MEHMET TUĞRUL AŞCI SKIN LESIONS DIAGNOSING BY ALEX NET METHOD NEU 2020

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A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF APPLIED SCIENCES OF NEAR EAST UNIVERSITY

By
MEHMET TUĞRUL AŞCI

In Partial Fulfilment of the Requirements for the Degree of Master of Science in Electrical and Electronic Engineering

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Approval of Director of Graduate School of
Applied Sciences

Prof. Dr. Nadire CAVUS

We certify this thesis is satisfactory for the award of the degree of Master of Science in Electrical and Electronic Engineering

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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To my family…

ABSTRACT

The aim of this study will be investigation of the skin lesions diseases. According to design system, skin lesions diseases are going to investigate with image processing methods for training and testing purpose. The study of data mining science in diagnosis of skin lesions can help doctors treat their patients. One of the most common diseases in the world is skin lesions, which those who have this disease are unaware about having this disease for a long time, and timely diagnosis of skin lesions are one of the problems that doctors are faced it for controlling and treating the disease. In this thesis, by combining of data mining algorithms, the results of the proposed method are examined and tested. Studies show that combined methods are more efficient than other data mining methods. The proposed method includes Alex net algorithm and artificial neural network can use together. When using this method, compared to the results of Alex net to Res net, Res net produced more positive results.

Keywords: Diagnosis of skin lesions; data mining; Alex net; artificial neural network; algorithm

ÖZET

Veri madenciliği biliminin deri hastalıkları teşhisinde incelenmesi doktorların hastalarını tedavi etmelerine yardımcı olabilir. Dünyadaki en yaygın hastalıklardan biri, bu hastalığa sahip olanların uzun zamandır bu hastalığa sahip olduğunun farkında olmayan deri hastalıkları ve bu hastalığın zamanında teşhisi, doktorların hastalığı kontrol etmek ve tedavi etmek için karşılaştığı sorunlardan biri. Bu tez çalışmasında veri madenciliği algoritmalarının birleştirilmesi ile önerilen yöntemin sonuçları incelenip test edilmiştir. Çalışmalar, birleştirilmiş yöntemlerin diğer veri madenciliği yöntemlerinden daha verimli olduğunu göstermektedir. Önerilen yöntem, Alex net algoritmasını, yapay sinir ağıyla birlikte kullanmak. Bu yöntem kullanıldığında Alexnet sonuçları Resnet sonuçları ile karşılaştırıldığında Resnet daha olumlu sonuçlar ortaya çıkarmıştır.

Anahtar kelime: Deri hastalık teşhisi; veri madenciliği tekniği; Alex net metodu; yapay sinir ağı; algoritma

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LIST OF ABBREVIATIONS

ART: Adaptive Resonance Theory

ANN: Artificial Neural Network

CNN: Convolutional Neural Network

NALM: Neuron Adaptive Linear Unit

RELU: Rectified Linear Unit

CART: Classification and Regression Trees

GPU: Graphics Processing Unit

DCN: Deep Convolutional Network

CHAPTER 1

INTRODUCTION

Over the past decades huge amount of data have been stored in databases. The result of this accumulation is that organizations are very rich in data, while very poor in acquiring useful and useful knowledge of this enormous data. Clearly, in today's society, knowledge is one of the most important assets of any organization. The volume of data available doubles every 3 years, and the organization is capable of managing at least 7% of its information. Discovering the knowledge of raw data is essential for making the right decisions, because raw data does not give us any information. Data mining arose in response to this need. Data mining technology is a way to access new and hidden patterns in data. Without data mining, it is difficult to fully grasp the data collected in organizations, because they are large, high-dimensional, distributed, and irrational. Exploring the Use of Data Mining in Different Sciences It demonstrates the applicability of this science to the application of data records in diagnosis and prediction. One of the applications of data mining in various sciences is in the medical field, which can be a viable solution by expanding the idea of assisting the computer to provide another opinion to the physician. One of the problems in medical science is timely diagnosis and prediction of some diseases, including skin lesions with medical tools and methods.

Using data mining strategies to discover the hidden knowledge in the Skin Lesions Data Collection as well as data mining in patient records is one of the strategies that are very effective in diagnosing and preventing this disease. These treatments will be much more effective if diagnosed early. Data mining strategies are used for the early detection of skin lesions diagnosing using information analysis. There are many skin diseases. The most dangerous and fatal one is melanoma. In this study we will find melanoma skin disease using alex net method.

1.1 Purpose of the Research

The use of data mining strategies in medical sciences to diagnose diseases in similar cases has been a good practice. The difference in data mining algorithms is only about the accuracy of detection. We propose a combination of data mining algorithms to diagnose skin lesions in this study to evaluate system performance. We will investigate and use the

Alex net method to extract useful patient information and ultimately test the effectiveness of this algorithm. Considering the trend of increasing numbers of skin lesions patients in worldwide scale, we are looking at effective strategies in timely diagnosis of the disease is vital. This study is an effective step in applying data mining science and information analysis methods in different sciences by investigating the proposed method. Weaknesses in the early stages of the disease are one of the problems for physicians. Studies show that most skin lesions patients are unaware of the onset of the disease, and this method can partly help clinicians in the early detection of the skin lesions. The most important part of this study is to evaluate the results of tests that can be effective in the diagnosis of skin lesions. Proving the Effectiveness of Data Mining in Medical Science Observing the results of disease diagnosis can be a useful step in using data mining in the diagnosis of skin lesions (Alban,et al.2017)

Lack of medical information for skin lesions patients and difficulty in accessing patients' private information is one of the problems of research in this field and most of the researches are investigating data mining algorithms on data presented by medical institutes. A review of related articles in the field of research shows that these articles are more statistical in scientific circles and have not been used for their application. Helping physicians to diagnose skin lesions are one of the most effective applications of data mining in various sciences. By combining data mining algorithms, the error rate of the proposed algorithm is evaluated. This method is an effective step in improving the efficiency of data mining techniques in medicine and by testing hybrid methods we can identify the strengths and weaknesses of the system.

1.2 Hypothesis

The deep learning attracted attention owing to the success it achieved in the “ImageNet” competition for the first time in 2012. There are two main reasons why Deep Learning has become popular in the recent years:

- It has got enough data for education;
- It has the equipment to commit these data.

In this Project Alex Net method and Computer Algorithm has been used, which is going to show the automatic disease description.

