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**Article**

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Internet Policy Review

**Provided in Cooperation with:**

Alexander von Humboldt Institute for Internet and Society (HIIG), Berlin

*Suggested Citation:* Carah, Nicholas et al. (2024) : Observing "tuned" advertising on digital platforms, Internet Policy Review, ISSN 2197-6775, Alexander von Humboldt Institute for Internet and Society, Berlin, Vol. 13, Iss. 2, pp. 1-26,  
<https://doi.org/10.14763/2024.2.1779>

This Version is available at:

<https://hdl.handle.net/10419/300741>

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Volume 13 Issue 2



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# Observing “tuned” advertising on digital platforms

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**DOI:** <https://doi.org/10.14763/2024.2.1779>

**Published:** 26 June 2024

**Received:** 19 October 2023 **Accepted:** 21 February 2024

**Funding:** This research was funded by Australian Research Council (ARC) Linkage Project (LP190101051) and conducted in collaboration with the ARC Centre of Excellence in Automated Decision-Making and Society (CE200100005).

**Competing Interests:** The author has declared that no competing interests exist that have influenced the text.

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**Citation:** Carah, N. & Hayden, L. & Brown, M.-G. & Angus, D. & Brownbill, A. & Hawker, K. & Tan, X. Y. & Dobson, A. & Robards, B. (2024). Observing “tuned” advertising on digital platforms. *Internet Policy Review*, 13(2). <https://doi.org/10.14763/2024.2.1779>

**Keywords:** Digital platforms, Advertising, Observability, Algorithms, Harmful industries

**Abstract:** The hyper-targeted advertising that emerged on digital platforms over the past two decades is now more productively understood as tuned advertising, a dynamic and unfolding process where ads are continuously algorithmically “optimised” to users in real time. Following Rieder and Hofmann (2020), we aim to develop a framework for the “conditions for the practice of observing” algorithmically-tuned digital advertising. We draw on our research across the Australian Ad Observatory and a multi-year research project on digital alcohol advertising. Across these projects we build customised tools to collect ads from platform ad libraries and through data donation from citizen scientists. We argue that the power of digital advertising is increasingly located in its capacity to tune. Platforms’ ad transparency tools draw our attention to ads, but we need to develop the capacity to observe the dynamic socio-technical process of tuning. We conceptualise and present visualisations of “tuned sequences” of ads, as an alternative to “libraries” of ads. We argue that developing the capacity to observe these tuned sequences better articulates the mode of observation required to develop the forms of public understanding and accountability both civil society organisations and researchers are looking for.

This paper is part of **Locating and theorising platform power**, a special issue of *Internet Policy Review* guest-edited by David Nieborg, Thomas Poell, Robyn Caplan and José van Dijck.

## Introduction

The publicness of advertising in mass and broadcast media was a definitive characteristic of its form and the basis for accountability and regulatory frameworks. The paradox of advertising on digital platforms, however, is that as it makes users more visible to its algorithmic operations, it becomes less observable to the public. Digital platforms like Meta and Alphabet derive their capacity to engineer new technologies that shape markets and societies from advertising revenue. The power of their advertising models rest both in their capacity to translate social life into data that trains algorithmic models and the opacity of those models to public observability (Crain, 2021). The Australian Competition and Consumer Commission's landmark Digital Platform Services Inquiry (2020-2025) has highlighted the extraordinary and largely unchecked market power of Meta and Alphabet and their status as an advertising duopoly (ACCC, 2020). Public concern about this market power is compounded by our limited ability to both understand our shared experience of advertiser-funded algorithmic flows and to mitigate the problems they raise, including targeting and discrimination, circulating misleading messages, and shaping social attitudes and identities (for instance, relating to body image, gender, and race) (Burgess et al., 2022; Phan & Wark, 2021; Trott et al., 2021). In this article, we focus on the case of alcohol advertising on Meta platforms in Australia to broadly conceptualise the observability of digital advertising as a precondition for making it accountable to users, civil society, and regulators. Following Rieder and Hofmann (2020), we aim to develop frameworks that create the “conditions for the

practice of observing” digital advertising as a process embedded in the commercialisation and datafication of our culture.

If platforms’ ad models are opaque, we must develop the combination of conceptual approaches, technical tools, and institutional formations required to observe them. We draw on our research across the Australian Ad Observatory (Burgess et al., 2022) and a multi-year research project on digital alcohol advertising (Hawker et al., 2022; Hayden et al., 2023). These projects involve extensive collaboration among researchers from computer science, law, media, communication, and cultural studies disciplines to build customised tools to collect ads from platform ad libraries, undertake data donation with citizen scientists and engage in extended collaborations with civil society groups. This network of collaboration is required to develop both the technical and conceptual infrastructure for observing the automated flows of digital advertising. We begin by arguing that digital advertising has shifted toward the logic of “tuning” over “targeting”, with significant implications for efforts to observe digital advertising. We then outline how civil society organisations in Australia have framed the problem of digital advertising by harmful industries and present an audit of the ad transparency tools provided by digital platforms (Hawker et al., 2022). We find that none of the major platforms we investigate – Meta (Facebook and Instagram), Alphabet (Google and YouTube), TikTok, Snapchat, or X (formerly known as Twitter) – produce a durable public archive of ads or contextual information about targeting, reach, and spend. This fundamentally limits the visibility and transparency of advertising on these platforms and inhibits public scrutiny, but we also consider the implications of platform transparency tools like ad libraries encouraging us to focus our analysis on the volume and content of ads.

Our analysis of ad transparency on digital platforms and our attempts to build approaches for observing ads lead us to consider whether ad libraries address, exacerbate, or obfuscate our efforts to observe and explain digital advertising (Zalnierute, 2021). If we could see all the ads, what would be revealed? We frame our response by considering the problems of explainability, glut, and approximation generated by associative algorithmic advertising models. We argue that libraries may serve platforms’ interests by leading both researchers and civil society toward observing the content of ads, placing them in the role of monitoring “bad” ads and advertisers, rather than analysing the technical and institutional formation of automated advertising systems. Using our collaboration between researchers and civil society organisations concerned about “harmful” forms of advertising, we argue that we need to develop the conceptual and technical frameworks for observ-

ing digital advertising as a dynamic, evolving process of “tuning” the relationships between advertisers and consumers. We advance this argument by conceptualising and presenting visualisations of “tuned sequences” of ads as an alternative to “libraries” of ads. Tuned sequences better articulate the process we need to observe in order to further develop the forms of accountability both civil society organisations and researchers are looking for.

