**ADSEE Project**

**Applied Data Science Educational Ecosystem**

**Retail Marketing**

**AI-Based personalized DOOH advertising**

**Approach Analysis Whitepaper**

**ADSEE - Marketing whitepaper:**

**AI-Based personalized DOOH advertising**

The marketing, more precisely, advertising industry has always been driven by the pursuit of personalization, precise identification of target groups, attracting the right audience and attribution for the least effort with the lowest cost. In order for this technique to be successful, it requires a significant and deep knowledge of the audience. That deep knowledge relies on data science, especially in marketing areas of search engine optimization, customer engagement, responsiveness, profiling and real-time marketing campaigns. Moreover, new ways to apply data science and analytics in marketing emerge every day as we witness activities like extreme personalization, micro-targeting, micro-segmentation, and many others.

As a result, OOH (out-of-home advertising) was disregarded until recently because of its lack of ability to provide attribution or consumer data. Nevertheless, the transformation from traditional out-of-home advertising to **digital out-of-home** (“DOOH”) advertising or any “digital media endorsing audio and video messages related to products or services outside of the home”1 illustrates how the advertising industry is leveraging new technologies to continue the pursuit of personalization and customization.

**Data science** is an interdisciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insight from many structural and unstructured data2. Data science is associated with data mining, machine learning, and big data, all with the goal of better understanding, structuring, and exploiting data. We will focus on use of biometrics and artificial intelligence in aiding increased personalization, precision, and attribution in the digital out-of-home (“DOOH”) advertising sector.

**Biometrics** are body measurements and calculations related to human characteristics.3 It can be used as a form of identification, access control and the identify individuals in groups.

**Artificial Intelligence** is defined as a “that seeks to remedy this situation by creating software and hardware that possesses some of the behavioral flexibility shown by natural intelligences, both human and animal.”4

Biometrics and artificial intelligence are just two of the many technologies currently transforming the advertising industry and are significant drivers of innovation in the DOOH advertising sector due to their unparalleled ability to create personalization and targeted advertising.

According to theinsights from [Dresner Advisory Services’](http://dresneradvisory.com/" \t "_blank)6th annual [2019 Data Science and Machine Learning Market Study](https://gumroad.com/l/dTfno), **40% of Marketing and Sales teams say data science encompassing AI and machine learning is critical to their success as a department.** Marketing and Sales lead all departments in how significant they see AI and machine learning to pursue and accomplish their growth goals. Business Intelligence Competency Centers (BICC), R&D, and executive management audiences are the next most interested, and all top four roles cited carry comparable high combined "critical" and "very important" scores above 60%. (Source Forbes5)

Let us consider the most familiar scenario to most marketers: The company spends a fortune on marketing to make its ads more visible, but the return on investment is not even close to expectations. Using data science, based on data collected from various sources such as the company’s official website or social media channels, analyzing this data can yield demographic data on customers beyond the age, geographic location and gender on which the analyzes were based in the past. A simple affinity analysis that investigates the simultaneous occurrence of certain consumer behaviors can provide insight into future purchases.

Simply put, in the past, data analysis was used to summarize data and provide insight into past customer behavior, while today, data science can be used to predict future behaviors. The data exploration tool uses artificial intelligence and mathematical modeling to discover a new set of insights. Based on this data, today´s marketing experts can answer questions such as: Who are your most promising customers? How do people feel about your brand? What other products do your customers want to buy? By using data science, a marketing team can eliminate waste and target customers in ways that are cost-effective and personalized.

**Case Study: GigBiG personalized advertising**

GigBiG was a regular outdoor advertising company based in Zagreb with billboards and digital screens seen while "on the go". Faced with above mentioned lack of ability to provide attribution or consumer data, the company decided to focus on bringing digital advertising capabilities to OOH.

Most recently, GigBiG offered its clients enabling dynamic audience-based selection management in real time. GigBig aims to bridge digital advertising and OOH using recognition software to target ads to walkers on the town’s main street. GigBiG’s value proposition is to deliver the right content, to the right audience, on the right channel, at the exact right time with AI, right where you work.

This technology and accessibility to real-time data increases GigBig’s value as they can accurately and immediately display an advertisement according to the advertiser’s outlined ideal target group. Because AI works based on user data, users can be targeted with more relevant advertising content that can provide an enhanced experience. Also, such advertising is a powerful tool that improves the relevance of advertising for users and increases ROI for advertisers.

With the technology that recognizes people by age and gender, as well as the items that passengers use or have on them, advertisers are able to collect unprecedented amounts of data and thereby can continually adapt their marketing strategy for success.

GigBiG uses object detection software called [ImageAI](https://github.com/OlafenwaMoses/ImageAI/blob/master/imageai/Detection/README.md" \t "_blank) which uses latest AI algorithms for detecting various objects in video stored by the camera placed on digital billboard. And based on that object detection and client’s targets defined in marketing campaign, GigBiG aims to provide **personalized advertising**and choose the best campaign video to display momentarily on the digital billboards.

