

Prediction Methodologies for Post COVID-19 Healthcare Management System

Dr. Abhay Shankar Mishra *, Anjali Thakur **, Vaishali Tidke ***

mishraabhays@gmail.com, tidkevaishali4@gmail.com, anjali.pathakthakur@gmail.com

Abstract: During the pandemics, any country's medical health system was born. Early data estimation can assist hospital administration in priori testing and dealing with patients. During the pandemic, a large number of COVID-19 patients and cases were reported to the little available medical resources. Despite inadequate infrastructure and facilities, medical administrators have outperformed in India in managing patient overflow. It is still a difficult open problem for hospital administrations to effectively manage post-pandemic cases and databases. It is past time to create an effective and easy mathematical model for analyzing the COVID-19 patient databases. Therefore, this paper addressed various mathematical learning and production approaches used in hospital administration data management. Various regression methods are addressed and basic data prediction results in terms of probability analysis is presented.

KeyWords: COVID,

1. Introduction

Significant data has been captured during the COVID-19 pandemic and also the post epidemic patients have significantly increased. Thus data management and resource management is a big deal for the hospital administration staff. This paper aimed to address this problem using the learning models. The mathematics curve fitting prediction approach for the best health administration system for the hospital industry across central India are derived based on the data. for various input-output relationships, a polynomial regression-based model is developed so that, if any of the data is accessible, the other factors for cost & occupancy analysis can be appropriately estimated. Paper also examined the optimization solutions based on linear regression and polynomial regression.

1.2 HealthCare Administration

A receptionist, a doctor or nurse, and possibly radiologist or other specialists are likely to engage with you when you are likely to visit a doctor's office or a hospital. However, behind the scenes, a health care administrator ensures that everything functions properly at the hospital. Health care administration stands at the convergence of Hospital and medicine. It's a field from which you can use your managerial and management talents to make a significant difference in people's lives.

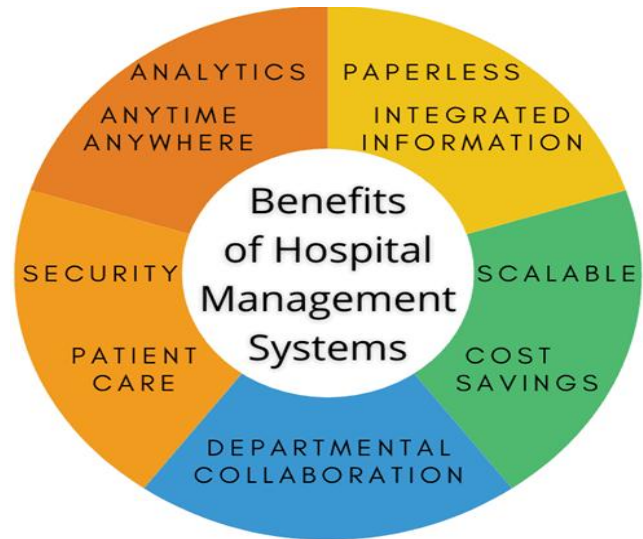


Figure 1 Benefits of Medical health Administration

1.2.1 Benefits of Medical Health Administration

Examples of the various benefits of the medical health administration are represented visually in the **Figure 1**. It is clear that based on the data and its analytics the medical health administration is responsible for efficient operation of health system in hospitals.

Medical facilities are notoriously difficult to administer, and the COVID-19 pandemic only added towards the difficulty. It also demonstrated how successful businesses rely on rapid, adaptable and resilient leaders to help them overcome obstacles. While there's a drop in healthcare employment during the initial phases of the pandemic, recruitment is expected to grow faster than in any other industry.

Furthermore, in the medical field the individuals currently working in front-line clinical positions will contribute unique and useful perspectives for managerial opportunities across the world. Various strategies for increasing the transparency and resilience for health administration systems have been developed. Health administration is having the wide area of the scope in versatile Medical Health applications.

In this section the some of major roles and applications of the health administrators are sequentially addressed. These action primarily includes patient care, financial aspects and managements, and in pharmaceuticals production process. The Applications of the Health Care Administration is shown in the **Figure 2**.

