مجلة التربوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3

معامل التأثير العربي 1.5
العدد 21

مجلة التربوي

مجلة علمية محكمة تصدر عن كلية التربية

جامعة المرقب

العدد الحادي والعشرون

يوليو 2022م

- المجلة ترحب بما يرد عليها من أبحاث وعلى استعداد لنشرها بعد التحكيم .
- المجلة تحترم كل الاحترام آراء المحكمين وتعمل بمقتضاها .
- كافة الآراء والأفكار المنشورة تعبر عن آراء أصحابها ولا تتحمل المجلة تبعاتها .
- يتحمل الباحث مسؤولية الأمانة العلمية وهو المسؤول عما ينشر له .
- البحوث المقدمة للنشر لا ترد لأصحابها نشرت أو لم تنشر .

مجـلة الـتربـوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3

معامل التأثير العربي 1.5
العدد 21

ضوابط النشر:

يشترط في البحوث العلمية المقدمة للنشر أن يراعى فيها ما يأتي :

- أصول البحث العلمي وقواعده .
- ألا تكون المادة العلمية قد سبق نشرها أو كانت جزءا من رسالة علمية .
- يرفق بالبحث تزكية لغوية وفق أنموذج معد .
- تعدل البحوث المقبولة وتصحح وفق ما يراه المحكمون .
- التزام الباحث بالضوابط التي وضعتها المجلة من عدد الصفحات ، ونوع الخط ورقمه ، والفترات الزمنية الممنوحة للتعديل ، وما يستجد من ضوابط تضعها المجلة مستقبلا .

تنبيهات :

- للمجلة الحق في تعديل البحث أو طلب تعديله أو رفضه .
- يخضع البحث في النشر لأولويات المجلة وسياستها .
- البحوث المنشورة تعبر عن وجهة نظر أصحابها ، ولا تعبر عن وجهة نظر المجلة .

Information for authors

1- Authors of the articles being accepted are required to respect the regulations and the rules of the scientific research.
2- The research articles or manuscripts should be original and have not been published previously. Materials that are currently being considered by another journal or is a part of scientific dissertation are requested not to be submitted.
3- The research articles should be approved by a linguistic reviewer.
4- All research articles in the journal undergo rigorous peer review based on initial editor screening.
5- All authors are requested to follow the regulations of publication in the template paper prepared by the editorial board of the journal.

Attention
1- The editor reserves the right to make any necessary changes in the papers, or request the author to do so, or reject the paper submitted.
2- The research articles undergo to the policy of the editorial board regarding the priority of publication.
3- The published articles represent only the authors' viewpoints.

مجـلة الـتربـوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3
معامل التأثير العربي 1.5
العدد 21

Prediction of Chronic Kidney Diseases Using Artificial Neural Network

Ashraf M. Saeid Benzrieg[1], Abdullah M. Hammouche[2], Abdelbaset M. Sultan[3]
Department of Software Engineering College of Computers Technology Benghazi, Libya[1],
Department of Information Systems College of Computers Technology Benghazi, Libya[2],
Higher Institute of Science and technology Elkhams, Libya[3]
Ashraf.binzoriq@gmail.com[1], Ahamosh2012@gmail.com[2], Basetsultan1@yahoo.com[3]

Abstract:
Kidney disease, also known as chronic kidney disease, is a public health problem around the world, and kidney failure is one of the top ten causes of death in the world, and early detection or prediction of the disease is very important for the health of patients, and this disease is growing increase. The purpose of this paper is to use machine learning techniques to predict kidney disease. Biological data collected from patients with kidney disease is used as the basis for a system for predicting kidney disease. We also hope that the presence of this system contributes to helping many patients, and such a system is considered as a decision support system used by medical professionals. This paper focuses on the use of patient databases on an Artificial Neural Network (ANN) in order to predict kidney disease, obtaining the accuracy possible by using a different number of nodes in the hidden layer in each trial. Also the best accurate results were 94% which was obtained when we used 54 nodes in the hidden layer.
Index Terms: Chronic kidney disease, Machine Learning, Artificial Neural Networks, confusion matrix, the ROC AUC.

I. Introduction

Chronic Renal Disease is a leisurely loss of kidney function for months or years. Early detection of CKD is crucial and helpful in decreasing medical resources as ESRD patients preserve their health through hemodialysis, peritoneal dialysis or kidney transplantation [1]. It is a silent killer as there are no physical symptoms in the early stage. CKD affected 753 million people globally in 2016, 417 million females and 336 million males. Over 1 million people in 112 poor countries die from renal failure every year, as they cannot afford the huge financial burden of regular dialysis or kidney replacement surgery [2].

