



# Understanding Consumers' Visual Attention in Mobile Advertisements: An Ambulatory Eye-Tracking Study with Machine Learning Techniques

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## ABSTRACT

As mobile devices have become a necessity in our daily lives, mobile advertising is also prevalent. Accordingly, it is critical for practitioners to understand how consumers visually attend to mobile advertisements. One popular way of doing so is via eye-tracking methodology. However, scant eye-tracking research exists in mobile settings due to technical challenges, e.g., cumbersome data annotation. To tackle these challenges, the authors propose an object-detection machine learning (ML) algorithm—You Only Look Once (YOLO) v3—to analyze eye-tracking videos automatically. Moreover, we extend the original YOLO v3 model by developing a novel algorithm to optimize the analysis of eye-tracking data collected from mobile devices. Through a lab experiment, we investigate how two types of ad elements (i.e., textual vs. pictorial) and shopping devices (i.e., mobile vs. PC) affect consumers' visual attention. Our findings suggest that (1) textual ad elements receive more attention than pictorial ones, and such differences are more pronounced in ads on mobile devices than those on PCs; and (2) mobile ads receive less attention than PC ads. Our findings provide managerial insights into developing effective digital advertising strategies to improve consumers' visual attention in online and mobile advertisements.

Mobile devices have become prevalent in our daily lives, and thus have developed into an essential digital advertising channel. The Pew Research Center's (2021) survey shows that 85% of Americans own smartphones; such high usage is consistent across different age groups (95% of those aged 18 to 49 years, 83% aged 50 to 64, and 61% over 65). Accordingly, mobile advertising has grown. A report from Statista (Chevalier 2022) indicates that, as of the second quarter of 2022, retail website orders using smartphones in the United States reached 60%, much higher than those using desktops (38%) or tablets (2%). Additionally, a recent report from the Interactive Advertising Bureau (IAB 2023) revealed that the mobile channel accounted for 73.5% (equivalent to \$154.1 billion) of internet advertising revenues in 2022. Therefore, it is critical to understand how

consumers attend to mobile advertisements to develop more effective digital advertising strategies.

Extant literature (Pieters and Wedel 2004; Chun and Wolfe 2005) has shown that consumers paying attention to visual stimuli while shopping online is influenced by two types of factors: (1) bottom-up factors, which reside in the stimulus; and (2) top-down factors, which relate to the attentional process. The salience of visual stimuli affects their received attention because salient stimuli are more noticeable and stand out more easily from other nearby stimuli (Van der Lans, Pieters, and Wedel 2008). Perceptual features such as the layout and size of stimuli determine their salience (Janiszewski 1998; Pieters and Wedel 2004). The informativeness of visual stimuli impacts how long consumers pay attention to the stimuli. Specifically, informativeness influences the speed at

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