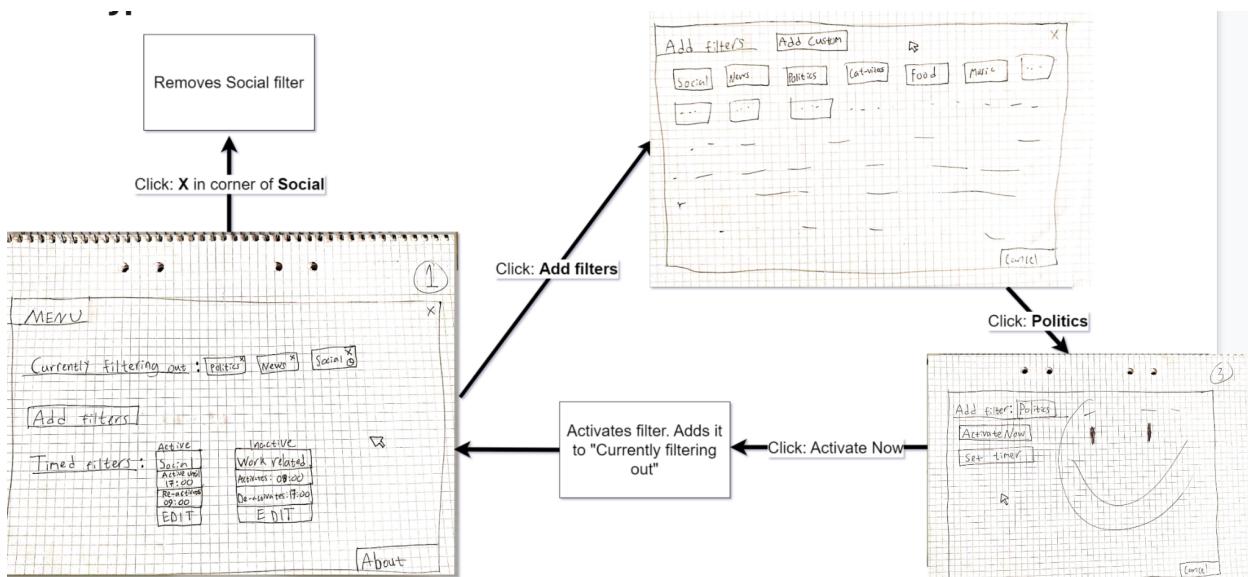


Figure 6 Simple task: Filter content

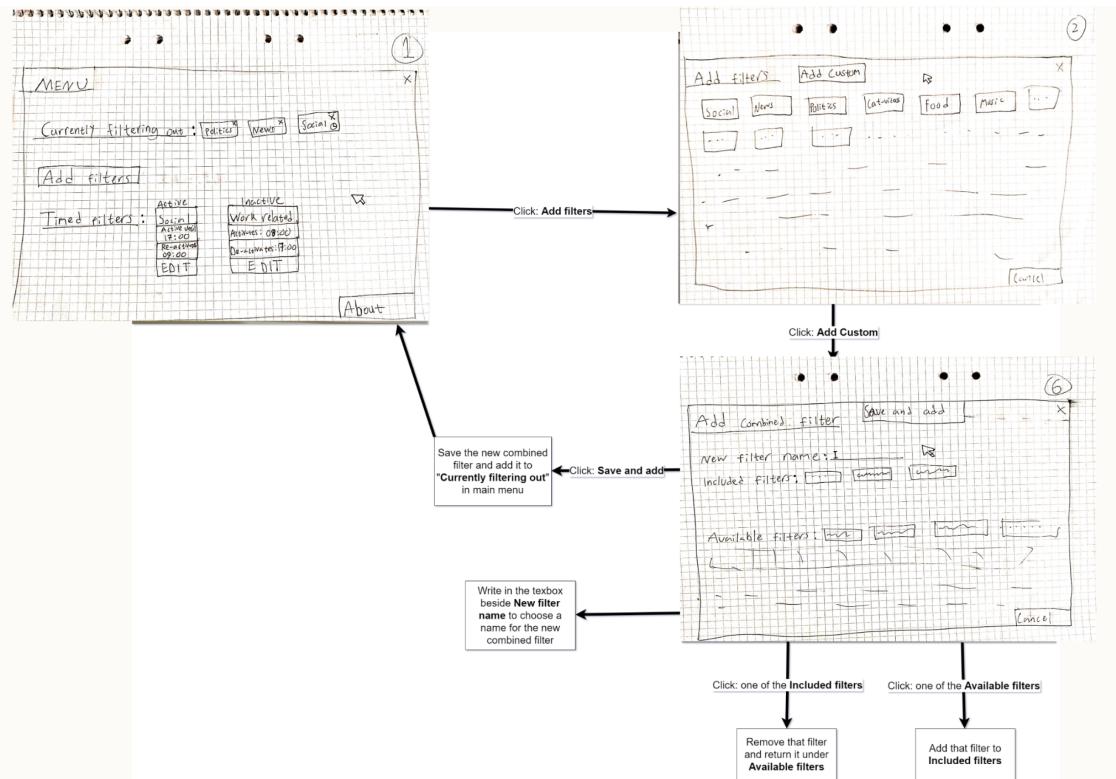


Figure 7 Complex task: Create custom filter

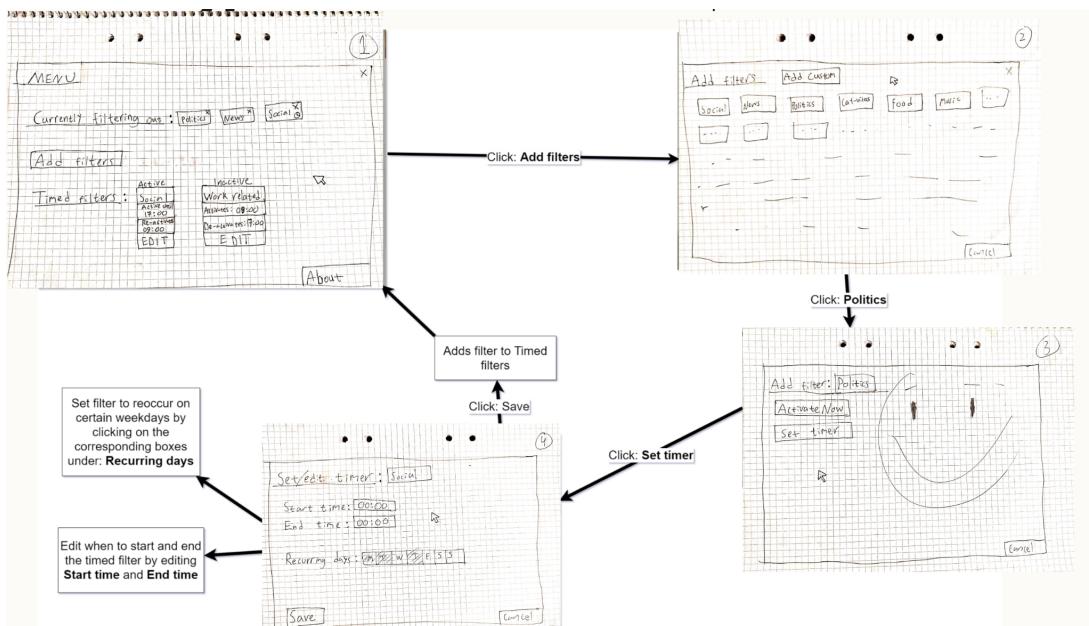


Figure 8 Moderate task: Choose different topics for different times a day

2. Mobile prototype #1:

- This version of the prototypes covers the primary gist of feed filtering, profile statistics and the building of custom topics for feed filtering.
- However, we find that the “add topic” screen may not be very intuitive in this version of the prototype.