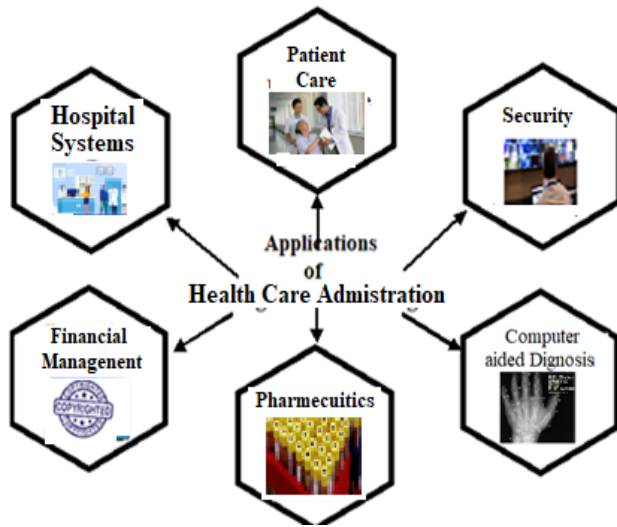


Figure 2 Applications of the Health Care Administration

Hospital administration has been greatly impacted by the COVID-19 pandemic, and a lot of hospitals are still getting used to the new possibilities and challenges. In the post-COVID-19 period, hospital management was focusing on several important topics, such as:

Security

The medical data security is the one of the prime concern of medical administration. Secure technique for protecting and authenticating the medical databases for patients' authentication. In recent times Block Chain (BC) is having wide scope to work for security of medical data Limited resource availability makes the BC based method robust.

Computer aided Diagnosis

The main focus of this synopsis is on developing the mathematical modeling for managing the computer aided diagnosis of the COVID-19 data and information overflow using the regression techniques. As a result, it must help to manage good administration skills. The basic flow diagram for the health administration system is shown in **Figure 3**

Pharmaceutics

Another versatile application of the Health administrator is the pharmaceutical industries for managing the drug production and the inventory management systems. The work is to manage the production process, finance and inventor.

Patient Care

The most important application of the health administrator is to take care of good environment and managing the staff like nursing and maintenance to make sure the quality of good care of patients. The patient care is essential for the fast recovery and the positive feedback of the hospital administration.

2 Literature Reviewf COVID 19 Evaluations

Many researchers have worked to evaluate the scenario of Pre and Post COVID-19 epidemic data one of the previous works is referred here. **Yoshiro Nishimoto and colleagues [1]** - Curve-fitting method with an asymmetric log-normal function has been applied to daily confirmed cases data in various countries. Most of the curve-fitting could show good forecasts, while the reason has not been clearly shown. The *K* value has recently been proposed which can provide good reasoning of curve-fitting mechanism by corresponding a long and steep slope on the *K* curve with fitting stability. Since *K* can be expressed by a time differential of logarithmic total cases, the physical background of the above correspondence was discussed in terms of the growth rate in epidemic entropy.

Bilal Majeed and Associates et al. [2] - In this study, they introduced a new multi-period curve fitting model to give a short-term prediction of the COVID-19 spread in Metropolitan Statistical Areas (MSA) within the United States. Since most counties/cities within a single MSA usually adopt similar mitigation strategies, this allows us to substantially diminish the variety in adopted mitigation strategies within an MSA. At the same time, the multi-period framework enables us to incorporate the impact of significant social events and mitigation strategies in the model. We also propose a simple heuristic to estimate the COVID-19 fatality based on our spread prediction. Numerical experiments show that the proposed multi-period curve model achieves reasonably high accuracy in the prediction of the confirmed cases and fatality.

S.K. Tamang et al [3] - In their work they have considered three scenarios to investigate the outbreak of the Covid-19 pandemic: Initially forecasting based on the current trend of increasing cases in various international locations, Secondly forecasting for one week based on development traits sustained with China and South Korea. Finally, forecasting if modern trends consistent with China and South Korea were followed up on earlier than per week. The findings reveal that ANN can accurately predict the fate of COVID 19 outbreaks in any country in the world.