## **From targeted to tuned advertising**

The hyper-targeted advertising that emerged on digital platforms over the past two decades can be productively understood as tuned advertising. Targeted advertising involves identifying and targeting a specific user on the basis of discrete categories, such as gender, age, or ethnicity. Tuned advertising, on the other hand, is a dynamic and unfolding process where ads are continuously algorithmically “tuned” or “optimised” to users in real time on the basis of an ever-changing and shifting set of variables (Brown et al., 2024). Variables based on an opaque and proprietary set of inputs and algorithmic weightings, from likes, comments, and shares to dwelling on certain posts, associations with other content, search histories, network affinities, and no doubt much more. If targeted advertising emphasises the experience of receiving a particular ad at a particular moment, tuned advertising draws attention to the mediated feeling of a continuous temporal flow or rhythm of ads (Brown et al., 2024; Carmi, 2020). This flow exceeds any specific ad, post, or piece of content to produce a “more general mood” (Dean, 2010). In this respect, the concept of tuning also helps to see broader continuities between the algorithmic flow of digital advertising and the flow first observed on television by Raymond Williams (Brown et al., 2024; Carmi, 2022; Lupinacci, 2020; Williams, 1974).

Digital ad targeting and tuning both rely on continual optimisation of ad texts in the pursuit of reaching the desired audience. However, tuning accounts for the concurrent refinement of the ad system at large as well as the dynamic subject receiving the ad. Optimisation, in the targeting sense, assumes the continual improvement of ad texts and data extraction to match ideal ads to ideal audiences (Crain & Nadler, 2019). In contrast, tuning aims to illustrate how the relations between ad texts, the ad model, and users shape each other over time. While targeting assumes a stable subject, tuning implies the emerging subject which is active and flexible (Brown et al., 2024). Tuning attends to the pre-emptive temporality of digital media, as not yet fully articulated, responding in real-time, affective, and anticipating the future through the monitoring, adjusting, and modulation of algorithmic models (Amoore, 2013; Andrejevic, 2011; Bucher, 2020; Coleman, 2018).

“What is the next ad in the sequence?” is the problem that tuned advertising solves for.

Piece by piece, over the past two decades, tuned advertising has emerged as digital platforms have automated the collection of data, targeting of ads, construction of audiences, and creation of content. Early digital advertising models automated data-collection and targeting based on precise criteria named by the advertiser, such as gender, age, and geography. From 2013, digital advertising models on platforms like Facebook and Google became much more associative and probabilistic, learning to optimise and tune audiences over time. For example, Facebook’s launch of “custom” and “lookalike” audiences were a key shift where advertisers uploaded data about existing audiences to generate new audiences. “Dynamic” ad-building tools also emerged over the past decade that automate the assembly and targeting of ads. Advertisers upload “ad components” like images, video, text, and buttons and the model learns what combinations to serve to particular consumers (Meta, n.d.). An advertiser might begin with information about their audience, basic criteria like age, gender and location, or an existing customer database. The ad model then dynamically tests and refines the ads, the audiences, and the relationships between them. Rather than pay just for impressions, advertisers pay for digital platforms to algorithmically “tune” an audience to act in predictable and quantifiable ways: dwelling on content, tapping a button, making a purchase.

If we’ve begun to get accustomed to algorithmic models that tune the placement of ads, we need to now also anticipate the emergence of algorithmic models that tune the ads themselves. Already we are seeing ads made from images that are synthetic, where the images and text are “tuned” by generative models. Automated ad-building tools will be integrated into platform models to generate synthetic digital content (Mehta, 2023; Vincent, 2023). For instance, local bars will create synthetic content that positions drinks in different interiors, or features different kinds of people at the bar. Google recently announced that advertisers will be able to supply creative content and a generative algorithmic model will “remix” this material to generate ads based on the audience it aims to reach, as well as other goals such as sales targets (Criddle & Murphy, 2023). Meta too is signalling the integration of generative AI into its ad building tools, together with a next generation of models that would turn tuning into a medium where multiple sensory inputs — text, sound, vision, movement, temperature — can generate outputs in multiple media (Misra et al., 2023). This will scale up to major brands running highly-tuned creative campaigns. In March 2023, Levi’s announced a partnership with the

digital agency Lalaland.ai to use generative AI to create "diverse" synthetic fashion models. The Verge reported this would allow customers to see clothing on "body-inclusive" models, "spanning a wide range of body types, ages, sizes, and skin tones" (Weatherbed, 2023). At present a dynamic ad is compiled from a database of texts pre-loaded by the advertiser, but these will increasingly be supplemented by a query that generates an ad "on demand". Advertising professionals will produce brand territories, campaigns, and content, but the final execution will be "tuned" by automated models that refine choice of figures, skin tones, clothes, settings, colourways, text, buttons. Ad libraries stand to become obsolete as ads are no longer fixed or stable texts that can be archived.

The power of digital advertising is located in the shift of control over advertising into the infrastructure of digital platforms like Meta and Alphabet. The capacity to tune consolidates this power because advertisers become more institutionally dependent on platforms not only as a channel that controls access to consumer attention, but as an infrastructure that builds and optimises ads, audiences, and the relation between them, over time. This power is further concentrated by platforms as they disintermediate media buying, market research, and data analytics by either assuming these functions or making them reliant on the platform ecosystem (van der Vlist & Helmond, 2021). This market power reduces competition and accountability among firms, and it also diminishes the possibility of observing the operations of platforms in shaping consumers' lives. The power of the automated advertising model of digital platforms is contested by public interest groups with longstanding concerns about harmful industries and digital rights. And, it is also contested by advertisers seeking more observability, accountability, and control in the audience and advertising products they pay for. In Australia, this has been observed most clearly in submissions from both civil society and advertiser groups to the Australian Competition and Consumer Commission's Digital Platform Services Inquiry (ACCC, 2019, 2020).<sup>1</sup>

## **Harmful industries marketing on digital platforms in Australia: The case of alcohol marketing, civil society, and Australian policy consultations**

In Australia, the use of digital platforms by harmful industries has been raised in a range of policy consultations and legislative reforms including the Digital Platform

1. The ACCC's Digital Platform Services Inquiry began when the commission was directed to investigate the impact of online search engines, social media and digital platforms on competition in media and advertising markets. A final report was published in 2019 and then a five year inquiry established that runs from 2020-2025 (see ACCC, n.d.)