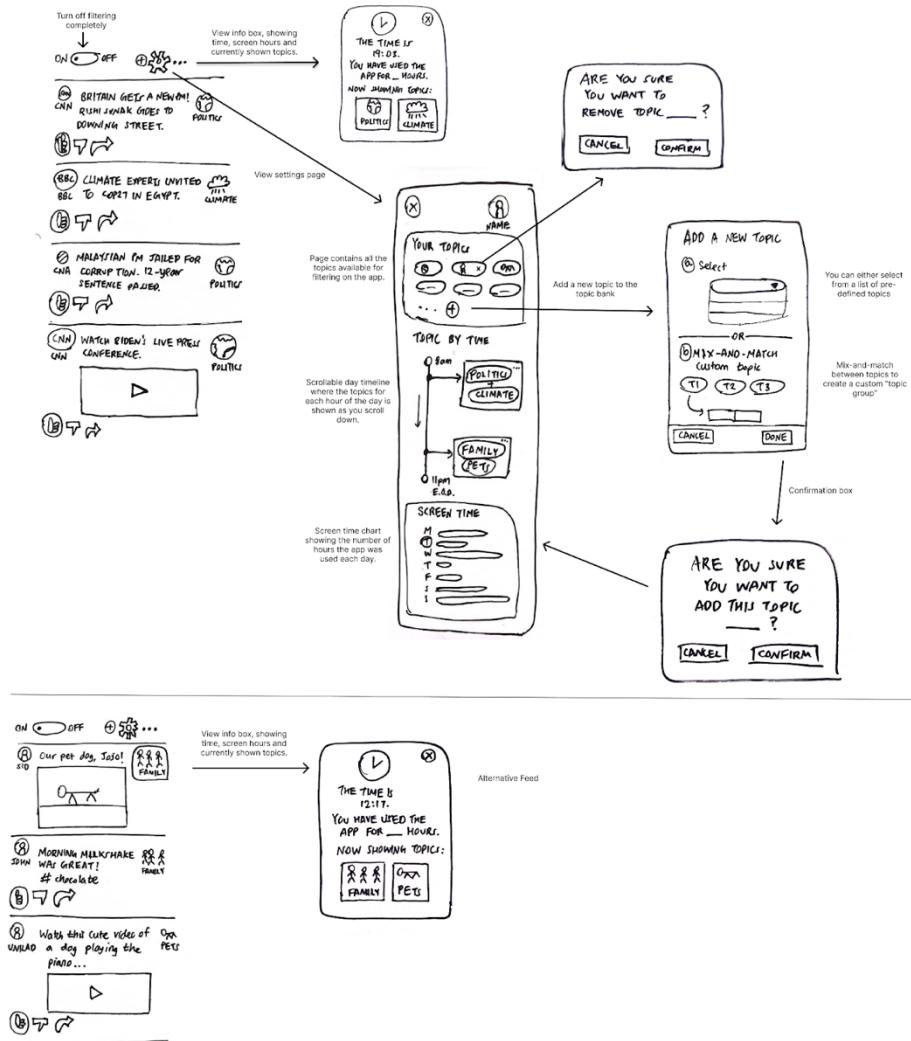


Figure 9 Mobile Prototype #1

3. Mobile Prototype #2

- a. The file version of this Prototype can be viewed with Draw.io website by uploading this file: [FileLink](#).

- b. Task #1 easily can be achieved with one button. Moderate and complex tasks contain more attention by choosing the topics, opening a dialog and filling in the fields. But mostly it was handled with basic UI components that user is familiar with in mobile phone environment.
- c. Here are two screenshots of the low-level Prototype with the flow between pages. All three tasks can be done by following the description in the flow. For example, for the simple task, by clicking filter icon in the main page it transfers user to filter page where you can easily turn on/off the filter feature by a toggle. Second, tasks can be achieved by clicking the timing button and selecting days and times for all topics or even for a specific topic. By clicking “your new topic”, you will be able to enter data related to a custom topic you want to create in complex task.
- d. When comparing mobile prototypes #1 and #2, we find that the filtering page on #2 is slightly more intuitive for the average user. Otherwise, the differences are minimal. We augment prototype #2 with the profile statistics page to bring it to completion.

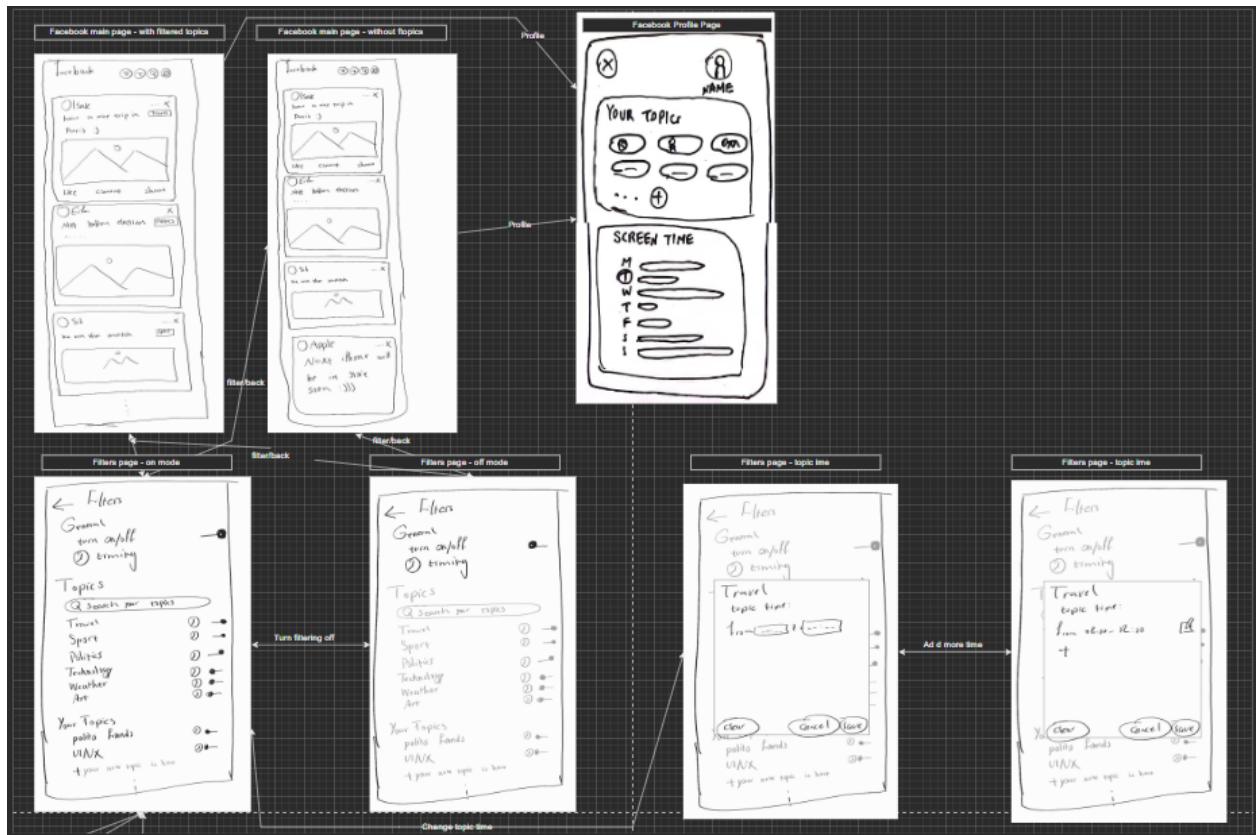


Figure 10 Designs that covers task #1 and some parts of task #2

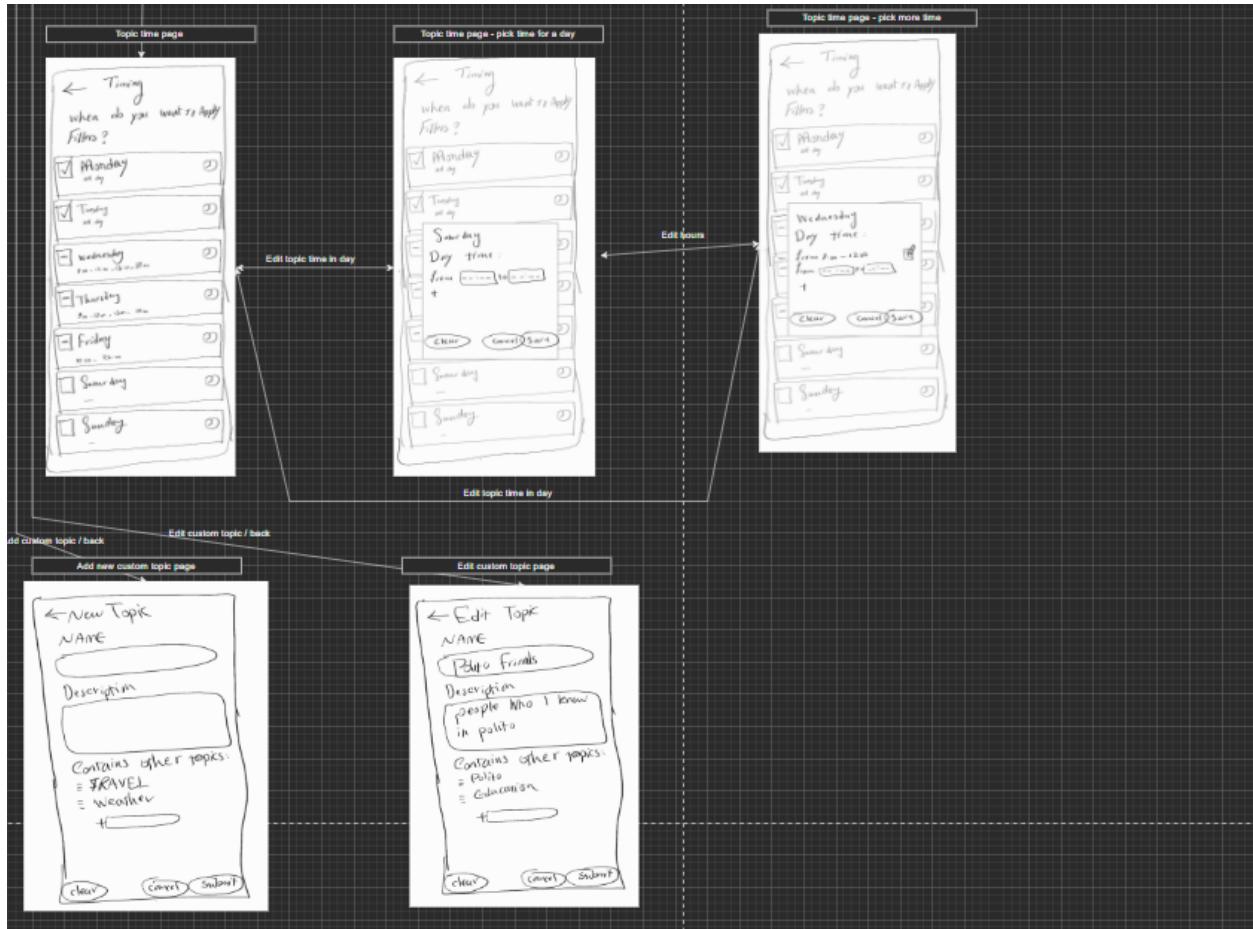


Figure 11 Designs that covers task #2 and #3

5.3 Selection rationale

List of pros/cons for each Prototype

1. Desktop browser extensions:

a. Pros:

- i. Limited UI content, so faster to implement
- ii. Easy to program for desktop format

b. Cons:

- i. Can only be accessed through desktop.
- ii. User's primarily use social media through mobile (as found in the interviews)

2. Mobile Prototype #1

a. Pros:

- i. The mobile modality is more frequently used by typical social media users

- ii. Homepage has an extensive, modern design
 - iii. UI is richer and more compact than others (multiple tasks can be achieved on a single screen)
- b. Cons:
- i. A bit difficult for a developer to interpret directly
 - ii. Complex tasks like custom drag-and-drop topics harder to implement in this modality. Its use was not directly comprehensible.
3. Mobile application:
- a. Pros:
- i. Simple and more straightforward UI
 - ii. Highly similar to #1 but each screen achieves fewer goals/tasks, making the app generally easier to understand
- b. Cons:
- i. Lacks essential screens such as profile statistics, drawings are also subpar

Final selected Prototype

In the end, we decided to go with prototype #3 in the mobile modality. Simply put, our target users are using apps mostly on mobile phones and outside of home/office and not the desktop version. The infinite scroll problem is also only primarily prevalent on mobile.

