Chapter 7
Conclusion

IoT and Fog Computing paradigm can play a pivotal and crucial role in the healthcare domain as compared to the IoT and Cloud Computing paradigm. The IoT-Fog architecture reduces transmission delay, CO_2 emission and it gives a very early response for time-critical diseases like ECG analysis. Special care must be taken while deploying an ECG analysis system on Fog Computing with respect to selecting the sampling frequency, selecting the right ECG recording device, and the lightweight windowing algorithm to process the ECG signal. A Raspberry Pi can be used as a Fog Computing node due to its processing, communication, storage capabilities and its energy efficiency. If multiple real-time data streams are submitted for real-time analytics to single Fog Node made of Raspberry Pi, it lags in computation power which affects the decision making time.

Hence, further improvement in existing Fog Computing architecture for health care application is required in terms of speed of processing for faster decision making. For this improvisation we have implemented Distributed Computing in Fog architecture and it is increasing the computational power using the cluster of Raspberry Pi as Fog Node, which has shown time improvisation in terms of ECG analysis.

The dispy tool is used to achieve ease of deployment in distributed Fog Computing. Improvements of 87% in processing time is noted when the Genome data and the ECG signal data are processed through this cluster and the dispy tool. To improve it further, the "OptiFog" algorithm is designed and implemented which is scalable and dynamic, it achieves 50% better computations. This has been achieved by selecting and deciding the member in the cluster based on its capacity to which process has to be submitted. The job size submitted to each node is also decided dynamically. Thus, providing optimized results in heterogeneous Distributed Computing environment.

Healthcare data is very crucial and sensitive and thus requiring a secured end to end transmission. Adding more burden on the IoT-Fog devices will delay the decision-making process due to their lower computational capabilities. Fog Computing helps reduce cloud traffic by only allowing important data to go onto the cloud. Introducing Multi-level Fog Computing architecture saves more bandwidth than the fog-cloud architecture. Due to the data being nearer to the source of data generation in the Multi-level Fog Computing architecture, it helps in getting more data analytics at faster rate. The end-to-end security scheme suggested is capable of encrypting any data at any device level with the security scheme designed being lightweight and having a significantly lesser time and space complexity.

Hence, the work done above is improving the quality of healthcare applications using IoT and Fog Computing. The improvement is in terms of device mobility, saving network bandwidth, defining the architecture, by optimization of results, securing the data, and Optimizing the Fog Node in terms of its computational power.

As future enhancement, the Multi-Fog-Level can be applied to the vehicular Fog Computing model to make it more suitable for healthcare applications anytime anywhere.