Chronic kidney disease can be said to be a relatively common chronic disease, but compared with other chronic diseases such as high blood pressure and diabetes, the general public's awareness is not high. Because it can be easily diagnosed through a relatively simple test, early diagnosis can slow the progression of the disease through early treatment. However, because the symptoms are not clear, the disease is often diagnosed after a long period of time, leading to kidney failure or even death due to complications such as cardio cerebrovascular disease. In general, chronic kidney disease continues to progress once it occurs. Thus, early detection and effective intervention are important to reduce the impact of CKD on public health [3].

Machine learning is a branch of computational sciences that deals with learning the systems automatically based on inputs. The Classification is the main problem which is located in supervised machine learning [4].gorKononenko (2001) presented a view on the use of Machine learning techniques 1) for the interpretation of medical data 2) for intelligent analysis of medical data in the current scenario and 3) for assistance of physicians in diagnosis of medical disorders, in the future. The authors suggested integration of machine learning techniques with the existing instrumentations for the acceptance of machine learning in medicine.

Recently, neural network models have been extensively used for text analysis tasks, achieving competitive results. Potential advantage of using neural networks for the disease prediction is that neural models use hidden layer for automatic feature combinations, which can capture complex semantic information that is difficult to express using traditional discrete manual features. This motivates a neural network model, which integrates the textual description information and physical indicators in EHR, for predicting kidney disease[5-6].

The purpose of this study is the use of machine learning techniques for predicting kidney disease. The biological data collected from patients with kidney disease is used as the basis for a system to predict kidney disease. In addition, the existence of this system contributes to helping many patients and such a system is considered as a decision support system used by specialist doctors. The study focuses on the use of databases for patients in a progressive area on ANN models in order to predict Kidney disease based on the following points:

1. Using ANN – Artificial Neural Networks different number of hidden layer nodes.
2. Getting the possible accuracy of each Experiment separately. Comparison of the accuracy of each one separately and then determining the best structure for the ANN model.

The rest of the paper is organized as follows. Section II review of previous studies. Section III Methodology. Section IV Dataset Information.Section V Evaluation frame work and results that show the efficacy of the work with different criterions.Section VI Results Evaluation.Section VII conclusion and future work.

II.PREVIOUS STUDIES

Represents Talk about Predicting Kidney diseases a wide area of interests across specialists and researchers in this area, Having dealt with many studies to Predicting Kidney diseases Research, study and evaluation, The following are some previous studies :

In[6]: We applied two different machine learning algorithms to a problem in the domain of medical diagnosis and analyzed their efficiency in prediction the results. The problem selected for the study is the diagnosis and factors affecting Chronic Kidney Disease. The dataset used for the study consists of 153 cases and 11 attributes of CKD patients. The objective of this research is to compare the performance of Artificial Neural Networks (ANNs) and Logistic Regression (LR) classifier on the basis of the following criteria: Accuracy, Sensitivity, Specificity, Prevalence, and Area under curve (ROC) for CKD prediction. From the experimental results, it is observed that the performance of ANNs classifier is better than the Logistic Regression model. With the accuracy of 84.44%, sensitivity of 84.21%, specificity of 84.61% and AUCROC of 84.41%.

In[7]: We are here describing a chronic kidney disease prediction system by using ANN technique. Back propagation algorithms are used for the training of ANN over the given dataset having several attributes containing information of patients. This neural network gives us an output which distinguish the patients having chronic kidney disease or not. As after doing so much of research regarding the above issue of prediction of kidney disease, artificial neural network shows a more accurate results than other machine learning algorithms.

In[8]: We use three algorithms and analyze the performance of them. The algorithms used are support vector machine, random forest, and a hybrid neural network model. We selected the most important features using Extra Tree Classifier. When Random forest was applied for the dataset it gave 100% accuracy which indicates that the model is over fitted. The accuracy of SVM is 84.78%. The hybrid model outperformed both SVM and Random forest. Even with a small amount of data, a hybrid neural network shows better performance compared to SVM and Random forest. Performance of the ML models can be improved in future by training with large amounts of data.

In[9]: We use machine learning and neural network techniques to diagnose chronic kidney disease with more than 90% accuracy based on a clinical data set, and to do a comparative study of the performance of the neural network versus supervised machine learning approaches. Based on the results, all the algorithms performed well in prediction of chronic kidney disease (CKD) with more that 90% accuracy.

