Classification of Alcoholic EEG Signals Using Deep Learning Method

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Abstract : Most of the methods to analysis alcoholic signals on machine learning base styles that cannot prize the deep concealed characteristics of Electroencephalogram (EEG) signals from different layers. Hence, this study aims to introduce a deep leaning-system that can automatically identify alcoholic EEG signals. To enquire, wither the person is alcoholic or not will detect using EEG signals for detection. CNN Algorithm has been used, It consist of three layers -an input layer, hidden layers, and an output layer. CNNs are inspired by the architecture of the brain. Just like a neuron in the brain processes and transmits information throughout the body, artificial neurons or nodes in CNNs take inputs, processes them and sends the result as output. The image of signals fed as input. The input layer accepts the image pixels as input in the form of arrays. In CNNs, there could be multiple hidden layers, which perform feature extraction from the image by doing calculations. This will include convolution, pooling, rectified linear units, and fully connected layers. Convolution is the first layer that does feature extraction from an input image. The fully connected layer classifies the object and identifies it in the output layer. "CNNs are feed forward networks in that information flow takes place in one direction only, from the inputs to the outputs.

IndexTerms - Classification of EEG, Convolution network, Layers in CNN, Alcoholic signal, Deep learning, Google colab.

I. INTRODUCTION

ALCOHOL is a severe complaint that affects the functionality of neurons in the central nervous system and alters the affected person. The most common negative goods of inordinate alcohol consumption on health are stroke, high blood pressure, cirrhosis, and increased threat of cancer. Alcohol can affect numerous parts of the body but, it particularly affects the brain, heart, liver, and other system. The identification of objects in an EEG signal would start with EEG signal processing techniques such as noise removal, by low-level feature extraction to locate lines, regions and possibly areas with certain textures.

1.1 OBJECTIVE

These findings are consistent with those from previous studies reporting that alcoholics exhibit increased EEG spectral power in the beta band. High-binge drinkers who are not alcohol-dependent may therefore exhibit EEG power variation predictive of future alcohol dependency

> ➤ CNNs have fundamentally changed our approach towards image recognition as they can detect patterns and make sense of them. They are considered the most effective architecture for image classification, retrieval and detection tasks as the accuracy of their results is very high.

> ➢ They have broad applications in real-world tests, where they produce high-quality results and can do a good job of localizing and identifying where in an image a person/car/bird, etc., are. This aspect has made them the go-to method for predictions involving any image as an input.

> ➢ A critical feature of CNNs is their ability to achieve 'spatial invariance', which implies that they can learn to recognize and extract image features anywhere in the image. There is no need for manual extraction as CNNs learn features by themselves from the image/data and perform extraction directly from images. This makes CNNs a potent tool within Deep Learning for getting accurate results.

1   LITERATURE SURVEY

Literature review:

Epilepsy is an infirmity which affects the brain causing repeated seizures. An automatic novel method is used for analyzing the EEG signal and for detecting epileptic seizure activity. The proposed method is tested on a publicly available dataset and it uses two time domain features namely line length and energy. Classification algorithms-1) Quadratic discriminant analysis (QDA), 2) K-Nearest Neighbour (KNN) and 3) Linear discriminant analysis (LDA) are used for classifying the EEG signals, and their performance is evaluated by measuring sensitivity, specificity and accuracy. The results of the three classifiers are compared and KNN classifier shows better results than the other two classifiers. An overall accuracy from 94.4% to 100% is achieved by the KNN classifier and the high classification results obtained verified the success of the method.

III   EXISTING METHOD AND PROPOSED METHOD

In machine learning, support vector machines (SVMs, also support vector networks) are learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall on.

A support vector machine constructs a hyper plane or set of hyper planes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks. Intuitively, a good separation is achieved by the hyper plane that has the largest distance to the nearest training data point of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier.

