Block the blocker: Studying the effects of Anti Ad-blocking

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Abstract. Advertisements generate huge chunks of revenues for websites and online businesses. Ad-blocker and tracker blocking programs have gained momentum in the last few years with massive debates raging on privacy concerns and improving user experience online. Acceptable Ads programme and Anti Ad-blockers are primary elements emerging in the last few years that combat ad-blockers.
In our seminar paper, we discuss at length data collection of top websites in the world, Germany, DACH region and news category. We generate feature based A/B testing metrics and employ classifier evaluations on them along with then analysing the result. Our paper also discusses how Anti Ad-blockers impact the economic, legal and ethical usage in Germany alongwith the recent changes in GDPR while taking a look at Whitelisting and Acceptable ads programme.

Keywords: Advertisements, Ad-blocker, Privacy, Anti Ad-blocker

1 Introduction

1.1 Motivation

Advertisement is a technique used by product or service manufacturers that detail the unique selling points of a product by means of which it becomes known to the general people. Marketers usually place ads at calculated locations for their products such that they are able to draw the attention of potential consumers and persuade them to buy it. Every product that is built comes along with it a unique set of features, functions and options that is targeted for a specific user base.

Online advertising or online marketing is a technique of delivering promotional messages to various consumers. It is what drives the economy of the World Wide Web. Most modern websites, in general, tend to monetize their user visits. They include certain spaces across their websites aimed at advertisers to come and put their promotional content. Thus, there is an implicit agreement between the website owner and the advertisers on displaying only genuine promotional content and not include malwares or trick users into any sort of scams.

Ad-blockers have emerged as the trend that blocks such advertisements to improve users' web-browsing experience, maintaining privacy, and recently protecting themselves against malware. This has impacted businesses that rely on revenues from advertisements.

Anti Ad-blockers have emerged as an increasingly popular solution. Anti Ad-blockers detect the presence of Ad-blockers and use several techniques such as simply notifying the user that the tool interferes with the content and the user-experience or other times when the message blocks the user from accessing the content until they have turned off the Ad-blocker. Haris et. al. [1] describe more on this in their paper, "Detecting Anti Ad-blockers in the wild.". In extreme cases the goal is to circumvent the tool completely.

Interactive Advertising Bureau (IAB) also have released a script to DEAL (Detect, Explain, Ask, Limit) with ad blockers: Ad Block Detection Code Access Request and their source code is available on Github [3]:

https://github.com/InteractiveAdvertisingBureau/AdBlockDetection

1.2   Roadmap

In our paper we propose to study approaches to:

– Study the usage of these Anti Ad-blocker scripts and their mechanism.
– Collect and analyse top websites in the world using Alexa Website Rankings.
– Economic impact of Anti Ad-blockers.
– Legality and ethics of Anti Ad-blocking.
– Alternatives to Anti Ad-blocking such as Whitelisting and acceptable ads program and also taking a look at Anti Ad-block killers.

This paper is structured as follows:

Section 2: In this section, we discuss the background related to how Anti Ad-blockers work and also take a look at the related work on this topic.

Section 3: In this section, we discuss how we collect top websites from different sources.

Section 4: In this section, we discuss how we process the data that we collected including methodology used for our results analysis.

Section 5: In this section, we discuss the results for the methodology used in the previous section.

Section 6: In this section, we analyze the impact of Anti Ad-blockers such as the economic, legality, ethical aspects including how recent changes in GDPR affects Anti Ad-blockers.

Section 7: In this section, we discuss alternatives to Anti Ad-blocking such as Acceptable Ads and Whitelists and also take a look briefly at Anti Ad-block killers.

Section 8: We conclude our discussion of our work and provide the roadmap ahead.

2   Background and Related Work

2.1   Background

Online advertisements or online marketing involves putting out promotional content on the Internet for users. Largely, the economy on the World Wide Web

hangs on the fate of such advertisements. Advertisements are put out at different locations on websites such that users are enticed to look at them and react if they are interested in such promotions.