In[10]: were used in this work to train three distinct models for reliable prediction. The LR classification method was found to be the most accurate in this role, with an accuracy of about 97 percent in this study. The dataset that was used in the creation of the technique was the CKD dataset, which was made available to the public. Compared to prior research, the accuracy rate of the models employed in this study is considerably greater, implying that they are more trustworthy than the models used in previous studies as well. A large number of model comparisons have shown their resilience, and the scheme may be inferred from the study's results.

In[11]: We use machine learning techniques, particularly classification and association techniques, to predict CKD. The study analyzes the effects of using feature selection techniques in combination with classification techniques. Classification techniques implemented in WEKA are used to benchmark the CKD dataset. The results are computed using 10-fold cross-validation with and without the feature selection technique. The results are compared for correctly classified instances, kappa statistic, and mean absolute value with and without the feature selection technique. The benchmark dataset is prepared using the Apriori association algorithm. The results note that the best result can be achieved using IBk with the Apriori associative algorithm.

In[12]: We propose a novel ultrasound kidney diseases prediction using the artificial neural network (ANN). To achieve the concept, we comprise the proposed system into four modules such as preprocessing, feature extraction, feature selection using OGOA and disease prediction using ANN. Initially, we eliminate the noise present in the input image using the optimal wavelet and bilateral filter. Then, a set of GLCM features are extracted from each input image and then we select the important features using oppositional grasshopper optimisation algorithm (OGOA). To classify the image as normal or abnormal, the proposed method utilises an artificial neural network (ANN). The performance of the proposed method is evaluated using accuracy, sensitivity, and specificity.

In[13]: This work gives a comprehensive study of the bio-clinical phenotype of cases with high-risk of Chronic kidney disease and will repeatedly assess victims over the long term and helps in classifying the stage of chronic kidney disease and then provides better recommendations (food, medicine) to prevent the rise of chronic kidney disease.

In[14]: Heterogeneous Modified Artifical Neural Network (HMANN) has been proposed for the early detection, segmentation, and diagnosis of chronic renal failure on the Internet of Medical Things (IoMT) platform. Furthermore, the proposed HMANN is classified as a Support Vector Machine and Multilayer Perceptron (MLP) with a Backpropagation (BP) algorithm. The proposed algorithm works based on an ultrasound image which is denoted as a preprocessing step and the region of kidney interest is segmented in the ultrasound image. In kidney segmentation, the proposed HMANN method achieves high accuracy and significantly reducing the time to delineate the contour.

In[15]: We analyzed the data of CKD patient and proposed a system from which it will be possible to predict the risk of CKD. We have used 455 patients' data. Online data set which is collected from UCI Machine Learning Repository and real time dataset which is collected from Khulna City Medical College are used here. We used Python as a high-level interpreted programming language for developing our system. We trained the data using 10-fold CV and applied Random forest and ANN.

In[16]: We focus on applying different machine learning classification algorithms to a dataset of 400 patients and 24 attributes related to diagnosis of chronic kidney disease. The classification techniques used in this study include Artificial Neural Network (ANN) and Support Vector Machine (SVM). To perform experiments, all missing values in the dataset were replaced by the mean of the corresponding attributes. Then, the optimized parameters for the Artificial Neural Network (ANN) and Support Vector Machine (SVM) techniques were determined by tuning the parameters and performing several experiments. The final models of the two proposed techniques were developed using the best-obtained parameters and features.

III. Methodology

1- Artificial Neural Network (ANN)

In recent years, increased interest in the use of artificial neural networks, which are used as an alternative to traditional models of classification. Neural network models verified their capability to anticipate and resolve problems by a large margin when compared with the accuracy of conventional statistical methods. Also, the success factors of artificial neural networks are their applications which do not require to looking at some assumptions about the nature of the existing variables and their relations with each other compared to other conventional methods [6]. Neural networks have seen a great revolution in the past few years where they were applied in diverse and distinct branches to solve major problems in various fields of science, including, engineering, medicine, geology, finance, and physics [7]. Neural networks have been achieved for two main reasons: first, to try to understand the functions of the human brain and the second is to be able to solve the problems of machines which were not possible to solve using the computer. Furthermore, artificial neural networks are considered an important field of artificial intelligence, which reproduce the significant developments in the way of thinking that is similar to the evolution of human thinking [8].