Whereas the original problem may be stated in a finite dimensional space, it often happens that the sets to discriminate are not linearly separable in that space. For this reason, it was proposed that the original finite-dimensional space be mapped into a much higher-dimensional space, presumably making the separation easier in that space. To keep the computational load reasonable, the mappings used by SVM schemes are designed to ensure that dot products may be computed easily in terms of the variables in the original space, by defining them in terms of a kernel function $k(x, y)$ selected to suit the problem. The hyperplanes in the higher-dimensional space are defined as the set of points whose dot product with a vector in that space is constant.
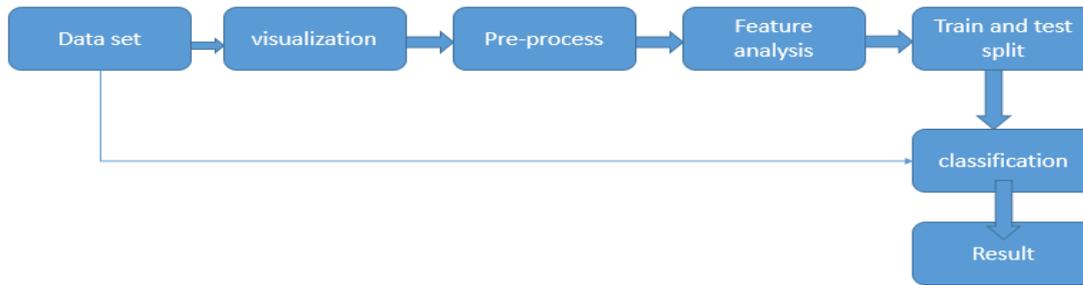
- SVM
- Cluster
- Conversion

Disadvantages:
- Less accurate
- No much more data access
- More time consumption

- Feature calculation is poor

Proposed method

- In this proposed method we are using Deep learning to identify the alcohol of EEG signal based.it will give accurate Pre-process, Train test split process, Deep learning, Feature analysis

Block diagram of the process

Step 1:In first step we have to assign the path for the dataset using operating system. For tumor and without alcohol cases. The os.path module is a veritably considerably used module that's handy when recycling lines from different places in the system. It's used for different purposes similar as for incorporating, homogenizing and reacquiring path names in python. All of these functions accept either only bytes or only string objects as their parameters. "os.path.basename" This function gives us the last part of the path which may be a brochure or a train name. Please the difference in how the path is mentioned in Windows and Linux in terms of the backslash and the forward rent.

Step 2:In step 2 add path with the extension of EEG signal files using glob.The glob module is a useful part of the Python standard library. glob(short for global) is used to return all train paths that match a specific pattern. We can use glob to search for a specific train pattern, or maybe more usefully, search for lines where the filename matches a certain pattern by using wildcard characters. "Glob patterns specify sets of filenames with wildcard characters". These patterns are analogous to regular expressions but important simpler. Asterisk (*) Matches zero or further characters Question Mark (?) Matches exactly one character.While glob can be used to search for a train with a specific filename, I find it especially handy for reading in several lines with analogous names. After relating these lines, they can also be concatenated into one data frame for farther analysis.

Step 3:In step 3 we have to give full details about the data set by Python dictionaries can be used when the data has a unique reference that can be associated with the value. As dictionaries are mutable, it is not a good idea to use dictionaries to store data that shouldn't be modified in the first place.

Given below:

- tumour = {'class': 'tumour',
-         'path': path_ tumour _cases,
-         'EEG signals': tumour_EEG signals_ls}

- Normal = {'class': 'normal',
-         'path': path_normal_cases,
-         'EEG signals': normal_EEG signals_ls}

Step 4:In step 4v we can use len() is a erected-in function in python. You can use the len() to get the length of the given string, array, list, tuple, wordbook, etc. Return value a return an integer value i.e. the length of the given string, or array, or list, or collections. So, we applied len() to find out whole length of the brain data set.

Step 5:In step 5 read EEG signals using imread from opencv package and use matplotlib for graphical representation for EEG signals.