This has led to many security and personal concerns. Users argue that they do not want such annoying advertisements on websites because it hampers their area of viewing actual content. Some users also say that they could be used to deploy malwares and scams on the web.

Ad-blocker tools are countering this problem by introducing a technique of removing such undesirable advertisements. Some of the famous Ad-blocker tools include Adblock Plus or Ghostery. These tools promise to limit any data leakage to servers. As of July 2018, more than 10 million users use Adblock Plus on Google Chrome [6] which shows that users are actively seeking to filter out or limit such advertisement promotions.

In a measurement study "Annoyed Users: Ads and Ad-Block Usage in the Wild" by Pujol et. al. [7], they observe that 22% of the most active users use Adblock Plus on their browsers.

The popularity of Ad-blockers in Germany. According to a "2017 Global Adblock Report" published by PageFair [10], Germany ranked highest in Ad-block penetration when it came to desktop Ad-blockers (Figure 1).

**Adblock penetration per online capita, %**

PageFair

	Desktop	Mobile	Overall
U. States	18%	1%	18%
China	1%	13%	13%
U. Kingdom	16%	1%	16%
Japan	3%	–	3%
Germany	29%	1%	29%
Australia	20%	2%	20%
Canada	24%	–	25%
France	11%	1%	11%
Brazil	6%	1%	6%
South Korea	4%	–	4%
Russia	6%	3%	6%
Italy	17%	1%	17%
Netherlands	17%	2%	17%
Spain	19%	–	19%
Mexico	8%	–	9%
Sweden	27%	–	27%
Indonesia	8%	58%	58%
Denmark	25%	2%	25%
India	1%	28%	28%
Argentina	14%	–	14%
Finland	23%	–	23%

Fig. 1. Top Ad Markets (ad spend) statistics taken from a PageFair report titled "2017 Global Adblock Report".

These statistics indicate a tremendous potential for European markets since there is no clear single solution for mobile Ad-block usage.

On the contrary, a report by Bundesverband Digitale Wirtschaft (BVDW) and Online-Vermarkterkreis (OVK) titled "Zentrale Adblocker-Rate des OVK"

[11] in December, 2016 showed a dip in adblock incidence rates from Q1 to Q3 of 2016 (Figure 2).
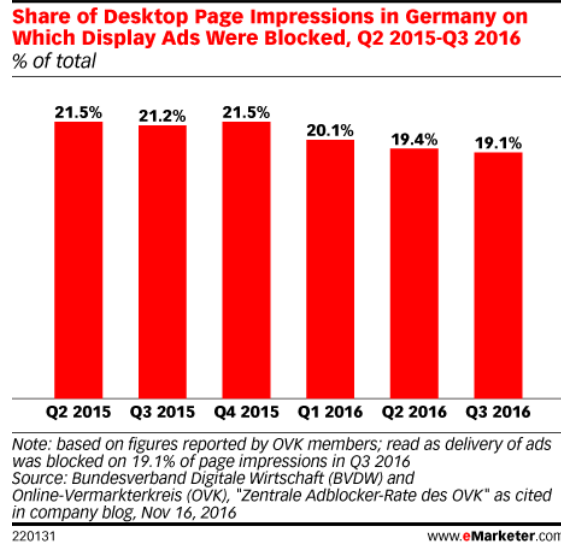

Fig. 2. Share of Desktop Page Impressions in Germany on Which Display Ads Were Blocked according to a report by BVDW and OVK [11]

The critical difference to be noted in the two sources cited above is that PageFair looked at the number of penetration/installations of Ad-blockers while BVDW & OVK focused on the actual number of websites that were affected by such Ad-blockers.

Working of Ad-blockers. Ad-blocker tools work mostly on removing browser page elements. They look for certain HTML, DOM or CSS elements in the web page and process them to be removed. Ad-blockers usually work on a set of rules that indicate which such elements must be removed. These rules are part of "filter lists" such as EasyList [12]. There are also user privacy protection lists such as EasyPrivacy [13] which remove trackers. Another technique that Ad-blockers use is web request blocking, where these tools remove URLs that correspond to any publisher.