A- Neural Network in the Medical Field

It is well-known that neural networks can accomplish accurate results in scientific and practical applications applied to the various functions and applications such as science, industry and business. Furthermore, the neural networks have been applied in numerous areas such as medical diagnosis, biochemical analyzes and the development of other medical applications, as well as to identify photos. Also, doctors use neural networks as an important tool for the diagnosis, analysis and testing of the type of treatment and it is also used as complex clinical data across a wide range of applications [9].

B.Back-propagation Algorithm

Back-propagation Neural Network is a multilayer or single layer training algorithm, the algorithm name goes back to the way that is used to compute the difference between the target values and calculated values after feeds the network forward, and then update the weights of the prior layers (feedback the network), from output layer to input layer and feeds the network forward again until to get an acceptable output. This Back Propagation algorithm is appropriate for solving problems that have the following features [18]:

1. When the inputs may be linked to or independent of each other and can take any kind of numbers. Also, it may be a function with a goal of produce separated values, may be real values or vector values.
2. If the training examples are discrete values and some real numbers lie between 0 and 1.
3. Training errors or ways of learning artificial neural networks generate noise significantly in the training process of data.
4. The training of the network takes time. Some of them may take a few seconds to a few hours, or days according to many factors, including the number of training examples or the number of weights in the network.
5. A weight which was utilized through neural networks is difficult to explain to humans and they are divided often by weights that lead to more accurate results, which were obtained from neural networks.

Back propagation algorithm is considered one of the common applications that use the neural network architecture. In addition, it cycles over two distinct passes:
A forward that is followed by a backward pass across the network layers. The main objective of back propagation algorithm is to update the weights to enhance the performance of the neural network and this algorithm is interchanged between these permits at numerous periodsas it tests the training data [18].
Forward Pass: In order to calculate the outputs for the whole neurons in thenetwork the algorithm in the first hidden layer starts using as input values of the training set.
1. The output of the whole neurons that are located in the first hidden layer will be calculated by using the combined relevant and the evaluation of activation function.
2. The outputs that are obtained from the first hidden layer are considered as inputs to the second hidden layer. Later, the combined relevant values will be calculated. Also, the activation functions are used in order to calculate the output for the neurons of the second layer.

- **Backward Pass:** Adjust the weights and deployment of error new forward pass when offered with a training data reflection.

C. Back propagation Preparation

There are many important concepts in this algorithm [6,18].

i. **Training Set:** Set of inputs and outputs which can be used in order to train the network.

ii. **Testing Set:** Set of inputs and outputs which can be used in order to enhancethe performance of the network.

iii. **Learning Rate-η:** A scalar parameter, corresponding to step size, used to set the rate of change.

iv. Total-Sum-Squared-Error (TSSE):

$$TSSE = \frac{1}{2} \sum_{patterns} \sum_{outputs} (desired - actual)^2 \qquad (1)$$

v. Root-Mean-Squared-Error (RMSE):

$$RMSE = \sqrt{\frac{2 * TSSE}{\# patterns * \# outputs}} \qquad (2)$$

The main goal of back propagation algorithm is to update the weights that are n the network and to make the outputs close to the supposed outputs. As a result, it will start to reduce the rate of error. The back propagation algorithm model is illustrated in figure 5.

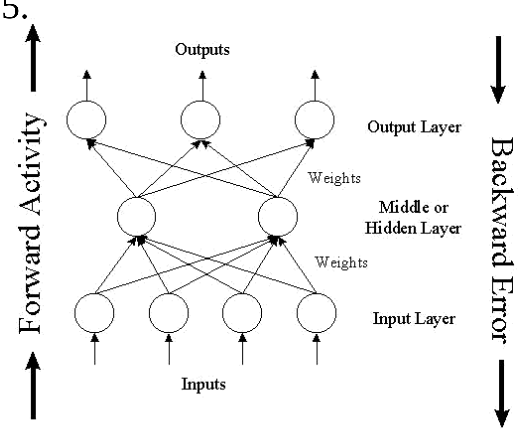


Figure 5 forward & backward in Back propagation algorithm

2- Cross Validation

A classifier learning process is usually done from the available data. However, the classifier may suit training data but may fail to anticipate the testing data. Cross validation can be defined as a method used to verify the performance of generalization of a specified classifier and can be used in order to assess performance of that specified classifier, as well as to adjust the parameters of the model. [6]

K-Fold-Cross-Validation

The holdout method is a technique used to divide the data into two groups, one group for training (called training set) is used to train the classifier and the other test (called test set) and is used to guess the mistakes of the trained classifier as shown in figure