Alemu Balcha et al.[4] - The research has done after collecting the first 90 days of data in Ethiopian case. Daily report announced by Ethiopian MoH is based on the test. And hence, the reported data as positive cases with COVID-19 is not actual positive case data in the country. Therefore, this paper has contribution for planning and taking further measure on the viruses by demonstrating the next 90 days predictive data. He used best curve fitting analysis using python function of the module politic algorithm to predict the trend of COVID-19 cases in Ethiopia.

Dipankar Das, Arijit Chakraborty, Avik Mitra [5] -In this research, they employed Auto-ARIMA, Auto-ETS, Auto-MLP, Auto-ELM, AM, MLP and proposed ELM methods for assessing accumulative infected COVID-19 individuals by the

end of July 2021. They made 90 days of advanced forecasting, i.e., up to 24 July 2021, for the number of cumulative infected COVID-19 cases of India using all seven methods in 15 days' intervals. They fine-tuned the hyper-parameters to enhance the prediction performance of these models and observed that the proposed ELM model offers satisfactory accuracy with MAPE of 5.01, and it rendered better accuracy than the other six models. To comprehend the dataset's nature, five features are extracted. The resulting feature values encouraged further investigation of the models for an updated dataset, where the proposed model provides encouraging results.

L. Pourkarimi, et al [6] opted the polynomials based curve fitting problem is examined from the angle of selection making in this work. A multiobjective optimization software version for curve fitting is given, which minimises the violations simultaneously as a vector, bearing in mind a few areas of weakness of both the norm-based totally processes. For the curve fitting hassle, this solution is very bendy. Indeed, by including the concept of efficiency into multi-objective programming, we can impose some extra useful secondary options. This method, in particular, can yield a fitted curve with green violations and a minimum average curvature or common slope.

3. Mathematical Optimization Methods

Typically, there are many available mathematical modelling and optimization methods being designed in the past and recent times for pandemic data analysis. The classifications flow diagram of HealthCare Administration (HA) based mathematical models and approaches are given in **Figure 3**.

Linear Programming- There are many approaches for designing the mathematical model for the usually used for logistic based regressions.

Genetic Algorithms-The genetic algorithms based algorithms are used for the data optimization and the classification applications.

The prediction methodologies as AI tools are widely being used for improving the Hospital management efficiency. The analysis and assessment of patient data becomes significant after post COVID19. The simplest of data management and analysis method is Regressions.

3.2 Regression Models.

The curve fitting techniques are mostly used for the regression based models. The regression techniques are polynomial methods for data fitting applications.

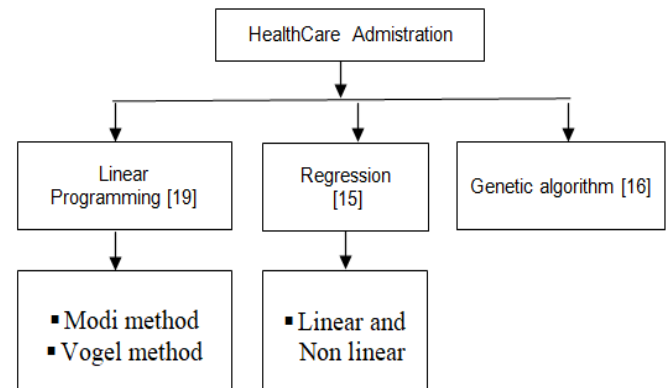


Figure 3 Broad classifications tree of HealthCare administration mathematical models and approaches

4 Paper Contributions

Some of the main objectives of the paper are as follows:

- It is past time to create an effective and easy mathematical model for analyzing the COVID -19 patient databases.
- Therefore this paper addressed various mathematical learning and production approaches used in hospital admiration data management.
- Various regression methods are addressed and basic data prediction results in terms of probability analysis is presented.