We incorporate thought-provoking elements from #1 and #2 into #3, such as the current time popup from #1 and profile statistics from #2. All realised changes are reflected in the high-resolution draw.io graphic linked above.

6 Medium-fidelity Prototype

We used Figma for creating mid-level Prototype, each of us started creating mid-level designs based on the refined output of low-level Prototype, and then we start merging to have the best way we can implement. We used some free pre-existing elements such as Timer picker, icons and etc from Material Design repo on Figma. It is more interactive, as we can implement the flow between pages, user can navigate between different screens, elements are positioned well and it is not like drawing with hand. Below, we select only the crucial screens. The full prototype can be found here: [Feed Machine Medium Fidelity – Figma](#).

Facebook

Elon Musk 7h Tesla team just completed a 500 mile drive with a Tesla Semi weighing in at 81,000 lbs!

CNN 7h American President Joe Biden announces universal Medicaid from the steps of the White house.

BBC 5h Britain gets a new Prime Minister. Rishi Sunak heads to Downing Street to meet King Charles.

Alex Sharma 8h Alex Sharma gives speech at COP27 summit in Egypt about constructive climate policy.

Filters

General Settings

Status

Timing

Topics

Search Topics

Sports	<input checked="" type="checkbox"/>
War	<input checked="" type="checkbox"/>
Politics	<input checked="" type="checkbox"/>
Weather	<input checked="" type="checkbox"/>
Tech	<input checked="" type="checkbox"/>

Custom topics

Global Affairs	<input checked="" type="checkbox"/>
Friends & Family	<input checked="" type="checkbox"/>

+ Add a custom topic

Figure 12 Main page: Facebook feed. Includes posts to be filtered, and buttons to access the rest of the features.

Figure 13 Filter settings page. From here the user can turn filtering on and off, add new filters, access the setting for changing their timing, and access the page for editing and creating custom filters.

Create Topic

Name

Christmas Travel

Description

Some description about your custom filter. Custom filters are either single topics or groups of existing topics. For instance, you could have a Christmas filter that includes the topics: "Travel", "Weather" and "Hotels".

Choose sub-topics:

Travel

Weather

Hotel

Search Topics

Flights

Cooking

Home Development

Memes

Programming

CREATE

Figure 14 "Create topic" page. Here the user can create a new topic by combining existing ones as well as giving it a new name and adding a description. Very similar to the "Edit topic" page.

Your Profile

Hi Sidharrth!

Check out your usage over the week and the topics you're filtering.

Your Topics

Screen Time

How much time did you spend on the platform each day this week?

23/11	5h
24/11	3h
25/11	4h
26/11	2h
27/11	3h
28/11	5h
29/11	3h

Topic Distribution

What kind of topics appeared on your feed this week?

Figure 15 Profile page to view and understand usage statistics

General Timing

When do you want to apply filtering to your feed?

You can choose when feed filtering should be applied on each day. This is the default filtering time for all topic filters and will be used unless overridden by custom topic filters.

<input type="checkbox"/>	Monday	
	Partially	
<input checked="" type="checkbox"/>	Tuesday	
	Full day	
<input type="checkbox"/>	Wednesday	
	Partially	
<input checked="" type="checkbox"/>	Thursday	
	Full day	
<input checked="" type="checkbox"/>	Friday	
	Full day	
<input type="checkbox"/>	Saturday	
	no filter	
<input type="checkbox"/>	Sunday	
	no filter	

Figure 16 General Timing

Build Filter

A filter can either be a single topic or a combination of topics. For instance, you can create called "Global Affairs" that includes "Politics" and "Climate".

Name

Christmas Travel

Description

Some description about your custom filter. Custom filters are either single topics or groups of existing topics. For instance, you could have a Christmas filter that includes the topics: "Travel", "Weather" and "Hotels".

Choose sub-topics:

Travel	
Weather	
Hotel	
Search Topics	
Flights	
Cooking	
Home Development	
Memes	
Programming	

Figure 17 Build Topic

7 Heuristic Evaluation

7.1 Received Heuristic Evaluation

We received feedback in this [link](#). Somehow more than half of the feedbacks were related to limitations of mid-level Prototype such as real data and functioning well, so, we discarded these feedbacks.

7.2 Heuristic Violations with Severity level 3 and 4

1. **H4: Consistency and standards** /Found by: E1

Where: "Timing" screen

What: Days checkboxes are not working

Why: Not able to activate or deactivate an entire day

Severity: 4

Our decision: We reject this because it is just a mid-fi prototype. The checkboxes will be working in the final Prototype

2. **H7: Flexibility and efficiency of use** / Found by: E2

Where: "Filters" screen

What: There is a clock icon to set the filter time next to each topic filter, but it doesn't contain the day of the week, while there is a timing label that is alone not related to specific topic where there is an option to select the day of the week and set time intervals.

Why: It is not clear where to set the time for the filters, near each filter or in the alone timing option, and do they overlap, or they are separated?

Severity: 4

Our decision: We agreed, and we changed the clock icons.

3. **H3: User control and freedom** /Found by: E1

Where: "Edit Topic" screen

What: Back button is not working, the only way to exit the page is through editing and confirming the edit

Why: Be able to navigate freely, in this situation he is obligated to confirm a modification just to go back

Severity: 4

Our decision: We reject this because it is just a mid-fi prototype. The button will be working in the final Prototype

4. **H1: Visibility of system status** / Found by: E4

Where: Personal profile page, Task 3

What: When I add a new topic to my profile, it is unable to go back to personal profile page and not show feedback message to let users know whether add topic success or not.

Why: It is important to provide a back to personal profile page and provide feedback message to let users know add topic is successful or fail.

Severity: 4

Our decision: We agreed, and we added a confirmation dialog.

5. **H3: User control and freedom** / Found by: E4

Where: Filters page, Task 3

What: When I click “edit topic” button, doesn’t provide save and cancel this edit button

Why: It is unable to save this new modification or go back to the previous defined.

Severity: 4

Our decision: We reject this because it is just a mid-fi prototype. The function will be working in the final Prototype

6. **H3: User control and freedom** / Found by: E1, E2

Where: “Your profile” screen

What: When in “Your profile” screen, user can create topic from the “Your topics” section, but after going there if the user clicks on the back button it goes to the “Filters” screen. Not to the previous screen which is “Your Profile”.

Why: The user doesn’t have the freedom to navigate back to the previous screen.

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype. It will be working in the final Prototype as it is fully interactive.

7. **H3: User control and freedom** / Found by: E1, E2

Where: “Your profile” screen

What: In “Your topics” Section, some topics open a descriptive cards, while

others behave like the container and goes to the filter page, and from there going back goes to the home page .

Why: The user doesn't have the freedom to navigate back to the previous screen, and confusion between what clicking on topics do.

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype. It will be working in the final Prototype as it is fully interactive.

8. **H5: Error prevention** / Found by: E1, E2, E4

Where: "Create topic" screen

What: If the user selects options to create a new custom topic, and miss click on the back button, it goes directly to the previous screen and there is no confirmation message to save or discard current modification.

Why: No error prevention on miss clicks which is common on touch devices.

Severity: 3

Our decision: We agreed, and we added a confirmation dialog before going back.

9. **H7: Flexibility and efficiency of use** /Found by: E1

Where: "Filters" screen

What: The dropdown in topics shows only on hover, and it is labeled "search"

Why: No need to search among topics since they are listed below, also the dropdown is not the correct way to develop a search functionality.

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype and the dropdown menu will not be fully interactable in this phase.

10. **H1: Consistency and standards** / Found by: E1, E2

Where: "Filters" screen

What: The label of the on/off toggle of the extension is called status.

Why: It is confusing because the term "Status" on social media apps like Facebook refers to another feature of the App. And it also appears on the feed, so toggling this will filter the other users posts about updating status or will activate the filter, it will be clearer if the label is the extension/application name or the word filters.

Severity: 3

Our decision: We agreed, and we changed "status" to "on/off"

11. **H5: Error prevention** / Found by: E1, E2

Where: "Create topic" screen

What: If the user selects adds a topic to the list, it still appears as an option to select again in the same custom topic so the user can select the same topic twice.

