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Case study: Machine learning in the hotel industry

How can artificial intelligence, machine learning, and Big Data boost efficiency in the industry?

TT0087MI

July 2017

Overview

Machine learning in the hotel industry

WHAT?

The use of machine learning and artificial intelligence (AI) is gradually embraced by the hospitality industry

- Hospitality was historically not one of the industries considered to be at the forefront of technological innovation[1]. Yet, during the past decade the digital revolution that took place has completely transformed practices within the industry, prompting players to adopt innovative strategies to adapt to the constantly changing environment.
- In the past, bookings and transactions were manually handled by the individual itself or by a travel agent. However, as more and more travelers are booking their holidays online, unparalleled quantities of data is being generated[1]. As the technology to process all this data automatically is now available, hoteliers should turn to Big Data, AI, and machine learning to take advantage of such information.

WHY?

AI can be used in multiple ways in the hospitality industry, ultimately boosting efficiency in the sector

- The expectations of customers are growing rapidly these days. With an abundance of travel deals, customers are increasingly valuing providers that can offer them memorable and personalized experiences based on their preferences[2].
- By taking advantage of the information related to customer purchases, machine learning identifies travel patterns and enables hoteliers to provide unique offerings to their customers[3].
- Besides data analytics, the use of chatbots, virtual voice assistants, and robots are also thought to enhance the experience of customers while staying at hotels[3].

SO WHAT?

The future success of hoteliers to attract customers and maintain their loyalty lies in machine learning, Big Data, and AI

- There are few industries that are as customer-centric as hospitality[3]. By processing all the available information through powerful analytic platforms, hotels can create valuable offerings that match the needs and preferences of their customers from the start to the end of their journey.
- This ultimately frees up the resources of hoteliers and allows them to focus on offering the best possible services to their customers, without constantly worrying about setting the right prices and updating the demand forecasts[3].

The rise of AI, machine learning, and Big Data in hospitality

Hotels are increasingly investing in AI to enhance customer experience

The hospitality industry is going digital

The digital revolution has already arrived in the hotel industry, and today, more than half of all hotel bookings worldwide are made online, according to Hotelanalyst's 2016 hotel distribution report[4]. Social media, hotels' websites, and online travel agencies all provide unparalleled quantities of data to the industry. This data could be used to enhance customer experience by proposing personalized offers. However, the existing infrastructure in the hotel industry is not capable of processing and analyzing the vast amount of data produced by multiple digital devices[4].

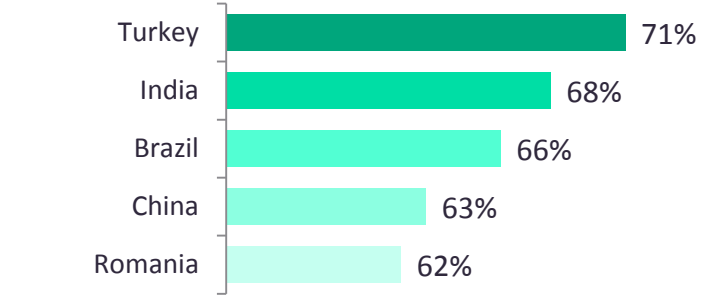
With the emergence of cloud systems and Big Data analytics services, hoteliers are now able to use AI and machine learning solutions for a much lower price, and without having to buy and manage their own hardware, which makes investing in them more attractive[3].

Big Data can help build brand loyalty

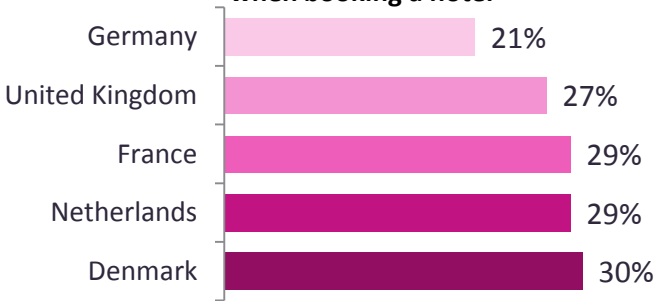
Understanding personal preferences and travel histories is fundamental to offering personalized products and services. New hospitality business models, such as Airbnb, have altered the way customers see the hotel industry and led to higher price sensitivity[3]. Therefore, maintaining customer loyalty has become paramount.

GlobalData's consumer survey Q4, 2016 shows that 47% of global respondents consider loyalty programs important when booking a hotel for their holidays. Big names such as Hyatt, Marriott, Best Western, and Hilton have already tried to capitalize on this trend by establishing guest reward programs to attract customers to their service and, more importantly, to collect valuable data. In some cases, machine learning analyzes this personal data to build individual user profiles and makes smart recommendations, offering services that better match customer needs.

Countries that are more likely to consider loyalty programs when booking a hotel*



Countries that are less likely to consider loyalty programs when booking a hotel*



* Respondents that say loyalty programs are very important or important when choosing a hotel

Source: GlobalData Consumer Survey Q4, 2016

Why is the hotel industry embracing machine learning and AI?