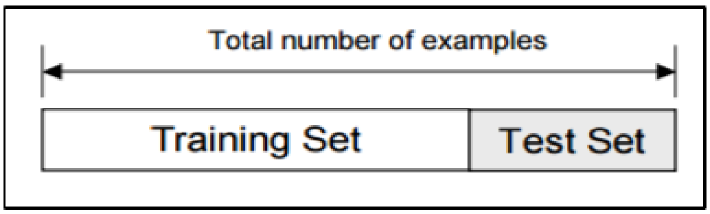


Figure 11 K-Fold Cross-Validation Subsampling

K-Fold Cross validation particularly is like Random Subsampling. K-Fold Cross validation benefits are that all the examples in the data set ultimately are used for both the processes of training and testing prior to guessing the true error.

3- Performance Measurement

The measurement is used in order to identify the efficiency of the classification algorithm that has been used. The measurements that are used frequently are Confusion Matrix classification accuracy, Receiver Operating Characteristic (ROC) curves, recall, and Area Under Curve (AUC).

Calculating Prediction Accuracy

Accuracy is considered one of the simplest measurement modes. The comprehensive effectiveness of the algorithm is measured by dividing the true labelling against the whole classification.

$$accuracy = (TP + TN)/(TP + FP + TN + FN) \qquad (4)$$

However, when the number of negative cases is highly greater than the number of positive cases, the accuracy that will be identified may not represent the performance measure adequately.

		Classified As:	
		Negative	Positive
Actual Class	Negative	TN	FP
	Positive	FN	TP

Table 1 Confusion Matrix

Furthermore, in order to evaluate the classifier, it is important to apply it with many cases where it is important to determine the real class of objects (at least at a later time).

An example of this case is medical laboratories. Then, that disease will be identified by using more complicated diagnoses to find out how true the person is injured by specific disease. Furthermore, the disease will be identified by using a more complex analysis to understand how this person is actually hurt by this disease. Also, the analysis will classify the person as sick or healthy. In addition, we say that the test results are negative (classification "healthy") or positive (classification "sick") because the result of the question is yes/no. Therefore, the healthy status will be compared actually with the
tests' result for each patient in order to evaluate the suitability of the test to diagnosing specific disease. There are four different cases which are:

1. **True positive (TP)**: The analysis makes the classification truly and the patient issick.
2. **False negative (FN)**: The test has been done wrongly as the patient is healthybut actually the patient is sick.
3. **False positive (FP)**: The test classified the patient is sick but actually the patientis healthy.
4. **True negative (TN)**: The test made correct classification and the patient ishealthy.

True Positive Rate (TPR) or the sensitivity

$$TPR = TP/P = TP/(TP + FN) \qquad (5)$$

True Negative Rate (TNR) or the sensitivity (SPC)

$$TPC = TN/N = TN/(FP + TN) \qquad (6)$$

False Positive Rate (FPR)

$$FPR = FP/N = FP/(FP + TN) = 1 - SPC \qquad (7)$$

Accuracy (ACC)

$$ACC = (TP + TN)/(P + N) \qquad (8)$$

IV.Data Set Information

This database comprises of 25 features but nearly all of the past studies have used all of them. The field named "goal" refer s to the existence of Kidney disease in the patient. This field contains integer values 0 or 1 and 0 refers to the absence of Kidney disease and 1 refers to presence of Kidney disease, , this dataset contains 150 records for healthy patients and 250 records for non-healthy patients. The national number and name which belong to each patient has been deleted from the database and swapped by dummy values. The preprocessed dataset is obtained from https://archive.ics.uci.edu/ .

A. Data Attributes

The Risk Factors forChronic Kidney Disease are presented in the next table :

S.No	Attribute	Description
1	Age	Age in years
2	Blood Pressure	Bp in mm/hg
3	Specific Gravity	Sg
S.No	Attribute	Description
4	Albumin	Al
5	Sugar	Su
6	Red Blood Cells	Rbc
7	Pus Cell	pc
8	Pus Cell clumps(nominal)	pcc - (present,notpresent)
9	Bacteria(nominal)	ba - (present,notpresent)
10	.Blood Glucose Random(numerical)	bgr in mgs/dl
11	Blood Urea(numerical)	bu in mgs/dl
12	Serum Creatinine(numerical)	sc in mgs/dl
13	Sodium(numerical)	sod in mEq/L
14	Potassium(numerical)	pot in mEq/L
15	Hemoglobin(numerical)	hemo in gms
16	Packed Cell Volume(numerical)	
17	White Blood Cell Count(numerical)	wc in cells/cumm
18	Red Blood Cell Count(numerical)	rc in millions/cmm
19	Hypertension(nominal)	htn - (yes,no)
20	Diabetes Mellitus(nominal)	dm - (yes,no)
21	Coronary Artery Disease(nominal)	cad - (yes,no)
22	Appetite(nominal)	appet - (good,poor)
23	Pedal Edema(nominal)	pe - (yes,no)
24	Anemia(nominal)	ane - (yes,no)
25	Class (nominal)	class - (ckd,notckd)

