

The Algorithmic Mirror

AUDITING TIKTOK RECOMMENDER SYSTEMS

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GITHUB LINK TO THE PROJECT <https://github.com/AdrianBindas/digital-methods-algorithmic-mirror>

CONTEXT. This project involves a **micro-audit of the TikTok algorithm**, in the context of the EU's **Digital Services Act**, aiming to assess the platform's recommender system's compliance with the law. We used **three pairs of archetypal TikTok user accounts** to test the app's personalization of content and advertisements and its profiling of users.

In the first pair, we tested whether **opting out of "personalized feed"** is effective for avoiding personally curated content, as ruled under 38 of the DSA. Next, we tested whether **minors are profiled for advertising**, which is explicitly prohibited in Article 28. Finally, we simulated two young adult users with health issues to check whether their **personal information on physical illnesses would influence the content** on their for-you page.

METHODOLOGY. Each audit **began with three seed searches** that signaled the user's interests to the recommender system. We watched, liked, and saved the videos from the search results and followed creators who posted relevant videos. The audit was executed manually on the Firefox browser with users based in Netherlands.

Next, we **watched videos on our for-you pages for 1.5 hours** while Zeeschuimer collected the data. The data sets were analyzed using Python (pandas, nltk, networkx), Gephi, and 4CAT. Video descriptions and hashtags were annotated using an LLM. We were particularly interested to check whether a) the seed searches influenced the personalization of content when scrolling TikTok and b) the advertisements were personalized for each user.

Do the TikTok recommender systems fulfill obligations stated by the Digital Services Act?

1. Are users' sensitive and protected characteristics (e.g., health data) omitted from TikTok's personalized ad recommendations as required by Article 26(3) DSA?
2. Are minors protected from profiling-based advertisements under the requirements of Article 28 DSA?
3. Does TikTok enable users to opt-out of personalized recommendations in accordance with Article 38 DSA?

1 ARCHETYPES

2 SET-UP PHASE

3 SCROLL PHASE

1.1 SCENARIOS (DSA OBLIGATIONS)

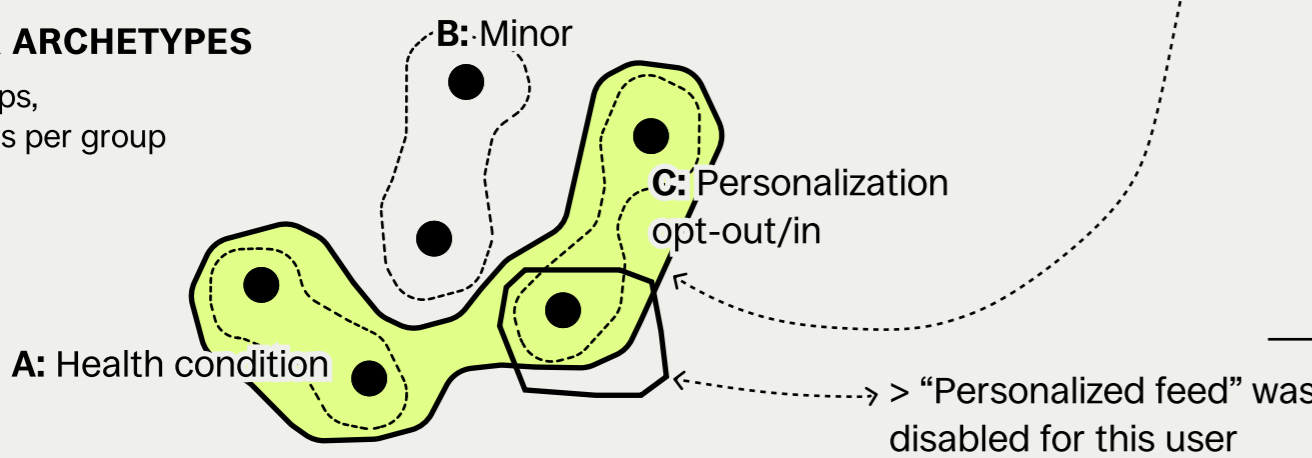
- > Personalization opt-out
- > Protected characteristics
- > Minors' profiling

1.2 ARCHETYPE DESCRIPTORS

- > Name, age, interests, bio, profile pic, search terms, hashtags

1.3 SIX ARCHETYPES

- > 3 groups, two users per group



- > "Personalized ads" setting enabled for archetypes **A** (health condition) and **C** (personalization opt-out/in), as it is not available for archetype **B** (minor).

