



# ADM+S WORKING PAPER SERIES

## > Australian Ad Observatory

Background Paper

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**Authors:**

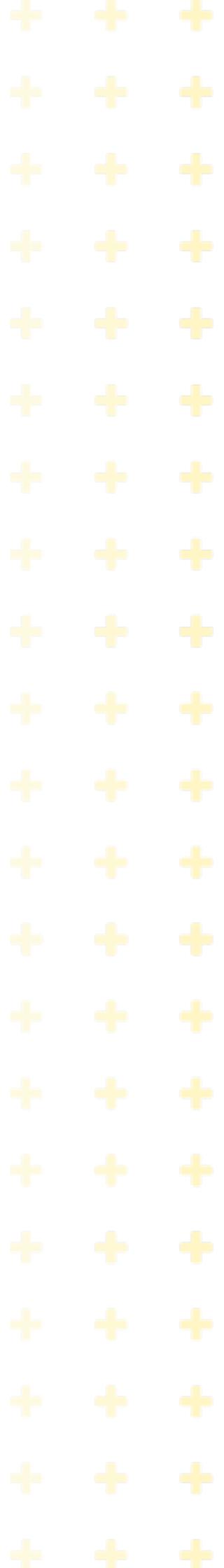
Professor Jean Burgess  
Professor Mark Andrejevic  
Professor Daniel Angus  
Dr Abdul Karim Obeid

**WORKING PAPER 004**



## ACKNOWLEDGEMENT OF COUNTRY

In the spirit of reconciliation, we acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.





## ABSTRACT

This working paper is designed to provide background information on the aims and methods of the Automated Decision-Making and Society (ADM+S) Australian Ad Observatory research project. We describe the rationale and broader context for the project, focusing on the need for improved observability of how Australians are being targeted with ads online. We discuss the need for new research methods and tools such as data donation and position these methods within broader initiatives to develop 'citizen science' approaches for the digital platform environment. The paper then describes the project's methods in further detail and discusses how the results can inform the public and policymakers about online targeted advertising in Australia.

**KEYWORDS:** PLATFORMS, SOCIAL MEDIA, ADVERTISING, DATA DONATION, AI

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# 1. THE AUSTRALIAN AD OBSERVATORY PROJECT

## 1.1 OVERVIEW

Launched in October 2021, the Australian Ad Observatory<sup>1</sup> is a project within the Data Program and News and Media Focus Area of the Australian Research Council (ARC) Centre of Excellence for Automated Decision-Making and Society (ADM+S). The project aims to improve the observability of targeted online advertising in Australia, and forms part of broader efforts to help improve transparency and accountability in the digital platform environment.

Similar to our Australian Search Experience project, the Australian Ad Observatory takes a citizen science approach to investigate how Facebook ads target Australian users. It relies on the general public donating data through a plugin available for desktop versions of leading web browsers. The plugin collects the ads displayed in each user's Facebook newsfeed, and our system then collates and analyses the relationships between these ads, their metadata, and the anonymous demographic information supplied by participants to identify patterns in how ads are targeted to Australian Facebook users.

This background paper outlines the motivations for this study, presents the broader context of the research, and describes the practical implementation of the Observatory. Further details and updates, and instructions on how to sign up and participate in the project, are also available from the Australian Ad Observatory website.

## 1.2 CONTEXT AND MOTIVATIONS

Advertising is a long-established element of the media industry and is undergoing significant change in the online environment. Much public attention has focussed on the dramatic changes in how news is distributed and consumed in the digital era.

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<sup>1</sup> <https://www.admscentre.org.au/adobservatory>



However, the digital transformation of advertising is equally worthy of attention, given the historically significant role played by advertising in shaping cultural values, attitudes, and beliefs and potentially influencing people’s behaviour. At the heart of this project is the need to systematically understand the social implications of this transformation (Andrejevic, Angus & Burgess, 2022).

Targeted advertising based on the detailed profiling of consumers now underpins the business models of most online services, including social media platforms. The economic disruption to the news and media industries has been significant as advertisers move from conventional forms of broadcast and print media to online platforms that capture the majority of new ad dollars. Simultaneously, the cultural function of advertising has shifted from a highly visible system for linking cultural values and marketing appeals to an increasingly personalised and private experience that is obscured from public oversight.