There are multiple uses of AI and machine learning in the hospitality industry

Recommendation engines

By collecting data and synthesizing information about the needs, preferences, and budget of each customer, recommendation engines build powerful algorithms, which they use to suggest deals that would make a good fit for each individual based on their previous choices. By taking advantage of such data, these engines can offer personalized and tailored products including car rental deals, new travel destinations, monuments and local attractions, and even propose alternative dates[3].

As modern travelers' days are hyper-informed and their expectations are increasingly complex, taking advantage of the abundance of data is a great opportunity for hoteliers to understand travelers more intimately and ultimately provide them with customized offerings that will keep them coming back, reinforcing customer loyalty[5].

Enhance customer experience

While AI in the hotel industry is mostly associated with the pre-arrival hotel reservation stage, the technology can also be used to boost the customer experience throughout a traveler's stay. Combining machine learning with the Internet of Things (IoT) can further assist in personalizing services available to customers[3]. Virtual voice assistants such as Amazon's Alexa, as well as the assistant of Apple and Microsoft, are connected with motion sensors and room control, allowing customers to control devices in their rooms, as well as communicate with the reception of the hotel to order room service or report any issues[7].

Revenue management systems

The shift in the competitive landscape has led to hoteliers focusing on profitability per room rather than overall occupancy. Consequently, concentrating on profitable guests with higher cross-selling and up-selling potential has become the main objective of the big hotel chains[3]. Lowering prices to increase occupancy has been replaced by dynamic pricing models. Even though different room rates have been provided to different customers for several years and with success, new revenue management systems (RMS) that leverage machine learning can determine the best possible room rate in real-time[3]. As a result, hoteliers can determine the most profitable guests at busy times while also avoiding low occupancy ratio in the off-season[3]. These sophisticated RMS solutions are able to automatically collect and analyze large amounts of complex data while also detecting patterns and anomalies. With growing availability of data, it becomes impossible for hotel staff to make pricing decisions, making AI crucial when implementing dynamic pricing models.

Optimizing demand forecasting

Given the cyclical nature of the tourist industry, it is very important for hoteliers to accurately forecast demand and be prepared to deal with unforeseen circumstances[3]. Until now, staff of hospitality companies were responsible for considering all the different factors impacting the sector and constantly updating the forecasting models to make sure they were up to date. Yet, the rise of machine learning and Big Data allows hoteliers to forecast demand more accurately — as they provide real-time analysis and automatically update forecasts according to changing external factors — and in less time[7].

Adapting to machine learning software

From Big Data analytics to chatbots and virtual voice assistants, hoteliers are experimenting with machine learning

Big Data in action

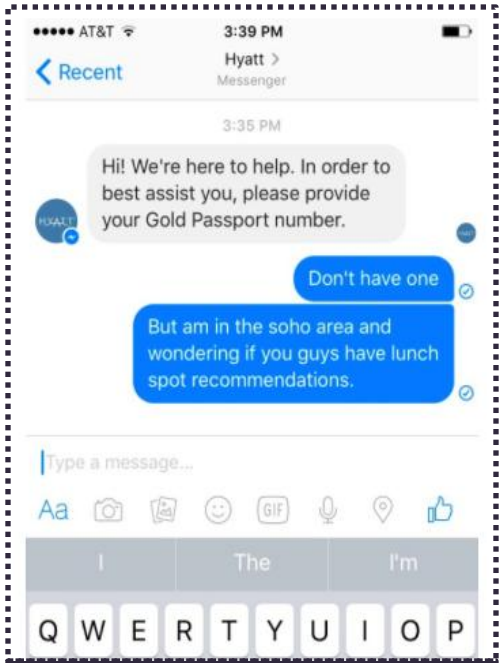
Marriot has built a hybrid cloud platform with IBM and VMware to enhance its analytics capabilities and create customized services[8]. In addition, Marriot utilizes Big Data analytics to predict the best dynamic price for its rooms, based on occupancy rates, competitor prices, and customer sentiment[8]. The hotel chain collects valuable data by offering its reward members a dynamic app featuring customized content and mobile check-in services.

Deniham also implemented analytics to improve its revenue streams and customer service. Partnering with IBM, it launched a machine learning software that not only analyzes its own data sets, but is also capable of analyzing information from review sites, social networks, and blogs[9]. Therefore, it is able to understand customers' preferences, optimize its services, and adjust the room prices immediately.

Chatbots in action

More hoteliers have started to introduce chatbots to secure a seamless 24/7 communication with their customers without direct human interaction.

Chatbots use natural language processing technology to understand the contextual semantic behind the customer's request[10]. Whereas Marriott or Edwardian hotels have introduced their own chatbots via their apps, others such as Hyatt or Starwood Hotels employ existing messenger services such as Facebook or WhatsApp to integrate chatbots and create seamless communication before, during, and after their guests' visit[11]. The potential of chatbots in the hotel industry has also attracted a number of start-ups targeting the sector. These include the likes of Hipmunk, Waylo, GuestUBot, HelloGBye, and SnapTravel[11].