Data collected from sensors placed around billboards further enhances the user experience by providing more personalization to each individual user. Thanks to the data processed by AI, the right content can be applied to the right customer at the right time. And that is the holy grail for marketers looking to satisfy today’s busy, demanding customers.

**Discussion Question #1:**As AI further develops and merges with technology like digital signage, the level of personalization will grow to a great extent. The question is only how far?

**Benefits of DOOH Advertising**

The latest digital signage technologies make DOOH advertising incredibly versatile. Media networks can deliver streaming ads in a bustling transit station, timely and relevant promotions in a shopping center, or high-definition visuals on a digital billboard at a high-traffic intersection.

DOOH Advertising actually offers several advantages over printed media or other types of advertising:

* Reach large audiences - DOOH advertising helps capture and keep customer attention in outdoor and public spaces. With consumers spending roughly 70 percent of their time away from home, outdoor media should be a critical part of any advertiser’s strategy.
* Target with greater impact - Because ads can be changed over the course of the day or week, digital advertisements can do a better job targeting the right audiences.
* Measure results and refine strategies - When paired with analytics, digital signage offers real-time attribution data and impact, both offline-to offline, and offline-to-online. This helps media networks and their customers increase the impact of their advertising efforts.

Digital signage brought new capabilities for analytics. It can determine how many people passed by the sign and even detect how many people viewed it. In some cases, it can determine how much time they spent looking at it and tell when a customer has walked into a store. This leads to two key opportunities.

First, such digital signage sensors can conduct market research for brands, and not just in fixed positions but also on the go. By using anonymized data, sensors and/or cameras can provide real-time insights into topics traditionally captured by surveys—such as brand visibility and perception.

Second, media networks can provide better information about target audiences. Not only do they know who is passing by, but they can also get a sense of who is paying attention to what different types of advertisements.

It sounds a bit futuristic, but digital screen cameras that use AI are able to detect audience demographics and then, based on that detection, for instance, serve the viewer one of 20 possible targeted video ads. A customer feels special if the technology treats them in a more personal way. AI learning enables digital signage to learn and interact with real people in a unique way that can recognize a client and for instance greet her or him.

**Discussion Question #2:**Using identification and interactivity technologies, DOOH brings an online experience to the physical world. The privacy impact associated with DOOH is not widespread as, so far, only a small percentage of digital signage units have the ability to measure, identify or interact with the audience. However, as the trend is towards greater adoption of measurement, identification and monitoring capabilities, the question arises as to whether existing laws and directives are sufficient or whether new regulations need to be drafted.

There is no impact of the GDPR directive on DOOH at all. Or at least not directly. The anonymized nature of DOOH audience data shows that they are outside the scope of the GDPR. When data is collected from other channels, such as mobile devices or locations, appropriate permissions should be provided for access to these data sources. Overall, the fact that the GDPR touches the DOOH space so lightly means that the DOOH is increasingly seen as a good replacement for those network channels that are now more strictly regulated.

**Discussion Question #3:**This year, Nature asked 480 researchers around the world who work in facial recognition, computer vision and artificial intelligence (AI) for their views on thorny ethical questions about facial-recognition research. The results of this first-of-a-kind survey suggest that some scientists are concerned about the ethics of work in this field — but others still don’t see academic studies as problematic.7

In the next phase, data is entered into the ad database where the content is selected, marked by desired targets, which are then recognized by input results. The content is then transferred to the digital billboard to be displayed. The selection of advertising video is based on the maximum number of the recognized object categories. As gender and age recognition and multiple object recognition is implemented with models, the recognition results are retrieved separately. For instance, if most adult women are recognized at a certain time point, advertisement relevant to this group will be displayed on the billboard. On the other hand, if the number of recognized objects is greater than the number of recognized persons, the object category with the greatest number will be referred to select an advertisement related to it.

The final phase is where the advertisement relevant to the real-time demographic is displayed. The process reiterates when the profile of a detected crowd changes.

In the future, artificial intelligence could help predict and automate real-time decision making. By identifying and learning from samples in large amounts of data, encompassing a multitude of different sources - previous transactions, weather forecasts, social media trends, shopping patterns, online viewing history, facial expressions analysis, seasonal shopping patterns - AI can help companies adapt and overcome the increasingly dynamic market environment. By improving forecasting accuracy, both machine learning and computer vision can help better predict consumer expectations while optimizing and automating negotiations with suppliers.

Some companies are generating an increasing share of the profits in a way that is directly attributable to AI, and the best performers are likely to increase their investments setting up a world of algorithmic leaders and laggards, according to a new paper from McKinsey & Company8.

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