In the mass media era, ads were widely publicly available—hence the association with ‘publicity’ and ‘public relations’. But as the online advertising business has evolved alongside the personalisation of social media, ads have gone ‘dark’ (Andrejevic et al., 2021): that is, they are increasingly only visible to those to whom they have been directly targeted. This development is profound. It changes our everyday advertising experience and has significant consequences for longstanding social concerns about the potential pathologies of commercial messaging, including discrimination, stereotyping, predatory advertising, and the circulation of false and misleading information. Personalised targeting also makes it harder than before to keep track of who is being targeted, for what purpose and on what basis.

The digital transformation of advertising also has significant broader cultural implications. Advertising has long been central to the business models of for-profit media communication, and commercial messaging played a central role in the rise of mass consumer society in the 20th century. For example, the historian Jackson Lears (1995) contends that advertising has collaborated with other social institutions to promote ‘dominant aspirations, anxieties, even notions of personal identity’ (1995: 2). In addition to its role in mobilising consumption to keep pace with industrialised mass production, advertising has a broader cultural significance. As the media historian Michael Schudson argues, advertising ‘may shape our sense of values even under



conditions where it does not greatly corrupt our buying habits' (1984: 23). He claims that 'advertising, whether or not it sells cars or chocolate, surrounds us and enters into us, so that when we speak we may speak in or with reference to the language of advertising and when we see we may see through schemata that advertising has made salient for us' (210).

Scholars have explored the role played by advertising in shaping attitudes towards female body image and beauty (Kilbourne, 1990), racial preconceptions and prejudices (Wilson and Gutiérrez, 1995) and class (Marchand, 1985), among other areas of social life. For example, we know that the long history of racism and sexism in advertising has helped reinforce the attitudes, associations and prejudices that support and enable violent and discriminatory policies and actions. Kathleen Jackson, an Australian Indigenous scholar, notes the connection between racist ads and harmful social policy in her discussion of the notorious Nulla-Nulla soap ad, which, in the 1920s, personified 'dirt' in the form of an Aboriginal woman being beaten on the head under the brand slogan, 'knocks dirt on the head'. As she puts it, 'Advertisements, such as Nulla-Nulla soap, provided subliminal support to the colonial campaign to enforce European cultural and economic values...A single complaint about the cleanliness of an Aboriginal child could result in the exclusion of Aboriginal children from school. This exclusion could establish neglect and allow...the removal of Indigenous children from their families' (Jackson and Barnes, 2015: 73).

As ads come to permeate contemporary life, the values and attitudes they select and reinforce become a core component of our everyday social worlds and have material impacts. Thus, both the ads and information about how they are targeted need to be available for public scrutiny. Despite the significant changes in advertising infrastructure and business models, little systematic or comprehensive sociocultural research has been conducted on the social issues associated with these newer forms of advertising. This lack of research is partly due to the limited availability of contemporary archives. The advent of technologies such as video and audio tape, and storage media such as microfilm and microfiche, led to the creation of enduring archives of advertising from the recent mass media era that can be drawn upon by researchers, media activists and the general public. However, contemporary online advertisements are far more numerous and dynamic, and hence ephemeral.



The use of automated, real-time split (or 'A/B') testing based on a large number of variables (Crain & Nadler, 2019) can mean a well-funded advertising campaign might, in theory, go through thousands of ad variations, in order to 'micro-target' users and dynamically improve advertising performance. Some research has cast doubt on how extensive the use of micro-targeting is in practice (Bennett & Gordon, 2020). However, the 'digital director' for US President Donald Trump's 2016 campaign reportedly claimed that on an average day, his team would make, '50,000 to 60,000 ads...changing language, words, colours, changing things because certain people like a green button better than a blue button, some people like the word "donate" over "contribute"' (Handley, 2017). Given the lack of meaningful oversight of the Facebook advertising system, there is no way to independently verify the extent of such practices and no way of knowing how many (if any) of the resulting ad variants are publicly archived, even temporarily, for later scrutiny. More broadly, because online ads are programmatic—dynamically and automatically targeted in real-time—they cannot be retrieved by revisiting the page on which they were displayed; and because these systems rely on personalisation, there is no universal or society-wide view of them. As a result, we are losing collective visibility of the advertising environment, making it difficult to address associated social issues.