Services Inquiry (2020-2025), Privacy Act Review (2023), and Basic Online Safety Expectations in the Online Safety Act (2022). The Australian eSafety Commissioner has recently noted that harmful advertising, including advertising relating to alcohol and gambling is in need of regulatory attention (eSafety Commissioner, 2022). The issue of harmful digital marketing has similarly been identified in the UK as a regulatory gap between online safety and privacy and competition and consumer protection regulations. In response, the UK Government is considering specific measures for regulating online advertising through their Online Advertising Programme consultation (Department for Culture, Media and Sport, 2022). The Online Advertising Programme identifies a full statutory approach that addresses all actors within the digital marketing ecosystem as the most likely strategy to be effective at increasing transparency and accountability of digital marketing, including illegal and legal online content that can create harm for consumers and businesses. It specifically identifies advertising for alcohol, gambling, and unhealthy foods as harmful advertising content. The World Health Organization (2021) has called for the "digital marketing ecosystem and global platforms" to be "mapped and understood by policy-makers at local, national and international levels" (p. xii). They have called on governments to "establish and fund research to monitor developments" and argued for the possibility of an international convention on alcohol marketing, similar to the tobacco convention. They have also pointed to the European Union Digital Services Act as a model to build on because it names the need to control the relationship between the "manipulative techniques" of digital marketing and negative impacts on public health and wellbeing.

Harmful industries' marketers, including alcohol corporations, are innovative actors who present a useful case for exploring the power dynamics in the digital platform's advertising models more generally. As one example, the Australian alcohol and gambling corporation Endeavour Group have developed and continue to invest in their EndeavourX initiative, which uses algorithmic models to drive increased sales across online and in-store platforms (Crozier, 2021; Weber, 2022). These models optimise the composition and targeting of ads, the provision of home delivery, and the layout of stores. Endeavour Group has collected data on 6.2 million Australians, about 1 in 3 adults, through their customer loyalty programme alone (Evans, 2022). This data can be integrated with digital platforms' advertising tools which are tuned to find people with similar characteristics to alcohol companies' most profitable existing customers, people who either frequently buy alcohol or buy alcohol in large amounts. These tools therefore disproportionately target people most at risk of harm from these products by design. These harms are potentially exacerbated by the integration of alcohol advertisements on digital platforms



with the online sale and delivery of alcohol (Hayden et al., 2023). Two-thirds of alcohol retailer advertisements on Facebook in Australia contain a ‘shop now’ button, prompting immediate purchase, collapsing the distance between the moments of seeing an ad and making a purchase. We treat harmful industries advertising on digital platforms as both an issue of public concern, but also a form of advertising that helps to highlight larger questions about observability and accountability in the ad model.

Platforms derive much of their market power and capacity to shape public attention and opinion from advertising revenue. Advertisers and platforms both claim to “empower” consumers by serving them more relevant messages, at the same time they agree that the power of digital advertising is its capacity to “interact with consumers at a highly intimate level, and control the communication and consumption environment” (Darmody & Zwick, 2020). Regardless of whether we are concerned about particular advertisers or the advertising model in general, we need to be able to observe how it operates at the level of controlling our environment and treating us as a “fragmentary, correlational, probabilistic, environmentally-contingent” platform user (Goldenfein & McGuigan, 2023).

This view of platform power is reflected in the calls from civil society organisations across digital rights, consumer rights, and public health that have recommended that digital platforms should be accountable for the automated predictions and decisions their advertising models make about consumers (ACCC, 2019, 2020). They argue that platforms should be required to provide the means to observe not just advertisements but how the advertising model works, including information about how people are targeted, who advertisements reach, and how much advertisers spend (Hayden et al., 2023). At the same time they are acutely aware that policy recommendations around targeting, such as prohibiting particular kinds of targeting criteria, have become outdated as ad models move toward the associative logic of tuning. They need to respond to this challenge by developing the capacity to understand and observe the emerging form of digital advertising. While the case of harmful industries advertising is a specific site where power is being contested by platforms, advertisers, civil society, researchers, and policy-makers, it also provides a setting for thinking productively about the power of digital advertising more generally.

## **Transparency and observability of advertising on digital platforms**

Rieder and Hofmann (2020) “propose the concept of *observability* as a more prag-

matic way of thinking about the means and strategies necessary to hold platforms accountable” (p. 3). Transparency is a precondition for observability, but critics have established its limitations as a standalone form of accountability (Crain, 2018; Zalnierute, 2021). Calls for transparency are “driven by a certain chain of logic: observation produces insights which create the knowledge required to govern and hold systems accountable” (Ananny & Crawford, 2018, p. 974). Advertising on digital platforms is not inherently transparent as most ads are only visible momentarily to the users who see them. Transparency of the ads and the automated ad model requires the development of technical and social tools by digital platforms, civil society, and researchers. Platforms play a critical role in this process because of their capacity to define the terms of transparency by the provision of access to information about their advertising model (Zalnierute, 2021; Leerssen et al., 2021). The question we need to consider is how platforms use their power to shape the social and technical configuration of observability.