Working of Anti Ad-blockers. The online advertising industry is impacted by Ad-blockers since revenues are hampered when no advertisements are rendered. This gives rise to Anti Ad-blocker scripts that detect the presence of Ad-blockers and displays appropriate messages such as asking users to turn off Ad-blocker tools or not allowing users to view content. One such script is published by IAB that "DEAL"s (Detect, Explain, Ask, Limit) with such Ad-blockers [3].
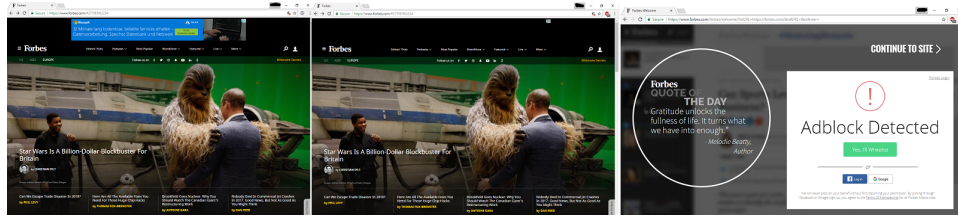
Fig. 3. Web page evolution for Forbes shows from left to right web page with ads, with Ad-blocker enabled and with an Anti Ad-blocker.
Source: `www.forbes.com`

Anti Ad-blocker scripts perform two operations. The first is to detect the any Ad-block tool and the second is to notify user to either disable Ad-block or to whitelist their website. These scripts may range from using first-party domains that check aesthetic attributes such as height or width of ads to more complicated scripts from third-party domains that provide baits such as time delays, continuous detection or even use cookies to track Ad-block detection. It is a big challenge to detect such scripts since they are obfuscated deep into the system.
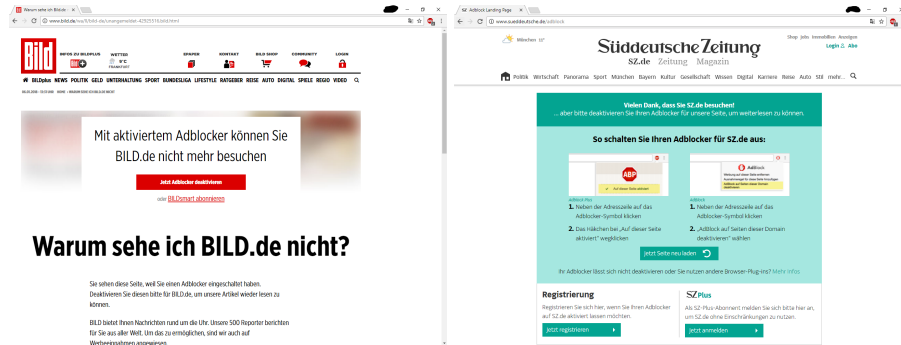

Fig. 4. German websites using Ad-blocker detection scripts.

Figure 4 shows examples of Ad-block detection responses. This is done by employing Anti Ad-blocking tools or scripts such as the one by IAB which detect the presence of such Ad-blockers.

Impact of Anti Ad-blockers. Researchers at the University of Iowa and University of California-Riverside published a paper "The Ad Wars: Retrospective Measurement and Analysis of Anti-Adblock Filter Lists". In this paper, Iqbal et. al. scan Alexta Top 5K websites for Anti Ad-block tools Anti Ad-block Killer List [16] and Combined EasyList for Anti Ad-block scripts. The results (Figure 5) taken from their paper, showed a gradual increase in Anti Ad-blocking