Advantages:

• More accurate

• Less loss of data

• Handle more data for checking process

IV   SYSTEM REQUIREMENTS SPECIFICATIONS

4.1 Module Description

4.1.1 Python

Python is an Object-Oriented, High Level Language, Interpreted, Dynamic And Multipurpose Programming Language.Python Is Easy To Learn Yet Powerful And Versatile Scripting Language Which Makes It Attractive For Application Development. Python's Syntax And Dynamic Typing With Its Interpreted Nature, Make It An Ideal Language For Scripting And Rapid Application Development In Many Areas.

4.1.2 Python Features:

1. Easy To Use:Python Is Easy To Very Easy To Use And High Level Language. Thus It Is Programmer-Friendly Language.
2. Expressive Language: Python Language Is More Expressive. The Sense Of Expressive Is The Code Is Easily Understandable.
3. Interpreted Language: Python is an Interpreted Language I.E. Interpreter Executes The Code Line By Line At A Time. This Makes Debugging Easy And Thus Suitable For Beginners.
4. Cross-Platform Language: Python Can Run Equally On Different Platforms Such As Windows, Linux, Unix, Macintosh Etc. Thus, Python Is A Portable Language.
5. Free and Open Source: Python Language Is Freely Available (Www.Python.Org).The Source-Code Is Also Available. Therefore It Is Open Source.
6. Object-Oriented Language: Python Supports Object Oriented Language. Concept Of Classes And Objects Comes Into Existence.
7. Extensible: It Implies That Other Languages Such As C/C++ Can Be Used To Compile The Code And Thus It Can Be Used Further In Your Python Code.
8. Large Standard Library: Python Has A Large And Broad Library.
9. Gui Programming: Graphical User Interfaces Can Be Developed Using Python.
10. Integrated: It Can Be Easily Integrated With Languages Like C, C++, Java Etc.

4.1.3 Open source (GOOGLE COLABORATORY):

Colaboratory, or "Colab" for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education. Load data from local drive to upload the file from the local drive write the following code in the cell and run it. Colab is free of charge to use. Colab resources are not guaranteed and not unlimited, and the usage limits sometimes fluctuate. This is necessary for Colab to be able to provide resources free of charge. Users who are interested in more reliable access to better resources may be interested in Colab Pro. Resources in Colab are prioritized for interactive use cases. We prohibit actions associated with bulk compute, actions that negatively impact others, as well as actions associated with bypassing our policies. The following are disallowed from Colab runtimes:

• file hosting, media serving, or other web service offerings not related to interactive compute with Colab
• downloading torrents or engaging in peer-to-peer file-sharing
• using a remote desktop or SSH
• connecting to remote proxies
• running denial-of-service attacks
• password cracking
• using multiple accounts to work around access or resource usage restrictions

4.2　　Hardware and Software Requirments

Hardware requirements:

- ➢ Core i3 operating system
- ➢ Around 40 GB storage hard disk
- ➢ Random Access Memory of 4GB

Software requirements:

- ➢ Windows 7 Ultimate Operating System
- ➢ Python coding language
- ➢ Google Colab
- ➢ Deep learning