Table 2 Dataset Attributes Description

V.The paper technique

In this project ANN was used to predict kidney disease. The dataset was divided into two main sections, one for training and the other for testing, we used the same dataset in the same way to normalize it for testing and training. The number of neurons in the hidden layer has been modified so that the network is trained and the results obtained and compared to each other in order to improve its performance in order to obtain better accuracy rates.

In order to accomplish the study goals, this sequence was followed:

1. The set of data was loaded.
2. In order to isolate the set of data into two groups one for training and the other for testing, cross validation (Leave-one-out) was used.
3. MaxMin technique was utilized to normalize the data.
4. The model was trained by using ANN.
5. The performance of classifier model was computed.
6. Confusion Matrix with AUC ROC curve was gathered.
7. The selected factor of the parameter was changed and the steps were repeated from step 4.
8. The different structure's results were accumulated.
9. The paramount model was chosen in order to predict Kidney disease.

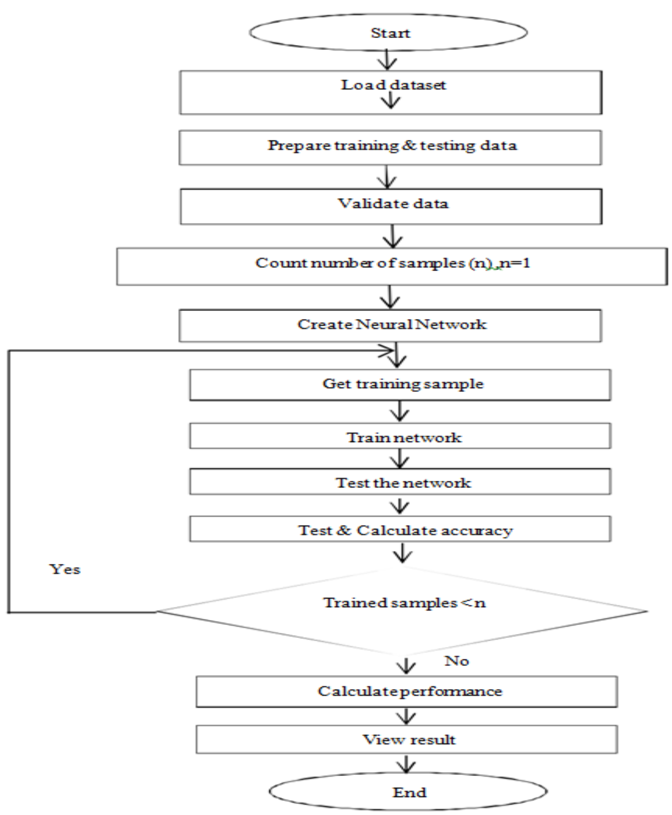
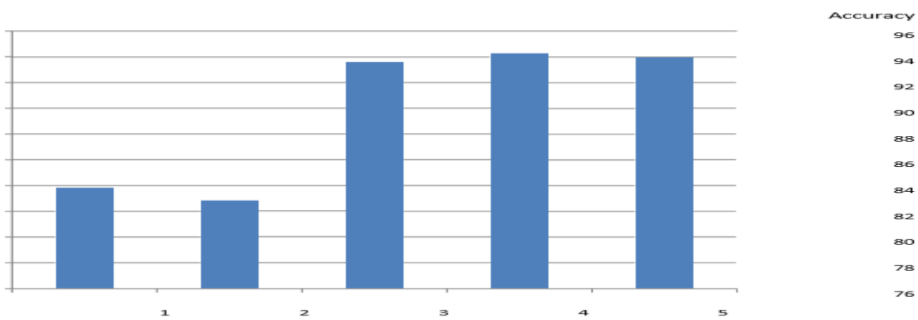


Figure 13- Paper Methodology

VI. Results Evaluation

In ANN, I used single hidden layer neural network. To improve the networkperformance I trained the network with a different number of hidden layer nodes. The results are depended on the number of nodes in the hidden layer. As shown in table 4.1 there are 5 experiments because I used random values of weights of the neural network, the different values of accuracies can be seen in Table 4.1.