With the Foundation for Alcohol Research and Education, we audited the transparency and observability of advertising on major digital platforms: Facebook, Instagram, Google search, YouTube, X, Snapchat and TikTok (Hawker et al., 2021). For each platform, we set out to document what advertising looks like on the platform and whether we could observe it by investigating platform features, reviewing academic and public interest research, and analysing platforms’ service offerings and business or developer blogs. We assessed the transparency of advertising on Meta (Facebook and Instagram), Alphabet (Google search and YouTube), Snapchat, X, and TikTok platforms against nine criteria, as detailed in Table 1 below:

1. Is there a public archive of the ads published on the platforms? This is the basic requirement for transparency, that all ads published can be publicly viewed regardless of who they are targeted at or tuned for.
2. Can the archive be accessed ‘at scale’ using an API (application programming interface)? Given the enormous volume of ads on digital platforms, the capacity to systematically access and analyse data is critical.
3. Does the archive have an up-to-date, accessible and searchable dashboard of ads? A searchable dashboard enables a broad number of users, especially members of public and civil society organisations, to monitor advertising in real-time without needing the technical skills required to use an API.
4. Are the ads permanently stored in the archive? Can we access ads that have been deleted or taken down by advertisers or the platform? Some archives remove ads that have been deleted from the platform for violating platform terms or because advertisers have removed them. This limits transparency, particularly of harmful forms of advertising.
5. Can the ads and information about them be extracted for analysis? A

facility that enables the extraction of advertisements and metadata for analysis is important for researchers to undertake detailed analysis of advertising over time.

6. Is there information about how the ads were targeted? The form and content of advertisements is of limited value without understanding how ads are targeted at particular users.
7. Is there information about how much advertisers spent? The amount spent on particular ad campaigns is important to understand which advertisers dominate the ad market.
8. Is there information about the reach of the ads? Information on how many users, and what kinds of users, an ad reaches is important to making judgments about the effects of advertising on particular groups.

**TABLE 1:** Ad transparency and observability on digital platforms

<b>CRITERIA</b>	<b>META (FACEBOOK AND INSTAGRAM)</b>	<b>ALPHABET (GOOGLE AND YOUTUBE)</b>	<b>SNAPCHAT</b>	<b>X</b>	<b>TIKTOK</b>
<i>A PUBLIC ARCHIVE OF THE ADS PUBLISHED ON THE PLATFORM</i>	Yes, through Facebook's ad library	Yes, through Google's Ad Transparency Centre	Only political ads in the United States, through Snap Political Ad Library	Only historical political ads, through the Ad Transparency Centre	No public archive
<i>ACCESS TO THE ARCHIVE OF ADS</i>	All accessible through a searchable dashboard. Political ads also via the Facebook Ads API	All accessible through a searchable dashboard. Political ads also via public BigQuery database	Accessible only as a downloadable historical archive	Accessible only as a downloadable historical archive	No public archive
<i>ACCESS TO A PUBLIC SEARCHABLE DASHBOARD</i>	Yes	Yes. But brands aren't always discoverable	No	No	No public archive
<i>PERMANENCY OF THE ADS IN THE ARCHIVE.</i>	Political ads are stored for 7 years, all other ads are only in the archive while the campaign is 'live'	Political ads are stored in the archive permanently, all other ads are searchable for 30 days	Political ads are stored in the archive permanently	Political ads are stored in the historical archive permanently	No public archive
<i>ACCESS TO DELETED ADS</i>	No	No	No	No	No public archive
<i>EXTRACTION OF THE ADS FOR ANALYSIS</i>	Partial. Web scraping is possible, but only political ads are officially supported via API	Partial. Web scraping is possible, but only political ads are officially supported via API	No	No	No public archive
<i>INFORMATION ON TARGETING CRITERIA</i>	Partial. Only political ads and basic demographic criteria	Partial. Only political ads and basic demographic criteria	Partial. Only US political ads and basic demographic and some interests criteria	Partial. Only historical political ads and basic demographic criteria	No public archive
<i>INFORMATION ON SPEND</i>	Partial. Only political ads	Partial. Only political ads	Partial. Only political ads	Partial. Only historical political ads	No public archive
<i>INFORMATION ON REACH</i>	Partial. Only political ads	Partial. Only political ads	Partial. Only political ads	Partial. Only historical political ads	No public archive

Our audit identified that only Meta and Alphabet have comprehensive public “ad libraries”. However, these public libraries have significant limitations. For Meta, ads are only visible while the campaigns are “live” on the platform and limited information is provided about where, when, and how ads appear in users’ feeds. Results are displayed in a list without any ability to sort, analyse, or make sense of them. For Alphabet, ads are visible for up to 30 days, but they only include advertisers

that have completed a verification process and can only be found by searching for the corporate entity that placed the ad (rather than the public-facing brand name of the advertiser). For instance searches for prominent global brands like Bailey's, Tanqueray, and Captain Morgan return no results unless you search for the parent company, Diageo PLC, that owns those brands. This is a form of obfuscation that makes these libraries unuseable for those without detailed industry knowledge.

## Observing tuned sequences

If platforms have made advertising a more powerful technology it is not because they have made the content of ads more symbolically persuasive, but because they have developed the capacity to engineer the auto-tuning of ad flows. We need to direct our attention toward developing the technical and conceptual approaches for observing tuned advertising and the institutional relationships that sustain it (Helmond et al., 2019). Above we have argued that ad libraries pre-define advertising as a collection of inert texts without any metadata, preventing us from understanding how they move in the algorithmic flow of platforms and everyday life. The library renders invisible the way advertising is experienced and felt by users as part of an uninterrupted, affective *sequence* tuned to ever-changing tastes, desires, times of day, location, moods, and movements.

