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Editorial

Edge Computing for Internet of Things

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1. Introduction

The Internet of Things (IoT) is maturing and becoming an established and vital technology. IoT devices are being deployed in homes, workplaces and public areas at an increasingly rapid rate. IoT is the core technology of smart homes, smart cities, intelligent transport systems and automated logistics systems. IoT has the potential to optimize travel, improve logistics, reduce energy usage and improve quality of life.

With the increasing use of IoT, the problem of managing the vast volumes of data, wide variety and type of data that are generated, and erratic generation patterns is becoming increasingly clear and challenging. As well as the increasing number of IoT devices conducting traditional sensing, generating more data, there is also an increasing number of cameras, generating large volumes of complex data with stringent processing requirements. The current standard IoT model with Cloud computing is not sustainable, and a new model is needed to improve response time, reduce data transfer and increase processing availability.

This Special Issue is focused on solving this problem through the use of edge computing. Edge computing offers a solution to managing IoT data by processing IoT data close to the location where the data are generated. Edge computing allows for computation to be performed locally, thus reducing the volume of data that need to be transmitted to remote data centers and Cloud storage. It also allows for decisions to be made locally without having to wait for Cloud servers to respond.

2. This Issue

The ten articles in this Issue all present research in the area of edge computing for IoT. They address topics in the areas of resource management and offloading, deployment management, failure recovery, architectures, and algorithms for processing IoT data.

With the increasingly complex demands from IoT applications regarding end nodes and edge computing, there is an increasing need to effectively utilize the available resources. In [1], the authors focus on maximizing the use of available IoT devices by allowing them to collectively execute services using their spare resources. This reduces latency and data transfer to cloud services and improves the overall performance of IoT applications. Offloading computation is needed when the resources for a particular device are not enough to perform a task. In [2], the authors propose a new cooperative offloading method which uses edge-computing resources in rapidly changing environments. In this way, the authors aim to reduce latency and energy use. IoT applications should use all available resources, but it is difficult to decide which computation should run on which available resource. In [3] the authors examine approaches to job scheduling and execution on smart phones, with the goal of enabling the widespread use of dew computing. In [4], the authors aim to use Fog resources efficiently by utilising deep-learning to optimize content caching in edge nodes.

Edge-based IoT deployments need to be managed effectively, efficiently and automatically. IoT applications that involve end-nodes, edge and fog computing are complex to manage. In [5], the authors propose a method for dynamically orchestrating services in a Fog architecture. The approach focuses on heterogeneous devices and the dynamic nature of the end devices. The appropriate placing of these edge resources is the focus of [6], which attempts to use reinforcement learning to optimize placement based on the latency and load of the server. The authors analyze the effectiveness of the proposed solution to attempt to maximize network-wide performance and focus on improving security using this approach.

The issue of automatically detecting and recovering from failures in container-based IoT deployment is the focus of paper [7]. The authors observe the rate at which data are received form the IoT end node, and if this is not as expected, perform the recovery process. The work is focused on container-based deployments, which are increasingly becoming the norm for IoT applications.

For edge computing to work effectively, system architectures that can be deployed in different contexts are needed. One such context is in automated warehouses, to support efficient logistics. In [8], the authors propose a hierarchical edge-based architecture to enable a rapid response in intelligent warehouses. The aim is to take advantage of edge nodes, to offer low latency while also enhancing the reconfiguration abilities of nodes at the edge of the network.

IoT data vary depending on their deployment and application; all data need to be processed in some way. In [9], the authors propose algorithms for processing spacial data that are of interest to the data mining field. They propose region-based frequent pattern growth (RFP-Growth) to search for associations in IoT data. In [10], the authors use deep learning algorithms to classify objects from RGB cameras on IoT end-devices.

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