Why: It is not clear if this will be treated as an error by the application, the Prototype doesn't show this possibility, but from experience with dealing with other apps selecting the same option twice in such situation will give an error.

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype.

12. **H4: Consistency and standards** / Found by: E1, E2

Where: "Select filter time" screen

What: Clicking on the option to select time, The time is in 12h AM/PM format, while clicking to add another time period, it displays the previous time period in 24h format with no AM/PM shown.

Why: The time format used should be consistent all over the app.

Severity: 3

Our decision: We agreed, and we added "AM/PM" format for selecting time in the time picker across the whole app.

13. **H1: Visibility of system status** /Found by: E1

Where: "Filters" screen

What: No labels on all topic toggles

Why: User should now the current state of the toggle whether if it's enabled/disabled, may be by a labeling or by disabling the item

Severity: 3

Our decision: We agreed because we forgot to show it properly to see it is off or on but in the final Prototype as it is used standard toggle button, it will be obvious.

14. **H1: Visibility of system status** / Found by: E1, E2

Where: "Select filter time" screen

What: Opening the overlay, minutes part of the timer seems to be selected while the user input on clock shows only hours

Why: user cannot differentiate which value is he entering

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype and a fully working interaction version will be in the final Prototype.

15. **H4: Consistency and standards** / Found by: E2

Where: "Your profile" screen

What: Topics shown in Your topics tab is not the same topics selected in the filters, and using different names for the same topic ex: Weather in the filters, Climate in Your topics

Why: Inconsistency in names of topics

Severity: 3

Our decision: We reject this because it is just a mid-fi prototype and we cannot expect to see working functionality.

7.3 Other Heuristic Violations

First, we reviewed all the feedback, and we decided which ones are reasonable in our opinion and then plan to implement. After that we changed our mid-level Prototype on Figma.

List of other violations and our decisions:

16. **H1: Visibility of system status** / Found by: E2

Where: "Select filter time" screen

What: Clicking OK on selected time doesn't apply selected time or give any feedback, just return to the previous screen with no time shown.

Why: No feedback on selecting time, or applying filter on specific time
(Maybe not complete implementation)

Severity: 2 (*Due to thinking it's a missing implementation*)

Our decision: We reject this applying time is a functionality for the application and not just a design thing.

17. **H2: Match between the system and real world** / Found by: E2

Where: Create topic screen

What: The title is using the word create topic, where the actual functionality is merging predefined topics, it is not possible to create a new topic that is not predefined.

Why: The title of the page is miss leading it doesn't match the real world meaning of the sentence create topic.

Severity: 2

Our decision: We changed to "Build".

18. **H3: User control and freedom** / Found By: E1

Where: "Home" screen

What: Clicking anywhere except for some buttons redirects user to "Your Profile" screen, and the page is not scrollable .

Why: User should be able to navigate, like posts and click blank spaces without being navigated forcefully

Severity: 2

Our decision: A problem related to Figma.

19. **H4: Consistency and standards** / Found by: E1

Where: "Add a custom topic" screen

What: Disabled topics from the main topics part can be activated in custom topics

Why: User should be informed about how the filters works in case of confliction between custom and pre-defined filters

Severity: 2

Our decision: Users can choose even disabled topics in "new topic". So, it is not a problem, But we added information to help users how it works in the "build topic" page.

20. **H4: Consistency and standards** / Found by: E1

Where: "Filters" screen

What: All filters can be disabled from timing in general settings, but enabled in a specific topic timing

Why: User should be informed which timer overrides the other.

Severity: 2

Our decision: We reject this because it fades the entire options, but anyway, we implemented and by turning off, hid entire options.

21. **H4: Consistency and standards** /Found by: E1

Where: "Time now" overlay – "Your profile" Screen

What: Some topics are clickable in your profile page; others are not and all topics in time now are not clickable

Why: A topic element behavior should be consistent

Severity: 2

Our decision: We reject this because it is just a mid-fi prototype and it will work in the high-level Prototype.

22. **H4: Consistency and standards** / Found by: E4

Where: Home page timing button and filters page timing button, Task 4

What: In filters page Timing and Home page Timing icon are same, but there are display different functions

Why: Both timing icons are the same, but there are applied different function, which can make confusion.

Severity: 2

Our decision: We changed the icon.

23. **H6: Recognition rather than recall** / Found by: E4

Where: Create a new post page, GENERAL

What: The heart button doesn't understand what it means

Why: The heart button is difficult to know what it adds for the new post

Severity: 2

Our decision: We reject this because it is just a mid-fi prototype.

24. **H8: Aesthetic and minimalist design** /Found by: E1

Where: "Time now" overlay

What: Topics shown now looks like buttons

Why: Button looks should be distinguishable and to not be confused with other clickable elements.

Severity: 1

Our decision: We agreed and at the high level we used standard "Tag" which is distinguishable.

25. H2: Match between system and the real world / Found by: E1, E2

Where: "Filters" screen

What: In both cases when topic filter is enabled or disabled it is possible to click on selecting specific time for the filter and do the steps to select time.

Why: It is expected from previous experience with application that to not be able to modify/customize a disabled element.

Severity: 1

Our decision: We reject this because it is just a mid-fi prototype not a high-level and fully working prototype.

26. H5: Error prevention / Found by: E1

Where: "Select filter time" screen

What: The clock input does not clearly show if the input is "from" or "to"

Why: user can be mistaken and not able to recognize which input did he select

Severity: 1

Our decision: We added the title to the timer picker dialog.

27. H4: Consistency and standards /Found by: E1

Where: "Filters" screen

What: Time editing button is same for the whole application timing and for each topic, but showing different options in both cases

Why: Since buttons have different functionalities, they should have different appearance

Severity: 1

Our decision: We reject this because it is just a mid-fi prototype.

28. H8: Aesthetic and minimalist design /Found by: E1

Where: "Filters" screen

What: The page is not organized enough, not partitioned except for using header text sizes

Why: Not very user friendly, the size difference between some elements is not noticeable

Severity: 1

Our decision: We Agreed, and we fixed the styling in the final Prototype.

29. H2: Match between system and the real world /Found by: E1

Where: Edit Topic screen

What: The button at the bottom says "edit"

Why: A more suitable nomenclature would be "saved"

Severity: 0

Our decision: We changed it to "Save".

8 High-fidelity Prototype

8.1 General Information

For the high-fidelity Prototype, we built a progressive web application (PWA), that is built as a website, but functions as a mobile app in terms of look and feel. Professor Alberto reminded us that the "infinite scroll" problem is mainly prevalent on mobiles, so simulating a mobile interface and putting together a mobile-friendly prototype is important. We choose a PWA on top of a native app for two reasons:

1. **Ease of sharing during testing-** Rather than sharing bulky APKs between testers, a simple URL would suffice.
2. **Development speed-** Developing on the web comes with significantly fewer compatibility obstacles, especially since time is of the essence.

The application is full-stack, with the following technologies and tools applied on each layer:

1. **Frontend-** React.js + Redux.js + Chakra UI

React is the main framework, Redux is used for application state management and persistence (coalescing with cookies), while Chakra UI provides a functional and adaptable set of pre-made components.

We use React as all 3 of us are very comfortable with it, and it is easily adaptable to a progressive mobile format with service workers. Redux is necessary for high-level state management and persistence between screens without over-polluting the React state tree. For instance, if filter settings are changed in one screen, other dependent screens that are not hierarchically

connected must reflect changes. Lastly, Chakra UI provides a distinct look and feel across the application, with the ability to modify CSS directly as component props; this greatly speeds up the implementation of custom designs in rapid prototyping without having to write an extensive amount of CSS.

2. **Backend**- Node.js + Express.js + MongoDB + Mongoose

We first thought that a backend is unnecessary, given the simplicity of the application. However, as Professor Luigi pointed out in the group, the Redux state composition became too complex. The backend is used for CRUD actions with posts and topics, while facilitating expensive computation such as the topic classification of posts.

Node.js and Express are both widely used, and their API-driven outlook makes integration with a React frontend simple. Furthermore, all team members are comfortable with this stack. MongoDB (and the Mongoose wrapper) is used as the database for rapid prototyping without having to worry about a schema. For instance, there were times when new fields were added and removed from the post and topic schema, and MongoDB allowed this to be done without breaking existing application logic.

3. **Natural Language Processing Engine**- FastAPI (Python) + Huggingface Transformers

In the NLP engine, there is a single route that calls inference on a zero-shot classification deep learning model. We chose FastAPI as it's the industry standard for the rapid deployment of ML models and Python is a more natural base for machine learning. Huggingface provides a set of pre-trained models that can be used out-of-the-box with minimal hassle.

8.2 GitHub Repository

All code can be found below, separated into "app", "server" and "nlp". Instructions to run each component can be found in the relevant subdirectory READMEs. Alternatively, all 3 components can be initialized through a simple shell command.