scripts, which prove the online advertising industry reacting to the immediate losses incurred by the use of Ad-blockers on their websites.
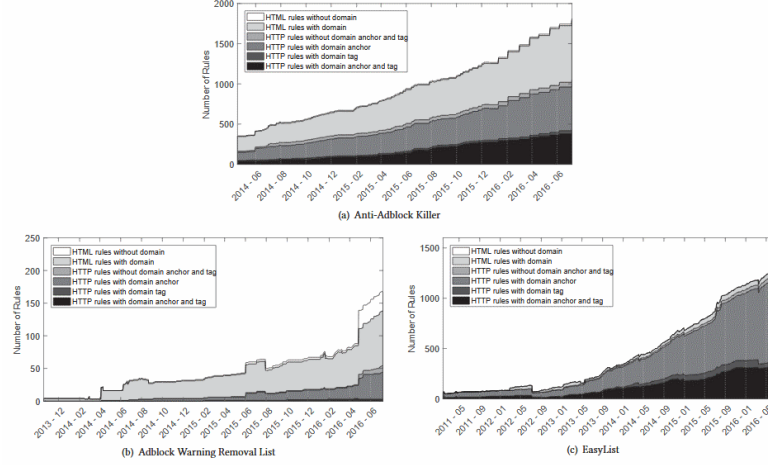
Fig. 5. Anti Ad-blocking scripts with their gradual rise in usage as cited in the paper by Iqbal et. al. [15]

2.2   Related Work

Our paper discusses in length the Anti Ad-blocking techniques and their effects adopted mainly by Nithyanand et al. [4] and Haris et al. [1]. Nithyanand et al. [4] in their paper "Adblocking and Counter-Blocking: A Slice of the Arms Race", found that 6.7% of top 5K Alexa websites employ Anti Ad-blockers. They also consider all websites that include Anti Ad-block scripts in their analysis.

Haris et al. [1] in their paper "Detecting Anti Ad-blockers in the Wild", observed that 686 websites in the Alexa top-100K deploy Anti Ad-blockers at their home page. They also notice different notifications ranging from asking users to disable Ad-blockers to paying a subscription fee.

3   Data Collection

As part of our data collection, we collected top websites from Amazon Alexa Website Rankings: *https://www.alexa.com/topsites*. Publicly available data is restricted to only 50 per category out of the 500 available ranked websites. The ranking is done based on the average daily visitors to a site and also over the pageviews for that site for the last month. We subscribed to a 7-day free trial to collect top websites for our different category use cases. Our data sets include

top 500 news websites, top 500 websites in Germany and a unique subset of top websites in the DACH (500 each for Germany, Austria and Switzerland) region.

To pull this data, we had to generate an access key with an Amazon AWS account which grants policy rights to AWIS (Amazon Web Information Services) located here: *https://aws.amazon.com/awis/*. Furthermore, we had to subscribe to the 7-day Amazon Alexa free trial so that we can pull the information from Alexa using API calls. Listing 1 shows an HTTP request using query parameters used to pull data using this API. We used Java to pull this information. We made use of the sample code provided by Amazon AWIS (*https://aws.amazon.com/awis/getting-started/*) and modified it to our needs to pull the site names.

```
1 https://awis.amazonaws.com/api?Action=CategoryListings&Count=20
2          &Descriptions=True&Path=Top%2FNews
3          &Recursive=False&ResponseGroup=Listings
4       &SortBy=Popularity&Start=1
```

Listing 1: An HTTP request to AWIS to pull top news sites

A maximum of 20 results can be pulled at each HTTP request to the host *"awis.amazonaws.com"* with a starting count of counter $= 1$ (Start). This counter is incremented by 20 for every request, till all the data has been pulled in. The code uses SHA-256 hashing algorithm to create an Authorization that includes the Access Key obtained earlier.

The response contains a list of websites sorted according to the parameters specified. A sample response is listed in Listing 2. The response is then parsed using an XML parser to obtain each website name and is stored in a file. For generating the unique subset of all the websites in the DACH region, we created a HashSet that does not allow duplicates to be entered into the set. This is done so that common websites is only taken into consideration once.

We also have collected a list of global websites using a collection of sources such as Amazon Alexa Web Ranking, Similarweb (*https://www.similarweb.com/top-websites*) [26] and Quantcast (*https://www.quantcast.com/top-sites/*) [27].

