CHAPTER 6

CONCLUSION AND FUTURE SCOPE

This thesis has promised to deliberate on one of the most demanded and trending topic of healthcare in rural areas. It has taken into the consideration of mixed integer non linear model to optimize the route to be traversed by MMU. This chapter summarizes the conclusion of the work carried out, limitations and last but not the least, the potential domain for future research.

6.1 CONCLUSION

1. In the first phase of the project, the discussion was done to understand the problems faced by public living in the rural areas of the developing countries like India. It consists of the topic of discussion for providing the quality healthcare to them. Also, it was well known that there is minimum or no healthcare service providers near these rural areas making patients difficult to travel to a hospital. The hospitals are either located at very far distance or near by healthcare service providers are partially or not equipped with all the facilities required by patients.
2. Also, it is very difficult for healthcare service providers to reach to the patient and provide them quality healthcare services. An existing solution of Mobile Medical Units was suggested in the paper. Also, specialists to provide services were taken into consideration.
3. The first objective of the thesis was to optimize the distance of mobile medical units along with the specialist in it. A mixed integer non linear model was formulated to optimize the distance so as to cover the maximum demand of the patients.
4. The MMUs were to travel from their centre location to different nodes (village centres in our research) in such a way that all the demands are covered by optimizing the

distance between node and village centre. A random sample generated was tested in GUROBI optimizer giving very good results. Ant colony optimization algorithm was incorporated for providing the solution for our problem

5. In the second phase of the project, we thank SUHRC, Pune to provide the data of their MMU to validate the model. The results were later compared with python model where decision making for optimized routes was done and Reinforcement Learning paradigms were used to justify the behaviour of the model. In our work we have trained the 70% of the data and 30% data was used for testing. The model worked well as described in the result section 5.4.
6. The second objective of the model gave the optimized distance that can be travelled with in the given time period. The motive behind the problem was to cover the maximum demand possible within the given time period considered (in our work, 8 hours are considered).
7. Also, the work was extended so as to provide quality medical supplies to the patients. For this, we understood the importance of transparency in the pharmaceutical supply chain model. We believe the traditional pharmaceutical supply chain model has many mediators, ultimately leading to many loop holes on the system and, hence, counterfeiting of the drugs and other medical supplies.
8. The third objective was to maintain the transparency in the medical supplies to the patients using blockchain technology. Important characteristics of the supply chain were noted and F-AHP was applied to it. The results shows the maximum dependency on the “transparency” of the data.
9. In this last phase of the thesis, a machine learning model was formulated to track the supplies at each and every stage from one supplier to end customer to maintain the transparency among every node. Data from various vendors was taken into

consideration. Descriptive analysis was done on the data followed by Predictive Analysis and Prescriptive analysis.

10. With the help of machine learning algorithms, notably Random Forest and Gradient Boosting, the system capitalizes on the insights extracted from historical dataset content. These algorithms have an understanding of the intricate relationships and patterns intrinsic to the dataset, which they use to precisely categorize transaction types. When users provide inputs such as account_id, date, operation, data, evidence, and k_symbol, the model orchestrates these inputs through the trained algorithms to produce educated forecasts regarding the probable transaction category linked with the given inputs.

6.2 FUTURE SCOPE

The prime thrust of the research is to provide the quality healthcare services to the people living in the rural areas. The present study can contribute to many government initiatives like Ayushman Bharat scheme to implement the model suggested so that maximum patients from rural areas are benefitted.

The MMUs are not just restricted to a particular area, in future they can extend their services. Till now, MMUs are providing basic healthcare services to the patients. The MMUs can deliver specialised services as discussed in our model. Also, there are possibilities that they can be equipped with medical supplies to handle the emergency situations serving as triage centres. These can also be served as telemedicine platform so that specialized service can be provided without travelling. We can inculcate more use of Artificial Intelligence in MMUs so that disease can be detected at early stage and healthcare providers can make decision accordingly. In future, MMUs can incorporate apps that can help in scheduling and follow up of patients. Also, Blockchain Technology can help in streamlining clinical trial and secure the management with the data at the same

time for maintaining the privacy. This can also help in providing the insights of the cost of the drugs.