Chapter 38
Mining Flickr to Better Understand Tourist Behavior

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ABSTRACT

The aim of this chapter is to present an automated instrument collecting the enormous amount of information available online allowing urban planners, public administrations, tourism services suppliers, and researchers to easily understand the spatial and temporal distribution of tourist behaviors towards tourist attractions in a specific area. Geo-located photos provided by Flickr are used to identify points of interest (POIs). The developed application has been tested with data automatically retrieved and collected in L'Aquila province (Italy) during the years 2005-2018. Given the richness of information, these data are able to show how POIs changed over time and how tourists reacted to the 2009 earthquake. Results demonstrate the importance of using analytics and big data in tourism research. Moreover, by using the province of L'Aquila as pilot study, it emerges that tourist behaviors change over time and space, varying among different typologies of tourists: residents, domestic, and international visitors.

INTRODUCTION

The diffusion of social networks and the increasing number of users is generating a massive amount of data in every moment. This is particularly evident in tourism sector, where three different sources of data exist: data generated by 1) users (i.e., texts or photos), 2) devices (i.e., GPS or mobile) and 3) operations (i.e., telephone companies, online booking or web search). This volume of information is in

some cases freely available and is called "open data" or "big data". In others, data can be sold by the owner with particular licenses of usage.

Tourism is an important economic sector in many countries around the world, significantly contributing to their economic growth (Seghir *et al.* 2015; Brida *et al*. 2016; Ohlan 2017; Perles-Ribes *et al.* 2017). Recent estimates indicate that the total contribution of the travel and tourism sector to the global GDP in 2018 was 10.4% with a growth rate of 3.9%, outpacing the growth rate of the whole economy for the eighth consecutive year (World Travel and Tourism Council 2019). Moreover, according to the tourism-led growth hypothesis (Balaguer and Cantavella-Jordà 2002; Dritsakis 2004; Louca 2006; Nowak *et al*. 2007; Proença and Soukiazis 2008; Cortes-Jimenez and Pulina 2010; Seetanah 2011), tourism represents an important driver of economic growth (see Bimonte *et al.* 2012). More specifically, the tourism sector may stimulate economic activity in different ways. Tourism directly creates employment and tax revenues; it has direct, indirect and induced effects in other economic sectors; it boosts investments in infrastructure; and it improves the efficiency of local firms, thanks to economies of scale and increased competition (Schubert *et al.* 2011; Tugcu 2014; Shahzad *et al.* 2017). According to the World Tourism Organization (UNWTO), before the diffusion of the pandemic related to COVID-19, tourism demand has been growing overtime and it was forecast a positive trend also for next years. Latest data pre-COVID-19 described a sector including 1,461 million of international arrivals in 2019, with a growth rate around 4% with respect to the same period of 2018. More than half of worldwide arrivals refers to European countries, where arrivals continue to grow and record more than 742 million. Italy is the third European destination, after France and Spain (UNWTO 2020a) and is the first country for UNESCO World Heritage Sites (Bank of Italy 2018).

However, an important feature of the tourism sector is that it is not evenly distributed, both from a spatial and temporal perspective (Butler 2001; Batista e Silva *et al.* 2018). Moreover, tourism can affect the destination by generating negative externalities (e.g., crime, congestion, overbuilding and degradation of nature, among others), which must be taken into consideration when tourism flows, and tourism behaviors are studied. Indeed, a recent strand of the literature analyses the case of *overtourism* as a phenomenon potentially affecting not only tourist cities, but also rural areas, island destinations or part of cities during certain events (Koens *et al*. 2018). Unfortunately, after the diffusion of the pandemic related to COVID-19 the tourism sector has been completely transformed. The UNWTO (2020b) declared tourism to be among the hardest hit sectors, emphasizing the high exposure of small and medium enterprises. International tourist arrivals fell by 74% in 2020 (UNWTO 2021), representing an unprecedented crisis. The magnitude of this figure is completely different compared to previous crisis. Indeed, the 2009 global economic crisis recorded a 4% drop of international tourist arrivals. Nevertheless, some positive signals are provided by domestic tourism that continues to grow in several large markets, such as China and Russia, where domestic air travel demand has mostly returned to pre-COVID-19 levels (UNWTO 2020b).

In this scenario, in which UNWTO forecasts that it could take between two-and-a-half and four years for international tourism to return to 2019 levels, it is essential to better understand the economic impacts of tourism in a given area, and analyze tourist flows and tourist behaviors in that specific region, by studying detailed spatiotemporal data on tourism (Batista e Silva *et al.* 2018). Analyzing tourist behavior and movement patterns at destination is important to develop appropriate infrastructure, transport systems and tourist products, as well as implement better destination marketing strategies and improve the management of the social, environmental and cultural impacts of tourism (Lew and McKercher 2018; Shoval and Ahas 2016). This emerges to be crucial also with respect to the new trends of tourism. After the COVID-19 pandemic, the UNWTO Panel of Experts predicts a growing demand for open-air and

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