<https://github.com/polito-hci-2022/The-Feed-Machine>

8.3 Architecture and Screens

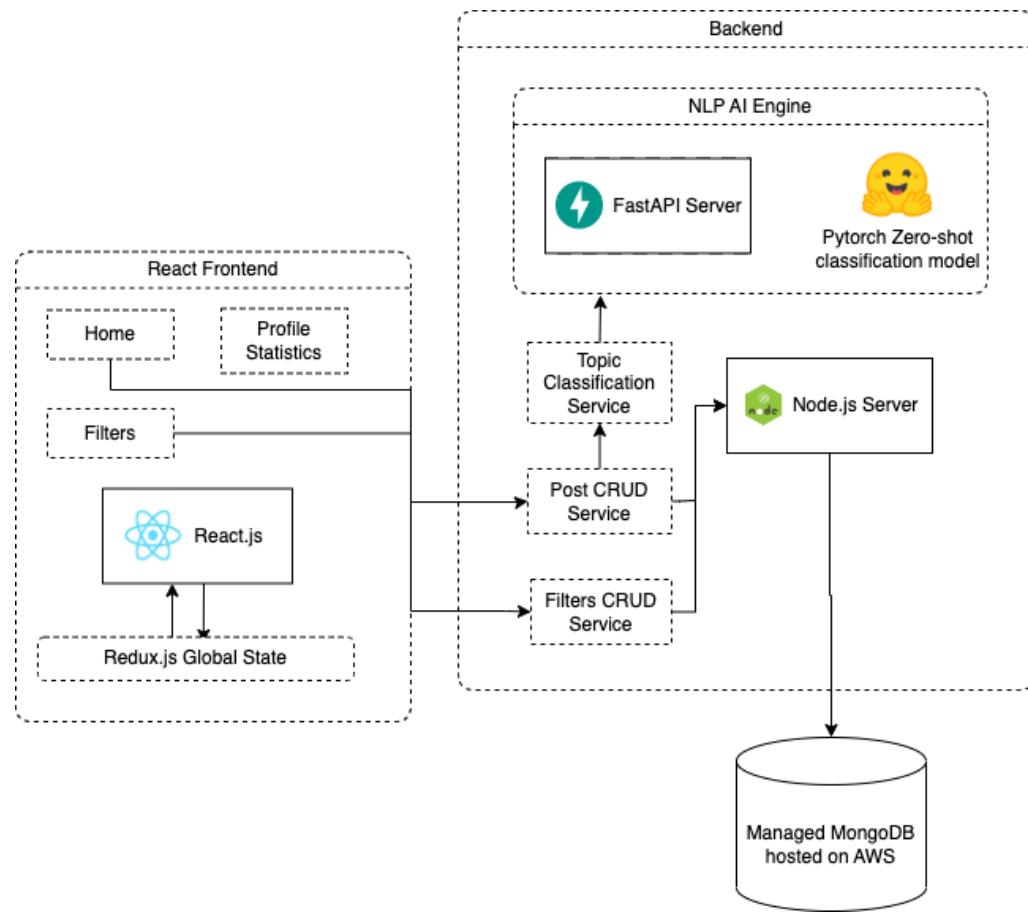


Figure 18 Overall Architecture

The application's architecture is shown above, with the React frontend interacting with the Node.js backend. The backend connects to both the NLP microservice (for topic classification) and a MongoDB database (to persist long-term user data).

8.3.1 Screen Navigation

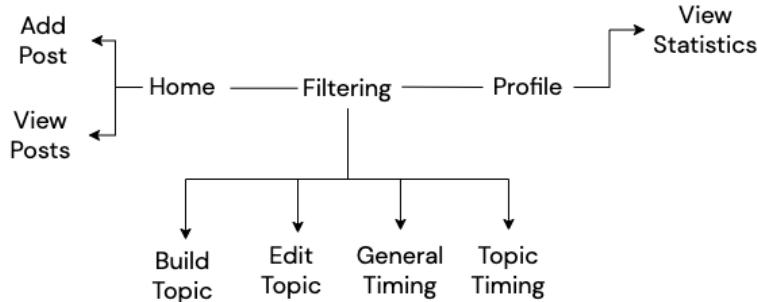
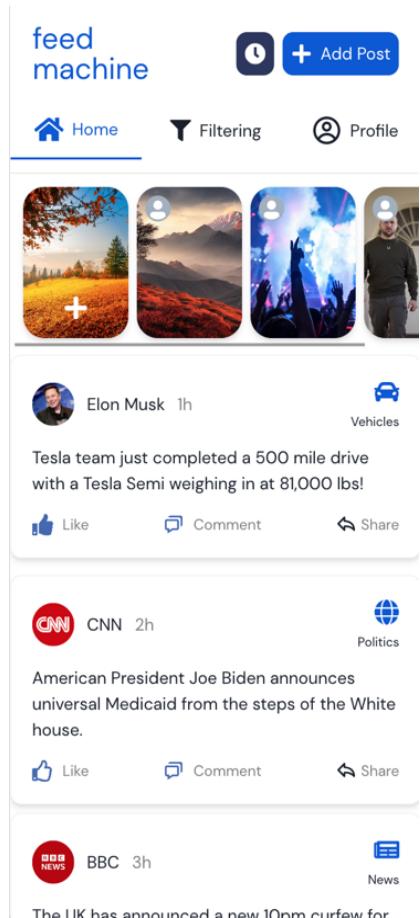


Figure 19 Flow of screens and corresponding functionality

8.3.2 Important Screens

The following are crucial screens that form the crux of the application.



Home Screen (Feed)

The home screen is almost identical to the feed in Facebook, with a few minor changes. It shows a title, navigation bar, hardcoded stories and a list of posts. Vertical scrolling is purposely made infinite to resemble the infinite scroll problem, that was discussed in earlier chapters. Hence, scrolling will simply render an infinite number of posts, much like a regular Facebook or Instagram feed.

Figure 20 Home Screen

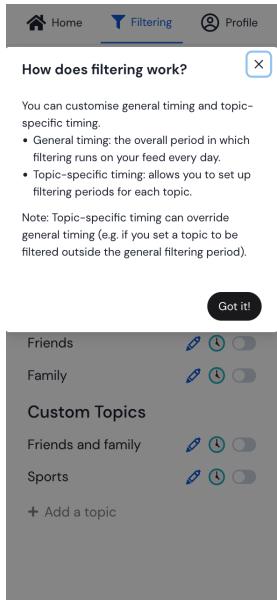


Figure 22 Filtering Information Popup

Filter Screen

Filters
How does this work?

Settings
On/Off

General Timing

Topics

Topic	Action	Status
Politics	edit, clock	On
Climate	edit, clock	On
Friends	edit, clock	On
Family	edit, clock	On
Custom Topics	edit	Off
Friends and family	edit, clock	On
Sports	edit, clock	On
+ Add a topic		

Figure 21 Filtering page

Allows user to toggle feed filtering, go to the general timing page and manually override filters for individual topics and custom topics.

← General Timing

When do you want to apply filtering to your feed?

You can choose when feed filtering should be applied on each day. This is the default filtering time for all topic filters and will be used unless overridden by custom timings for specific topics.

Monday	
Start Time	10:00
End Time	12:00
	trash
Start Time	14:00
End Time	16:00
	trash
+ Add another time set	

Tuesday	
Partial Filtering	

Wednesday	
No Filtering	

General Timing

Adjust general timing sets on each day. General timing is used as the default when topic-specific times are unset/unavailable.

Figure 23 General Timing Screen

← Politics Timing

When do you want to see posts related to this topic?

Monday Partial Filtering

Tuesday Partial Filtering

Start Time 10:00	End Time 12:00	█
Start Time 14:00	End Time 16:00	█
Start Time 18:00	End Time 20:00	█

+ Add another time set

Wednesday No Filtering

Thursday

Figure 24 Topic Timing

← Build Filter

A filter can either be a single topic or a combination of topics. For instance, you can create called "Global Affairs" that includes "Politics" and "Climate".

Filter Name

Filter Description

Choose sub-topic(s)

BUILD

Figure 25 Build Filter

Topic-Specific Timing

The time sets for each topic can be modified, on a per-day basis. The circular progress bar indicates the extent of filtering on a single day.

Build Filter

Create a feed filter by choosing from a preset list of topics or combining topics to create a custom filter.

If a custom filter is called "Global Affairs" and is made up of "Politics" and "Climate", both will be filtered out when the filter is active.

[← Edit Politics](#)

A filter can either be a single topic or a combination of topics. For instance, you can create called "Global Affairs" that includes "Politics" and "Climate".

Filter Name

Politics

Filter Description

Choose sub-topic(s)

 Politics X ▼

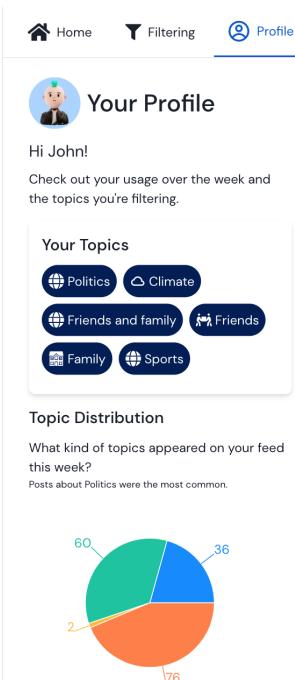
[DELETE FILTER](#)

[SAVE](#)

Edit Filter

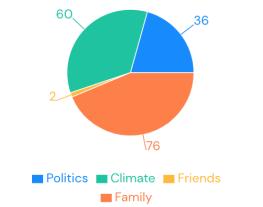
Edit an existing filter by modifying name/description/sub-topics. Also allows user to delete the filter entirely.

Figure 26 Edit Filter



Profile Screen

Shows current topics, distribution of topics on feed (if you've seen too much of one topic on your feed, you could proactively modify the filters to see less of it).



Screen Time

How much time did you spend on the platform each day this week?



8.4 Limitations

Since this is only a prototype, we pre-load data such that the application replicates the interface a user will see after several months of using and interacting with the application.