1.3 Importance of Research Application

Considering the increasing trend of skin lesions patients worldwide, it is crucial to study effective strategies for timely diagnosis. This study is an effective step in applying data mining and information analysis methods in different sciences by investigating the proposed method. Weakness in the early stages of the disease is one of the problems for doctors, with studies showing that most skin lesions patients are unaware of the onset of the disease, and this method can partly help physicians in the early detection of the disease. The most important part of this study is to evaluate the results of tests that can be effective in the diagnosis of skin lesions (Bengio,Y et al,.2009) Proving the Impact of Data Mining in Medical Science Observing the results of disease diagnosis can be a useful step in using data mining in the diagnosis of skin lesions.

1.4 Research Limitations

The lack of medical information for skin lesions patients and the difficulty of accessing patient's private information is one of the major research problems in this field. A review of related articles in the field of research shows that these articles are more statistical in scientific circles and have not been used for their application.

1.5 Research Motivation

Helping physicians diagnose skin lesions is one of the most effective applications of data mining in various sciences. By combining data mining algorithms, the error rate of the proposed algorithm is evaluated. This method is an effective step in improving the efficiency of data mining techniques in medicine and by testing hybrid methods we can identify the strengths and weaknesses of the system.

1.6 Thesis Structure

The second chapter deals with the application of data mining in medical science and the use of data mining methods in disease prediction. The following is the implementation of data mining algorithms, and use of the Alex system framework for data mining and the description and use of algorithms used in disease detection, including the artificial neural network. Throughout Chapter 3, the suggested approach and problem-solving approaches for this study are defined. Chapter 4 would address the techniques of simulation and

analysis of the outcomes with the previous methods and analyze the algorithm suggested. A description and recommendations for further study are given in Chapter 5.

1.7 Definitions Issue

1.7.1 Data mining

Data mining means the extraction of cache information or patterns and relationships identified in large volumes of data in one or more large databases. Many people find data mining to be synonymous with common knowledge discovery data. Data mining analyzes databases and large data sets as they are discovered and extracted. Such studies and explorations can indeed be regarded as the continuation of ancient knowledge and omniscient statistics. The major differences are in the scale, breadth and variety of contexts and applications, as well as the dimensions and dimensions of today's data that require machine learning, modeling, and machine learning techniques. Data mining refers to the use of data analysis tools to discover valid patterns and relationships that have been previously unknown.

1.7.2 Data mining features

Data mining tools analyze data and discover data patterns that can be used in applications such as business strategy determination, knowledge base and scientific and medical research. The gap between data and information has led to the need for data mining tools to convert valuable data into valuable knowledge. In (Chandran, et al., 2014), a representation of the early stages of knowledge discovery it has been shown.

1.7.3 The steps of knowledge discovery

Knowledge Discovery has the following steps:

- Simple evidence (incompatibility between noise reduction and results).
- Integration of data (combining multiple data sources).
- Collection of data (database data is derived from the empirical analysis).
- Conversion of data: Converting data into data mining form, for example summation and matching.
- Data mining (the main process using intelligent data extraction routines). Data mining.

- Object assessment (i.e. visual representation, techniques of knowledge representation to provide the consumer with discovered information).
- Analysis of information (e.g. visual representation, methods in awareness analysis to use user-discovered knowledge).

1.7.4 Data mining limitations

While data mining products are powerful tools, they are not sufficient in terms of functionality. To succeed, data mining requires skilled analysts and professionals who can analyze and interpret the resulting output mix. As a result, the limitations of data mining relate to primary data or individuals rather than to technology. Although data mining helps to identify patterns and their relationships, it does not express the importance or value to the user. Such decisions are up to the user himself. Detecting the relationship between behaviors or variables is another limitation of data mining that does not necessarily recognize random relationships. In fact, personal behaviors including work (need to travel for a limited time), family status (need medical care for the sick), or recreation (benefit from last minute discounts to see new places) may affect the additional variables.

1.7.5 Data mining methods

The basic methods of data mining are divided into two general categories: descriptive and predictive. These two groups also represent the goals and performance of data mining methods.

A. Descriptive

- Clustering
- Associative rules
- Briefing
- Modeling dependency

B. Prediction

- Classification
- Regression
- Time series
- Forecasting

A. Descriptive method techniques

In descriptive methods, the general properties of data are expressed. The purpose of description is to find patterns in data that can be interpreted by humans. Descriptive methods also include techniques: clustering, summarization, sequence discovery, association rules.

Clustering:

Clustering is the grouping of similar samples together into a single data volume. Clustering is an unmanaged (unmanaged) category that has no predefined categories. In clustering, unlike classifications, where each data is assigned to a predefined class (class), there is no knowledge of the classes within the data, that is, the data are extracted from the clusters themselves. The purpose of the Clustering is to separate existing data in several groups, which have as different as possible the data of the different groups and which have to be very similar to that of the same group. This segmentation can be used for obtaining the information about the data or dividing the new data after the data are divided into several logical and justifiable groups. Multiple uses of clustering. Clustering often is called the first step in data mining processes used to identify a set of related records, which later can be a starting point for analysis, before other processes. In some cases, it is used to detect outliers that differ significantly from other data. Clustering is used in data mining activity:

- Similarity or dissimilarity analysis: Analyzing which data points in a sample are similar to each other.
- Outbound data detection: Detects data that is significantly different from other data.
- Dimension (Size :) As data pre-processing before data mining activities, the size or dimension of data can be reduced by clustering techniques.

Associative rules:

Associative rules a kind of data mining operation that searches to find the relationship between features in a dataset. Another name for this method is market basket analysis. This method extracts rules in order to quantify the relationship between two or more properties. Associative rules are contingent in nature and are defined as if and when and with two criteria of support and certainty. These two indicators, respectively, demonstrate the

usefulness and reliability of the rules of revelation. Confidence Criterion: Indicates the degree of dependence of one particular product on another. That is, it calculates the degree of dependence between the two sets of X and Y and is considered as an indicator for measuring the power of a rule. Support Criterion (X, Y): Indicates the percentage or number of transactions (subsets of purchased items) that contain both X and Y items.

Briefing:

Briefing involves approaches to locate a lightweight data subset definition. We can provide a simple example: averages table and default variance in all areas. More complex approaches include integration laws, multivariate simulation strategies and the exploration of features. For data analysis and automatic report creation, the use of tabloid methods is widely employed.

Modeling dependency:

A formula to explain the important correlations between the variables is a tool for dependency modeling. The systemic stage and the functional point are two stages of dependency models. Structural form, the model decides which variables depend locally on drawing. The power model defines computational relations at the functional level. A->B is shown with the dependencies.