From an individual user's perspective, the shift in the online ad environment makes it harder to determine how one person is being singled out and, potentially, discriminated against or targeted in exploitative ways. Users are exposed to more advertising and branded messaging than ever before, while, from the broader societal perspective, a rapidly growing portion of these ads is effectively invisible (Carr, 2021). Individual users may see the ads that have been targeted to them, but they have no way of knowing whether others are seeing the same ads and, if so, which others. For example, a man who sees a job ad may not know that this ad has been targeted exclusively to men of a particular age. A person seeing an ad for easy credit cannot know whether the interest rate they are being offered is the same as that offered to others receiving similar ads. This lack of oversight of online advertising provides potential cover for advertisers to engage in activities they might otherwise avoid, especially if they knew they were subject to public scrutiny.



Much of the research on the role of digital platforms in distributing these ‘dark ads’ has focused on political advertising (Saunders, 2020), but the impact of advertising reaches far beyond electoral politics (Ewen, 1974; Schudson, 1984). In the absence of full transparency and systematic research in this area, some progress has been made by investigative journalists and researchers undertaking hypothetical, experimental explorations of online advertising systems. For example, independent journalists experimenting with the purchase of different types of ads discovered that Facebook made it possible to deliver job ads that discriminated by age—in violation of US federal law (Angwin et al., 2017). Consequently, Facebook was fined US\$5 million and agreed to create a separate category of ads for jobs, housing and credit that prevented targeting in protected categories (Yurieff, 2021). Latanya Sweeney (2013) found that a higher percentage of background check service ads appeared for black-identifying first names than for white-identifying first names in searches on Google and Reuters, which hosts Google AdSense ads. Similarly, a study of Google Ad Settings by Datta et al. (2015) found that setting a user’s gender to ‘female’ resulted in seeing fewer ads related to high-paying jobs than setting the gender to ‘male’. More recently, investigative reporters discovered that Google has a setting that allows advertisers to exclude users of unknown gender, potentially enabling discrimination against non-binary people for protected categories of services, including employment, housing, and financial services.<sup>2</sup>

Amending or removing potentially discriminatory settings like these would not necessarily eliminate discrimination in advertising, as Facebook’s algorithms have been shown to customise ad delivery based on previous response patterns. If, for example, a previous ad was primarily clicked on by men, the algorithm may target a new ad with a similar appearance or context primarily to men, even if the advertiser had not requested this (Ali et al., 2019). In this way, Facebook’s advertising system might independently perpetuate historical forms of discrimination—without the advertisers intending to do so. Therefore, developing methods to systematically investigate

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<sup>2</sup> <https://searchengineland.com/a-google-ads-setting-allowed-advertisers-to-exclude-people-of-unknown-gender-346045>



existing patterns in ad targeting is crucially important to understand the impact of advertising on society in the digital age.

### 1.3 PRECURSOR PROJECTS

In response to concerns about ad targeting and calls for transparency, Facebook (now Meta) created a publicly available Ad Library, which is intended to ‘[provide] advertising transparency by offering a comprehensive, searchable collection of all ads currently running from across Meta technologies’.<sup>3</sup>

While this is an important and welcome move, the Ad Library as currently implemented has several significant limitations: there is no way to independently verify the completeness of the Ad Library; it only archives ads not related to social issues, elections or politics,<sup>4</sup> while others are removed from the library when they are no longer running on the platform; and, crucially for our purposes, it does not provide detailed information about how the ads are targeted and using what specifications (which may include or extend beyond demographics as traditionally understood).

To address this gap, investigative journalists and researchers have been developing alternative methods to provide greater public oversight of advertising. Many of these initiatives rely on ‘data donation’ tools that allow members of the public to share information voluntarily with researchers. While the degree of active involvement from users varies, the data donation model generally enrolls participants to contribute to the project as ‘citizen scientists’ (Araujo et al., 2021), and in this way is similar to scientific projects that encourage amateur meteorologists, naturalists or astronomers to contribute their observations to professional scholarly efforts.