4.2.1 Architectures

Deep Neural Network – It is a neural network with a certain level of complexity (having multiple hidden layers in between input and output layers). They are capable of modeling and processing non-linear relationships.
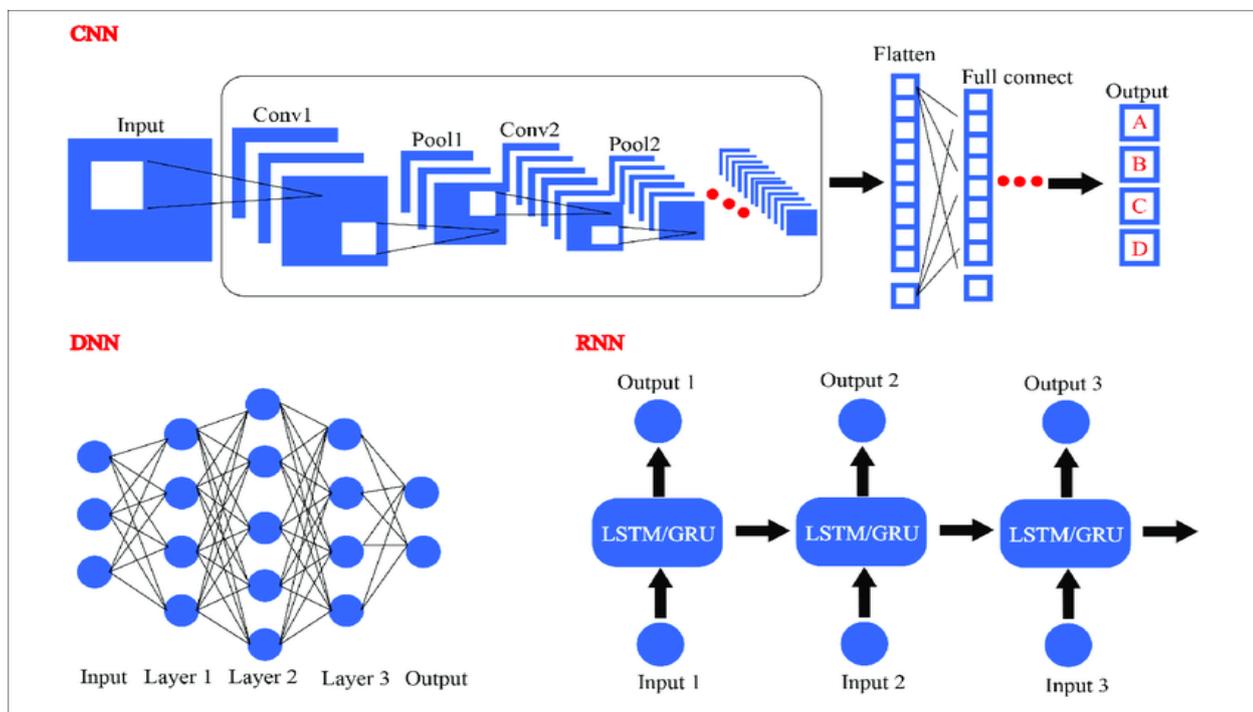
Figure Architecture

Deep Belief Network (DBN) – It is a class of Deep Neural Network. It is multi-layer belief networks.

Steps for performing DBN:

a. Learn a layer of features from visible units using Contrastive Divergence algorithm.

b. Treat activations of previously trained features as visible units and then learn features of features.

c. Finally, the whole DBN is trained when the learning for the final hidden layer is achieved.

 Recurrent - Perform same task for every element of a sequence.

 Neural Network – Allows for parallel and sequential computation. Similar to the human brain (large feedback network of connected neurons). They are able to remember important things about the input they received and hence enable them to be more precise.
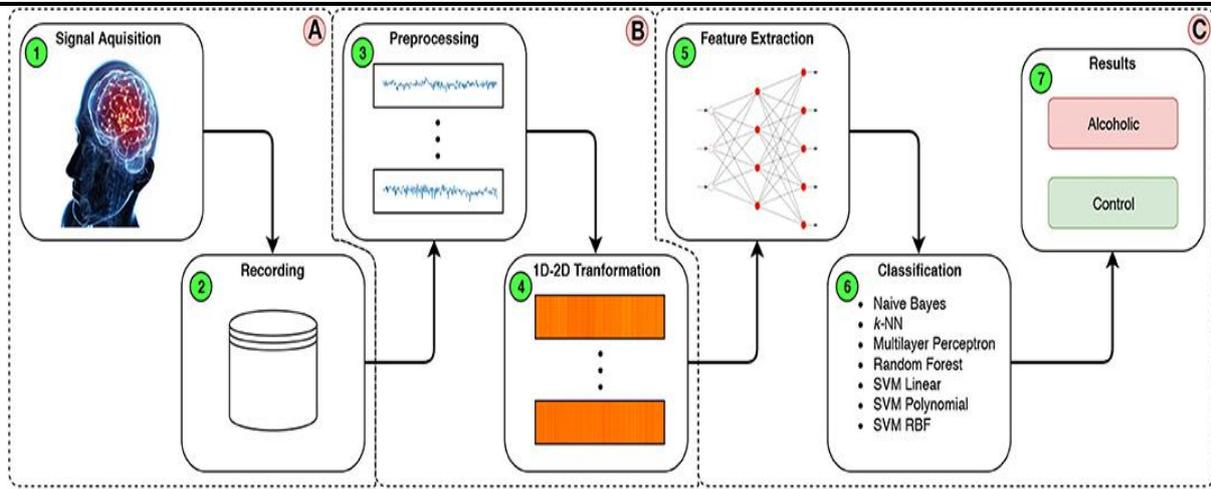
Figure of processing