B. Prediction method techniques

Classification:

Classification or systematization is actually evaluating the properties of a set of data and then assigning them to a set of predefined groups. This is the most common data mining feature. In categorization, we look for a model that can identify unknown categories of other objects by identifying categories. Classification is used to predict discrete and nominal values. Classification is a type of learning that is done through examples and it’s based on predefined sets. Classification is a two-step process. In the first step, a model is constructed based on the training dataset in the database. These models are displayed in forms of decision trees, or mathematical formulas. The training dataset consists of records, examples, samples, or objects that contain a set of attributes or aspects. The system will train itself based on this training set, or provide the classification parameters. Each instance

has a known class tag, which is randomly selected from the dataset. The next step after the training phase is to anticipate and reflect. The model can be used to predict class labels for new data with unknown class labels by the rules (Girshick,et al., 2014). Data mining techniques used for classification generally include neural network and decision tree techniques. The classification has many applications in commerce, banking, medicine, communications, agriculture and etc.

Regression:

Regression is the best model for linking output variables to several input variables. The simplest case is a linear value model that linearly determines the relation between the variables input and output. For addition, classification and regression are the two main types of prediction problems that forecast discrete and nominal values, while a calculation of continuous values is used for regression. For regression and classification, the same models can be used. To order to construct clustering and regression trees, for example, CART decision tree algorithm may be used. They can also be used with neural networks.

Time series:

Time series analysis is another technique in data mining that aims to find interesting properties and orderly high volume data. One is a time series of sequences of observations that describes the value of an object as a function of time in the collected dataset. The sequence of events is essentially a set of events that occur after a specific event.

Forecasting:

Forecasting is one of the data mining techniques that predicts possible values for unknown variables. Neural networks and genetic algorithms are used for prediction.

1.8 Evaluation Criteria for Clustering Algorithms

There are several criteria for evaluating and evaluating different types of clustering algorithms:

- Ability to apply large numbers of sample.
- Ability to process different types of attributes.
- Manage the data above.

- Ability to handle dynamic data.
- Ability to process perturbed and disturbed data.
- Discover clusters with custom shapes.
- Dependence on input parameters.
- Sensitivity to the order of the input records

1.9 Data Mining Problems

Information uncertainty generally, uncertainties in database systems fall into two categories divided into:

A. Incomplete information (unspecified values) means properties for which no value is recorded.

B. Incompatible Information: Information created by incorrect measurement or noise in the data and the values recorded are not equal to the actual values.

High volume of data, the number of records in some databases reaches several hundred billion. The following methods are usually used to resolve problems with these systems when dealing with bulky data:

- Design fast algorithms: complexity reduction, optimization, and parallelization.
- Data Reduction: Sampling, Discretization and Data Reduction.
- Applying a relational model: Using data storage and retrieval capabilities in databases.

Many issues with data mining occur because there are many instances of various attributes. Furthermore, such organisms are often strongly dimensioned and therefore have very many observable characteristics. The extra dimension in bulk data sets creates a problem dubbed the "space epidemic" concept for data mining. The design of large spaces produces this spatial pesticide, and this data space is unique to the question of data mining. The features of large spaces often seem to be contradicting intuitive perceptions, since the reality of the world is in a small space, for instance two-or three-dimensional space.

1.10 Machine Learning

As one of the most widely used branches of artificial intelligence, machine learning regulates and explores ways in which computers and systems can learn.

1.10.1 Machine learning intentions

The goal of machine learning is to enable the computer to gradually perform better with increasing data performance. The scope of this task can range from automatic face recognition by seeing a few examples of the target face to learning how to operate two-legged robots by receiving a reward and punishment signal. The range of research in machine learning is wide. Researchers aim to develop new learning methods and study the feasibility and quality of learning for their methods, while others are trying to apply machine learning methods to new problems. Of course, this spectrum is not discrete, and research has components of both approaches. Machine learning helps to save money on operating costs and improve data analytics speed. In the oil and petrochemical industry, for example, using machine learning, the operational data of all drilling is measured, and the data are analyzed by algorithms that are optimized and optimized for subsequent drilling.

1.10.2 Classification of machine learning tasks

Machine learning activities are usually categorized into three broad categories:

- Controlled learning, in which the system eliminates the features of branded training data,
- unrivaled learning, where the system attempts to obtain a data structure that is unscheduled
- Enhanced learning, where the system communicates with a data.

A. Supervised learning:

Supervised learning is an overall machine learning process in which a system is equipped with input-output pairs and the program aims to learn from input to output a result. In order to train the program, supervised learning requires some input data. Nonetheless, there are several issues with which the guided learning system does not produce the correct outcomes. Such problems do not respond very closely to control learning. Strengthening learning is a model for these questions.

B. In reinforcement learning:

The system tries to optimize its interactions with a dynamic environment through trial and error. Reinforcement learning is a problem that an agent must learn to behave through trial

and error interactions with a dynamic environment. In reinforcement learning, no input-output pairs are provided.

C. Unsupervised learning:

Overall, 53% of those used by supervised learning methods and 13% of those identified with unsupervised learning, and more specifically, supportive driver association rules, emerge as the most successful and widely used algorithm.

1.11 Data Mining in the Health Area

The transformation in the health industry is driven by the single goal of how health organizations make costs Reduce and enhance quality and stay competitive? Going forward, this is always a big challenge. Quality improvement in the health industry can be better defined by the drivers that affect it, including the drivers of health data; in other words, in any patient-centered quality improvement program, data is at the heart of that program. In today's age of information, data is the most important asset for health organizations and the success of health organizations is in collecting, storing and analyzing them. However, collecting and storing large amounts of data can be a waste of time unless data is used efficiently and becomes a source of funding for the organization. To turn this potential value into strategic information, many organizations have resorted to data mining because it enables the discovery of hidden relationships, processes and patterns between data and the acquisition of new knowledge in the open challenges of the organization. It will be possible. Concept Knowledge Discovery has been in use in financial-business environments for more than a decade, and has taken its place in communications management, engineering, web mining, crime analysis and medicine. Although knowledge discovery was introduced into the health field with the aim of identifying financial embezzlement, it was also gradually used in the clinical domain. This is due to the rapid shift in consciousness towards health information. The health industry is continually producing a large amount of data, and people who encounter this type of data have found that there is a large gap between their collection and interpretation; the relatively young and growing field of data mining in health. Among the ways that this industry can benefit from in-depth analysis of this data is to develop medical research and scientific decision-making in the field of diagnosis and treatment (Jiang, et al., 2011). Data mining has been

slowly but increasingly used to solve numerous problems in knowledge discovery and in the health sector. 4 of the most important reasons for this slow growth in health; the sensitivity of medical science and its relation to human life (slight differences in data mining patterns can change the balance between death and life), confusion in defining data mining (sometimes creating a simple database design) Medicine is mistakenly referred to as data mining model), privacy and privacy of health data, and ultimately the most important challenge is to assure that data mining results are completely reliable; Traditional medicine is difficult to make evidence-based medicine. Today, the health sector is in dire need of data mining and moving from traditional medicine to evidence-based medicine is one of the things that can underline this. Following are the most common data mining strategies, data mining techniques and examples of its applications in health.

