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# The Anti-Influence Engine: Escaping the Diabolical Machine of Pervasive Advertising

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AUTHOR VERSION – EXTENDED  
CHI'17 Extended Abstracts, May 06 - 11, 2017, Denver, CO, USA  
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## **Abstract**

This paper aims to stimulate discussion about the need for and possible incarnations of anti-advert technology. Advertisers are increasingly using pervasive and nonconscious routes to emotionally manipulate people. HCI researchers have yet to provide the tools to counter these unwanted influences. This paper outlines a design fiction solution, the Anti-Influence Engine: a distributed system that returns to users the power over their own associative memories. The Engine gathers advert-exposure information, and offers users multiple ways to counteract emotionally manipulative adverts. Design and ethical issues are discussed.

## **Author Keywords**

Anti-advertising technology; nonconscious technology; design fiction; pervasive advertising.

## **ACM Classification Keywords**

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

## **Introduction**

This paper is a deliberately provocative design fiction [47,74]. It draws on behavioural science to explore how technology might counter the ubiquitous

conditioning of people by manipulative advertisers. The work is a direct response to calls for research into enabling people to protect themselves against advertisers seeking increasingly sophisticated routes to affect consumer choice beyond their conscious control [6,40,76].

The work is in the tradition of *Walden 2*, a utopian science fiction book by the psychologist B F Skinner written in 1945 [72], which uses behavioural science to speculate how technology might improve society. It was also partly inspired by the CV Dazzle project [39] which explores how fashion can defeat face-detection algorithms, enabling people to protect their privacy against pervasive detection technology. The project prompted the question: how can technology itself enable people to protect themselves against advertisers using increasingly sophisticated algorithms to target their associative memories, often without their knowledge?

Delivering large-scale, personalised adverts is no longer prohibitively expensive. Advertisers are using increasingly pervasive digital channels such as mobiles [32], social networking sites [15] and public displays [2,55] to deliver ads personalised through big-data driven individual behaviour profiling [5], nonconscious advertising techniques [1,40]. The ads are dynamically inserted into content [9], and even target children [79].

These developments fit Bernays' fears of "invisible rulers" [8] and Tausk's conception of a "diabolical" "influencing machine" [77]. The latter machine "produces ... thoughts and feelings by means of ... mysterious forces which the patient's knowledge ... is inadequate to explain" [77]. This paper shows how

advertising is moving to affect people's purchasing decisions beyond their conscious attention, and proposes an Anti-Influence Engine system to free people from the diabolical influencing machine of pervasive advertising.

### **Section 1: The Diabolical Machine**

Establishing the extent to which people are manipulated by unwanted advertising is problematic, not least because of the difficulty in defining *manipulation*. Although Sunstein defines the term as influence that "does not sufficiently engage or appeal to [people's] capacity for reflection and deliberation", he also notes that manipulation is often characterized by "a justified sense of ex post betrayal" [76]. Yet in the light of evidence that users are influenced by adverts without being able to consciously recall them, a sense of betrayal after the fact is unlikely.

This evidence includes research showing that activating pre-existing associations outside of awareness can have an impact on consumer behaviour. Coates et al. showed that nonconscious brand priming increases selection [19]. Lee et al demonstrated that even irritating animated ads, although initially disliked by consumers, ultimately generated a positive user attitude through the mere exposure effect [51]. The mere exposure effect is a phenomenon where exposure to even naturally-valenced stimuli can increase the subsequent liking of those stimuli [82]. It has been shown to extend to *subliminal* exposures, i.e. exposures where people cannot consciously recall being shown a stimulus [10,16].

Why might people be concerned about the impact of the content of advertising, regardless of recall? Even

before the current technology-driven explosion in pervasive adverts, researchers expressed concern about the impact of TV advertising on children [38], specifically about the possibility of harmful associative learning such as positive views of unhealthy foods or alcohol [56]. Yet a further problem in determining the potential impact of pervasive advertising is that academic analysis of marketing on new technology platforms such as social networks lags behind their popularity [57]. Nevertheless, Nicholls' analysis of social media drinking adverts found regular exhortations to drink, and attempts by advertisers to link drinking with specific cues in the form of a particular day [57].

