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Digital Model for Diagnosis of Postoperative Complications in Medicine Using Bioinformatics:
Evaluate and Predict the Patient's Condition

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ABSTRACT

Digital models are needed in medicine using bioinformatics for diagnosis and prediction. Such models are especially needed in personalized medicine using bioinformatics. In this area, it is necessary to evaluate and predict the patient's condition from a priori knowledge obtained from other patients. Therefore, a new direction appeared - predictive medicine using bioinformatics. Predictive medicine, or "in silico medicine" is the use of computer modelling and intelligent technologies in the diagnosis, treatment and prevention of diseases. Using predictive medicine, the doctor can determine the likelihood of the development of certain diseases and choose the optimal treatment using bioinformatics. Predictive medicine begins to be applied in surgery. The prognosis in surgery consists in the preoperative evaluation of various surgical interventions and in the evaluation of possible outcomes of surgical interventions.

KEYWORDS

Bioinformatics, Diagnosis, Digital Models, Evaluate and Predict Patient Condition, Personalized Medicine, Prediction, Priori Knowledge Patients

INTRODUCTION

Digital models are needed in medicine for diagnosis and prediction using bioinformatics. Such models are especially needed in personalized medicine using bioinformatics. In this area, it is necessary to evaluate and predict the patient's condition from a priori knowledge obtained from other patients. Therefore, a new direction appeared – predictive medicine (Brigham & Johns, 2012; Miner et al., 2014). Predictive medicine using Bioinformatics is the use of computer modeling and intelligent technologies in the diagnosis, treatment and prevention of diseases. Using predictive medicine and using Bioinformatics, the doctor can determine the likelihood of the development of certain diseases and choose the optimal treatment. Predictive medicine begins using bioinformatics to be applied in surgery (Joskowicz, 2017). The prognosis in surgery consists in the preoperative evaluation of various surgical interventions and in the evaluation of possible outcomes of surgical interventions.

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This article discusses the diagnosis of postoperative complications of acute medicine using bioinformatics. The problems of early diagnosis, treatment, prevention and prognosis of complications of acute medicine using bioinformatics are relevant. Among urgent operations, the proportion of medicine using bioinformatics removal operations is about 85%. Despite the active use of medical equipment for ultrasound, computer, magnetic resonance, laparoscopic, endoscopic diagnosis of acute medicine and its complications, the problem remains unsolved. The solution to this problem is the ability of the doctor to apply diagnostic methods and to objectively interpret them. It is necessary to perform a medicine using bioinformatics with a clinical analysis of the situation in the abdominal cavity in a timely manner and on the basis of indications: to identify infiltrates, abscesses, and local peritonitis. It is necessary to develop treatment tactics that prevent the development of purulent-inflammatory complications. It should be noted that purulent-inflammatory complications after appendectomy occur in 2.7% –39.1% of patients. So far, mortality in acute medicine using bioinformatics varies from 0.1% to 1.6%. Solving these problems requires the development of methods for predicting postoperative medicine complications. In (Prabhudesai et al., 2008; Park and Kim, 2015), artificial neural networks that diagnose the presence of acute medicine were developed. In (Juliano et al., 2017), a study of risk factors associated with complications of acute medicine using bioinformatics is conducted, specific types of complications were investigated in (Bakti et al., 2011). However, mathematical models to predict postoperative medicine using bioinformatics complications are absent.

Experiments conducted by the authors with a three-layer neural network for the direct distribution of the classical architecture (Haykin, 2008) showed that such networks do not provide high diagnostic accuracy. In addition, such networks are prone to over fitting. Currently, neural networks of deep architecture, using specific learning algorithms and activation functions, are very popular (Goodfellow et al., 2016; Aggarwal, 2018). Such networks are used to solve various problems of image processing, sound sequences, etc. Their main advantage is that they are able to capture very complex non-linear relationships in the data. The tasks of medical diagnostics, as a rule, have a large number of non-linearly interconnected signs characterizing the patient's condition. Moreover, the sets of features that characterize patients with different conditions may differ quite slightly. Therefore, it seems promising to use neural networks of deep architecture for medical diagnostics, in particular, for the diagnosis of postoperative medicine complications.

The aim of the work is the study of direct propagation neural networks of deep architecture for the diagnosis of postoperative medicine using bioinformatics complications.

FEATURE SELECTION AND PROCESSING

Problems of machine learning in the field of medicine have their own characteristics. For example, to solve problems in which the input data are images (computed tomography of the brain, x-rays of the lungs, etc.), apply its class of machine learning algorithms. In the field of medicine, there is another data format - this is tabular data. For example, test results, assessments of the patient's condition, and so on. For tabular data, you need to use very different approaches. Data of this kind have their own characteristics, in particular, a large number of gaps in the data. Absences occur when a standard set of tests is enough for a doctor to make a diagnosis. And for other patients, it was necessary to clarify the diagnosis by making additional tests. There is also the problem of a small amount of data, and a sufficient amount of data is needed to identify patterns in the data by the machine learning algorithm, but this is a common problem of machine learning tasks, and not just tasks in the field of medicine.

The solution to the problem of machine learning begins with the engineering and the selecting of features. The task of feature engineering is not formalized and is a kind of art. In the case of medical diagnosis should be guided by well-known guidelines and regulations. To diagnose complications of medicine using bioinformatics, we will be guided by a set of features of a registered database of acute medicine using bioinformatics (Vaschenko et al., 2014).