8.4.1 Pre-initialized components

Pre-stored components are initialized with a statistically reasonable amount of data, but this data can be augmented/modified accordingly by the user when using the app.

1. Posts- There are a list of posts from a variety of topics and users, to simulate a regular Facebook feed, that is put together by the algorithm.

The screenshot shows a MongoDB collection with two documents. The first document is from Elon Musk, posted 1 hour ago, about a Tesla team's 500-mile drive. The second document is from CNN, posted 2 hours ago, about President Biden announcing universal Medicaid. Both posts include a preview of the full body text and standard social media interaction buttons (Like, Comment, Share).

```
_id: ObjectId('63c090fce2d39d8a91ded96e')
id: "p1"
user: "Elon Musk"
userPhoto: "musk.jpeg"
body: "Tesla team just completed a 500 mile drive with a Tesla Semi weighing ..."
liked: true
topics: Array
time: "1h"

_id: ObjectId('63c090fce2d39d8a91ded96f')
id: "p2"
user: "CNN"
userPhoto: "cnn.png"
body: "American President Joe Biden announces universal Medicaid from the ste..."
liked: false
topics: Array
time: "2h"
```

Figure 28 Preset post data in MongoDB collection

Figure 29 Posts rendered in UI

2. Screen Time Statistics (Preloaded and Randomized)- Since the user will not be using the Prototype for more than a few minutes, screen time statistics are completely randomized to allow the user to interact with the data on a chart.

```

const screen_time = [
  {
    name: new Date(Date.now() - 6 * 24 * 60 * 60 *
      1000).toLocaleDateString(
      'en-UK',
      options
    ),
    'Screen Time': Math.floor(Math.random() * 10),
    // find day of week on the date
    day: new Date(Date.now() - 6 * 24 * 60 * 60 * 1000).
      getDay(),
  },
]

```

Figure 30 Random generation of screen time statistics using Javascript

3. Topics and a preset list of timings- In a real app, the user would spend some time to set up the topic filters and their respective timings. In order to immediately show how these might work to the tester, several topics and timing sets are pre-loaded (although modifiable).

8.4.2 Hardcoded Components

1. Logged in user- There is only one logged in user who is introduced during the prototype startup. Any interaction/post created will be from this user and there will be no option to log out/change user.

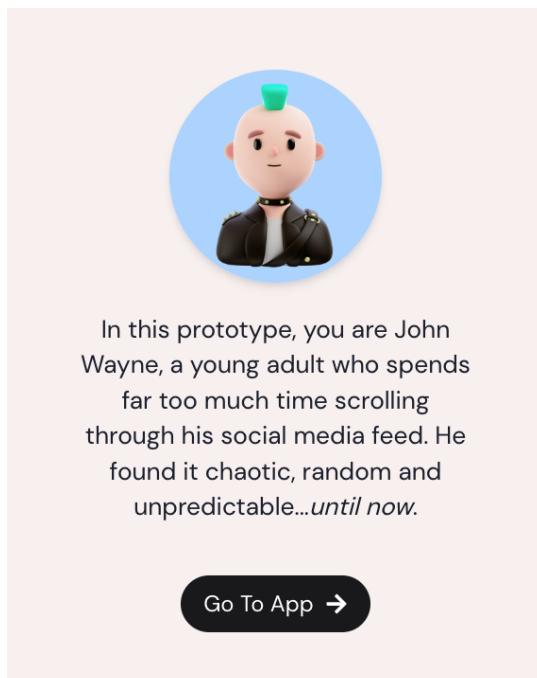


Figure 31 Logged in user

2. Stories: The only purpose of the stories slider is to simulate a regular Facebook feed interface. Clicking on it simply results in a "To be implemented" toast. The images and stories are also hardcoded, purely for UI purposes.

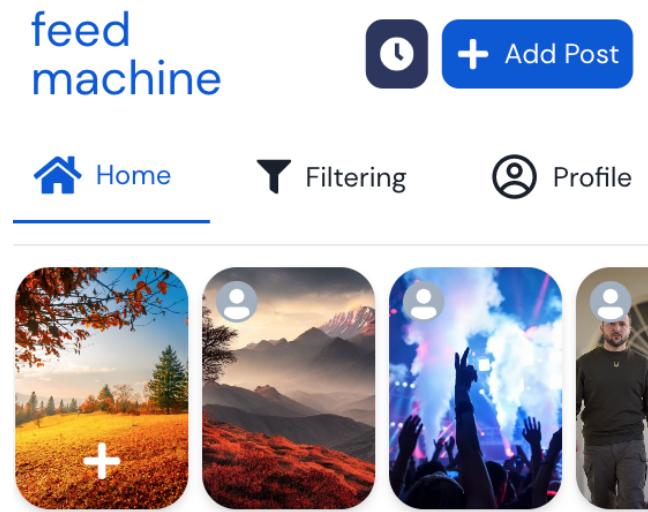


Figure 32 Hardcoded Stories in the App

3. Comment and share on posts- Since both these features are irrelevant to the task, their existence is purely aesthetic and non-functional. Similar to stories, clicking on them or trying to interact with them simply results in a "Not Implemented" popup.

9 Usability testing

9.1 Preparation and run

9.1.1 Evaluation

Brief

A total of 3 evaluations were conducted. 2 of them were conducted over Zoom due to the geographical location of the testers, 1 was conducted physically. The camera of the participant was turned on during virtual sessions, to not only observe their interactions with the app, but also their facial expressions. These are strong indicators of feelings like surprise, frustration and relief while interacting with the app.

Setup

Due to the virtual nature of the interviews, we live-shared our local port with the participants while running the app locally. We asked each participant to join a VSCode live share session, where the app ports were shared simultaneously. Thus, when running the frontend on port 3000 on our side, it would also be visible on their 3000 through port sharing.

The physical interview was conducted with a real mobile phone, where the app and the servers were run on a computer and accessed on the phone through the local network.

General Methodology

1. Collect pre-test information about the participant by asking questions about:
 - a. Their social media habits
 - b. How much time they spend on social media platforms
 - c. Their attitude towards infinite scrolling on social media feedsPre-test information is collected informally through chat, not through a formal questionnaire.
2. Introduce ourselves, the app and why we're here
3. Explain why such an app was created.
4. General consent for recording, the use of this data, and fielding for questions about their involvement.
5. Allow participant to spend some time playing with the application, to walk through the guided tutorials we embed inside.
6. Start the task list, ask the participant to perform the task while narrating what they're trying to do and encouraging them to voice frustrations. Due to the fluidity of video chat, micro-expressions, reaction times and task times are carefully observed. If one task takes unusually long for multiple participants, this becomes something we note down. We stay careful to not walk the participant through the task entirely, as this may corrupt our test data.
7. After making it through the task list, we spend some time asking for general feedback and anything the participant found frustrating. Often, they had several hallmark concerns (often minor) for us to address, such as the visibility of a certain button.
8. General thanks

Refined set of tasks

We are careful to not make the tasks too UI-specific, allowing the user to figure out the semantic relationship between their actions on the app and the functionality they

wish to access. Tasks are also expanded from the existing list, and structured in an order that resembles the logical use of this application (which is to solve the problem of unpredictable social media feeds).

#	Text of the task	Success criteria	Average Time Taken	Attempts/Error s	Complet ions	Notable Facial Expressions
T1	Activate filtering on your social media feed	Feed is filtered according to the filters set	5-7 seconds	P1- 2 P2- 3 P3- 0	3/3	All completed easily. For custom topic filters, they did not understand if a toggle on keeps posts of that topic in the feed or removes them. As is natural human tendency, they did trial and error to see if it was kept/removed.
T2	Write and create a new post	New post is classified and appears on the feed	20 seconds	P1- 4 (Server went down when participant was trying to test) P2- 0 P3- 0	2/3	P1 took a bit longer to find the "Add Post" button. This could be because he is used to see "Add Story" in that position in other social media apps.

T3	Create a custom social media filter to filter out ... from your feed	A new filter appears on the filters page with timing options and a toggle	25-30 seconds	P1- O P2- O P3- O	3/3	All took an extensive amount of time to find the "Add" button on the filters page. Font colour was grey and not immediately striking
T4	Adjust the timings of this filter to remove them from your feed on Monday mornings	Time sets are added or removed	40 seconds	P1- 2 P2- O P3- O	3/3	All showed frustration when trying to differentiate between general timings and topic-specific timings. P1 and P3 went to "General Timing" first to try and complete this task. While they were partially correct, this task expected them to adjust topic-specific timings.
T5	Find out how much time you spent on the platform in the	Numbers on charts understood quickly	10 seconds	P1- O P2- O P3- O	3/3	No issues

	past week					
T 6	Find out which type of topics you saw most of	User can identify the most common topic from the pie chart almost instantly	5 seconds	P1- O P2- O P3- O	3/3	Took a bit longer than expected
T7	Make sure you see less of those types of posts by ramping up its' filtering for every day of the week	The corresponding filter can be easily found in the list and the timings can be adjusted accordingly	30 seconds	P1- 4 P2- N/A P3- N/A	3/3	P1 and P2 had no issues with repetitively adding the filter manually to every day of the week, but P3 immediately gave up and asked if there was an automatic way to apply the same filter to every day of the week through a button
T8	Remove the recently created custom filter	Filter removed without errors and reflected successfully in the filtering engine	30 seconds	P1- N/A P2- O P3- O		No issues

Note: N/A where data was not recorded

Documents

1. The protocol document can be found [here](#).
2. The signed consent form can be found in the shared Google Drive folder.
3. The post-test questionnaire can be found [here](#).