5. Results and COVID-19 Data Prediction

Curve fitting (CF) is one of most widely used and effective parameter estimation and supervised learning. The purpose is to find the mathematical curve models that match the data of randomly oriented entire data points as well as possible. Ideally, CF alloys should be used to produce estimations or predictions that best fit the data's recorded pattern. As a result, gathering accurate and thorough data on input parameters will become increasingly important in the future.

Paper presented the probability of the COVID-19 data prediction as the results of the Hospital admiration work.

Research considers the various running data collected from third party logistic service providers. Based on the data the mathematical curve fitting based models are derived for optimum running cost for transportation industry in India. The polynomial regression based model is derived for different input output relations. So that if any of the data is available then all other parameters can be optimally derived. Research also compared the linear regression and the polynomial regression based optimization results.

Case study of Age wise probability

The Figure 5 and Figure 6 presented the study of the probabtion histogram of dCOVID19data for the Age of patient on the x axis vs frequency of the patient's age wise tested and reported data for the coronas tests. These data is for total positive and negative cases. Figure 5plotted cases reported ofTotal 149.

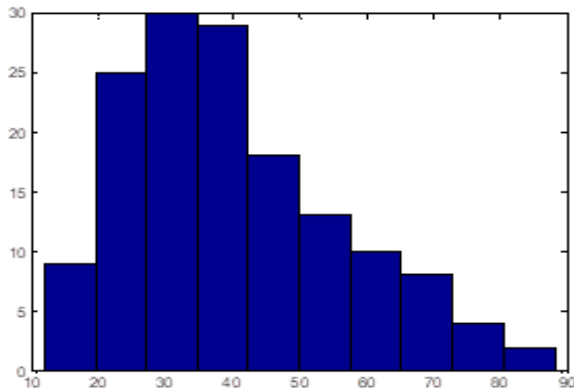


Figure 4 Histogram for the reported COVID 19 Patients data for a hospital the Age wise data probability.

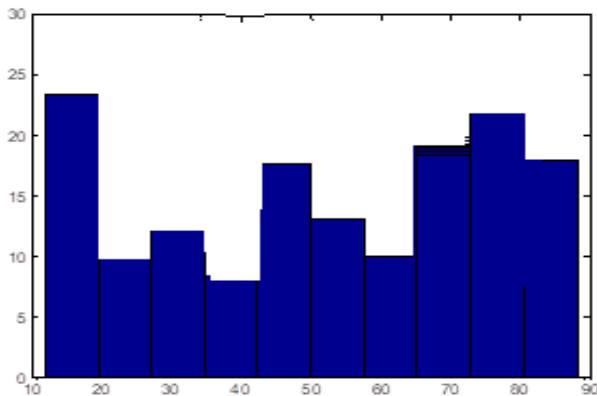


Figure 5 Histogram for the reported Negative COVID 19 Patients data for a hospital the Age wise

6. Challenges to Hospital Management

After pandemic has increased load and offered many challenges faced by the hospitals,two major novel challenges are; WorkForce management: Hospitals are striving to assist their personnel by offering proper training as resources, as well as by tackling stress and exhaustion, as the epidemic has put a pressure on medical professionals.

Tele Health: Since the pandemic, Tele Health has grown in significance, and hospitals are investing in fresh programmers and technology to increase patient access to telemedicine. Numerous services, including assessments, appointments for follow-up and mental health care, might be provided via telehealth.

7.Conclusions and Scopes

It is still a difficult open problem for hospital administrations to effectively manage post-pandemic cases and databases. It is past time to create an effective and easy mathematical model for analyzing the COVID -19 patient databases. Therefore, this paper addressed various mathematical learning and production approaches used in hospital administration data management. Various regression methods are addressed and basic data prediction results in terms of probability analysis is presented.The researcher has collected the age wise data of COVID-19 patients, presented the evaluation and prediction probability for age wise data of 149 patients. It was concluded that the maximum probability of COVID 19 patients reported are vortex Age group 30 to 50 were found positives,while the testing is done maximum for old age patients group.

Future Work

The performance of administration data under various possible questionnaires and tags will be evaluated. In future scope of research the polynomial regression will be used for mathematical modeling for good administration in future.

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