II. RESULTS AND DISCUSSION

Abnormal EEG signal
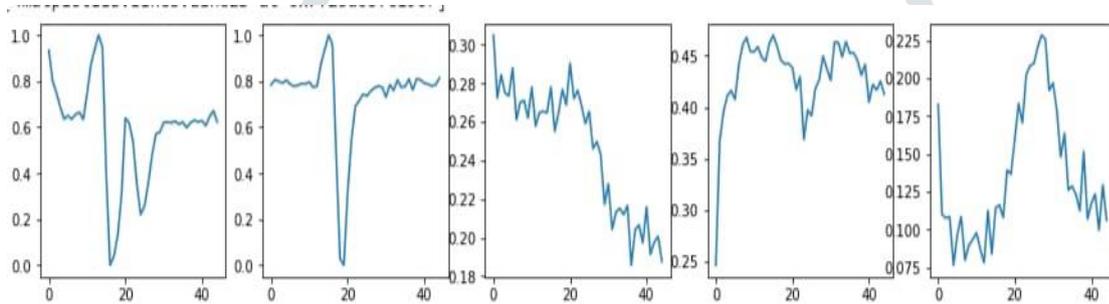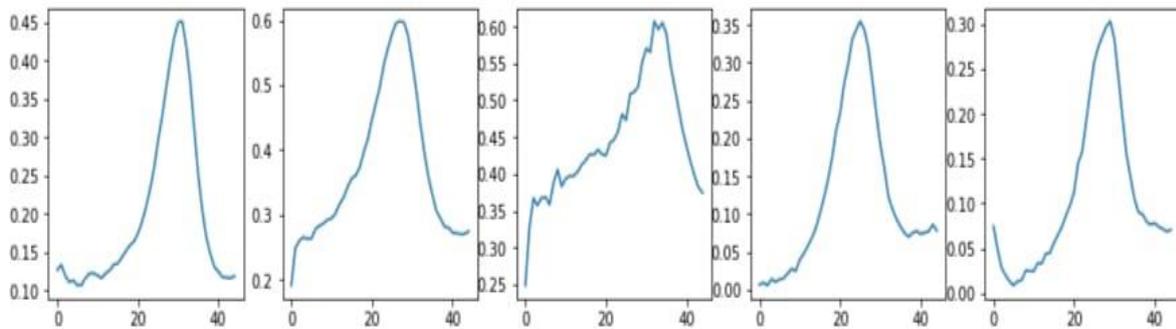