These websites are then sent through our data processor described in the next section.

```
1  <aws:CategoryListingsResponse xmlns:aws="http://alexa.amazonaws.com/doc/2005-10-05/">
2  <aws:Response xmlns:aws="http://awis.amazonaws.com/doc/2005-07-11">
3  <aws:OperationRequest>
4  <aws:RequestId>3ffe5d1a-8939-5b7a-9002-bec5a1243i9a</aws:RequestId>
5  </aws:OperationRequest>
6  <aws:CategoryListingsResult>
7  <aws:Alexa>
8    <aws:CategoryListings>
9      <aws:RecursiveCount>21</aws:RecursiveCount>
10     <aws:Count>2</aws:Count>
11     <aws:Listings>
12       <aws:Listing>
13         <aws:DataUrl type="navigable">http://www.reddit.com</aws:DataUrl>
14         <aws:Title>Reddit.com</aws:Title>
15         <aws:PopularityRank>2</aws:PopularityRank>
16       </aws:Listing>
17       <aws:Listing>
18         <aws:DataUrl type="navigable">http://www.cnn.com/</aws:DataUrl>
19         <aws:Title>CNN</aws:Title>
20         <aws:PopularityRank>3</aws:PopularityRank>
21       </aws:Listing>
22     </aws:Listings>
23   </aws:CategoryListings>
24 </aws:Alexa>
25 </aws:CategoryListingsResult>
26 <aws:ResponseStatus xmlns:aws="http://alexa.amazonaws.com/doc/2005-10-05/">
27 <aws:StatusCode>Success</aws:StatusCode>
28 </aws:ResponseStatus>
29 </aws:Response>
30 </aws:CategoryListingsResponse>
```

Listing 2: An HTTP response in XML for top news sites.

4   Data Processing

4.1   Methodology

4.2   Extracting features using Python

4.3   Generating .arff files using Weka

4.4   Classifier Evaluation

5   Results Analysis

5.1   Analysis of Test Set

5.2   Ad-block Detection Responses

5.3   Geographical Comparison

5.4   Limitations

Our methodology cannot detect all websites that employ Ad-block detection due to some limitations. They are described below:

- We remove all anti Ad-block filters in EasyList. This may not be the default configuration used by most people. But as we are attempting to quantify websites which employ Anti Ad-blockers we feel that this configuration will give us a clearer picture.
- We only check anti Ad-blockers on the home page. Some websites don't employ them at the home page but only when you open a linked page.
- We look at websites that detect Ad-blockers and make any HTML or DOM changes to the browser page as using Anti Ad-blockers.
- We use Adblock Plus for our measurements but there are other Ad-blockers in the market like uBlock origin which is not part of our measurements.
- For the sake of simplicity we don't consider style features and cosine similarity features used by Haris et al. in their paper [1].

6   Impact of Anti Ad-blockers

6.1   Economical Impact

Revenue Generation for Ads. In a 2015 report titled "Digital advertising in Europe - Statistics & Facts", The Statistics Portal [8] cited "online advertising revenues worldwide amounted to about $170B, a figure that is expected to grow to more than $330B by 2021. In a 2017 global comparison, the United Kingdom, Germany and France ranked among the largest online advertising markets in the world (Figure 6), with digital ad revenues of $11.72B, $7.37B and $5.13B, respectively. In Germany, the 2017 revenues stood at $7.37B." They also noted
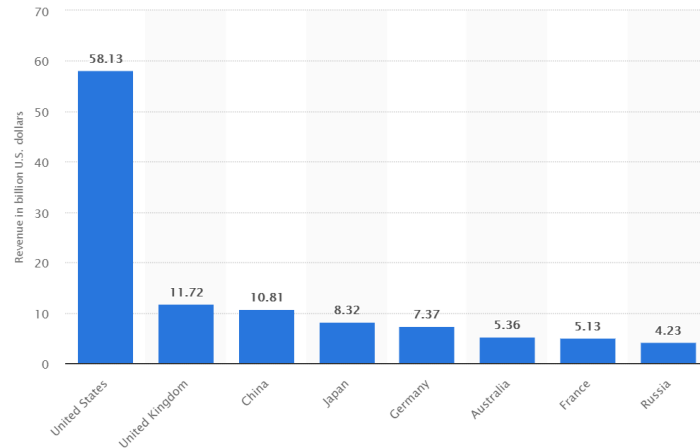
Fig. 6. Largest online advertisement markets in 2017 as published in the The Statistics Portal report titled "Online advertising revenue". [9]