1.12 Some Common Applications of Data Mining in Medicine

- Diagnosis of disease (predicting probability of disease occurring in individuals)
- Finding Rules for Treating Diseases (Predicting Treatment)
- Predict the drug (s) appropriate for the treatment of any particular patient
- Predicting medical costs.
- Predicting the severity of a particular disease in people who have early symptoms of a particular disease.
- Predicting survival in cancer patients or specific patients.
- Patient grouping in terms of severity of disease.
- Discover the causes that affect or exacerbate the disease.
- Discovering Pharmaceutical and Medical Cheating.

1.12.1 Skin lesions introduction

The deep learning attracted attention owing to the success it achieved in the 'Image Net' competition for the first time in 2012. There are 2 main reasons why Deep Learning has become popular in recent years. It has got enough data for education. It has the equipment to commit these data. There are five models of Deep Learning. They are Alex Net, ZF Net, Google Net, Microsoft Rest Net, R-CNN, Fast R-CNN and Faster R-CNN Models In this

Project I am going to do, the Computer Algorithm, is going to show me the automatic disease description. Alex Net method will be used.

1.12.2 Artificial neural networks

New computing systems and methods for the learning of machines, knowledge demonstration and ultimately the acquisition of knowledge to optimize outputs of complex systems are artificial neural networks or more simply neural networks. The underlying concept behind such réseaux is motivated partially by how the biological nervous system integrates information and data for learning and the production of awareness. The key element of this idea is the creation of new information processing systems structures. In the real nerve, the dendrites change the amplitude of the pulses that are received, and thus the nerve is learned. The nerve activates and releases the signal along the anchor when the received signal is strong enough (more than a threshold value. In turn, this signal could input a different synapse and stimulate additional nerves. The true nerve is shown in Figure.5.

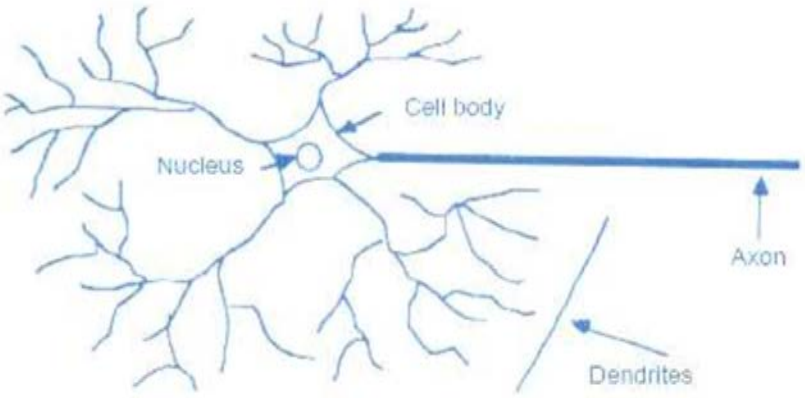

Figure 1.1: is the real nerve sample

1.12.3 History of artificial neural networks

From the 19th century onwards, simultaneously but separately, neurophysiologists tried to discover the learning and analysis system of the brain, and mathematicians, on the other hand, sought to develop a mathematical model that could be generalized and analyzed The first simulation attempts were made by McCluck and Walterpits with their logic model, which today is the principal component of most artificial neural networks. Hypotheses of the function of neurons are provided in this model. Inputs and outputs are based on the

performance of this template. The neurons are excited when the sum of inputs exceeds the threshold value. This pattern culminated in simple tasks such as AND / OR. The neurosimulation was not only supported by neurophysiologists but also by psychologists and engineers. Rosenblatt introduced the Perceptron network in 1958. It has three layers, with a middle layer called the bonding layer. It is similar to the previous models. The system can learn to apply the appropriate random output to the specified input. Another system is the Neuron Adaptive Linear Model, developed in 1960 by Widro and Huff, the first neural network to deal with real world issues. Minsky and Paper wrote a book in 1969 describing the limitations of single and multi-layer systems. Judging and discontinuing investments for research into neural network simulation. They suspended the research for several years, claiming that the perceptron plan could not solve any interesting problem. Although public enthusiasm and investment has diminished, some researchers have continued their research to develop machines capable of solving problems such as pattern recognition. The result of this book was the prejudice and discontinuation of investment in neural network simulation research. They suspended the research for several years, claiming that the Perceptron plan could not solve any interesting problem. Although the public's enthusiasm and investment has diminished, some researchers have continued their research to develop machines capable of solving problems such as pattern recognition. He also co-founded Carpenter ART (Adaptive resonance theory) Networks, which differs from natural models. Anderson and Kuhonen were also who developed techniques for learning. Verbas created the error propagation training method in 1974, which was a multilayer perceptron network with stronger training rules. The advances made in the years 1995 to 1954 were crucial for drawing attention to neural networks. Some factors also contributed to the exacerbation of this, including the extensive books and conferences offered to people in a variety of disciplines. Today, there are many developments in ANN technology.