2.1 SEARCH THREE PHRASES

- > watch + like + bookmark first 10 videos

2.2 SEARCH THREE HASHTAGS

- > watch + like + bookmark first 10 videos

2.3 FOLLOW 10 RELEVANT CONTENT CREATORS

- > From top results of the hashtag searches

3.1 TIKTOK SCROLLING

- > Like, bookmark, and watch only videos related to the archetype's seed searches

3.2 DATA DOWNLOAD

- > Via Zeeschuimer: JSON + CSV from 4CAT

3.3 GDPR DATA REQUEST/DOWNLOAD

- > Via Tiktok settings

1. Are users' sensitive and protected characteristics (e.g., health data) omitted from TikTok's personalized ad recommendations as-required by Article 26(3) DSA?

HEALTH CONDITION

ARCHETYPE A

NAME
Sem Van Dijk

BIRTH
1 July 2004

BIO

Studying at UVA
Type 2 diabetes
Explorer

SEED SEARCHES

diabetes type 2, diabetes meal ideas, diabetes reversal

ARCHETYPE B

NAME
Sem Van Dijk

BIRTH
1 July 2004

BIO

Studying at UVA
Type 2 diabetes
Explorer

SEED SEARCHES

STD symptoms women, STD vs UTI, STD prevention

WHAT THE LAW SAYS

Article 26, paragraph 3 of the DSA states that **online platforms are prohibited from displaying ads based on profiling that utilizes sensitive personal data**. This includes information like a person's race, religion, political opinions, sexual orientation, health status, etc.

These types of data are considered "special categories" under EU privacy law (Article 9 GDPR). The goal of this rule is to protect users from being unfairly targeted or discriminated against based on deeply personal characteristics when they are shown ads online.

WHAT WE FOUND

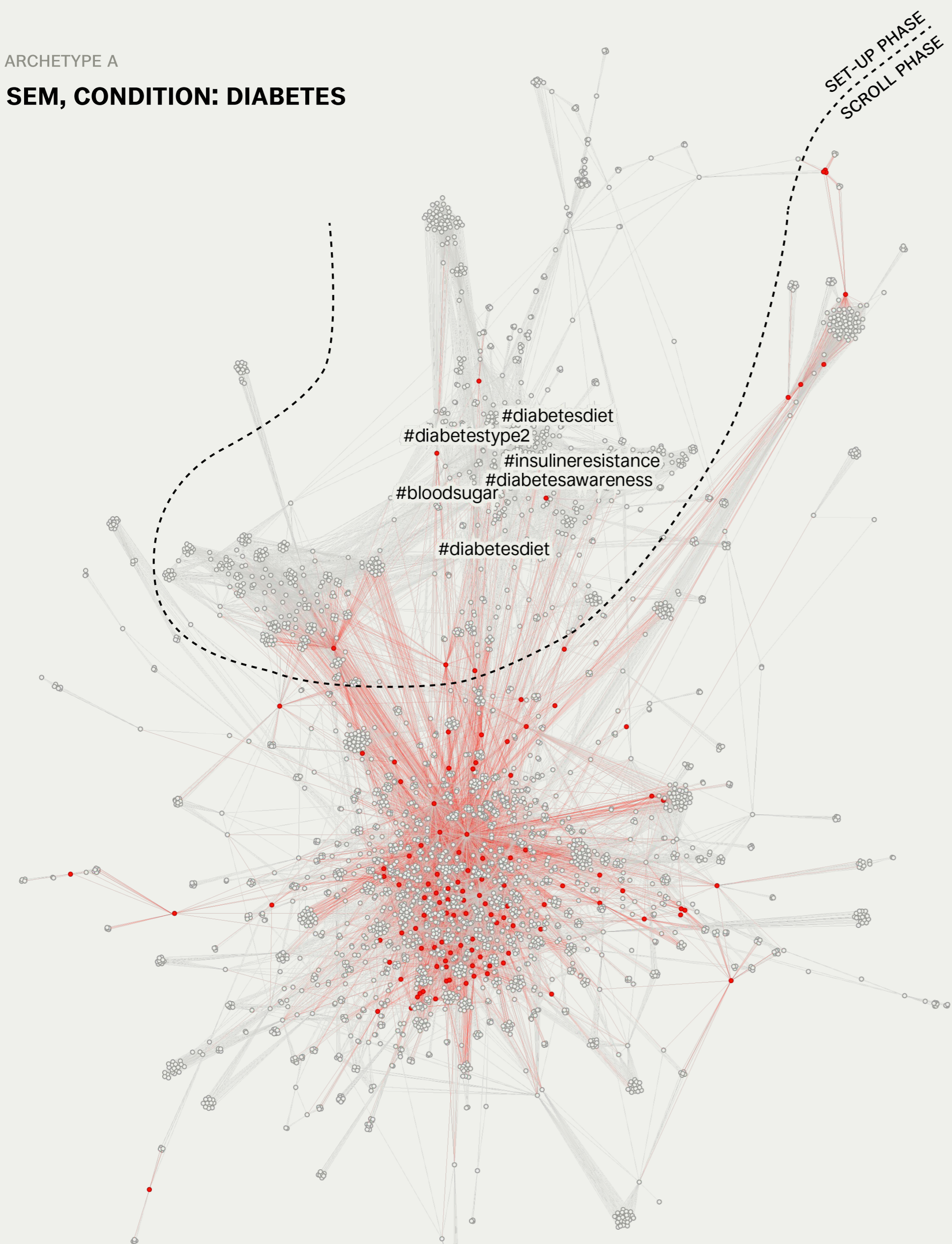
In our audit scenarios, **we created two archetypal user profiles who were concerned about diabetes and sexually-transmitted infections (STIs)**. These concerns were signaled to the recommender system through seed searches of relevant terms.