Hyatt's messenger chatbots[12]

Source: Salesforce

Adapting to machine learning software

From Big Data analytics to chatbots and virtual voice assistants, hoteliers are experimenting with machine learning

Virtual voice assistants and robots in action

Big hotel chains have implemented virtual voice assistants such as Amazon's Alexa or Google Home to enhance customer experience[3]. Hilton has gone further, by implementing Connie, a robotic concierge based on IBM Watson's machine learning algorithm, in one of its hotels in Virginia[13]. Connie is based on a cognitive intelligence that learns, adapts, and improves its recommendations the more it interacts with customers[13]. Starwood hotels, in cooperation with robotics company Sacioke, has also trialed two robot concierges called A.L.O in its Cupertino Aloft hotel. In Japan, Henn-na Hotel has even replaced all of its service assistants with robots[14, 15]. While the rise of artificial intelligence in the hospitality industry sparks fears of human workers losing their jobs to machines, some believe that robots can "free up existing staffs' time and allow them to create a more personalized experience for guests"[15].

Henn-na hotel in Nagasaki is the world's first robot-staffed hotel[14]

Source: TTG Nordic

Starwood's A.L.O robotic butlers[15]

Source: Techcrunch

What is the way forward for the hospitality industry?

Source: Shutterstock

Capitalize on Big Data

The growing expectations of consumers and the large amount of data available in our days are transforming the hospitality industry[16]. In a world where customers can compare a vast number of hotels, resorts, and flights through platforms such as Expedia, Trivago, and Booking.com, hoteliers need to protect their market shares by focusing on increasing customer loyalty[3]. It is therefore key that they are in a position to provide travelers with more personalized offerings that satisfy their needs.

The technology of Big Data offers hoteliers great opportunities as it enables them to aggregate, process, and automatically analyze millions of real-time data every day, providing the most accurate insight on traveler patterns, as well as pricing and revenue management, ultimately allowing hotels to increase their sales[3]. At the same time, customers are able to enjoy services tailored to their preferences, which presents a win-win situation. Yet, it should be pointed out that there is a thin line between companies becoming intrusive by spamming their customers and being able to effectively target them at specific moments in order to qualitatively build brand loyalty [16] .

Source: Shutterstock

Embracing robots and moving towards the 'smart hotel'

The number of robots used in the hospitality industry is growing rapidly, assisting staff to deliver basic services. The price to build robots is now dropping quickly and the skepticism of the public towards such machines is similarly decreasing[4]. As a result, robots present a cost-effective solution in the hospitality industry and given the early stage of adoption, it is still considered a novelty for customers[4]. Another important benefit stemming from the employment of robots is that such machines can collect valuable data as they interact with people and carry out their tasks. Still, there are many who believe that automation and the rise of artificial intelligence will start replacing human workers, leading to high unemployment, so a more cautious approach to the employment of robots should be adopted.

Moreover, as the IoT is expected to grow significantly, all data streams and devices in hotel rooms are going to be interlinked, providing a unique guest experience[18]. Most importantly, the IoT will not only be able to enhance one's stay at a hotel, but to ultimately transform the experience at a destination. Smart hotels of the future will be 'plugged' into 'smart cities' and provide the traveler information about events, activities, and services that match their interests[19].

Terminology and definitions

TERMINOLOGY	DEFINITION
AI	Artificial Intelligence (AI) refers to the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
Big Data	Big data is a term that describes the large volume of data — both structured and unstructured — that inundates a business on a day-to-day basis. But it is not the amount of data that is important. It is what organizations do with the data that matters. Big data can be analyzed for insights that lead to better decisions and strategic business moves.
IoT	Internet of Things (IoT) refers to the interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data.
RMS	Revenue Management System (RMS) is a software used to predict customer demand, to optimize inventory and price availability, and maximize revenue growth.
Smart city	Smart city is one that utilizes ICT to meet the demands of the market (the citizens of the city), and that community involvement in the process is necessary for a smart city[20]. A smart city would therefore be a city that not only possesses ICT technology in particular areas, but has also implemented this technology in a manner that positively impacts the local community.

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Elena is an associate analyst in GlobalData's Digital Industries team. She is responsible for covering the role of IT and digital transformation trends in the travel and leisure industry.

Before joining the group, Elena was a junior quantitative analyst in the risk management team for Commerzbank AG, where her main responsibility was the daily validation of booking of structured and exotic trades in equities, commodities, and alternative investments. Prior to that, while studying for her degrees, Elena worked as a market researcher for Ipsos MORI.

Elena holds an MSc in Financial Modelling and Optimization from the University of Edinburgh and an MA (Honors) in Economics and Mathematics from the same educational institution.

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