What about pervasive adverts in the broader environment? Dalton et al. note that advertising displays are becoming more pervasive and increasing in size [25]. However, there are few rigorous studies that quantify exactly how many adverts a given user may be exposed to in naturalistic settings. In 2005, a UK newspaper used a glasses-mounted camera to record the number of adverts one of its journalists saw in central London, UK, over 1 ½ hours [35]. The camera recorded 250 adverts featuring 100 brands in 70 different formats in 1½ hours, although the journalist could only recall one advert without prompting. Nevertheless, we should be skeptical about newspaper claims about pervasive advertising since some reported claims of 5,000 ads a day [75] appear to be without a research basis [18].

More rigorous research includes Dalton et al.'s work tracking eye movements of shoppers in a large shopping centre in London, UK [25]. On average, participants fixated on 16 adverts for an average of

0.318 seconds over a 15 minute task. Participants were not asked to recall any advertising instances. However, visual response times of 0.1-0.3s are considered to be rapid and automatic [54], which suggests that:

- people are unlikely to be able to consciously recall 16 adverts seen over 15 minutes at a later date, and
- low conscious attention means any 'cognitive defences' from advert literacy will not be in place

There is a clear need for further research into the number, emotional valence and mode of delivery of adverts encountered in naturalistic settings. Without these facts, and in the absence of concrete user recall, it is difficult to complain about manipulation.

What, then, is the basis for believing that the current trends in advertising are any more pernicious than before? Are advertisers using "dark patterns" [11,36] that exploit psychology to influence people beyond their intentions? There are 3 broad current developments in advertising that are particularly concerning:

1. the increased use of technology-driven behavioural targeting, i.e. the gathering of user interaction and other behavioural data and the use of it to personalise ads.
2. the recent rise in use of neuroscience-based physiological monitoring to fine-tune nonconscious responses to adverts; and
3. a movement towards 'native' ads [50], ads that are concealed within content.

These trends are outlined below, before addressing how behavioural science might provide some defences.

### 1. *Behavioural targeting*

Behavioural targeting is the use of adaptive user profiles generated from both explicit user-shared information and implicit user information derived from their behaviour such as browsing activity [2]. The profiles are then used to tailor adverts. The adaptation and tailoring may occur in real time: a recent patent seeks to “symbiotically” link adverts shown in public spaces to personal mobile devices to allow interaction between them [20], while other research has demonstrated how to automatically augment user behaviour profiles with behavioural information [2].

### 2. *Nonconscious advertising*

The need for technology to counter pervasive advertising has become more urgent because of a rise in interest in nonconscious advertising [22], in line with interest in nonconscious techniques in health and behaviour change [67,71]. Acar notes that “incidental advertising processing, states of unconscious learning, and pre-attentive exposure effects” are currently being investigated by advertisers [1].

Advertisers are also using “consumer neuroscience” [45,46] and “neuromarketing” [7,26,68,83] to try to maximise the nonconscious impact of adverts on recipients. These techniques allow advertisers to establish the affective impact of their work over and above conscious self-report, and give advertisers the power to manipulate people’s emotions and attitudes beyond their conscious control.

### 3. *‘Native’ advertising*

The advertising trend is towards ‘native ads’ —adverts that are integrated within SNS content such that they are difficult to distinguish from content, such as Twitter and Facebook’s sponsored content, adverts in search results and newspaper articles [15,24,50]. These adverts are resistant to ad-blocking plugins [81], making opting out difficult. The difficulty in distinguishing ads from actual content is highlighted by the development of a plugin to specifically detect and flag up native ads [85].

Although some business researchers view this form of advertising positively as non-disruptive [15], there are serious concerns amongst less vested interests, including journalists, e.g. Robert Peston’s speech against “news that is a disguised advert” [62], psychologists e.g. Bargh [6] and legal scholars e.g. Sunstein [76].

The combination of these three trends sets up a serious asymmetry between advertisers and their targets. Advertisers know who has been watching their adverts and when, with what emotional affect and behavioural effect, with what interaction and in what context, while users are unable even to consciously recall what adverts they have seen. Indeed, Couldry & Tarrow [21] argue that the asymmetry of information and “deep personalisation” risk threatening democracy itself by eliminating collective experience: advertisers will be able to show different versions of reality to different audiences.