An important precursor to our project is the browser extension developed by ProPublica, a not-for-profit investigative journalism organisation, to collect political ads on Facebook during the 2016 presidential election in the United States.<sup>5</sup> In an approach that other media organisations, including Wired magazine and The Guardian

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<sup>3</sup> <https://www.facebook.com/ads/library/>

<sup>4</sup> Meta’s explanation of how these topics are defined is at:

<https://www.facebook.com/help/180607332665293>

<sup>5</sup> <https://projects.propublica.org/facebook-ads/>



have since followed, ProPublica invited members of the public to install the tool on the browser(s) they used to access Facebook. They also created a tool for automatically identifying political ads. This model has subsequently been adopted by researchers at New York University's Ad Observatory<sup>6</sup> and adapted by other research teams internationally (e.g., Silva et al., 2020).

Building on this work, the Australian Ad Observatory develops new methods for providing more accurate insight into demographic and post-demographic patterns of ad targeting. As discussed in the previous section of this paper, while most precursor journalistic and scholarly research projects focus on the undoubtedly significant issue of political advertising, we aim to investigate the role of online advertising in areas that go far beyond electoral politics and extend into other areas of everyday life and identity. For example, in the pilot study for this project (led by Monash University) that included 150 participants, we found a strong demographic skew towards men in the delivery of technology ads: 2,519 ad views compared to 741 for women (Trott et al., 2021). The Australian Ad Observatory aims to enable the exploration of such patterns on a national scale.

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<sup>6</sup> <https://adobserver.org/>



## 1.4 IMPLEMENTATION

Building on the open-source tool developed by ProPublica and deployed by a range of research groups and media outlets, the Australian Ad Observatory project extends and enriches the functionality of the data donation plugin and dashboards, including ensuring compatibility with current plugin standards for the desktop versions of leading web browsers: Google Chrome, Mozilla Firefox, and Microsoft Edge.<sup>7</sup> The main difference between ProPublica's tool and ours is that our installation procedure collects voluntarily supplied demographic information. We have also designed a more extensive 'back-end' for enabling different kinds of analysis of ads captured through the observatory plugin.

The project (including the deployment of the plugin) was approved by the Queensland University of Technology (QUT) Human Research Ethics Committee (approval number: 4555) and was also ratified by the ethics committees of other ARC Centre of Excellence for Automated Decision-Making and Society (ADM+S) Participating Organisations involved in the project. The browser plugin is available from the browser extension stores of the three targeted browsers, and background information about the project, as well as links to the plugin in the extension stores, are available from the Australian Ad Observatory project website at

<https://www.admscentre.org.au/adobservatory/>.

When signing up to the Observatory, participants complete a short demographic questionnaire used to link ads to the demographic characteristics of the users who encounter them. The collected demographics include age range, gender, postcode, education level, annual income range, primary language spoken, employment status, political preference, and whether or not they identify as an Indigenous Australian person. These optional responses are valuable in investigating whether different demographic groups encounter different search results but do not allow us to identify or track individual users, either on Facebook or elsewhere online. The plugin does not access any personal information from the user's computer or online profile.

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<sup>7</sup> The code and documentation for our data donation plugin is available publicly via the ADM+S Github repository: <https://github.com/ADMSCentre/australian-ad-observatory>

Participants are also assigned a unique private key that links their experience of Facebook advertising to a dedicated marker. This key allows participants to use the plugin to see a personal archive of the ads the plugin has collected from them (see Figure 1).