While browsing through the for-you pages of these accounts, **we did not encounter any advertisements related to these health conditions at any point**. However, videos on these conditions appeared on both feeds during the second round of scrolling on the day after the accounts were created.

Networks of the hashtags for videos appearing in the set-up and scrolling phases. In red, the hashtags appearing in both phases.

ARCHETYPE A

SEM, CONDITION: DIABETES



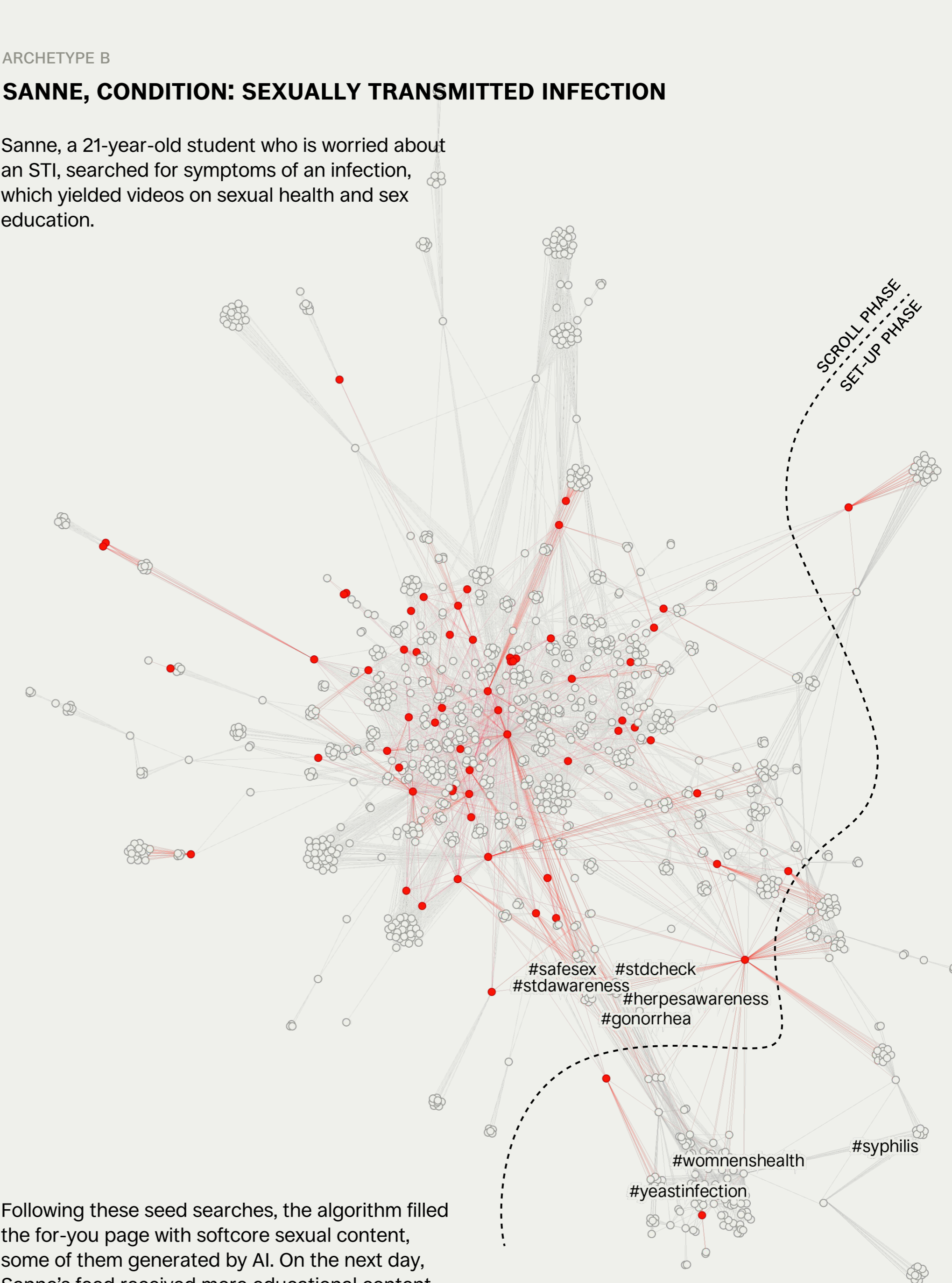
The for-you page of an account indicating that the user suffers from diabetes did not initially adapt to their searches and engagement with diabetes-related content (Figure). However, during a second round of scrolling the following day, the feed significantly featured diabetes-related videos.

