Chapter 3
Advanced Predictive Analytics for Control of Industrial Automation Process

Sai Deepthi Bhogaraju
InkforTech, India

Korupalli V Rajesh Kumar
https://orcid.org/0000-0002-7989-1824
VIT Chennai, India

Anjaiah P.
Institute of Aeronautical Engineering, India

Jaffar Hussain Shaik
KSRM College of Engineering, India

Reddy Madhavi K.
Sree Vidyanikethan Engineering College, India

ABSTRACT

The recent evolution of the fourth industrial revolution is Industry 4.0, projecting the enhancement of the technology, development, and trends towards the smart processing of the automation in industries. The advancements in communication and connectivity are the major source for the Industrial IoT (IIoT). It collaborates all the industrial functional units to work under a single control channel, digital quantification analytic methods deployment for the prediction of machinery, sensors, monitoring systems, control systems, products, workers, managers, locations, suppliers, and customers. In addition to IIoT, AI methods are also playing a vital role in predictive modeling and analytic methods for the assessment, control, and development of rapid production, from the industries. Other side security issues are challenging the development, concerning all the factors digitalization processes of the industries need to move forward. This chapter focuses on IIoT core concepts, applications, and key challenges to enhance the industrial automation process.

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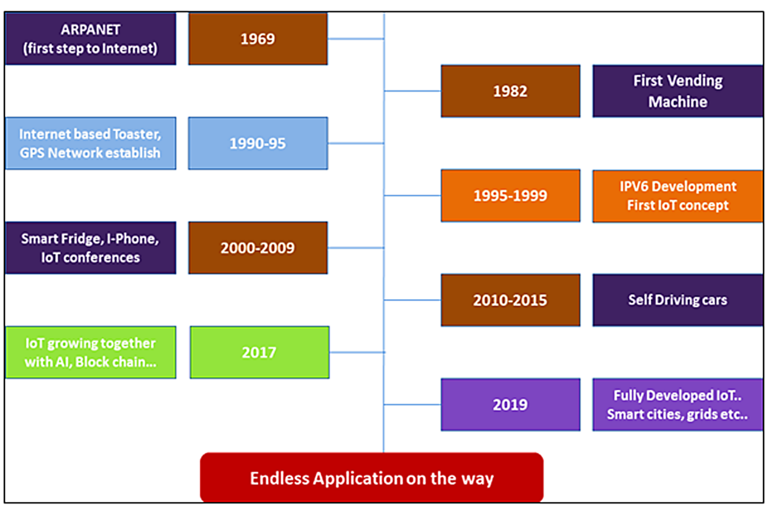
INTRODUCTION

Internet of Things is a network that connects mechanical, digital, and computing machines with the least human-computer interaction. In 1982, a Coca Cola vending machine at Carnegie Mellon University was the first machine connected via the internet and it was designed to know if the cool drinks in the vending machine are cool without the need for a physical check. Later in 1990, an Internet controlled toaster was built by John Romkey which switches on and off the toaster automatically without human interaction. Father of IoT Kevin Ashton, the Executive Director of Auto-ID Labs at MIT first introduced the term IoT in the presentation designed for Procter & Gamble in the year 1999 (Shimanuki, 1999). He believed that Radio Frequency Identification (RFID) is the base of the internet and the devices that are connected via the internet can be tracked and managed from the computer. A constellation of 27 satellites created by the United States of America provides a highly stable communication system for IoT (Asenjo et al., 2014; Bravo et al., 2014; Carlsson et al., 2016; Ray, 2019). Internet Protocol address (IP address) assigns a label to every device that is connected to the Internet for communication, the introduction of IPv6 changed the course of the address allocation by assigning a 128-bit IP address to every device connected to the internet without any limit. In 2000's advancement in the IoT helped in developing smart devices like Smart Fridge (LG), Smart Homes, Google self-driving cars, Google Home, Amazon Echo, smart wearable technology, etc., (Breivold & Sandström, 2015; Kumar et al., 2020; Wang et al., 2015)

Figure 1. Development of Internet of Things- Timeline.



The IoT is mainly concentrated in the sectors Consumer, Industrial, Commercial, and Infrastructure varying from Smart Wearables to Smart Homes. Automation helps to fulfill the tasks with minimum human intervention. The third industrial revolution a Digital revolution began with introduction sensors, computers, robots to the industries in the 1970s (King & Mamdani, 1977). The industries are partially automated and are controlled using memory programmable controls and computers without human intervention. The current Industrial revolution Industry 4.0 replaced the third industrial revolution with the advancement in communication and connecting components of machinery, people, sensors, etc., via

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