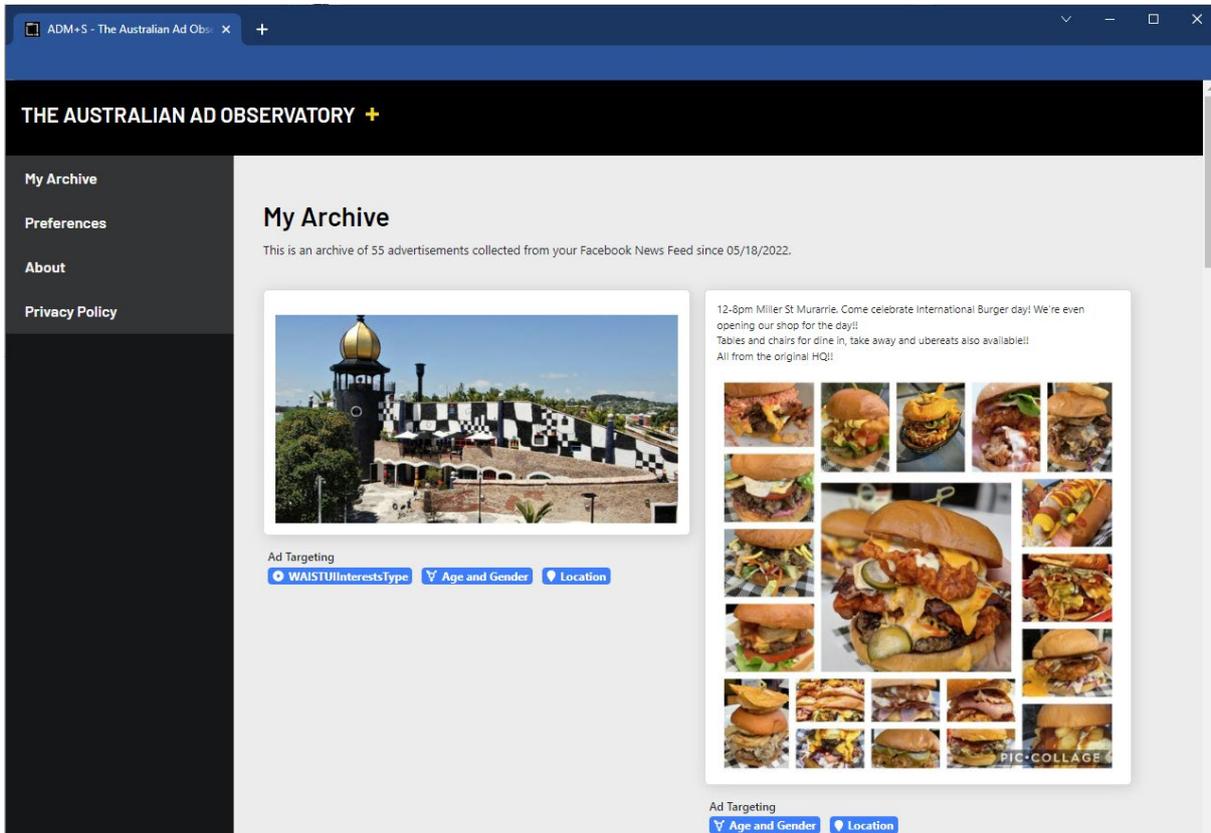


Figure 1: The plugin allows users to retrieve and examine all ads they have encountered and submitted to the central database through their personal use of the plugin.

After registering their demographic details, a participant simply needs to scroll through their Facebook News Feed to implement the data donation process. The plugin will independently scan for ads displayed in the browser in which it is installed and will collect the associated media, for example, text, images or image ‘carousels’ (rotating sets of ad images), or full video advertisements. We also collect the name of the page or account that registered as the source of the ad, any associated disclaimer (e.g., ‘paid for by’, ‘published by’), URLs for any links incorporated into the ad, and additional metadata such as Why Am I Seeing This (WAIST) tags, otherwise known as ‘interest codes’. We do not collect any of the user’s Facebook profile information or anything else from their newsfeed, and data collection ceases if the user uninstalls the plugin.



As soon as they are encountered in the newsfeed, ads are collected and sent from the participant's computer to a secure cloud server. Once received by the server, the ad also triggers an additional query to Meta's Ad Library API or Webpage (Meta, 2022) to enrich the ad content with additional data available from these sources. In cases where the ad is classified as relating to social issues, elections or politics,<sup>8</sup> Meta's Ad Library API provides access to global ad spend information and other engagement data collected by Facebook, including distribution of impressions by age, location and gender. Meta's Ad Library API does not support ad queries for 'non-political' content; therefore, a query is loaded into a mechanised web-browsing session that accesses Meta's Facebook Ad Library website under the 'all ads' category for ads that are not related to social issues, elections or politics. Ads listed under the 'all ads' category do not contain as much enrichment data as those in the 'social issues, elections or politics' categories; however, they still provide information regarding when the ad campaign began, and other associated 'creative' materials (images, videos, text) that can be gathered and added to our system as useful ad data enrichment.