1.12.4 Mathematical model of artificial neural network

Their complexity is ignored and only basic concepts are appreciated when modeling nerves. If not, it would be very hard for the modeling approach. Inputs that act as synapses should be included in the nerve model at a glance. The inputs are multiplied by weights for signal strength determination. Finally, a mathematical operator decides that the inputs are

multiplied by weights to determine whether or not the neuron is activated. The artificial neural network processes data therefore with a simplified real nerve model. Despite this definition, a basic model can be suggested for the representation of a neuron (the node in the neural artificial network). The main difference between this model and truth, besides the simplifications applied, is that inputs are time signals in the real network, whereas they are real numbers in this model. Artificial neural networks usually depend on learning: fixed weight networks and variable weight networks. The training networks are split into two groups, with and without supervisors. Samples are used in high power networks during the workout with the ideal performance corresponding to them. In other terms, data samples are labelled in such networks. For unattached networks, a separate class is assigned according to a criterion (e.g. distance) and a competition type. Since the neural network is a simplified body nerve model, it is as learning as it is. In other terms, the network will know the pattern patterns using the knowledge its administrator collectsSimilarly to men, therefore, human models inspired the neural network learning process, which provided many examples to the network so that it could follow the respective output network. Two possible ways to sample neural input data:

A. Batch mode

This shows all samples in the grid and ultimately calculates the grid error across the whole sample and changes weights. All the data is reproduced to the network again in the next step, and the process is carried out peer-to-peer until an acceptable error is reached. This method is certainly complex and timely and requires a great deal of memory. The algorithm can also be accessed at least locally.

B. Pattern mode

This method gives the measurements to the grid each time and automatically measures the error relating to the same results and adjusts the weight of the grid to match. The next sample is then shown in the network and the like is done. Because weight correction is carried out on the basis of each case in every step of this process, the algorithm has a good convergence and the local minimum risk is eliminated given the random nature of the single data presentation.

The system consists of a large number of highly interconnected processing elements called neurons that work together to solve a problem and transmit information through synapses (electromagnetic communications). In these networks, if one cell is damaged, the rest of the cells can compensate for their absence, and contribute to its regeneration. These networks are capable of learning. For example, by burning the touch nerve cells, cells learn not to move to the hot body, and with this system algorithm learns the system to correct its error. The learning in these systems is adaptive, meaning that the weight of the synapses is changed by the use of parables to generate the correct response when new inputs are given. The function of this system is that by using computer programming knowledge, the data structure can be designed to act as a neuron. Then, by creating a network of these interconnected synthetic neurons, he developed a training algorithm for the network and applied it to the network. These networks have shown great performance for estimation and approximation. The application of these mathematical models given the function of the human brain, it is very large, and as a few small examples, this mathematical tool can be used to process biological signals, telecommunications and electronics to aid astronomy and astronomy. If we consider a grid as a graph, the grid training process will be to determine the weight of each initial edge. Figure.6 illustrates how an artificial neural network is structured.

Each layer has a certain number of neurons by the weighting coefficients on the neurons of the other layers is related. The weight coefficients of the network are corrected during the network training process based on the back propagation algorithm 1. The total input to neuron i is the product of the multiplication of the output values of the neurons associated with neuron i in the values of their associated weights.

$$X_i = W_{io} + \sum_{j=1}^{N} W_{ij} \ldots X_j \tag{1.1}$$

In Equation 1, where the Xi input to neuron i, N is the total number of neurons connected to neuron i and W is weight of the neuron bias is i. The output from the neuron is shown in Equation (1.2)

$$V_i = f(x_i) \tag{1.2}$$

As the output of neuron V and F is stimulated. The purpose of neural network training is to

find weights that are the issue. For this purpose, the mean squares errors should be minimized Equation (1.3)

$$MSE = \frac{1}{gk}\sum_{e=1}^{g}[d_k(q) - y_k(q)]^2 \quad (1.3)$$

In this way:

g= Number of training data

K= Number of outputs

$d_k(q)$ = the actual value is for the q input.

Back propagation algorithm is one of the common methods for achieving balanced weights in neural network. Equation (1.4)shows how weights are updated:

$$W_{ij}^{t+1} = w_{ij}^{t} + \Delta w_{ij}^{t+1} \quad (1.4)$$

Δw is the Weight changes. Weight changes by the Levenberg- marquardt algorithm to the relation form Equation (1.5) is calculated.

$$\Delta w_{ij}^{t+1} = [J^t J + \mu l]^{-1} J^T e = [H + \mu l]^{-1} g \quad (1.5)$$

J Jacobean matrix, adjustable network training parameter, unit matrix and total errors. After updating the weights, the neural network generates a new output of the input data and calculates the mean squared of the squares. If the overall squared value is reduced, the network also reduces the value of the training parameter. This will continue until the values of the function of the mean squares of the weights are less than acceptable. After the neural network training is completed and its weights are fully explained, the neural network is evaluated by the input data. If the network responds correctly to data that did not participate in the network training process (test data), then the neural network would be generalizability and can be used to predict the desired values for different values of the neural network input parameters.

1.12.5 Perceptron neural networks

One model used by neural networks is perceptron multilayer neural networks. Perceptron is a machine learning algorithm that falls under the category of learning. The perceptron

algorithm is a binary classification algorithm (a type of classification that can decide whether an input belongs to a class depending on the input vector). This algorithm is a linear cluster, meaning that it performs its predictions based on the linear composition of the input weights of the algorithm. Perceptron is a type of binary cluster that corresponds its input x (a vector of real numbers) to the output value f(x) (a scalar with binary values), which is calculated as Equation 1.6.

$$f(x) = \begin{cases} 1 \\ 0 \end{cases} \rightarrow \begin{matrix} if\_w.x>0 \\ otherwise \end{matrix} \quad (1.6)$$

w is a vector of weights with real values, and $w.x = \sum_{i=1}^{m} w_i x_i$ the internal multiplication of the weights and the input vector, where m is the number of perceptron inputs. In Equation(1.6) represents a bias that its task is to move the decision boundary from the source and its value does not depend on the inputs. In the field of artificial neural networks, perceptron is a type of synthetic neuron which its function is dependent on the Heaviside bridges.

CHAPTER 2

LITERATURE REVIEW

In recent years, the use of neural networks has been one of the important tools in artificial intelligence applications. Applications such as image classification, voice and speech analysis, and text review are applications that use neural networks. The use of deep learning is not only applicable to categorization tasks but more commonly used as a feature extraction method (Bangui, 2009). Data representation plays a decisive role in most machine learning approaches, which is why many of the work in developing machine learning algorithms tends to pre-process, feature extraction, and feature learning. In feature learning, an attempt is made with input data to create a feature extraction system that can be used for classification and other applications. One of the benefits of deep networks in feature learning is that with the help of unlabeled data, they can extract complex features of training data and increase the power to differentiate between different categories of data (Yan Ming et al., 2013).

