Chapter 2
Analysis of Industrial and Household IoT Data Using Computationally Intelligent Algorithm

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ABSTRACT

In this chapter, data mining approaches are applied on standard IoT dataset to identify relationship among attributes of the dataset. IoT is not an exception; data mining can be used in this domain also. Various rule-based classifiers and unsupervised classifiers are implemented here. Using these approaches relation between various IoT features are determined based on different properties of classification like support, confidence, etc. For classification, a real-time IoT dataset is used, which consists of household figures collected from various sources over a long duration. A brief comparison is also shown for different classification approaches on the IoT dataset. Kappa coefficient is also calculated for these classification techniques to measure the robustness of these approaches. In this chapter, standard and popular power utilization in household dataset is used to show the association between the different intra-data dependency. Classification accuracy of more than 86% is found with the Almanac of Minutely Power Dataset (AMPds) in the present work.

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INTRODUCTION

In recent time the use of computational intelligence in every aspect of life is increasing day by day. New research findings from different types of computational intelligence domain like machine learning, neural network, meta heuristic algorithm, fuzzy systems are emerging at a very fast rate. In recent times smart devices are also being connected in Internet of Things (IoT) in a fast rate (Atzori, et al., 2010). Data collected from those smart devices can show important relationship and data analytic (Mohammadi & Al-Fuqaha 2018).

IoT is a network of objects e.g. vehicles, appliances, mobile phones, cameras, instruments, buildings etc (Parker 2014). These devices are all connected, doing communication and sharing information based on some protocols to achieve secure control of all the devices. There are certain characteristic of IoT like Interconnectivity, Heterogeneity, Scalability, Safety and Connectivity. Some of the application areas of IoT are Smart Appliances Control, Smart Intrusion Detection, Smart Energy Use, Smart Transportation and Parking, Smart Waste Management, Smart Pollution Control, Smart Fire Detection, Smart Wildlife Protection, Smart Protection from Hazardous and Explosive Gases, Smart Patients Monitoring, Smart Power Controllers, Smart Animal Farming, Smart Child Care etc.

Kevin Ashton at MIT's AutoID Lab around early 2000 A.D. pioneered the key concept to IoT (Internet of Things) (Barnaghi, et al., 2012). He thought of a system where information would be collected from the RFID tags attached to a host of connected devices and then this information would be linked to the Internet. Since then the concept has grown to such a stage that it encompasses the most modern ubiquitous paradigm and aim i.e. any device, anywhere, anytime can be connected to any other devices/equipments/people/systems through any means of communication mode to share and exchange information (Patel & Patel, 2016).

So the IoT is a hardware-software enabled behemoth network of physical objects in real life domain that connects a host of devices may be, computers and non-computers, living or inanimate, all sorts and forms to one another through a set of agreed, diverse standard data communication protocols sharing and updating data via wired and wireless connectivity (Sleman & Moeller 2008). This interconnected network of physical objects naturally has devices of all sizes, features and types, like mobile phones, data tablets, vehicles, home appliances, cameras, imaging systems, medical instruments, domestic and industrial components and systems, people, tree, water, roads, buildings, bridges, animals etc.

Till date about 5 billion devices have been deployed and connected in this interconnected scenario, but according to Cisco's IOTG (Internet Of Things Group), there will be over 50 billion connected devices in the world by 2020 (CISCO Report).