## Methodology

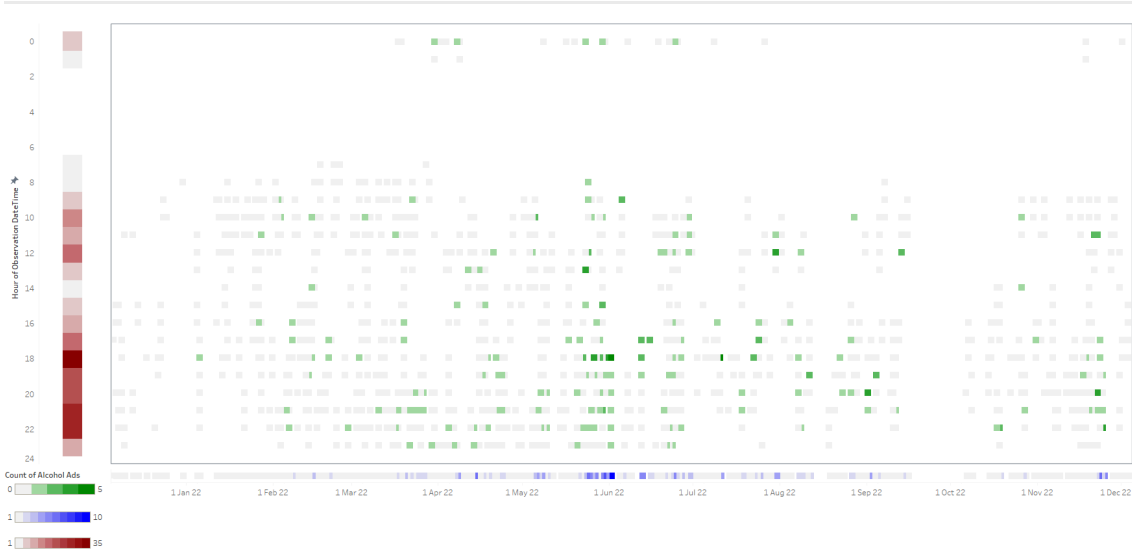
In the remainder of this article we propose a conceptual framework and techniques for observing tuned advertising through sequences of ads. We draw on our collaboration between researchers and civil society organisations through both the Australian Ad Observatory and an associated project with the Foundation for Alcohol Research and Education focussing specifically on digital alcohol marketing. In these projects we use a combination of computational and citizen-science data donation methods to generate collections of ads published on Meta platforms in Australia. In the case of the Australian Ad Observatory, 1904 participants have donated a total of 737,418 ad observations and 328,107 unique ads. Participants complete a short questionnaire about their demographic characteristics and install a browser plug-in which collects and donates an "observation" of each personalised ad they see when scrolling in their Facebook News Feed (Burgess et al., 2022). In our work focussing on alcohol advertisements, we complement the Ad Observatory collection by developing computational methods for monitoring ads published on Meta platforms – Facebook, Instagram, Messenger, and the Audience Network – by 1205 alcohol brands, retailers, and venues (Hayden et al., 2023). These projects are undertaken in partnership with civil society, journalists and researchers across

computational, law, and media disciplines (Angus et al., 2024). One of the outcomes of our collaboration has been developing a shared interest in addressing questions about the power and potential harms of tuned advertising. Through the development of methods, analysis of data, regular workshops, and project meetings we are jointly attempting to conceptualise what tuned advertising is, how to observe it, and how that might lead to better forms of accountability.

Our aim is to develop an approach to observing the moment where “algorithms give an account of themselves” (Amoore, 2020) in the tuned advertising model of digital platforms. To operationalise this notion of tuned sequences, we developed two prototype visualisations in Tableau (2022) using data from the Australian Ad Observatory. Both attempt to make the tuned sequence of ads users see observable in ways that are not possible in an ad library.

## Visualisations

The first visualisation (Figure 1) displays an individual user’s tuned sequence of ads over time, by revealing temporal patterns of ads observed across short-term and long-term scales. It provides a detailed view of a user’s tuned ad sequence by hour and by date, guided by Shneiderman’s (1996) approach to visualising data in layers: overview, zoom and filter, and details on demand. The matrix provides an *overview* of all ads observed by a user where the x-axis represents each day and the y-axis each hour of those days. Each square of the matrix is colour value coded to indicate the number of alcohol-related ads observed within that particular hour. Alcohol-related ads are identified as those published by one of the 1,205 advertisers in our manually compiled list. The addition of summary bars along the axes represent the aggregate values for those times (y-axis) and days (x-axis) to highlight the common patterns along these dimensions. The interface allows a single user to be selected to *filter* the advertising within that user’s sequence. The visualisation can be further interrogated by clicking on a square to provide *details on demand* about the observations logged within the hour, including a timestamp and the name of the advertisers’ page.



**FIGURE 1.1:** An individual user’s tuned ad sequence. The interactive visualisation depicted in Figures 1.1 and 1.2 is available at Tableau Public, see Angus (2024).

The sequence pictured in Figure 1 illustrates observations of alcohol advertising increasing later in the day, peaking first at 6pm and after 8pm. Alcohol advertising also appears fairly consistently throughout the year with a higher concentration of ads around early June. Where Meta provides users with a “why am I seeing this ad?” function attached to each individual ad in their feed, our visualisation points us toward a different question: why am I seeing *these* ads? It shifts our vision away from the targeting of an individual ad and toward our overall experience of the algorithmic flow of tuned advertising. The detail-on-demand view enables a further qualitative interpretation of the sequence, as shown in Figure 1.2 with a series of whiskey ads in close succession along with ads for sport and entertainment. An individual user might be able to relate this pattern to their interests and consumption practices, knowing whether these are brands they see, if they are associated with sports they watch, or whether they buy them along with their groceries.

Observation DateTime	Brand/Category
2/06/2022 6:22:36 pm	Hennessy
2/06/2022 6:22:49 pm	Monash University Sleep and Circadian Medicine Laboratory
2/06/2022 6:23:09 pm	Grainshaker
2/06/2022 6:32:45 pm	Selfwealth
2/06/2022 6:33:36 pm	The Glenlivet
2/06/2022 6:34:02 pm	Canberra BMW Motorrad
2/06/2022 6:34:19 pm	Coles Express
2/06/2022 6:34:53 pm	SBS VICELAND
2/06/2022 6:36:07 pm	Jim Beam
2/06/2022 6:39:48 pm	Kayo Sports
2/06/2022 6:40:26 pm	University of Tasmania
2/06/2022 6:40:42 pm	AFL
2/06/2022 6:42:09 pm	Solar Program ACT
2/06/2022 6:45:48 pm	AFL Nation
2/06/2022 6:46:17 pm	Stan.