that the European online advertisement market rose by 12.3% in the year 2016 in comparison to 2015.

6.2   Legality Aspects

European Union. Article 5.3 of the European Union's ePrivacy Directive [19] states: "Member States shall ensure that the use of electronic communications networks to store information or to gain access to information stored in the terminal equipment of a subscriber or user is only allowed on condition that the subscriber or user concerned is provided with clear and comprehensive information in accordance with Directive 95/46/EC, inter alia about the purposes of the processing, and is offered the right to refuse such processing by the data controller. This shall not prevent any technical storage or access for the sole purpose of carrying out or facilitating the transmission of a communication over an electronic communications network, or as strictly necessary in order to provide an information society service explicitly requested by the subscriber or user."

Under this EU law and the recently introduced GDPR regulation (described in a later section), publishers must ask for permission before accessing a user's personal information, similar to how websites must ask for permission to store cookies on user devices. But as publishers are only detecting via JavaScript, HTML or DOM elements if the ads have been delivered, and not checking if any Ad-blocker is installed, they are complying with the ePrivacy directive.

Germany. Media groups Süddeutsche Zeitung, Pro-Sieben-Sat.1, and IP Deutschland, an RTL subsidiary recently fought a legal battle against Cologne-based Ad-blocking vendor Eyeo for banning of Eyeo's Ad-blocking software Adblock Plus. According to a report by Wired.de [20] titled "Adblock Plus: Werbeblocker bleiben in Deutschland legal", Munich higher regional court ruled that the Ad-blocking software Adblock Plus is legal. The Munich higher regional court also said that Eyeo's business model is not "forbidden aggressive advertising" and hence the software did not violate any competition laws in Germany. Although joining Eyeo's whitelist is free, media groups are objecting to the fact that Eyeo is making money from the extra revenues that the advertisers are making by joining these whitelists under the Acceptable Ads programme.

This court order comes is contrasting to another in Cologne. Digiday's article [21] titled "What Axel Springer's loss in ad-blocking suit means for UK publishers", describes the fact that publisher Axel Springer secured a partial victory against Eyeo by stating that Adblock Plus must add Axel Springer to their Whitelist for free but must abide by the Acceptable Ads criteria. These contradicting case rulings could potentially build to Germany's Federal Court of Justice.

In a Hamburg judgement for Spiegel versus Eyeo, which has since been made public, Eyeo cited [23] in the judgement "Urteil des Landgerichts Hamburg (Az. 315 O 293/15)", that as of August 2015: "Adblock Plus was installed on approximately 9.55 million browsers with German IP addresses, which accounted for around 5% of the computers in Germany used to access the Internet". The judges concluded that Internet users have a genuine interest in the removal of

such undesired advertising, protection from potentially malicious software and control of their data.

In a blog post detailing the court decisions [22] Adblock Plus maintain in their article "Adblock Plus and (a little) more", their legality under German laws and as such the German judges have since not favored the usage of Ad-blocking detectors.

6.3   Ethical Aspects

The argument of Anti Ad-blocking ensues on the topic of maintenance of websites and henceforth businesses. Ad-block users often fail to understand how these websites pay for their monthly server and bandwidth charges. For most of such "free" sites, their revenue is generated through advertisements. Other websites use subscription services while the rest consume the costs. The latter ones are those that have another source of revenue which is usually not Internet based.