Interviews

All participants are young adults from various parts of the world. The international background of the team allowed us to conduct a very diverse set of interviews.

1. Tan Guan Yu

Nationality: Malaysian

Age: 22

Location: Melbourne, Australia

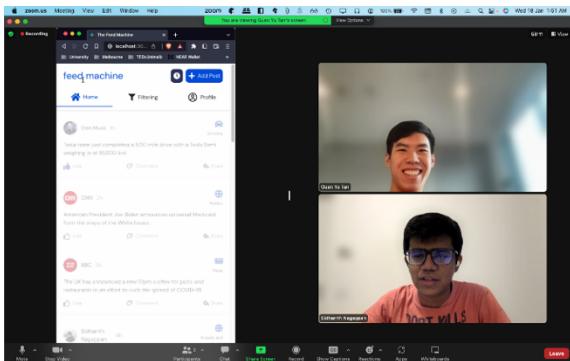


Figure 33 The 3-minute window where Guan Yu explored the app and tried to unders

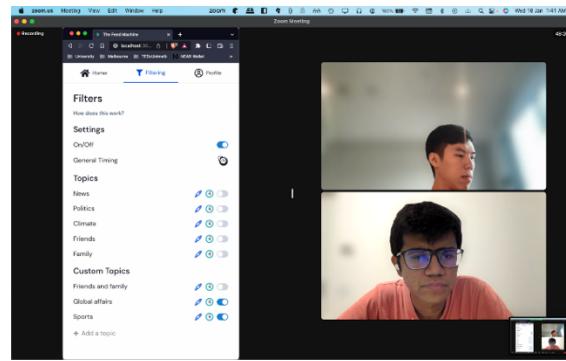


Figure 34 Toggling filters back and forth to view the changes on the home screen

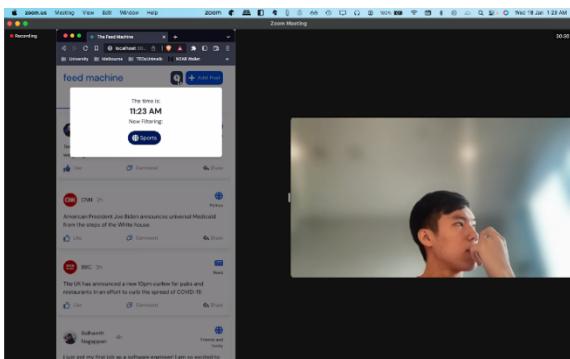


Figure 35 Finding out which topics are filtered through the modal

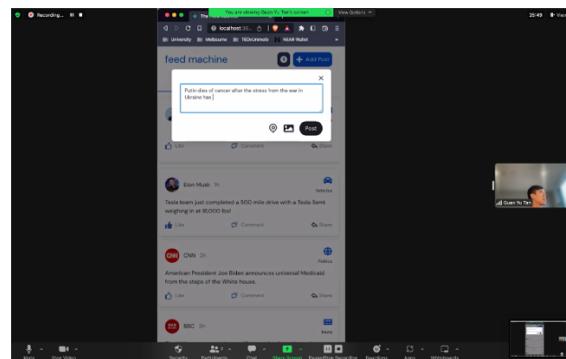


Figure 36 Creating a post and trying to confuse the classification model

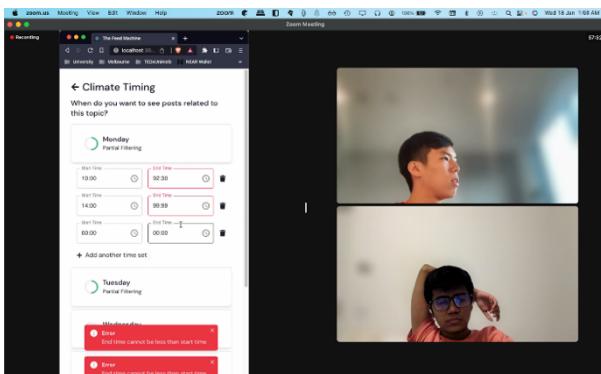


Figure 37 Trying to adjust topic timings. He tried entering illegal times to mess with form validation.

2. David Ostling

Nationality: Swedish

Age: 24

Location: Stockholm, Sweden

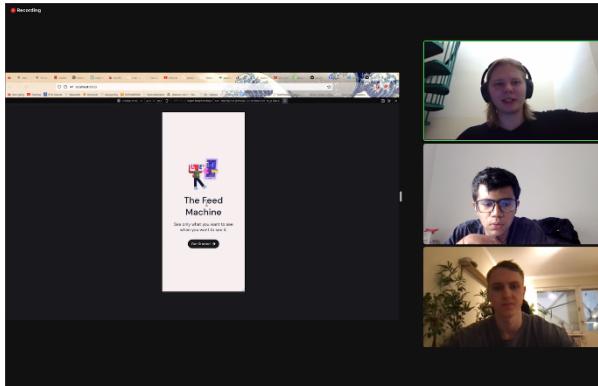


Figure 38 Walking through the instructions and getting familiar with the app

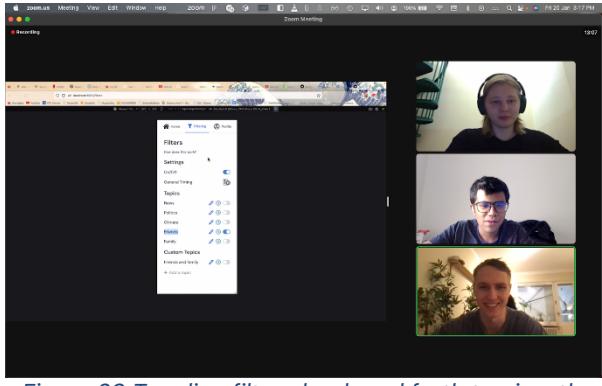


Figure 39 Toggling filters back and forth to view the changes on the home screen

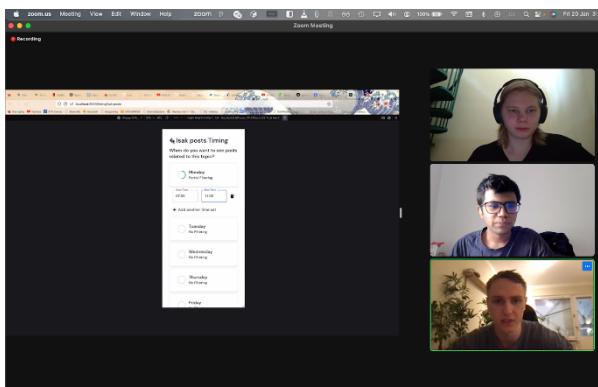


Figure 40 Adjusting filter timings

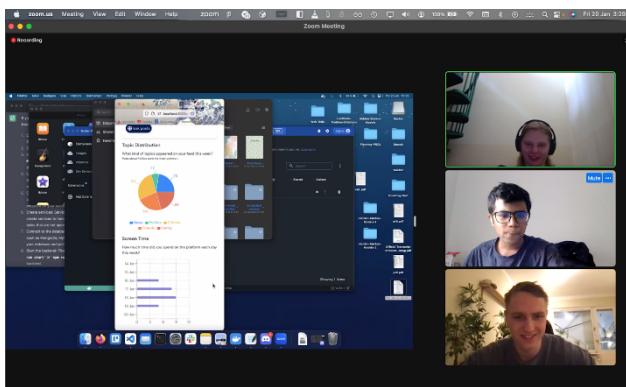


Figure 41 Viewing profile statistics

3. Abdulah Frotan

Nationality: Iranian

Age: 25

Location: Turin, Italy

Interview conducted in person

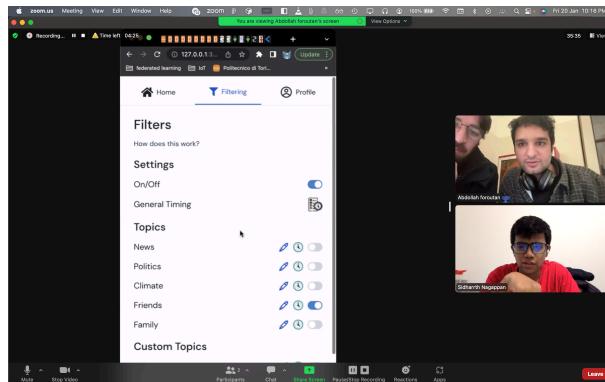


Figure 42 Editing filtering

Post-test Questionnaire

After each interview is conducted, we conduct a post-test questionnaire through a Google form within 24 hours. The questionnaire is divided into 3 sections: general user understanding, difficulty of important tasks and SUS scale questions.

General User Understanding

1. How many hours a day do you think you scroll through your social media feed (cumulative total)?
2. What was your favourite part of the app?
3. What do you feel could be improved?

Difficulty of Crucial Tasks

4. Activating filtering on your feed
5. Creating a post
6. Building your own custom filter
7. Customising your filter timings
8. Viewing and understanding your screen time
9. Proactively customising your filtering times over the week

SUS Scale Questions

10. I think that I would like to use this app frequently.
11. I found this app unnecessarily complex.
12. I thought this app was easy to use.
13. I think that I would need assistance to be able to use this app.
14. I found the various functions in this app were well integrated.
15. I thought there was too much inconsistency in this app.
16. I would imagine that most people would learn to use this app very quickly.
17. I found this app very cumbersome/awkward to use.
18. I felt very confident using the website.
19. I needed to learn a lot of things before I could get going with this website.