**FIGURE 1.2:** Details on demand from a tuned ad sequence that shows the ads seen in a one hour period (Angus 2024).

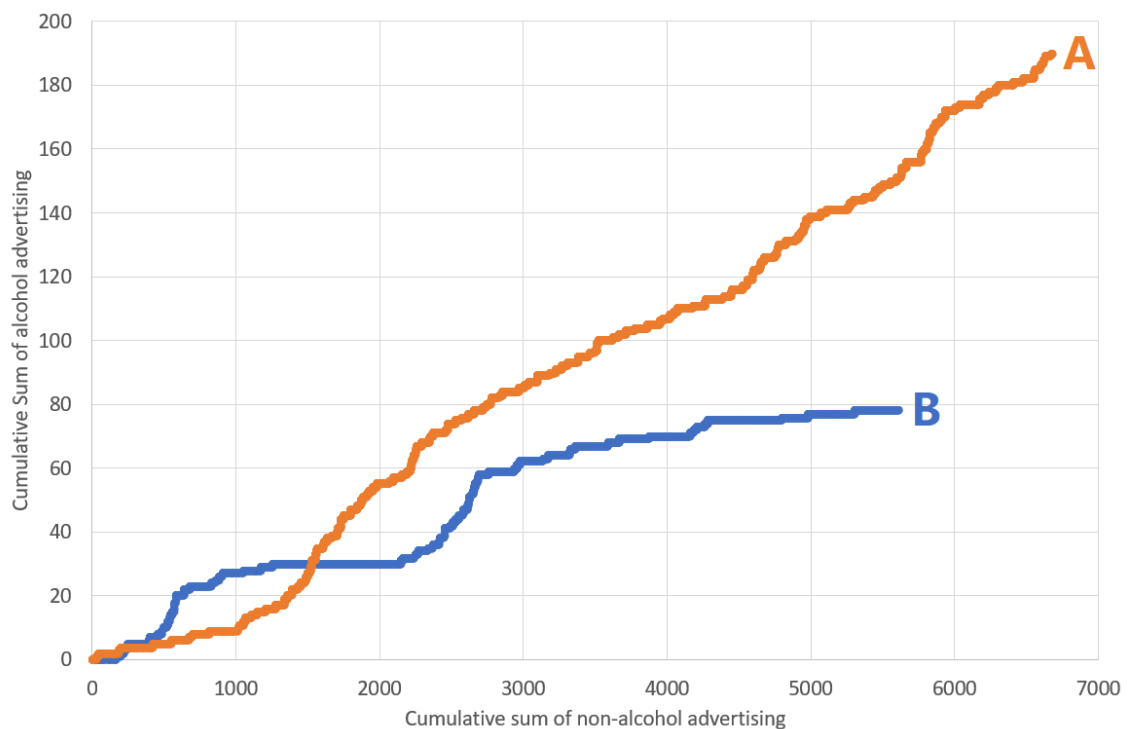
On its own, a close reading of a single sequence does little to explain the associative algorithmic logic of the advertising model. While an individual user might be able to see themselves reflected in their sequence of ads, their sequence only becomes meaningful when they see it associated or approximated with other sequences. For researchers, civil society, and regulators, questions about the power of the advertising model and the harms it may cause require an observation of sequences at scale. To respond to this problem, Figure 2 uses time-series modelling to extend analysis of both individual and groups of ad sequences. Figure 2 illustrates how alcohol ads, as a subset of all ads seen by a participant, are delivered as part of a sequence to provide an image of the rhythm of tuning. In the case of alcohol ads, it helps us understand how the ad model adapts to different consumers in the pattern and intensity of ads it serves. Furthermore, with associated information about the ads and consumers receiving them, we could understand the relationship between different kinds of tuned sequences and harm. We could ask, for instance, whether drinkers who consumed alcohol at high-risk levels were served particular kinds of sequences, whether younger consumers were served different kinds of sequences and so on. The approach we have taken is to index all ads received by time and then cumulatively sum the number of alcohol and non-alcohol ads against these indices. This enables us to visualise alcohol and non-alcohol ads received over time as a line chart, where the x-axis represents the number of non-alcohol ads and the y-axis represents the number of alcohol ads. The sequence then reveals periods where a significant number of alcohol ads are delivered in a short space of time (vertical lines), versus periods where relatively few alcohol ads are seen (horizontal lines).

## Analysis

While it is beyond scope to provide a full analysis, in Figure 2 we visualise sequences of two members (Participant A and B) of the Australian Ad Observatory cohort to illustrate the value in this approach of comparing sequences. In this graph we can firstly note how A is exposed to more ads over time. A tends to receive alcohol ads interspersed amongst their stream of non-alcohol ads with a steady, cumulative regularity. By comparison, we note two steep vertical segments for B early in their ad donation journey, which correspond to periods of intense and repeated exposure to alcohol advertising. These different patterns between participants A and B reveal why it is important to develop such a visual time-series analysis. The visualisation of numerical distributions that share near-identical statistical properties (such as mean and variance), can be markedly different in terms of their underlying distributions. The importance of examining realistic datasets graphically, not just numerically, has been an important touchstone in the field of



statistics and data science (Anscombe, 1973). Simple percentages or counts of alcohol ads hide the reality of the sequencing of alcohol advertising which can be highly regularised (like that of A), or punctuated by periods of intense exposure (like that of B). This plot alerts us to the different “rhythms” of users’ sequences, and we can speculate about the different ways these sequences might be understood as harmful or not. For researchers, civil society, and regulators this would lead us toward modelling typologies that sequences create, how they are associated with different kinds of users, and what harms they may cause. For individuals, if they could see their sequence relative to other users’ sequences, then they could better appreciate how the model tunes for them and makes their experience different to others. It might also then create the conditions for platforms to create controls that enable users to shape their experience less at the level of an individual post and more at the level of their overall sequence.



**FIGURE 2:** Comparing two users’ sequences of alcohol and non-alcohol ads over time.

The modelling of tuned sequences can also develop in two further directions:

- Probabilistic projection of sequences: we can statistically model a sequence to predict future patterns. This could be done by using data about all the sequences in an ad observatory to understand the volume and pattern of particular ads users will see into the future based on what they have seen so far. This might also enable the experimental modelling of changes to algorithmic models to create different kinds of sequences. In

the case of alcohol advertising, this would enable us to model the differences between who “accumulates” alcohol ads and who gets “bursts” of ads over time. Platforms and advertisers could be required to provide data that then enables researchers, civil society, or regulators to understand the relationships between these different kinds of sequences and patterns of consumption.