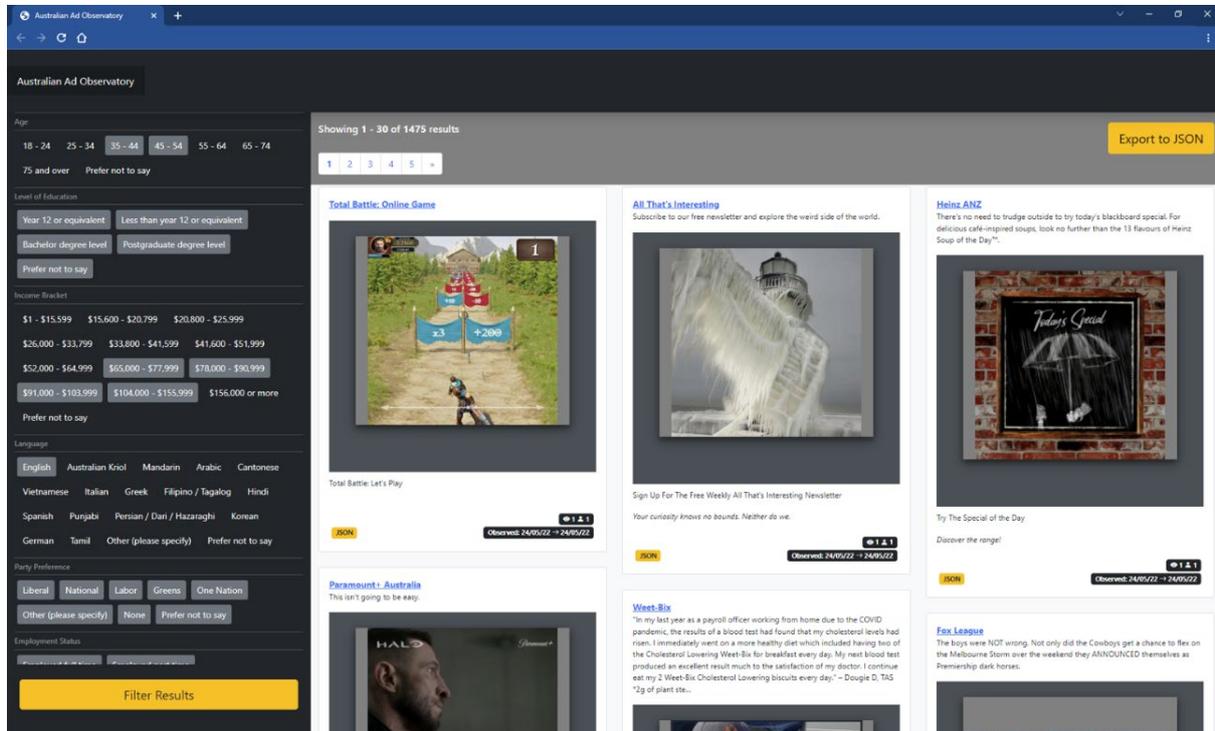
Following these steps, the image data for each ad (including still frames extracted from video content where applicable) are fed into an image analysis pipeline, which implements numerous techniques that enhance our ability to identify the ad content ahead of manual qualitative analysis. Among these techniques, each image is first evaluated for text content through an 'Optical Character Recognition' (OCR) implementation (Jaided AI, 2022; Baek et al., 2019; Shi et al., 2016). Then each ad is evaluated for the presence of relevant insignia using a specialised variation of the Ultralytics, inc. (2022) 'You only look once' (YOLO) implementation. A Facebook Detectron2 object detection implementation (Wu et al., 2019) then searches for the presence of relevant physical objects within the image, and an image saliency implementation that determines the 'point of interest' within the image (Montabone & Soto, 2010). These techniques could automatically detect political logos during the 2022 Australian federal election and appear to hold promise for the detection of commercial products, including potentially harmful (or inappropriately targeted) products.

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<sup>8</sup> As defined at <https://www.facebook.com/help/180607332665293>

## 1.5 RESEARCH DASHBOARDS AND ANALYTICS

All data generated using the browser plugin can be accessed using a dashboard tool. The Observatory dashboard allows approved researchers to filter, search, and sort through all the ads collected to date (see Figure 2). The data analysis functions



leverage the various data elements captured, allowing ads to be filtered by a specific demographic category, within a particular time range, by specific Facebook WAIST interest codes, ad text, or visually distinctive objects and/or logos. Filtered subsets of ads can then be downloaded by researchers for offline analysis and interpretation.