These videos were primarily educational or recipe-focused, but they also included misinformation regarding "diabetes reversal". Notably, no health-related advertisements were found in the feed during approximately two hours of browsing.

ARCHETYPE B

SANNE, CONDITION: SEXUALLY TRANSMITTED INFECTION

Sanne, a 21-year-old student who is worried about an STI, searched for symptoms of an infection, which yielded videos on sexual health and sex education.



Following these seed searches, the algorithm filled the for-you page with softcore sexual content, some of them generated by AI. On the next day, Sanne's feed received more educational content on sexual health, although sexual videos were strewn in there as well.

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MINOR

ARCHETYPE A

NAME
Emma Jansen

BIRTH
1 July 2009

BIO
NL | 16
skincare & ootd's
livie forever
#dutchgirlthings

SEED SEARCHES
Olivia Rodrigo,
skincare routine,
outfit inspo

ARCHETYPE B

NAME
Bram Jansen

BIRTH
1 April 2010

BIO
stim & chill

SEED SEARCHES
Neurodivergent,
autism, video
games

2. Are minors protected from profiling-based ads under the requirements of Article 28 DSA?

Scrolling sequence per category: focus on ads frequency

- Ad & sponsor
- Health & Lifestyle
- Culture & entertainment
- Beauty & fashion
- News, politics & society
- Education
- Relationship
- Other

WHAT THE LAW SAYS

Minors face greater risks on TikTok because its recommendation systems can amplify harmful content, impacting their mental health and compromising their privacy. Protecting them from profiling-based advertising is one of the key objectives of the DSA, as seen under Article 28, which restricts online platforms from profiling minors based on personal information.

In the Children's Privacy Policy, it is worth noting that there is a wording contradiction wherein **TikTok states that they “do not engage in profiling which results in legal or similarly significant effects, as defined under**

applicable law.” However, the platform still **uses minor users' interactions (likes, comments, etc) to predict and suggest content** that aligns with their interests, and continuously refines recommendations on the for-you page. This act of predicting minors' interests based on their online behavior is defined as 'profiling' under Article 4(4) of the General Data Protection Regulation (GDPR), as referred to in Article 28 of the DSA.