- Comparison between sequence typologies: we can model “typologies” of sequences to examine statistically the form they take and how those forms are associated with particular kinds of users and user experiences. Imagine that both sequence A and B are each a composite of many different users. We could then start to understand tuning as not just selection of ads but the creation of different kinds of ad rhythms and velocities for different kinds of users. The creation of typologies could illuminate the function of proxies by considering the areas where groups converge and diverge.

## From ad libraries to ad observatories

Ad libraries carry well-established risks with transparency: too much information creates noise, the wrong kind of information is a distraction, the choice of what information is made public defines the object and problem in advance (Ananny & Crawford, 2018; Leerssen et al., 2021; Rieder & Hofmann, 2020; Zalnieriute, 2021). This is particularly the case where “the details of a system will not only be protected by corporate secrecy or indecipherable to those without technical skills, but inscrutable even to its creators because of the scale and speed of its design” (Ananny & Crawford, 2018). Ad libraries are “transparency-washing” initiatives that carefully obfuscate and redirect attention away from the processes and techniques that make platforms powerful (Zalnieriute, 2021). Ad libraries focus our attention on the ads, when we really need to observe the algorithmically-tuned sequences that make digital advertising powerful. Reflecting on this challenge, we frame three main conceptual problems with ad libraries, regardless of how transparent, comprehensible, and accessible they are:

1. The problem of glut: libraries present information that is difficult to search and analyse and more information would not enable better forms of understanding.
2. The problem of explanation: libraries present ads that do not help to observe and explain the algorithmically-tuned advertising model, but more technical explanations of algorithms would not help either.
3. The problem of approximation: the associative and generative algorithmic models that drive digital advertising do not map onto straight-forward symbolic and causal explanations as to why a person saw a particular ad at a particular moment.

To respond to these problems we propose that we need to develop the capacity to observe the dynamic social and technical process of tuning through ad sequences.

## **The problem of glut**

Ad libraries reproduce the “paradox of an era of information glut” where we think the more information we have the more likely we are to be fully informed, that with enough data reality will speak for itself, but the data glut becomes noise that obfuscates understanding (Andrejevic, 2013). If we asked digital platforms to archive every advertisement they ever published, we would end up with libraries of extraordinary scale. They would be too big to be made sense of at a human-scale and would require significant resources to develop and maintain automated techniques for organising, classifying, and sense-making. Our only recourse would be to automated forms of sense-making, likely developed and operated by digital platforms themselves and organised around their interests (Andrejevic, 2013). Power to understand advertising would remain with actors that have the capacity to process, analyse, and visualise the data. The existing ad libraries already thwart observability by creating the conditions of info-glut: large collections of ads that are not searchable or interpretable in ways that enable users to understand how digital advertising works. Where transparency was once a response to a lack of information, it now only benefits those with the capacity to utilise information at scale. Under these data-saturated conditions, curation emerges as a critical issue (Davis, 2020). We need to develop forms of sense-making that enable us to understand how the advertising model’s “curatorial algorithms” work to “encode users’ implicit desires and propensities based on individual and collective behavioural patterns” (Davis, 2020, p. 51). We need to ask algorithms to give an account of their curatorial practices as they tune flows of content, curating what to show when and where (Davis, 2020).

## **The problem of explanation**

On the face of it, ad libraries contribute to the problem of explanation because they provide partial information: only two platforms provide libraries, no library provides a complete or accessible archive of ads, and no platform provides useful information on targeting, reach, or spend. A more fundamental problem is that the ad libraries shape the research agenda on digital advertising. The problem with industry-created transparency tools like libraries is that the platform plays the determinative role in choosing what is made transparent, researchers are unable to verify the reliability of the data, and the capacity to analyse the data is complicated by the configuration of platform dashboards and APIs (Bruns, 2019; Mehta & Erick-

son, 2022). Researchers become methodologically and conceptually oriented toward analysing the object in the library: the content and number of advertisements. In the pursuit of more comprehensive libraries, researchers and civil society groups lose opportunities to observe how ads are integrated into users' feeds in an uninterrupted way, how ads appear in sequences over time, associate with other ads and content, and respond to triggers from users' actions (Mehta & Erickson, 2022).

At the same time, explanations of the technical operation of "the algorithm" would not explain the power of the advertising model to tune and optimise. Amoore (2020) argues that we need to move away from forms of explanation organised around technical documentation and toward approaches that enable an understanding of the associative and generative operations of algorithmic systems in the social world. One way to see this in practice is to look at the analytics dashboards and ad builder tools that platforms provide to advertisers, which differ from the architecture of the library (Mehta & Erickson, 2022). Rather than technical explanation of algorithms, these tools and dashboards provide dynamic visualisations that enable advertisers to understand how their ads and audiences are being tuned in ways that respond to their strategic choices, the actions of their consumers, and the platform tools they are using. Researchers and civil society also need the tools to observe the dynamic relations between advertisers, platforms, and users. This mode of observation is particularly important as automated models move beyond structured decision-making models and toward open-ended and associative ones that optimise and tune sequences of content. We are ultimately trying to understand not the technical operations of an algorithmic model but how it operates in the world.

## **The problem of approximation**

Ad libraries provide little information about how ads are targeted. The two exceptions are political ads on Meta and Alphabet and, since 2023, ads on Meta published in the EU. But even then, information about targeting shows only very basic demographic criteria like age range, general location, and gender that obfuscates how the ad model operates. Targeting implies a direct symbolic link between the choice of "a target" by an advertiser and the delivery of an ad. In a tuned ad model, ads aren't targeted only, or even at all, by the selection of particular criteria that correspond with aspects of our identity, but instead by iteratively and probabilistically associating us with other users based on our "likeness", "approximation" or shared patterns of expression, movement, swiping, tapping, and so on (Brown et al., 2024). Even if an ad model restricts advertisers from using categories related

to race, gender, or age, it learns to target not based on who we are but who we are proximate to (Phan & Wark, 2021). Phan and Wark (2021), for instance, argue that Facebook's removal of "ethnic categories" does not eliminate racial classification and discrimination. While these categories no longer exist as a means for advertisers to target people, they are reinscribed through our proximity to each other. To understand how platforms' ad models position us in proximity to each other, we don't need to "pry open" the algorithmic black box, but instead develop the social and technical capacity to observe the end products and the abstractions that algorithmic systems produce (and reproduce) in the world (Phan & Wark, 2021).

