

Chapter 1

Predictive and Prescriptive Analytics for IoT Unlocking Insights

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ABSTRACT

In today's information era, the use of internet of things (IOT) technologies and associated devices has multiplied, and they are now present in every sector. IOT technologies use sensors to sense data from the environment of deployment. Sensors generate a great deal of data that has valuable insights. Therefore, this chapter explores the intersection of predictive and prescriptive analytics within the context of the IoT. The chapter delves into the theoretical foundations, technological advancements, and practical applications of predictive and prescriptive analytics in the IoT domain. By understanding how these analytics techniques work synergistically, organisations can harness the power of IoT data to make informed decisions, optimize operations, and create value.

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INTRODUCTION

Predictive analytics is a branch of advanced analytics that uses historical data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes based on historical data. In simpler terms, predictive analytics predicts what might happen in the future based on patterns found in past and present data. It's widely used in various fields including business, finance, healthcare, and marketing for making informed decisions and optimizing processes (Bhatia et al., 2022).

Predictive analytics (Kumar & Lalotra, 2021) in the context of the Internet of Things (IoT) involves leveraging data generated by IoT devices and sensors to predict future events or trends. By applying sophisticated algorithms and machine learning techniques to IoT data, businesses and organizations can anticipate issues, optimize operations, and improve decision-making processes (Adi et al., 2020).

Prescriptive analytics (Frazzetto et al., 2019) in the context of the Internet of Things (IoT) takes predictive analytics a step further. While predictive analytics predicts what might happen based on historical data and current conditions, prescriptive analytics goes beyond that by suggesting specific actions or strategies to optimize outcomes. It not only predicts future events but also provides recommendations on what should be done to achieve desired results in IoT applications.

The role of IoT in sustainable development for building a Smarter and greener future is today's prime need (Memić, et al. 2022). In the pursuit of a sustainable future, the integration of innovative technologies has become crucial. One such transformative force is the Internet of Things (IoT), which plays a pivotal role in reshaping industries, enhancing efficiency, and promoting sustainable development. IoT refers to the interconnected network of devices, sensors, and systems that communicate and share data, leading to smarter and more efficient processes.

The introduction provides a comprehensive overview of the Internet of Things (IoT), highlighting its exponential growth and the challenges faced due to the vast volume of generated data. It introduces predictive analytics as the practice of using historical data to predict future outcomes, and prescriptive analytics as the process of recommending actions for desired outcomes. An example of predictive analytics in IoT (Kumar & Lalotra, 2023) could be predicting equipment failures based on sensor data trends. Prescriptive analytics, on the other hand, could recommend maintenance schedules or optimal operating conditions to prevent those failures. We discuss the challenges faced by organizations in handling vast IoT data and introduce predictive and prescriptive analytics as solutions.

Table 1 contains the highlighting key differences between predictive and prescriptive analytics in the context of IoT (Internet of Things) (Deshpande, et al., 2019).

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