Users may agree to surrender their behavioural data in exchange for technological advance or social network access, but they are likely to remain unaware of exactly

how their personal data is used to manipulate content in order to elicit strong affective associations towards particular products embedded into their daily lives. And, unfortunately, as we outline below, even if they were aware of the problem, awareness affords no cognitive defence to nonconscious manipulation.

Social networks have attracted criticism for conducting large-scale field experiments in emotional manipulation without the knowledge of their users [49,53]. It is possible to argue that advertisers are doing exactly the same thing, without even 'implicit' user consent, yet without attracting controversy.

#### *Possible solutions*

Although users can avoid some ads on some platforms, e.g. by fast-forwarding through time-shifted television content, what defence do users have against manifestations of this diabolical influencing machine embedded within SNS, search engines, internet email, games, news sites, newspapers, magazines, public displays, etc.?

Policy-makers often advocate an advertising literacy strategy [3]. This approach implicitly accepts a conscious "cognitive defence" model: that critical thinking about advertising can mitigate its effects [70]. However, as Rozendaal et al. (ibid) point out, there are both theoretical and empirical reasons to doubt the approach. On the theory side, in line with dual process theories [31] including the Elaboration Likelihood Model [63], the cognitive defence is useless in situations where conscious attention is not directed towards a given advert, and the evidence suggests that children, for example, are "avid multitaskers" [3]. On the empirical front, there is a lack of evidence to support

the efficacy of such interventions. Likewise, strategies to limit media exposure [3] are unlikely to be successful in the context of advertising that increasingly encroaches into more technology and public spaces.

At the core of our solution, the Anti-Influence Engine, is the assumption that people are affected by associative processes. The association of brands with positive affect is the key problem in advert-based manipulation: advertisers seek to associate memories of their brand with positive experiences in order to make their brand more likely to be recognized and retrieved in the future [68]. Plassman et al. argue that an important predictor of a person's choice between brands is their memory of previous exposures to those brands, which may be formed on an unconscious level [68]. Dalton et al. note that advertising displays are focusing more on attempts to associate brands with positive affective experiences [25].

Stayman & Batra provide evidence this strategy works to boost retrieval: positive affect at the point of ad exposure can speed up retrieval, particularly in low involvement conditions [73]. Similarly, Pham & Vanheule, showed that even advertising *fragments* can trigger activation in an associative network [64].

In an advert-free world: brand selection would be a function of expected utility, formed primarily from a person's past experience together with some minimal inputs from brand packaging and perhaps from word-of-mouth. Manipulative advertising seeks to inflate the expected utility function by falsely associating the brand with positive affect. The key to solving the problem is therefore to (a) capture the valence of the

false effect, and (b) to neutralise it by exposing the user to an association of the brand with a diametrically opposite negative affect. This is the basis of the Anti-Influence Engine.

## Section 2: The Anti-Influence Engine

This section outlines our proposed solution to the problem of unwanted manipulative pervasive advertising. Our “Anti-Influence Engine” has two key subsystems: the first gathers information about adverts a user experiences, and the second retrains them to counter the effects of those adverts.

1. **Gather** – subsystem unobtrusively gathers information about all adverts the user experiences and annotates them with relevant contextual and affective information.
2. **Retrain** – subsystem retrieves pre-seen adverts and presents users with retraining in various forms depending on platform. Customisable to allow users to increase or decrease their preference for adverts and/or other items.

The Gather subsystem operates continuously; the Retrain function runs at opportune moments—including during user sleep— as outlined below.

### *Gather subsystem*

The Anti-Influence Engine first gathers candidate adverts the user experiences within both the wider environment (bus stops, public displays, ads in magazines, etc.) and from personal screen technology (all computer displays, TVs, etc.). These candidate adverts are processed to extract their contextual and affective information, including:

- The brand name or product itself
- Length of exposure (ms)
- Mean size of exposure in field of vision (mm)
- Volume (for audio/video)
- Visual field of exposure (peripheral vs foveal)
- Platform (e.g. public display or magazine)
- Emotional valence of adjacent stimuli, i.e. a measure of the affective images advertisers have used in their advert
- Contextual information (location; time; physiological markers, etc.)