*Figure 2: The researcher dashboard. The control panel on the left allows researchers to sort, search and filter collected ads using a simple visual interface.*

We are also implementing more advanced features, such as the construction of ad 'categories' as a basis for automated filtering, so that we can, for example, search for all ads in the 'politics' category to locate political advertising, as we recently did for the 2022 federal election. When constructing categories, we draw on clusters of features such as logos, text and page IDs. Categorisation allows researchers to quickly assess the extent to which particular kinds of ads are targeted to users with particular demographic characteristics.



Ad search, filter and categorical construction are aided through combinations of data enrichment provided by a suite of back-end daemon processes. These processes include OCR to extract text from videos/images, salience detection to highlight the most visually salient regions of ad images, object detection to label easily recognised objects within images and videos, and logo detection. While the OCR, object and salience detection adopt common machine vision approaches, the logo detection applies our extended ‘you only look once’ (YOLO) learning approach. The YOLO classifier allows researchers to create custom sets of visual logos, where they only require singular authoritative versions of these logos, which are fed into our machine classifier. Logos can then be accurately detected in ads even if variations in their visual presentation are applied, for example, skew, warp, colour variation, or partial occlusion.

## 1.6 ROADMAP FOR FURTHER DEVELOPMENT

The launch of the Australian Ad Observatory project in October 2021 was accompanied by coverage in major Australian news media, social media promotion and a major outreach campaign.<sup>9</sup> The project website hosts a number of these materials, including basic infographics outlining browser plugin functionality (see Figure 3). Further outreach and engagement activities will continue throughout the project’s lifetime.

From here, the team will begin a focused period of data analysis to identify and interpret patterns and trends in Australian online advertising and the way users are targeted, with an initial focus on observations made during the Australian Federal Election in May 2022. In September 2022, the project will host the ADM+S Dark Ads Hackathon, which will bring together interested experts, researchers and students to explore potential next steps, including methods to capture mobile advertising, novel approaches to the data we have already gathered, and new research questions. A series of formal publications and updates on interim findings will be made available as the project continues to progress.

The project’s ongoing challenges are mainly related to scale. Because we rely on volunteer participation, we are reaching only a relatively small, self-selected portion of

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<sup>9</sup> <https://www.admscentre.org.au/adobservatory/project-media-coverage/>



the overall population (approaching 2,000 users as of July 2022). Gaining further visibility into patterns of online advertising would require the ability to collect ads at an increased scale with a representative population—an endeavour that would require a system with tremendous storage capacity and more widespread opt-in of Australian Facebook users. It is important to note, however, that this relatively small cohort of data donors is generating a large database of ads—a quarter of a million ads were collected in the first few months, and the existing tool is useful for providing indicative trends and capturing and archiving a sampling of ads served to participating contributors. As we progress, further development of the systems used to make sense of the large amount of data we have already collected is required. Future work will include more open-ended machine vision approaches to perform clustering and classification of ads based on latent visual properties, not just based on specific objects and text.

Beyond the research findings that the Ad Observatory project will generate, our goal is to demonstrate techniques and approaches to enhance public observability of platforms' data operations, which continue to be opaque, not least due to personalisation. In the interest of enhancing public oversight and understanding of these issues, we are working towards making information about the ads and associated demographic data we have collected available as a public dataset, with appropriate governance and access requirements in place to ensure the preservation of participant privacy. We are also planning significant dashboard enhancements that will enable research participants to explore and investigate their personal ad libraries and associated metadata; in turn, we hope this will enable richer mixed or 'hybrid' digital method approaches (Burgess et al., 2021), enhancing the participatory elements of the 'citizen science' model so that it goes well beyond passive data donation.

Work is also underway on developing national research infrastructure that can sustainably support these and other projects at a similar scale and level of complexity and provide governance and access mechanisms that will make their data and affordances available to academic, government and industry researchers.