The bottom line of any business is that labor must be paid. It must be in accordance to what a writer, producer, musician, developer or any professional creates. This also revolves around the fact that the cost of living varies across the globe. Websites are compensated based on impressions measured by pay per click or cost per click on the adverts. While significantly bigger businesses could potentially hire more people to keep their websites running on profit, the smaller businesses are the ones likely to suffer the most. With the increasing costs worldwide, publishers rely heavily on such revenue sources.

There is a noticeable trend in publishers who detect the presence of Ad-blockers are now fighting back against Ad-blockers by asking users to disable Ad-blockers or by subscribing for an ad-free version. This poses an ethical dilemma to users, using an Ad-block and stopping revenue income for publishers as well as for publishers, using an Anti Ad-blocker to prevent users' intentions of blocking ads.

6.4   Impact of GDPR

The General Data Protection Regulation (GDPR) came into effect on the 25th of May, 2018 after a two year transitioning period in the European Union. The regulation carries a few important changes to how user's personal data is handled by companies. The GDPR does not allow companies to store or use user's personal data unless explicity agreed by the user. Cookies, for example, are also considered to be part of this data. Users also have the right at any time to ask com anies to delete their complete data.

Section 26 of the GDPR document [5] states, "The principles of data protection should therefore not apply to anonymous information, namely information which does not relate to an identified or identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable. This Regulation does not therefore concern the processing of such anonymous information, including for statistical or research purposes."

As we have analysed in our discussion so far, detecting Ad-blockers work mostly on the concept of identifying HTML and DOM elements which are completely unrelated to the users. These HTML elements cannot be related or be identifiable to any user and hence there is no such transmission of user's personal data to any server which would lead to a violation of the GDPR. Also, there is no scope for such detectors to store user related information since all they rely on is client browser HTML and DOM elements for Ad-blocker detections.

Of course, with advances in Ad-blocking detection techniques such as user targeted ads by collecting cookie information, there may be a case where a technical implementation could ideally violate the regulations of GDPR, but that is not in the scope of this paper.

7   Alternatives to Anti Ad-blocking

7.1   Acceptable Ads Programme

Acceptable ads programme (by Adblock Plus) [18] lays down a technique that is focused on effecting ads on websites. They define a certain set of criteria or rules that ensure that ads placed on websites are not annoying to users, disrupt or distort any of the primary web page content and are transparent such that there are no popups or any unseen advertisements that could potentially lead to nonacceptance of an advertisement on a website.

7.2   Whitelists

Websites that adhere to the Acceptable Ads programme can apply for their websites to be "whitelisted" with Adblock Plus. This is very similar to antiviruses marking some applications as "safe" or "non-malware" and allowing them to run, while blocking other potentially harmful ones. As a common practice, publishers who employ Anti Ad-blocing techniques ask users to whitelist their websites for the Ad-blocker. While most Ad-blockers allow users to configure their browsers to whitelist individual websites, users rarely make use of this or are unaware of this functionality. That is where Ad-blockers like Adblock Plus provide a default whitelist.

7.3   The rise of Anti Anti Ad-blockers

Anti Ad-block killers are on the rise. They deploy tricks into thinking that the user is not using an Ad-blocker. The Ad-blocker blocker lets the user keep the Ad-blocker on making everything look normal. This lets users can work around any bans on Ad-blockers from getting Ad-blocker related messages.

Anti Ad-block killers such as AAK: *https://github.com/reek/anti-adblock-killer* [17] are composed of a user script called «AakScript» (uses JavaScript) and a filter list called «AakList». They use the same syntax as filter lists of AdBlock Plus. It helps users keep Ad-blocker active. AakList filter list can also be added to various Ad-block plugins available.

8   Conclusion and Future Work

8.1   Future Work

If any opportunities arise in the future we would like to conduct a more exhaustive evaluation of websites in Germany and also refine our methodology to account for the fast-changing world of Ad-blockers and Anti Ad-blockers.

8.2   Acknowledgements

8.3   Source code and data release

Source code for this project can be found at the link: `https://github.com/RohitPanda/seminar-blocking-adblockers`

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