These three challenges illustrate the need to develop approaches that begin with asking "what do we need to observe?" rather than jumping to techniques for observing "the ads", "the targeting", or "the algorithm". By focussing on observability we raise "the complicated question of how data and analytical capacities should be made available, to whom and for what purpose" (Rieder & Hofmann, 2020). Three issues are important: arriving at a shared understanding of what we need to observe, having the technical capacity to observe it, and having the social and institutional relationships to make practices of observation meaningful. While we should continue to advocate for ad libraries that meet minimum standards for archiving, access, searchability, and analysis, we also need to ensure that we are not confined to the way platforms define ad transparency. To reckon with the power of digital advertising we need to imagine forms of observability that begin not with the ads but with the socio-technical process of advertising. In this article we proposed the "tuned sequence" as an observable object to enable better forms of public understanding and accountability of tuned advertising on digital platforms. We argue this helps resolve the problems of glut, explanation, and approximation by focussing on the emergent process of optimising the relationships between ads, users, and the feeds in which they are assembled.

Our approach aims to reconfigure a *glut* of inert, individual ads into a sequence that enables us to observe the emergent rhythm and pattern of ads. Tuned sequences are a curatorial technique that helps to navigate and make sense of large amounts of ad content in ways that enable us to apprehend the algorithmic logic of the advertising model. In the case of the Ad Observatory, as one example, an inert collection of 700,000 ads becomes 1,800 sequences. Those sequences can be further modelled to locate meaningful typologies and patterns. Importantly, this means we can revisit the content of ads as not just symbolically powerful but also technically powerful because of the way they function as data points in a process of algorithmic optimisation. The content of ads both symbolically shapes our iden-

tities, feelings, and behaviours, and helps to train models that optimise audiences and their consumption practices.

This would enable us to better *explain* the temporal and associative operations of the ad model. The abstractions and patterns that algorithms produce reveal the logic of automated systems without having to “open the hood” of the algorithms themselves (Amoore, 2020; Phan & Wark, 2021). The tuned sequence is the mode through which the algorithmic ad model gives an account of itself. While tuned sequences are the right place to begin our observation, they also set the grounds for developing meaningful accounts of how they are produced – through what technical models, with whose data, within what kind of platform and commercial relationships. They also prompt questions about how the sequence operates in the lives of users of digital media platforms: how is the sequence experienced? Not just by looking but also by tapping and swiping? How does it shape our desires and subjectivity but also organise our practices?

The tuned sequence enables us to model how users are *approximated* or associated with each other through a range of emergent categories, without specifying any targeting criteria. For example, where do the “typologies” of sequences we proposed converge and diverge? Are those differences not just about the kinds of ads, but the patterns of ads, their intensity, velocity, and rhythms as the model looks not for stable targets but for emergent possibilities? By visualising and analysing tuned sequences of ads, we get closer to apprehending the outputs of the algorithmic model that makes digital advertising powerful, a matter of public concern, and potentially harmful. In this article, we’ve demonstrated our attempt to build a socio-technical infrastructure for observing digital advertising that includes researchers from computational, legal, advertising, and media disciplines working together with civil society groups and public interest journalists. This infrastructure of observability is needed to locate the power of digital platforms and build multi-faceted forms of public accountability, and complements efforts to build infrastructure for mapping relationships between platform and advertising industry actors (van der Vlist & Helmond, 2021).

## Conclusion

The relationship between digital platforms and advertising is a key vector of power in our public culture. The market power of many digital platforms is grounded in a dominance of advertising markets that enables investment, not into the production of content like mass media industries, but into the engineering of platform interfaces, hardware, and automated models. This relationship is complicated. In

one sense advertisers are beholden to platform ownership and control of the automated models and tuned audiences they use, but at the same time platforms have helped advertisers to create more optimised and responsive market formations. Platforms and advertisers have collaborated and competed in the creation of a form of advertising that is powerful because of its capacity to tune sequences that channel, modulate, and pre-empt interests, preferences, and choices within a larger system of consumption that shapes our lives, wellbeing, health, and environment.

In our collaboration between researchers and civil society we aim to build observatories rather than libraries. Libraries serve platforms' interests because they obfuscate the algorithmic-tuning that makes digital advertising powerful, determine how civil society and research groups approach advertising, and thus influence policy processes such as public inquiries and the development of regulatory approaches. Observatories are socio-technical arrangements through which we can develop the capacity to monitor how flows of ads move and interrelate, rather than storing and archiving collections of ads over time. As platforms' algorithmic models become more emergent in their ordering of ads and in their capacity to create ad content, we need modes of observation that are focussed less on cataloguing the ads and more on understanding the operations of algorithmic models in our everyday lives. The algorithmic sequences of ads are entangled with the individuals who scroll through them. These sequences demonstrate a key characteristic of emergent and generative algorithmic models – they become powerful by operating and learning from the social and cultural settings they are deployed into.

Observatories require large multi-disciplinary teams that include researchers across media and communication, public health, public policy, law, and computer science, and collaborations with civil society and regulatory stakeholders. This requires investment not just in research projects but also research centres and infrastructure often in partnership with civil society, industry, and government. While observatories help develop better forms of understanding and control for individual users, they most importantly enable the development of public cultures, techniques, and frameworks for observing digital platforms. The goal isn't to establish comprehensive archives or libraries of content, but to be engaged in the ongoing social and technical work of making the optimisation and automation of public culture observable, understandable, and accountable to shared interests. The shift to observatories focuses our attention on the dynamic power relationship between platforms and advertisers, aiming to create forms of observation that enable meaningful understanding and accountability focussed not on "bad" ads with "bad"

messages, or “bad” forms of targeting, but on the emergence of a new cultural form where power is located in the capacity to tune and shape our patterns of consumption and ways of life.

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