

# Chapter 7

## Data-Driven Mall Advertising

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### ABSTRACT

*Mall advertising is a critical factor for retailers to gain revenue. Traditional mall advertising strategies mainly rely on impression and empiricism which might be inefficient and result in a waste of resources. Recent research demonstrates that the effectiveness of advertisements can be affected by exposure time and relevance to customers. Authors in this chapter propose a data-driven approach to achieve these goals using fine-grained trajectories of customers. They first preprocess the trajectories and model the floorplan. Then detect stopping locations where customers stay for relatively long time and analyze the correlation between different locations. They also detect customers' facing directions at each stopping location. Lastly, according to the correlation of stopping locations and customers' facing direction, appropriate advertising locations and contents can be determined. According to evaluation analysis, the proposed approach can significantly improve average advertisement exposure time and advertisement relevance by 75% and 58%, respectively.*

### INTRODUCTION

Nowadays, shopping malls not only contain various shops but also provide important services like entertainment, which makes them indispensable in modern lives. According to the survey (Zhao & Shibasaki, 2005), shopping malls have become the third most frequent location for Americans, after home and work. 75% of all Americans visit a mall at least once a month. On average, shoppers spend \$105.11 per visit and average \$3,910 in annual expenditure at a mall. One significant contributing factor of such a high expenditure is inspiring and irresistible mall advertisements (ads).

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Mall Advertising (MA) refers to advertising that reaches consumers while they are inside malls. Kiosks or mallscapes are one of primary forms of MA, which are ad panels located in high traffic areas like entrances, escalators. Kiosks can utilize back-lighting to enhance visibility and awareness, which turns it into a perfect medium for mall advertisers.

Traditional MA focuses on high traffic areas like entrances, but people need to keep moving fast otherwise there would be a congestion. Under this situation, high traffic areas do not necessarily equal to long exposure time which is reported by recent research (Goldstein, McAfee, & Suri, 2011) that is beneficial for ad recognition and recall. This interesting finding can also be used to derive more effective and reasonable advertising pricing scheme. Current MA pricing scheme is mostly determined by impression and empiricism (Goldstein et al., 2011). Since it was difficult for advertisers to evaluate the effectiveness of ads. Besides ad exposure time, there are many other factors affecting the effectiveness of MA. Apparently, quality of ads is among the most important factors. Apart from this, Batra and Stayman (Batra & Stayman, 1990). demonstrate the facilitating effect of positive mood on brand attitudes of printing advertising. In addition, consumers' interests are also indicated very important for advertising (Brown 1947). Mehta and Abhilasha (Mitchell, 2013) point out consumers' general attitudes towards advertising can also affect the advertising performance.

To facilitate effective MA in a comprehensive way, all aforementioned factors should be taken into consideration, but some subjective and mental factors are difficult to measure directly on a scale, like ads' quality and consumers' mood. On the other hand, some factors like exposure time and consumers' interest can be measured using data-driven approaches. In this chapter authors will elaborate on the possibility of using existing techniques to achieve effective MA considering ad exposure time and customers' interest based on consumers' fine-grained trajectories. One of the enabling techniques of data-driven mall advertising is passive indoor tracking, which has been an active research area for decades. Different tracking systems, including vision based tracking system (Goldstein et al, 2011), laser range scanner based tracking system (Zhao & Shibasaki, 2005), and wireless based tracking system (Menard & Bryan, 2002), have their distinct pros and cons and suit various application scenarios.

Based on consumers' trajectories, their shopping behaviors can be inferred to measure ad exposure time and ad relevance through data analytics.

The formal formulation of the problem is as follows. Given fine-grained consumers' trajectories (including velocity and facing angles) and floor plan of the shopping mall. The objectives to be obtained includes:

- Find the best locations to place ads in terms of exposure time.
- Specify the most suitable ad content to be placed in an ad location.
- Evaluate ad performance in suggested ad locations.
- Mine potential rules from massive trajectories that can be further utilized in MA.

Authors apply data mining algorithms, including clustering and sequential pattern mining to process trajectory data, detect consumers' frequent stopping locations, conduct correlation analysis among different stopping locations, and find the general facing direction of every stopping location. Authors use an open data set collected in ATC shopping mall in Oscar Japan (Brscic, Kanda, Ikeda, & Miyashita,

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