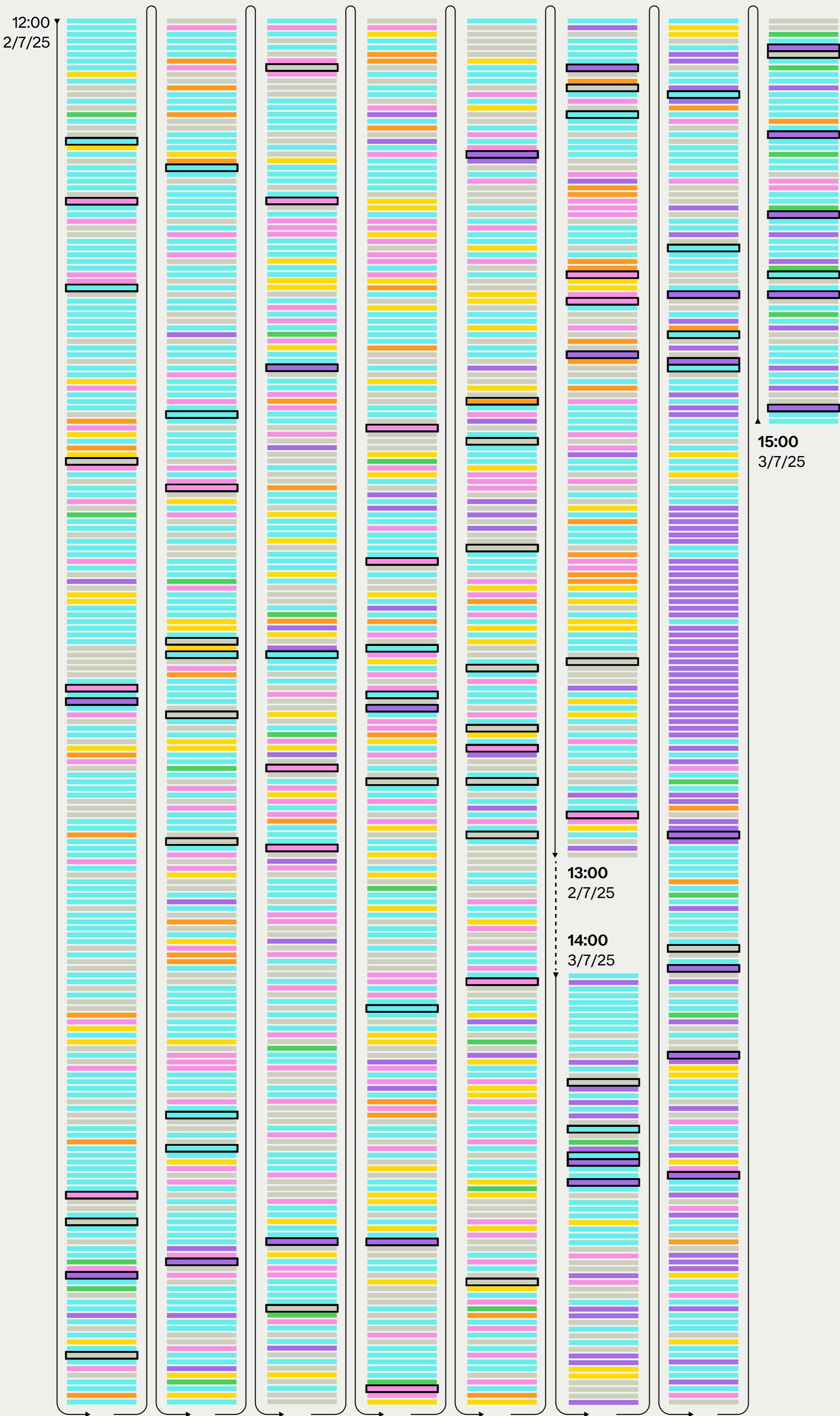
WHAT WE FOUND

Both accounts belonging to minors received content that can be identified as advertisements, as defined in the DSA. These videos were labeled “paid partnership”

and contained the hashtag #ad. The ads were related to PC gaming and skincare (with HEMA partnership). Both topics are relevant to the minor accounts' seed searches. Ads shown to minors were tailored to their interests. Personalized advertisements curated to the interests of the minors' accounts indicate a clear misalignment between regulatory requirements and platform compliance under Article 28 of the DSA, which prohibits profiling minors for advertising purposes based on their personal data, raising concerns about the platform's adherence to the law.

ARCHETYPE A

EMMA, 16 YO, INTERESTS: SKINCARE, POP MUSIC AND FASHION



ARCHETYPE B

BRAM, 15 YO, INTERESTS: GAMES AND AUTISM