As shown, the maximum accuracy value is 94.9%, obtained with 54 nodes in the hidden layer. Also we can find the small difference between all the maximum values of the experiments, especially between experiment 3, experiment 4, and experiment 5. The Confusion Matrix of the best result and AUC ROC, are shown in Figure 4.2 and Figure 4.3.



Experiments

Figure4.1AccuraciesofExperimentalresultsofANN

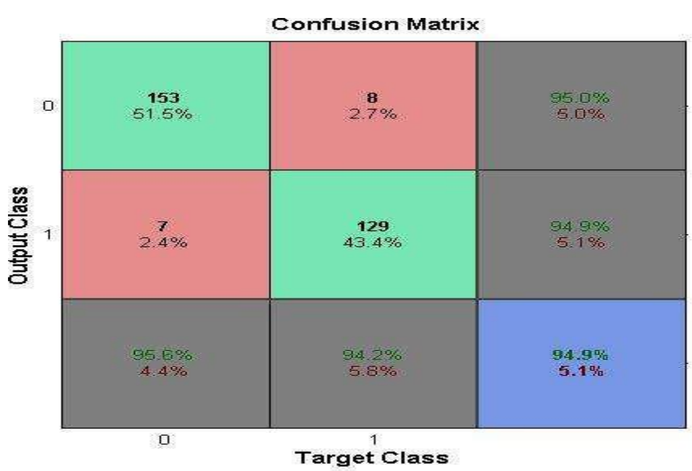


Figure4.2ConfusionMatrixofANN

The higher accuracy's obtained where the number of nodes of hidden layer was 54. The best accuracy was 94.9%. As shown in figure 4.2. Also, 153 samples are accurately classified as non-recurring, and 129 samples are classified as a recurrence. We can see that 8 samples are incorrectly classified as non-recurring and 7 samples are incorrectly classified as a recurrence. Thebest result represented byAUC ROC analysis is shown in Figure 4.3.

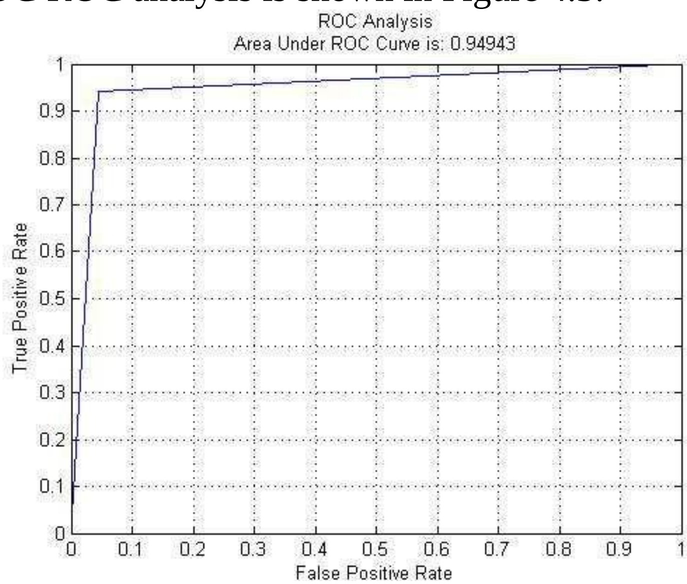


Figure4.3AUCROCofANN

The network performance illustrated in figure 4.4 shows the performance of neural network with 94.5% accuracy.

VII. CONCLUSION AND FUTURE

One of the future work that we will do is to compile a larger database on patients from our country, Libya, and try to find risk indicators for this disease that may give us better results and help more in predicting this dangerous disease. We will also link this smart model with data management systems within hospitals specialized in the kidneys diseases.

We can use other algorithms, compare the results with the algorithm used, and determine the most accurate algorithm, as we suggest using SVM and KNN.

VIII. References

[1] Fuzhe Ma, Tao Sun, Lingyun Liu, Hongyu Jing, "Detection and diagnosis of chronic kidney disease using deep learning-based heterogeneous modified artificial neural network", Future Generation Computer Systems, 2020.