Advert objects are annotated with these extracted values. Each object is given an overall score as a function of these values to give a priority list of candidates for the retraining phase. The objects are stored to provide input to later retraining.

The gather subsystem comprises a set of Sense Monitors and a set of Technology Monitors. *Sense Monitors* comprise EyeWear and ContextWear modules. EyeWear is a lightweight, unobtrusive gaze tracker [13] with video and audio capture capability integrated into fashion glasses to gather visual and audio advert information, including the brand itself, affective images and/or words associated with the brand and, for visual ads, gaze activity around the advert. ContextWear is a smartphone module used to report a user’s current context, including collating data from any available physiological monitors (e.g. activity, heart rate, blood pressure monitors). *Technology Monitors* include automated screen capture and processing plug-ins for all computer screens, specifically tailored to capture both native and non-native ads.

When candidate adverts are captured by both systems, for example when the EyeWear captures a native ad on a SNS, a disambiguation module runs to ensure the candidate advert is represented only once in the retraining database.

#### *Retraining subsystem*

The core of the retraining subsystem is the use of aversive evaluative conditioning and cognitive bias modification techniques to counter advertising exposures. The subsystem primarily uses an *incidental* approach to deliver training, i.e. the repurposing of existing behaviour [27,66]. The training is a distributed ecosystem across all of a user's devices: training may be delivered on any screen-based technology the user is currently using: a smartphone, a tablet, a TV, a smart fridge, a smartwatch.

The Anti-Influence Engine uses an anticipatory behavioural model [61] to determine which technology a user is likely to operate next and for how long. An appropriate retraining mechanism is then selected based on the currently available technology platform, behavioural predictions and the advert attributes outlined above. For example, a user may be required to pair an unpleasant image of maggots with a brand image of crisps in order to unlock their phone or open their fridge, or an interim screen while switching TV channels might feature a very brief presentation of the unpleasant-brand pairing.

The core retraining options are:

- Aversive evaluative conditioning, where a user is exposed to the brand juxtaposed with a negatively-valenced image.

- 'Push away' training, where pre-existing push or swipe away gestures are hijacked to include a stimulus that a user wants to avoid/reject, for example rejecting unhealthy food items at smartphone unlock time [66].

Aversive evaluative conditioning is the pairing of an unpleasant stimulus with a target item to alter the emotional valence of the target. The Anti-Influence Engine pairs target advert images with unpleasant stimuli. It uses the estimate of the valence of the positive affect for the brand generated from analysing the advert to select an unpleasant stimulus of the same, opposite valence. The overall aim is to 'reset' the affective association of the stimulus to neutral.

Aversive conditioning has been used in HCI [23,34,48] despite concerns that it might result in users rejecting the technology [33]. Our approach is based on evidence that negative emotional arousal is related to poorer associative memory recall [37]. Thus brands paired with unpleasant stimuli become less likely to be selected. The unpleasant stimulus may take the form of an image [43], a sound [12], a smell [4] or even an electric shock [14,60].

Cognitive bias modification techniques aim to retrain problematic automated paths within the brain [42]. The Anti-Influence Engine's implementation of these techniques is based on evidence that 'push away' gestures can retrain attention bias for unwanted stimuli and impact on user behaviour by ultimately reducing the real-life selection of those stimuli [80].

#### SLEEP MODULE

One potential problem with using image-based retraining for redressing unwanted positive associations with products is that there is a risk that the exposure to the product image can trigger and reinforce existing associations [64].

There is evidence that emotional memory storage is somewhat malleable during sleep, such that people can 'unlearn' unwanted associations during sleep [4,41,44]. The Engine's sleep aversive conditioning plays an aversive sound, e.g. the sound of an approaching zombie apocalypse [84], alongside captured audio ads and/or simple speech representations of brand names.

#### SMELL MODULE

Users opting to purchase the additional Smell Module are provided with an on-demand Smell Recorder, and a bedside Smell Player, which integrates with the Sleep Module. When users encounter a marketing smell [28,69] they find difficult to resist, for example the smell of freshly baking crisps, they trigger the Smell Recorder. The data from the recorded aroma is then transmitted to the Smell Player to be 'replayed' alongside unpleasant smells while the user sleeps. This module operates in line with evidence that olfactory aversive conditioning during sleep can successfully alter attitudes and behaviour [4].