2.1 Deep learning is a subset of machine learning

Deep learning is generally a subset of machine learning that has been introduced since the beginning of 2005 and has been taken seriously since about 2012. Deep learning has different processing algorithms and is more robust than machine learning, which usually uses neural networks. (Zeiler et al., 2113) In deep learning to teach the computer so-called practical use of repetition and deeper use of the problem and go deeper into the problem and try to look deeper into a topic, for example deep learning about processing The image works by a neural network (CNN) method that goes deep into the image layer by layer and tries to extract different features in each layer of the image that can ultimately be grouped into one image. Example By giving an image to the program entry, get the name of the class that the image belongs to from the output Deep learning (Cireșan et al., 2007) Deep learning is usually applied to large dimensions of data, and the initial processing volume requires stronger hardware, usually very heavy processing on graphics card GPUs. GPUs in deep learning processes are due to the high GPU capability of parallel processing because each GPU contains several hundred to several thousand small processing cores, each capable of independently performing the part of the processing required. In this

regard, Nvidia8 is a leading edge graphics vendor, and most conventional libraries (such as Google Tensorflow) use GPUs to use the mid-level language (Cuda) associated with Nvidia graphics cards (He et al., 2015). Increasingly, the use of deep learning algorithms is expanding, and many scientific competitions such as ImageNet are being held each year to improve its algorithms. In-depth learning uses training data to perform learning action, such as a convolutional neural network, for example, for image recognition, including a set of Images that contain an object, all of these images must have the same size and a label (whether in the image or not), this so-called DataSet training set may already be pre-prepared, such as a set MNIST or Imagenet comments, the first is a collection of manuscript figures and the second is a large collection of natural photographs (such as trees, flowers, tables, etc.) that identify objects in the image. A data set can also be prepared for a personal application (Gershick et al., 2014; Cireşan et al., 2011).

2.2 Artificial Intelligence Deep Learning Research Background in Medical

In 1996, Spencer used Fluorescein Angiograms images to detect microaneurisms, and the retinal color images were subdivided into pathologies and anatomies using two image segmentation techniques, namely thresholding and area growth. Then the curves, computer-generated results were compared with the views of five ophthalmic surgeons and the same results were reported in both methods. They also designed an adaptive filter assuming to identify microanurisms of the same shape and size (Spencer et al. 1996).

A study conducted by Hipwell in 2007 to identify microanurasms from algorithms that characterize microanuras points. To improve, was used. In this method, the probable microanurisms obtained from the previous step are categorized according to the intensity and size using the rules extracted from a dataset. The result was 81% sensitivity and 93% specificity (Hipwell et al., 2011).

(Cree et al., 2005) identified the pathologies of microanurysms in fluorescence images. Initially, the images were processed using shadow correction techniques, and then the features were extracted from the processed images using morphological techniques. The result of this method is reported 82% of sensitivity.

In order to identify microanurisms in 2007, Walter Used color retinal image analysis. The images were first processed by shadow correction and contrast enhancement methods and

then by using the segmentation technique to extract micro-aneurysms from the above images. The efficacy of this method is reported to be 86.4%. (Walter et al., 2007).

Proposed to diagnose microanurisms in year 2009 Ravishankar using vascular fragmentation and color properties localization method, and the result of the study was 6.5% sensitivity and 1.5% specificity (Ravishankar et al., 2009).

Solanki used a supervised learning approach, image processing techniques, and neural networks to classify eye images and diagnose microaneurisms. The results of this study reported images classified into five classes and 50% accuracy (Solanki et al., 2010).

2.3 Application of Data Mining in Skin Lesions

In recent years, especially in the last 10 years, the application of data mining methods in medicine and care Health has expanded, and much research and research has been done around the world to explore data mining applications in medical science. Thus, one of the most popular areas where data mining is widely used is medical and health care. Recently a skin disease has been a problem for everyone. Factors like due to age, from bacteria, exposure to sunlight causes skin damage.

2.4 Diagnostic Guidelines for Melanoma Skin Lesions in Medical Societies

Most of us don’t consider our skin as an organ, but it is also our organ. If a person has suffered from melanoma in the past, disease recurrence is high. Melanoma is a kind of skin cancers. It is rare. There are has been an increase in melanoma in recent years. This is due to exposure to sunlight and ultraviolet lights in the solarium. Specifically, it is a type of tumor originating from moles in the human body.

CHAPTER 3

METHODOLOGY and RESULTS

A skin disease is a not normal growth or appearance of the skin. There are two types of skin lesions: Skin disease that occurs during birth or during a person's life and irritated or manipulated skin disease. We will automatically diagnose disease for skin lesions with machine learning. In this study we will find melanoma skin disease using alex net method. Because in 2012 Alex Net was the first in 'Image Net' competition and an also the error rate is very low. There are the most common skin lesions: Nevus, Dermatofibroma, Pigmented Bowen's, Pigmented Benign Keratoses, Basal Cell Carcinoma, Vascular and Melanoma. All of them dangerous but the most risky is melanoma and it can be resulting in death.

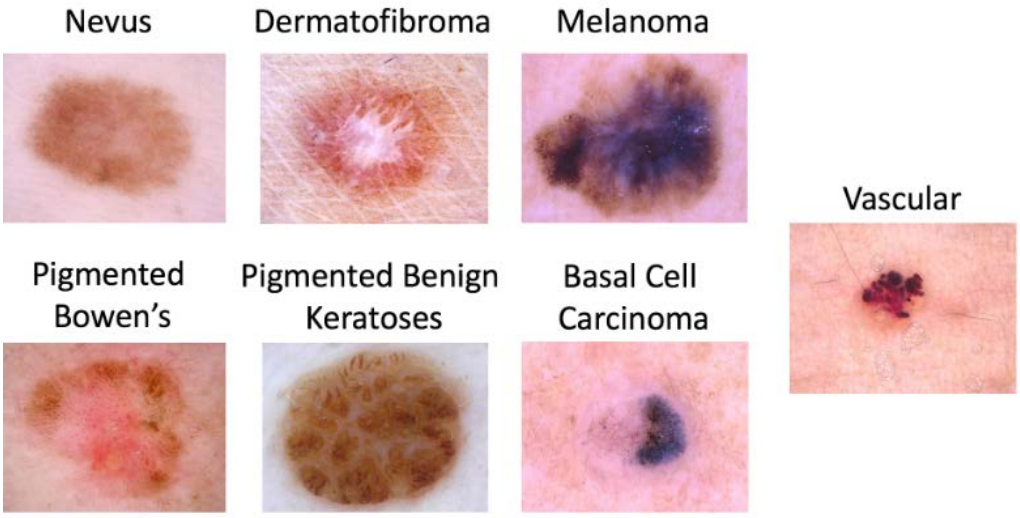

Figure 3.1: Skin lesions

3.1 Alex Net Method

Although it is said that the first application of deep learning was published by Yann LeCun in 1998, this was heard by the whole world in 2012. AlexNet model has won the ImageNet competition with a deep learning architecture which was actualized that year. The study was published with the article which name is 'ImageNet Classification with Deep Convulutional Networks' (Krizhevsky, Sutskever et al. 2012.) and 16227 quotations were cited from October 2017. With this architecture, the error rate of defining computerized

object has been decreased from 26.2%.to 15.2%. The architecture given in the figure below consists of 5 convolution layers, these are a pooling layer and 3 fully interrelating layers. It is designed to classify 1000 objects of architecture. The filters are determined 11x11 in size and the side step (step slip) is determined number 4.