Figure 5.1 Abnormal EEG Signal

Normal EEG Signal

Figure 5.2 Normal EEG Signal

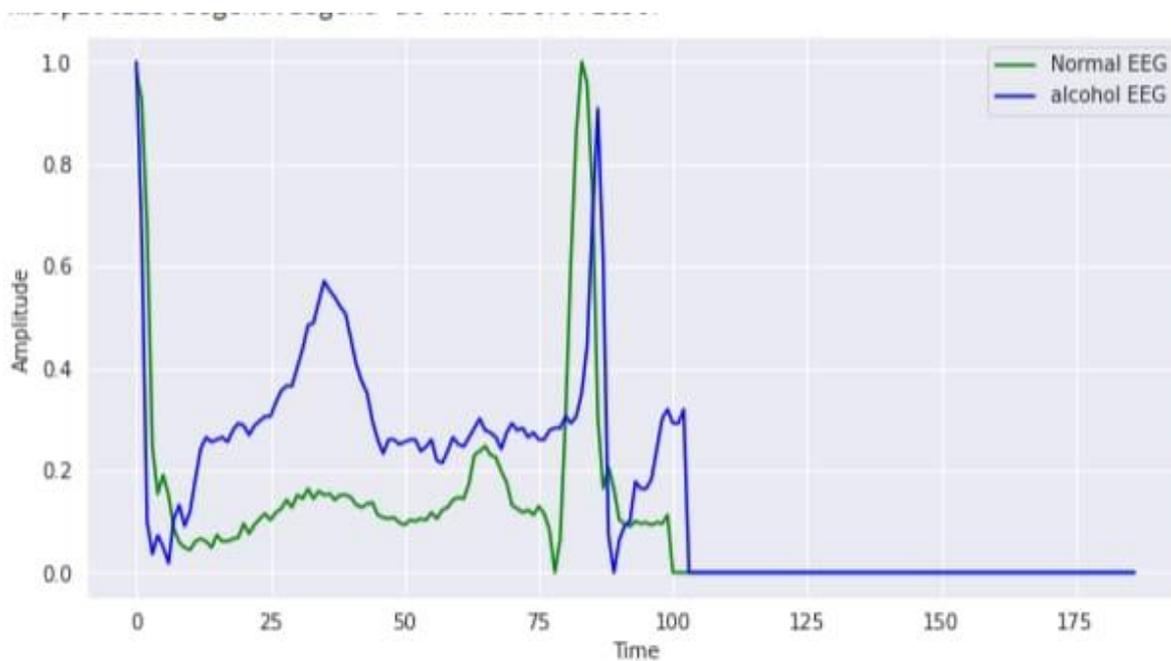**ALCOHOLIC AND NORMAL EEG SIGNAL**

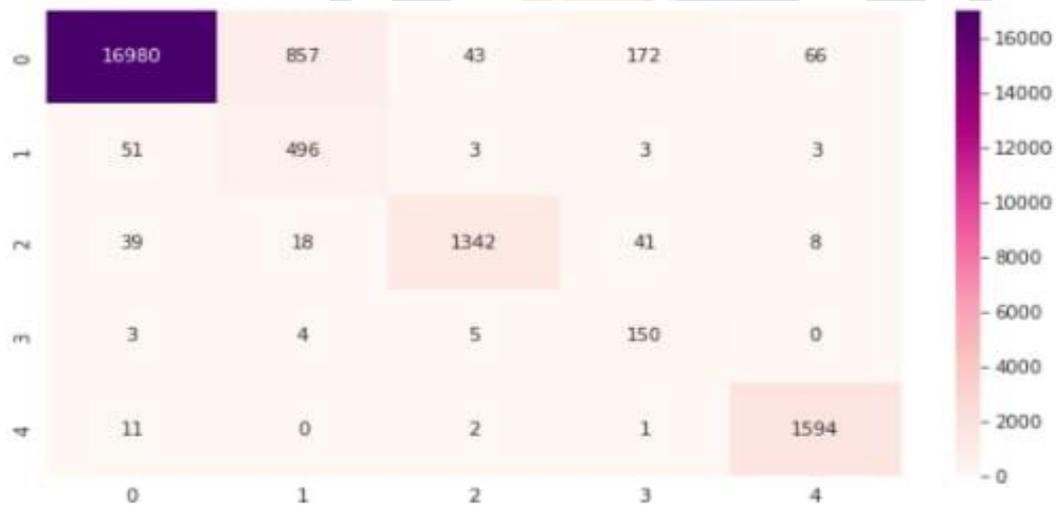Figure 5.3 Alcoholic And Normal EEG Signal

