

# Chapter 52

## FogLearn: Leveraging Fog-Based Machine Learning for Smart System Big Data Analytics

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### ABSTRACT

*Big data analytics with the cloud computing are one of the emerging area for processing and analytics. Fog computing is the paradigm where fog devices help to reduce latency and increase throughput for assisting at the edge of the client. This article discusses the emergence of fog computing for mining analytics in big data from geospatial and medical health applications. This article proposes and develops a fog computing-based framework, i.e. FogLearn. This is for the application of K-means clustering in Ganga River Basin Management and real-world feature data for detecting diabetes patients suffering from diabetes mellitus. The proposed architecture employs machine learning on a deep learning framework for the analysis of pathological feature data that obtained from smart watches worn by the patients with diabetes and geographical parameters of River Ganga basin geospatial database. The results show that fog computing holds an immense promise for the analysis of medical and geospatial big data.*

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## INTRODUCTION

Cloud computing has provided for exchange and sharing of data belonging to various stakeholders. This emerging computing has created a robust framework that enabled wide variety of users to retrieve and access geospatial data along with associated metadata in a secured manner (Brovelli et al., 2016a; Chen et al., 2012). It has leveraged for land use and urban planning, natural resources management, environmental assessment monitoring marine and tele healthcare monitoring. There are numerous emerging applications of cloud computing in geospatial and health application. It has the ability to integrate and analyze heterogeneous thematic layers along with their attribute information to create and visualize alternative planning scenarios (Brovelli et al., 2016b) in geospatial scenario. It has integrated widespread geospatial database operations with variety of queries formations, different overlay analysis, and numerous statistical computations with unique visualization functionalities. These types of features have distinguished the cloud computing based framework from other geospatial decision support systems. This framework has widely used tool in private and public sectors for predicting outcomes, illumination events, manipulating and designing strategies (Brovelli et al., 2014; Barik. and Samaddar, 2014b; Coleman et al., 2016; Georis-Creuseveau et al., 2016).

Geospatial data contains geospatial distributions and informative temporal data. In traditional setup of cloud computing based GIS framework, it sends data to cloud server where these are processed and analyzed (Huang et al., 2013; Yang et al., 2011; Yang, et al., 2017). This scheme has taken for large processing time and required high Internet bandwidth. Fog computing overcomes this problem by providing local computation near the edge of the clients. Fog computing enhances the Cloud computing based GIS framework by reducing latency at increased throughput. Fog devices such as Intel Edition and Raspberry Pi has provided low-power gateway that can broaden the throughput and reduces the latency period near the edge of geospatial/end user clients (Barik et al., 2016; Dubey et al., 2017; Yang et al., 2010). In addition, it reduces the cloud storage for geospatial big data. Also, the required transmission power needed to send the data to cloud is reduced as now we send the analysis results to cloud rather than data. This leads to improvement in overall efficiency. Fog devices can act as a gateway between clients such as mobile phones and wearable sensor devices. The increasing use of smart devices led to generation of huge geospatial big data. Cloud and fog services leverage these data for assisting different analysis. It suggests that the use of low-resource machine learning on Fog devices which kept close to smart devices. For traditional systems, the different processing and machine learning modules are deployed in cloud that process physiological data.

The increasing use of wearable in smart tele-health system led to generation of huge medical big data. Cloud and fog services leverage these data for assisting clinical procedures. IoT Healthcare has been benefited from this large pool of generated data. It suggests that the use of low-resource machine learning on Fog devices which kept close to wearable devices for smart tele-health. For traditional telecare systems, the signal processing and machine learning modules are deployed in cloud that process physiological data. The present research paper also illustrates on unsupervised machine learning big data analysis for discovering patterns in physiological data in fog environment.

So, both geospatial and medical data are processed at the edge using of fog devices and finally has stored at the cloud layer. The present research paper has made the following contributions:

- It describes the detail concepts and architectural framework about the edge, cloud and fog computing;

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