[2] Weilun Wang, GoutamChakraborty, BasabiChakraborty, "Predicting the Risk of Chronic Kidney Disease (CKD) Using Machine Learning Algorithm", Multidisciplinary Digital Publishing Institute, 2021.
[3] Dong-Hyun Kim and Soo-Young Ye, " Classification of Chronic Kidney Disease in Sonography Using the GLCM and Artificial Neural Network" , Multidisciplinary Digital Publishing Institute, 2021.
[4] AlexandruBurlacu, Adrian Iftene, IolandaValentinaPopa, RaduCrisan-Dabija, CrischentianBrinza, Adrian Covic, "Computational Models Used to Predict Cardiovascular Complications in Chronic Kidney Disease Patients: A Systematic Review", Multidisciplinary Digital Publishing Institute, 2021.
[5] YafengRen, HaoFei, Xiaohui Liang, DonghongJi,Ming Cheng, " A hybrid neural network model for predicting kidney disease in hypertension patients based on electronic health records", Springer, 2019.
[6] Omar QusayAlshebly, Dr. RizgarMaghdid Ahmed, "Prediction and Factors Affecting of Chronic Kidney Disease Diagnosis using Artificial Neural Networks Model and Logistic Regression Model", Iraqi Journal of Statistical Science, 2019.
[7] Gaurav Dubey, Yashdeep Srivastava, Aman Verma ,Shriyansh Rai, "Chronic Kidney Disease Prediction Using Artificial Neural Network", Springer Nature Singapore Pte Ltd. 2021.
[8] Meghana H L, Vaishnavi S Kuber, Yamuna B S, Varshitha T L, Prof. Vikrant. B. M,"Chronic Kidney Disease Prediction using Neural Network and ML Models", International Journal of Engineering Research & Technology, 2021.
[9] Shreya Nag, NimithaJammula, "Comparison of Neural Network and Machine Learning Approaches in Prediction of Chronic Kidney Disease", Journal Of Student Research, 2021.
[10] Gazi Mohammed Ifraz, Muhammad Hasnath Rashid, TahiaTazin ,Sami Bourouis , Mohammad Monirujjaman Khan, "Comparative Analysis for Prediction of Kidney Disease Using Intelligent Machine Learning Methods", Computational and Mathematical Methods in Medicine, 2021.
[11] Pooja Mane, NareshThoutam, NehaTiwari, GauriMandlik, NutanPandey, "Chronic Kidney Disease Prediction Using Machine learning", International Journal of Research Publication and Reviews,2021.
[12] S. PackirisamyBalamurugan, GurusamyArumugam, " A novel method for predicting kidney diseases using optimal artificial neural network in ultrasound images", International Journal of Intelligent Enterprise, 2020.

[13] Chalumuru Suresh; B. Chakra Pani; C. Swatisri; R. Priya; R. Rohith, "A Neural Network based Model for Predicting Chronic Kidney Diseases", IEEE, 2020.
[14] Fuzhe Ma, Tao Sun, LingyunLiub, Hongyu Jing, " Detection and diagnosis of chronic kidney disease using deep learning-based heterogeneous modified artificial neural network", Future Generation Computer Systems, 2020.
[15] ShanilaYunusYashfi, MdAshikul Islam, Pritilata, NazmusSakib, Tanzila Islam, Mohammad Shahbaaz, Sadaf Salman Pantho,"Risk Prediction Of Chronic Kidney Disease Using Machine Learning Algorithms", IEEE, 2020.
[16] NjoudAbdullahAlmansour, HajraFahimSyed, NuhaRadwanKhayat, RawanKanaanAltheeb, RenadEmadJuri, Jamal Alhiyafi ,SalehAlrashed, Sunday O. Olatunji, "Neural network and support vector machine for the prediction of chronic kidney disease: A comparative stud", Computers in Biology and Medicine, 2019.
[17] tefan M. Kallenberger, Constanze Schmidt, "Forecasting the development of acute kidney injury using a recurrent neural network", European Society of Cardiology, Cardiovascular Research, 2019.
[18] S. M. K. Chaitanya, P. Rajesh Kumar, "Detection of Chronic Kidney Disease by Using Artificial Neural Networks and Gravitational Search Algorithm", Springer, 2019.
[19] YedilkhanAmirgaliyev, ShahriarShamiluulu, AzamatSerek, "Analysis of Chronic Kidney Disease Dataset by Applying Machine Learning Methods", IEEE, 2018.

معامل التأثير العربي 1.5
العدد 21
مجلة التربوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3

الفهـــــــــرس

معامل التأثير العربي 1.5
العدد 21
مجـلة الـتربـوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3

مجـلة الـتربـوي
Journal of Educational
ISSN: 2011- 421X
Arcif Q3