9.2 Results

9.2.1 Analysis of Error Rate

Tasks such as the creation of custom filters and adjusting general and topic-specific timings took longer than expected as these tasks were particularly new to the user. All participants had to explore different pages before realising how to complete the task.

In particular, despite the fact that the informational popup explained the difference, only one user took the time to read it and understand the difference between general and topic-specific timing. **This shows us that not all users take the time to properly read guides/instructions. They look for these instructions only after realising that they do not know how something works/how to do something.** In other words, information is only sought when required, users don't ingest this information before starting to use the app/do tasks.

Adjusting and navigating specific topic timings also took a while as users had to manually create a time set for each day. While 2/3 users proceeded to do this, one immediately complained that there is no automatic way to apply a time set to every day of the week.

An overall conclusion is that we have to attempt to make complicated concepts like topic-specific filtering, planning more intuitive and easy to understand on first

attempt, as additional documentation/informational popups (that were a solution to several heuristic violations) are largely insufficient.

9.2.2 System Usability Scale Scores

Based on the results obtained via the Google Form, we proceed to compute the SUS scores for each participant before averaging them out.

Person 1:

Odd numbered questions: $4 + 4 + 4 + 3 + 2 = 17$, $X = 17 - 5 = 12$

Even numbered questions: $2 + 4 + 1 + 2 + 1 = 10$, $Y = 25 - 10 = 15$

SUS score = $(X+Y) * 2.5 = 27 * 2.5 = 67.5$

Person 2:

Odd numbered questions: $5 + 5 + 5 + 5 + 4 = 24$, $X = 24 - 5 = 19$

Even numbered questions: $1 + 1 + 1 + 1 + 1 = 5$, $Y = 25 - 5 = 20$

SUS score = $(X+Y) * 2.5 = 39 * 2.5 = 97.5$

Person 3:

Odd numbered questions: $4 + 5 + 5 + 4 + 1 = 19$, $X = 19 - 5 = 14$

Even numbered questions: $2 + 2 + 1 + 1 + 3 = 9$, $Y = 25 - 9 = 16$

SUS score = $(X+Y) * 2.5 = 31 * 2.5 = 77.5$

AVG SUS = $(67.5 + 97.5 + 77.5) / 3 = \mathbf{80.83}$

With the average SUS score exceeding, the application enters the “good” category. While all 3 users did admit that the complexity of the app took some time to get used to, they did not report any out-of-the-ordinary or illegible components.

9.2.3 Learnings from Test

Our learnings can be summarized into the following points, based on visual, verbal and written feedback conducted before, during and after the usability testing phase.

- **Positives**

1. The app has a distinct UI feel that all the participants immediately complimented. Because of the similarity to existing social media apps, they did not take long to get used to the UI. The element of familiarity took over after years of using the same social media apps.
2. All participants immediately understood the use and motivation of the app, acknowledging that such an app does not exist in the market. When asked to create a custom filter, they immediately had something in mind. This could be social media elements that were bugging them for a while and could now be filtered out after being given a chance to do so. For instance, Frotan was quick to come up with a filter for "Middle Eastern affairs", while David came up with a filter for posts from an individual person. Guan Yu created a "Global Politics" filter.
This is a testament to the value of the project and is further validation of the discoveries we made in interviews prior to the final usability testing.
3. No reported errors or bugs related to the primary filtering engine and algorithm, which proved to be an exceptionally complex Javascript + Redux implementation. This solidified the core functionality of the application.

- **Negatives and Potential Solutions**

1. 2 of the 3 participants were confused by the meaning of the toggle next to each topic. In the real world, when you turn on a filter for something, you only see posts about that particular item. For instance, on Amazon, a price filter only shows items that comply with the conditions set by the active filter. However, in our app, when a filter is on, the posts that comply with the filter are **removed/filtered out**.
While this is clarified in the informative popup, the use of the toggle is not directly clear and may not resemble the functionality of filters in the real world.

News



Figure 43 Toggle item in the application

Potential solutions:

- a. Make this definition more obvious in the app by directly labelling the toggle buttons and/or adding the documentation about this directly on the screen instead of in a popup, as it is now.
- b. Reverse the toggle functionality in the app- When a filter is activated, the corresponding topic is kept in the feed instead of removed. **However, this may not make sense as filtering out something means diverging from the status quo where everything is included.** In this case, if many topics are to be kept in the feed, a lot of unnecessary toggles would have to be shown.

In this case, for the short term, the team prefers (a), while making the UX of the filtering mechanism more natural is a long-term goal.

- 2. Informational popups with documentation kept popping up in an annoying fashion. 2 of the 3 participants commented that this element might be annoying.

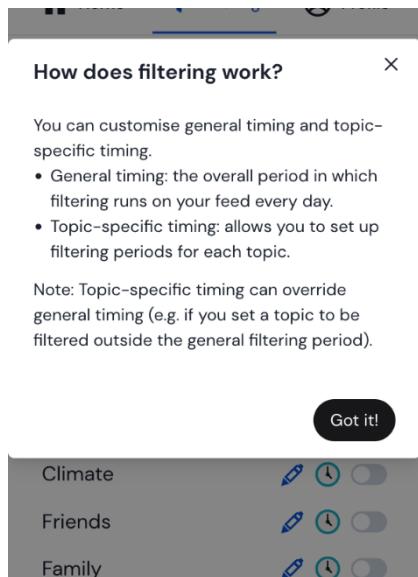


Figure 44 Informational popup

Solutions:

- a. Add a "Don't show me again" button, as is common with informational tutorials that are shown on app startup. This works because the information can be repetitively shown to induce rote memory, until the user decides he does not want to see the

informational popup anymore. It achieves both goals without being annoying to the user.

3. (Minor) When there is no filtering, the "Now Filtering" popup does not reflect the change.

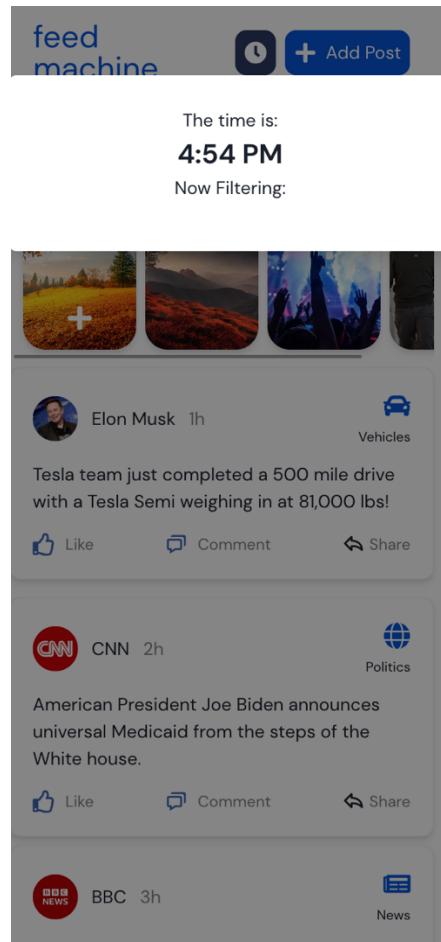


Figure 45 Now filtering popup

Solutions:

Fix the bug by checking for list of active filters and conditionally modifying the UI. This is simply a bug and requires no justification.

4. Unable to automatically bulk-apply a certain time set to all days. When creating a filtering time set for a particular day, there is no option to apply the timing for every other day directly. This is especially in cases of general rules such as "block this out every day at 8-10 am", where the user would currently have to open each day's dropdown and add the time set.

← News Timing

When do you want to filter out posts related to this topic?

The screenshot shows a user interface for filtering news based on timing. At the top, there's a circular icon with a green outline and a grey fill, followed by the text "Monday" and "Partial Filtering". Below this, there are two sets of time inputs. Each set consists of a "Start Time" input (containing "10:00") and an "End Time" input (containing "12:00" for the first set and "16:00" for the second). To the right of each pair of inputs is a small black trash can icon. At the bottom left is a plus sign button labeled "+ Add another time set".

Figure 46 Filter Timing page

Solutions:

- a. Upon adding a time set, make visible a button that allows that time set to be applied to every other day. While this is not a reported issue with the system itself or its core functionality, in hindsight, this is a good feature to have, especially since all 3 testers tried to create and apply one-off general timing rules.

10 Conclusions

10.1 Learnings

We learnt a lot about the core HCI processes, especially good and bad practices in terms of design and UX heuristics. It was shocking to see the number of heuristic violations we make unknowingly.

In terms of digital well-being, while we assumed it to be entirely about controlling one's screen time, we understood through Professor Alberto that it encompassed a much larger area of research, that involved improving one's experience on social platforms rather than simply limiting it. This went on to subsequently influence the theme and app direction we implemented in the end, which tackled the "infinite scroll" and unpredictability hurdle on social media feeds using natural language processing.

Throughout the project, we built a thorough understanding of the entire human computer interaction process, particularly components of the process that are usually neglected such as the need-finding and ideation phases. Some of us, who were purely into backend or frontend engineering, learnt tonnes about excellent UI design and good and bad practices.

The experience overall was fantastic and the professors for this course were very supportive throughout, often going out of their way to give feedback or answer queries we had related to the project.

10.2 Group Work

The group functioned effectively and there are no complaints in this regard. We all learnt a lot about HCI processes through every step of this project, from inception till the end.