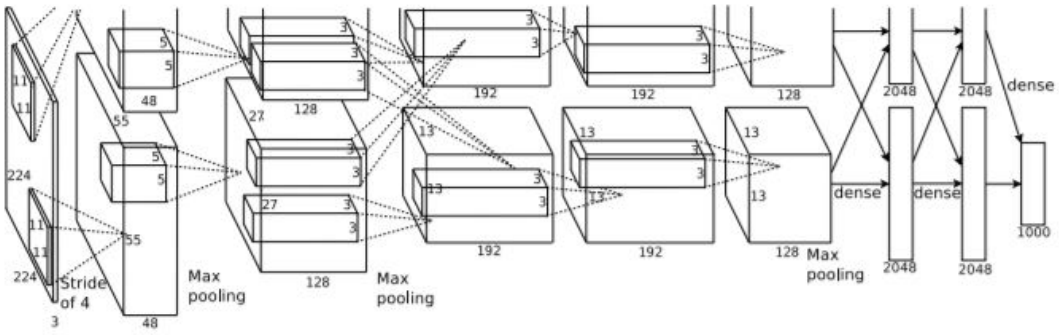

Figure 3.2: Original architecture image from (krizhevesky, 2012)

The figure shows proposed Alex Net deep learning method. First, input images go through five convolutional layers and then three fully connected layers. Images are convolved with 96 filters of size 11x11 in the first convolution layer. The output is then used as an entrance to the second convolutionary layer. Then the production of the second convolutionary layer is grouped together. This input is filtered in the second convolutionary layer with 256 kernels in size 5x5. For the third and fourth and fifth convolution layers this process is carried out. Then the layers are designed entirely linked. Finally, we use Softmax for skin lesions detection. AlexNet has five convolutionary layers with three fully linked layers. In short. After a fully attached sheet, the relu is added. Before the first and second year, falling is implemented in complete contact. The network has a large threshold and a forward-looking capacity of 1.1 billion device units. We can also see convolution layers that consume 95 percent of the computation, accounting for 6 percent of all parameters.

3.2 ISIB 2018 DATASET

Nevus, dermato fibromas, bowen pigment, benign pigments, baseline carcinoma, vascular and melanoma are the most common lesions on the skin. The following are commonly reported:

All of them dangerous but the most risky is melanoma and it can be resulting in death.

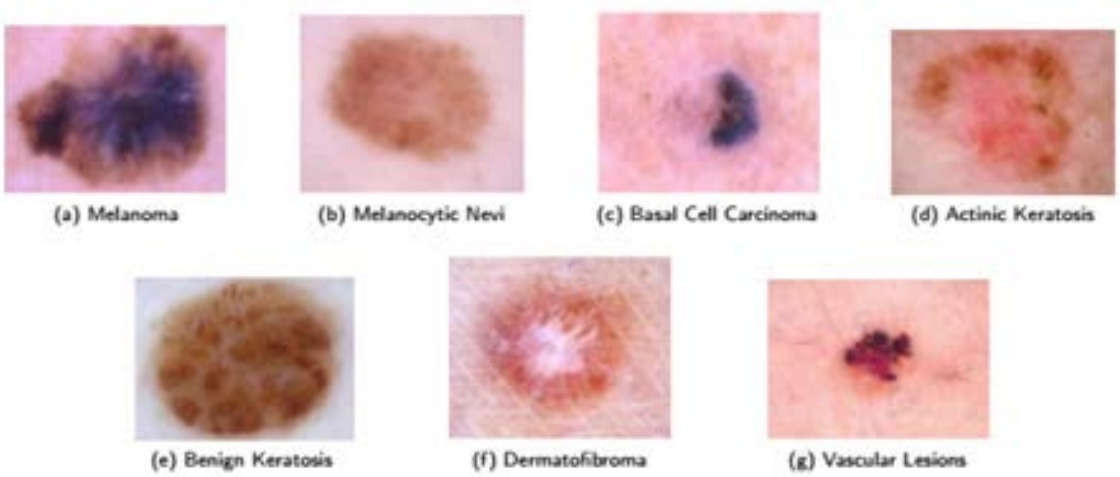

Figure 3.3: Skin lesions data set

3.3 MELANOMA and NON MELANOMA IMAGES

Once melanocytes begin to develop out of control, the earliest stage of melanoma starts. Between the outer skin layer (epidermis) and the next layer (dermis), melanocytes are identified. The early period, when a tumor is less than 1 mm thick, is referred to as the radial growth stage (Krizhevsky, et al., 2011) . As the cancer cells have not yet penetrated the blood vessels in the skin, this early stage melanoma is very difficult to spread to other parts of the body. In this stage, if melanoma is detected, it can usually be removed completely by operation.in figure 3.4 non melanoma and melanoma images can be seen and their basic different is obvious.

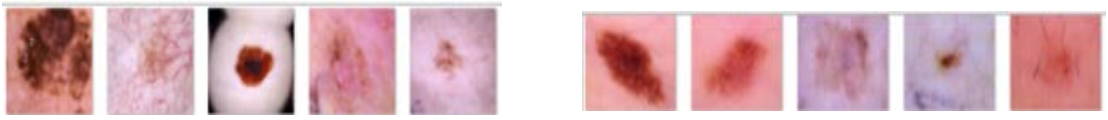

Figure 3.4: (Left) Melanoma images, (right) Non-Melanoma images

3.4 AUGMENTED MELANOMA and NON MELANOMA IMAGES

In the figure below (3.5) we can see 36 skin lesions' images. Some of them melanoma and others non melanoma.