The proposed Australian Social Data Observatory (ASDO)<sup>10</sup> would be an Australian

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<sup>10</sup> <https://www.admscentre.org.au/asdo/>



federal government-resourced, national research infrastructure that would provide the tools and capabilities to gather and analyse online user experience data, algorithms and interactions on a national scale. While still a proposal, the Australian Government Department of Education, Skills and Employment’s 2021 National Research Infrastructure Roadmap highlighted the proposed ASDO as a ‘landmark initiative’.<sup>11</sup> The ASDO would make digital platform data dramatically more usable for Australian researchers—across many levels, including universities, government, industry and civil society.

Overall, we hope the project will provide evidence to energise the conversation about platform transparency and accountability in Australia and internationally. While tools like those used by the Australian Ad Observatory can demonstrate the importance of transparency in the online advertising environment, such initiatives cannot approach the scale or level of detail the platform themselves can access. Thus, we hope that projects like ours might help generate support for stronger transparency requirements—for example, that all ads served on a platform are entered into a publicly accessible database that includes information about ad spend and targeting.

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<sup>11</sup> <https://www.dese.gov.au/national-research-infrastructure/2021-national-research-infrastructure-roadmap>



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## 2. PROJECT TEAM



**Prof. Mark Andrejevic**  
Chief Investigator,  
Monash University



**Prof. Daniel Angus**  
Associate Investigator,  
QUT



**Prof. Jean Burgess**  
Centre Associate Director,  
QUT



**Dr Abdul Obeid**  
Data Engineer, QUT



**Prof. Axel Bruns**  
Chief Investigator, QUT



**A/Prof. Nicholas Carah**  
Associate Investigator, UQ



**Dr Robbie Fordyce**  
Postdoctoral Research  
Fellow, Monash University



**Dr Timothy Graham**  
Associate Investigator,  
QUT



**Dr Christopher O'Neill**  
Postdoctoral Research  
Fellow, Monash University



**Prof. Christine Parker**  
Chief Investigator, University  
of Melbourne



**Dr Verity Trott**  
Postdoctoral Research  
Fellow, Monash University



### 3. THE ARC CENTRE OF EXCELLENCE FOR AUTOMATED DECISION-MAKING AND SOCIETY

The rapid expansion of automated decision-making, enabled by technologies from machine learning to the blockchain, has great potential benefits, while it also creates serious new risks to human rights and welfare. Potential harms range from data discrimination against disadvantaged communities to the spread of disinformation for political and commercial ends. Increasing inequality, lower productivity and diminished economic security have been highlighted as risks in the coming decade.

The ARC Centre of Excellence for Automated Decision-Making and Society (ADM+S) is a cross-disciplinary, national research centre that aims to create the knowledge and strategies necessary for responsible, ethical, and inclusive automated decision-making (ADM). Funded by the Australian Research Council from 2020 to 2027, the ADM+S Centre is hosted at RMIT in Melbourne, Australia, with nodes located at eight other Australian universities and partners around the world. The Centre brings together leading researchers in the humanities, social and technological sciences in an international industry, research and civil society network.

Our Centre aims to contribute to the mitigation of the social and economic risks in the development and implementation of ADM and to improve outcomes and efficiencies in four key focus areas where automation is already well advanced: news and media, transport and mobility, health care, and social services.

#### 3.1 THE DATA RESEARCH PROGRAM

The Data research program brings together data science with social science to find responsible, ethical and inclusive ways of constructing, sharing and using data to solve problems and automate decision-making systems; and uses critical data studies approaches to critically examine the data logics, infrastructures and flows that sit behind ADM systems.

This group deploys new digital tools and methods to improve awareness of data-related issues and involve the public in research, and works closely with our partners to collaboratively develop and embed responsible, inclusive and ethical data practices



in industry, government and community settings, leading to more effective ADM with fairer outcomes.

### **3.2 THE NEWS AND MEDIA FOCUS AREA**

Modern digital news and media platforms deploy ADM systems intensively, with positive and problematic results. Search engines, personalised newsfeeds, content moderation systems and programmatic advertising all now play integral roles in media.

This enables new forms of computer-assisted reporting and audience analytics in journalism but also creates risks to democratic processes and social cohesion through the automated curation of personalised information and the algorithmic amplification of misinformation and other social harms based on opaque and inequitable selection principles.

The News and Media Focus Area investigates and improves the uses and impacts of ADM in news work, social media platforms, and the digital media and communication environment more broadly.



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