#### User options

The Anti-Influence Engine is also configurable by users. Users can configure:

1. User goals. These affect the types of adverts shown in the retraining phase. For example, a

user might choose to undo any associations of unhealthy foods with pleasure.

2. Training. Where, when and how the training should be delivered. Users might select a specific time period to perform their retraining, or prioritise a particular platform.
3. Specific stimuli. The system's personalization options also enable users to alter the wantedness or otherwise of detected adverts and to add their own stimuli for either negative or positive training. For example, say a PhD student has identified an unwanted fondness for a certain brand of crisps. She can upload an image of the crisps to the Anti-Influence Engine system and rank it highly as a problematic item on which to receive aversive training.

#### Benevolence & Ethics

This system gives people the power to influence what they believe and how they act. Although the Anti-Influence Engine has benevolent aims, i.e. to allow individuals to avoid manipulation by unwanted outside sources, there is clearly an ethical tension in giving people this power. One usage scenario outlined above enables a user to devalue memories of crisps. However, other users might select parameters to achieve more unpalatable ends, e.g. to enforce and deepen a particular gender or race bias, or seek to influence their nonconscious minds to avoid food altogether.

The Anti-Influence Engine might also offer a specific religion module, intending that users can use it to devalue their attitudes towards culturally-imposed religious beliefs. It is possible this might be used for the opposite purpose. Future creators of the system will

need to consider carefully whether they disable such reversals; if not, a very careful set of rules must be embedded restricting the system's use to particular reversals only.

### **Future Work**

Our solution above considers time-shifted attempts to redress advertising manipulation: user exposure is tracked and users are retrained at a later time convenient to them. However, this model is not suitable for more immediate in situ manipulation that can affect consumer choice such as shelf placement [17] and even music [59]. A remaining design challenge is to develop techniques to counter this real-time manipulation without disrupting users.

It may be the case that the simple pairing of unwanted adverts with aversive images is insufficient to reverse years of pre-Anti-Influence Engine exposure to ads. In this situation, the Anti-Influence Engine could be augmented with a Pain Module to administer aversive training with (mild) electric shocks, in line with other consumer wearable pain technology [60].

### **Discussion**

The Anti-Influence Engine is a design fiction solution to a current real-life problem using near-future technology. The Engine seeks to return to individuals the power over their own associative memories, in response to advertisers altering these memories beyond people's knowledge or control. The Engine gives people multiple escape routes from the diabolical influencing machine constructed by advertisers who are increasingly focused on pulling the levers of nonconscious control.

The technology-mediated future of pervasive manipulation looks bleak: it is easy to anticipate reactive pervasive displays that draw on data about user reactions from live physiological monitoring [52] and facial expressions [55], in-store movements [30] and data from user profiles on their own synced technology [2,20] to deliver personalised, maximally affective adverts. Companies are likely to participate in real-time bids for the right to target particular users in particular locations via multiple channels. For example, a company may wish to present a particular food brand to a happy, hungry user on a large-scale display whilst at the same time sending a discount code to their smartwatch and turn-by-turn directions to their smartphone for the nearest outlet in-store.

Realistically, comprehensively countering such pervasive advertising is an onerous task. Research into the number and content of pervasive ads lags behind both technical developments and behind research into ever-more intrusive ways to target individual nonconscious processes.

Likewise, there is a lack of research into effective means for countering advertising. Although research into the use of cognitive bias modification techniques on smartphones and tablets is starting to emerge [29,65,66], the broad efficacy of the technique remains unknown, and unexplored on a wider range of platforms. Similarly, HCI research into the application of aversive evaluative conditioning is sparse despite evidence from psychology of its potential to alter implicit attitudes and subsequent behaviour [43,78].

This paper is intended to open a debate on how best to start countering the future manipulation of all corners

of our lives –and all our technologies- by advertisers. We have much work to do.

### Acknowledgements

I am indebted to the actual fiction of Jeff Noon [58], worryingly turning into a design reality. I would also like to thank all my reviewers for their helpful words.

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