MATRIX FORM OF COMPLETE DATA

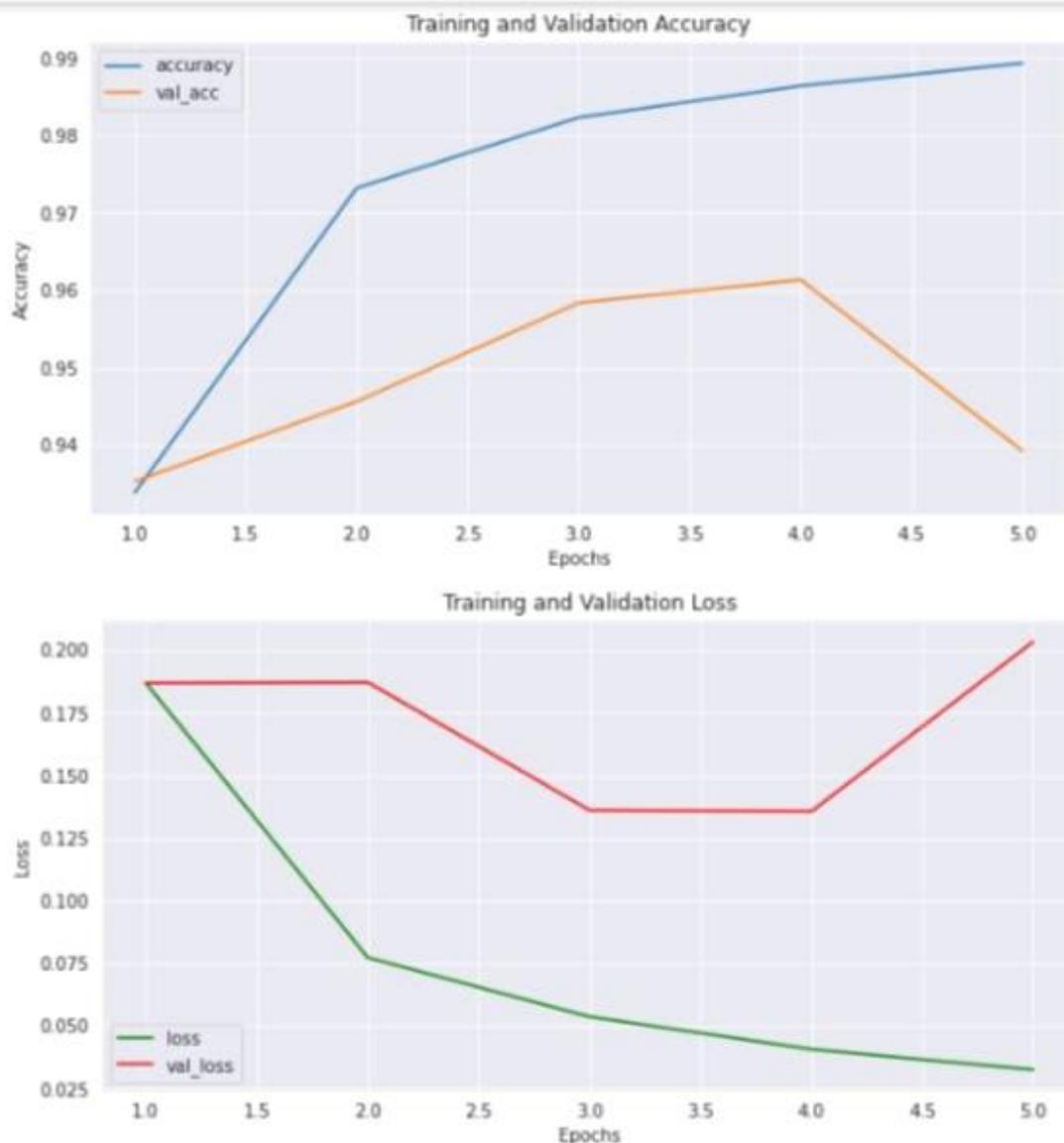Figure 5.4 Convolution matrix

ACCURACY AND LOSSES VS EPOCHS

Figure 5.5 Accuracy and Losses Vs. Epochs

III. ACKNOWLEDGMENT

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