

Chapter 69

Prediction of High-Risk Factors in Surgical Operations Using Machine Learning Techniques

Anitha N.

Kongu Engineering College, India

Devi Priya R.

Kongu Engineering College, India

ABSTRACT

Prediction of risk during surgical operations is one of the most needed and challenging processes in the healthcare domain. Many researchers use clinical assessment tools to predict perioperative outcomes and postoperative factors in surgical operations. Even though traditional model yields better results, they are not able to achieve promising accuracy due to the enormous growth of data in medical domain. Since the data size grows seamlessly every day, some of the investigators over the past decade use machine learning techniques in their model to predict the risks before and after surgery. Most of the existing systems produced better accuracy by impute missing values in dataset through some common imputation method. However, in order to increase the accuracy level further, two new techniques proposed in this chapter to handle missing values using iterative deepening random forest classifier and identification of surgical risk by using iterative deepening support vector machine. Both of the methods worked well in experimental data set and obtained promising accuracy results.

INTRODUCTION

Surgical process is the most needful one to save human life from severe complications. Many standards of practice like AST standards are available to health care providers for proper surgical treatment. Everyone believes an effective surgeon is the only responsible person for successful surgery operations. However, making an informed decision in surgical process is the challenging one even by an expert surgeon. Even though, Chand et al (2007) determined that the decision making process in surgery has evolved over

DOI: 10.4018/978-1-6684-6291-1.ch069

Prediction of High-Risk Factors in Surgical Operations Using Machine Learning Techniques

time, it still requires some qualitative support to treat the patients effectively and smoothly. Due to the environment pollution and vast change in weather condition, rate of infection arises rapidly. To predict the infection risk for a patient during surgery is the complicated process. Pre-operative prediction and quantification of risks will support the patient as well as doctor for safe treatment. Stonelake et al (2015) recommended the huge number of clinical assessment tools are available to predict the risk. However, to provide an optimized solution for risk identification, many researchers use AI and machine learning techniques to make an instinctive decision-making.

Nowadays, there is a rapid growth of data in all sectors and especially in medical field, it grows enormously. Massive amount of data is generated every day and needs to be stored in Electronic health record (EHRs) data warehouse. In this digital era, huge number of genetic data and medical information is stored and manipulated using Machine learning and predictive modelling techniques. To handle those massive amount of data, many researchers preferred to use machine learning and data science technologies. Hence, Ehlers et al (2017) determined that the using machine learning technique in risk prediction during surgery will accurately detect risk and help to treat patients smoothly. When compared with traditional clinical methodologies, machine learning techniques can efficiently find features and nonlinear relationships that exist among them more accurately using predictor variables. Hence, machine learning techniques is widely used in many applications of health care like identification of diabetes, prediction of risks during surgical operations etc. Some health problems can be treated only with the help of surgeries which involve decisions made on collection of sensitive values. Most of the developed countries spend around billions of cost per year for surgical complications. Hence, health care organizations need an effective predictive modeling and accurate solution to detect high-risk individuals in surgery operations.

Classification is one of the supervised learning methods and helps to predict class labels or objects. It is used in many practical applications like image classification, document classification, and speech recognition and so on. Most commonly used algorithms in classification are Naive Bayes, Logistic regression, Decision-tree, Random Forest and SVM classifiers.

Brieman in the year 2001 has recommended Random Forest classifier (RF) which is one of the standard and ensemble classification algorithms. RF uses random subspace method in which each tree is constructed independently based on random samples. Based on training samples and features, a tree is constructed and the root node decision depends upon best split value of k randomly selected variables. Random forest is a well suitable method to handle large number of features in a dataset. As well as it is an efficient process to predict the attribute values even though dataset holds missing values. RF is widely used by many researchers in various fields and produce prominent classification results in health care domain. However, the result interpretation process is vague because of random tree construction process.

Nowadays, researchers uses ensemble classifiers in all domains especially in remote sensing applications. A complete review and future scope on RF classifiers in remote sensing field is prescribed by Belgiu & Dragut (2016). RF classifier is one of the best suitable classifiers for high dimensional data. In order to achieve effective text classification, Thiago et al (2018) have proposed an improved version of Random forest classifier. They eliminate the major issue of Random forest such as over fitting problem particularly in high dimensional data by using the nearest neighborhood training set projection. Thus, the modified RF classifier works better than the other classifiers in automatic text classification process. Random forest has also outperformed well in health care domains. Zhen et al (2019) have developed an integrated approach called LSTM-based ensemble malonylation predictor (LEMP) which is the combination of RF and deep learning network with one hot encoding mechanisms. They predict

19 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/prediction-of-high-risk-factors-in-surgical-operations-using-machine-learning-techniques/307513

Related Content

Generating an Artificial Nest Building Pufferfish in a Cellular Automaton Through Behavior Decomposition

Thomas E. Portegys (2019). *International Journal of Artificial Intelligence and Machine Learning* (pp. 1-12). www.irma-international.org/article/generating-an-artificial-nest-building-pufferfish-in-a-cellular-automaton-through-behavior-decomposition/233887

Integrated Regression Approach for Prediction of Solar Irradiance Based on Multiple Weather Factors

Megha Kamble and Sudeshna Ghosh (2021). *International Journal of Artificial Intelligence and Machine Learning* (pp. 1-12). www.irma-international.org/article/integrated-regression-approach-for-prediction-of-solar-irradiance-based-on-multiple-weather-factors/294105

Patient Monitoring System Using Internet of Things

Bollipelly PruthviRaj Goud, A. Prasanth Rao, Sravan kumar S. and Sathiyamoorthi V. (2021). *Challenges and Applications of Data Analytics in Social Perspectives* (pp. 275-289). www.irma-international.org/chapter/patient-monitoring-system-using-internet-of-things/267251

Factors Shaping the Patterns of Online Shopping Behavior

Fahima Khanam, Mahmud Ullah and Muhammad Omar Al-Zadid (2023). *Encyclopedia of Data Science and Machine Learning* (pp. 1127-1142). www.irma-international.org/chapter/factors-shaping-the-patterns-of-online-shopping-behavior/317512

Dew Computing: State of the Art, Opportunities, and Research Challenges

Amit Kumar Tyagi (2024). *Machine Learning Algorithms Using Scikit and TensorFlow Environments* (pp. 332-345). www.irma-international.org/chapter/dew-computing/335197