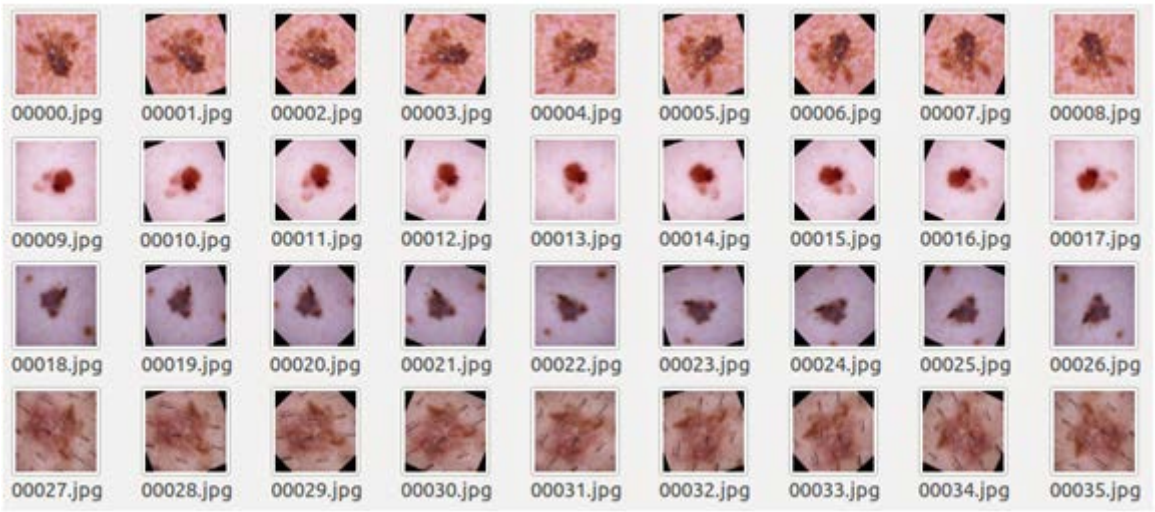

Figure 3.5: Augmented images

There are 10015 skin lesions in table 1.

Table 3.1: ISIB 2018 dataset

Skin Lesions	**Number of Images**
Melanoma	1113
Melanocytic Nevi	6705
Basel Cell Carcinoma	514
Actinic Keratosis	327
Benign Keratosis	1099
Dermatofibroma	115
Vascular Lesions	142
Total	**10015**

Alex Net Method made a classification among the common skin lesions. These classifications are melanoma and other skin diseases, you can see it in table 2. Melanoma is 8109, non-melanoma is 6529 totally 14638.

Table 3.2: Augmented Dataset

Skin Lesions	**Number of Images**
Melanoma	8109
Non-Melanoma	6529
Total	**14638**

3.5 Performance Evaluation Metrics

We use accuracy, sensitivity, specificity as performance evaluation factors. These factors can be described as follows:

$$Accuracy = \frac{TP+TN}{TP+TN+FP+FN}$$

$$Sensitivity = \frac{TP}{TP+FN}$$

$$Sensitivity = \frac{TN}{TP+FP}$$

We denote true positive, positive, true negative, false positive, and false negative as TP, TN, FP and FN respectively.

Table 3.3: Proposal method results

Method	Network	M-AUC	M-ACC	M-SE	M-SP
Proposal (1)	AlexNet	0.65	0.68	0.44	0.72
Proposal (2)	ResNet-50	0.70	0.74	0.52	0.76

Considering mentioned results and defining M_AUC as melanoma Augmented, M_ACC melanoma accuracy that already define by negative and positive subcategorized, M_SE melaanoma sensitivity and M_SP melanoma specificity also defined in section 3.5 by false and true positive and negative statistic factors.

CHAPTER 4

CONCLUSION AND FUTURE WORKS

Canonical neural network has had one of the best algorithms in the field of computer's oblivion, especially in image classification in recent years. Therefore, various algorithms of this kind have been introduced in recent years, most notably VGGNet, AlexNet, ResNet. These algorithms have achieved the highest accuracy in recent years. AlexNet dataset is of the highest quality compared to other huge datasets. With all these definitions, the memory usage and the amount of readable parameters of these algorithms, and some of the accuracy provided by this model, make it difficult to use them, so algorithms that save memory consumption are needed to increase performance. Slow and requires less readable parameters to achieve the desired result.

Based on the previous sections on the convolutional neural network and the algorithms in this field, it is concluded that in order to reduce the error and increase the accuracy of ResNet and alexnet algorithm prediction to detect melonama images and classify the images into two groups of images positive and negative results images. The study shows that in the implementation of the problem using ResNet model if the data set is not large and the complex model does not need to be implemented many layers won't be needed, as too many layers create overhead and time required for training increases. Given the size of the existing set of images and the level of classification in the two classes, the alexnet algorithm with multiple blocks has been used to implement this problem. In this algorithm, Bottleneck is used to reduce the processing overhead. This network has been trained and tested on a Kaggle dataset using a GPU. Implementation of this algorithm employs 22 layers of convolution, 1 layer of Max Pooling and 1 layer of Average Pooling. The conv1 layer uses the 7 * 7 filter, stride2 and padding 3, and the conv2 layer uses the 3 * 3 filter, stride1 and padding1. The Max pooling layer also uses the 3 * 3 filter, stride 2 and padding 2. The reason for using Max Pooling is that it can result in faster convergence, better generalization (generalization improvement) and a choice of more invariant features. In recent years, various rapid implementations of various types of CNN networks have been performed on GPUs, most of which use Max pooling operations. Max pooling and average pooling are also very useful for deformation management. It also uses the RELU activation

function in the form of a layer that implements the activation function on the element elements. The most common form of a convoluted neural network neural network algorithm is the CONV-RELU multilayer, followed by overlapping layers, and this template or design is repeated until the input image is as small as desired. Layers like Average pooling can also be used. The last layer contains output such as category rating. In this implementation, multilayer cannulas are placed before each Max pooling layer. In general, this approach is a good idea for large and deep networks because several layers of converged layers can obtain more complex features of the input mass before they are eliminated by aggregation operations.

4.1 Research Achievements

In this study skin lesions disease Diagnosed by machine learning. Also Alex Net method used to gives the acceptable results and error rate which is very low. Classification has been made among the common skin lesions. These classifications are melanoma and other skin diseases. Also classifying of each disease is also found during using Alex Net method as one of machine learning method. In thıs study our aim was to make early diagnosis, to separate a deadly disease melanoma from others. The research which have done can help doctors in the health field. Also it can reduce doctor’s errors and save time.

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