**CHAPTER 1**

**INTRODUCTION**

This project is aimed to Predicting the expenses tracker. This project is developed mainly to automate the user expenses details . The purpose of this project entitled as to computerize the user expenses based on weekly, monthly and yearly, to develop software which is user friendly, simple, fast and cost-effective. Traditionally, it was done manually .The main function of the system is to login or register newly and store the expenses details , retrieve and these details as and when required, and also to manipulate these details meaningfully. Money management is a topic people of all age are used to hear. From an early age, the subject money is introduced to toddlers in a way that they should really be mindful of how they spend and saves up their money. Parents would literally prepare their child a piggy bank so that their child would learn to save money. The reason for teaching their child on how to save up money is very valid. It has been reported from The Star newspaper dated 22 June 2015 that close to 25,000 Malaysians below the age of 35 have become bankrupt since 2010. (Adzis et al, 2017) Since then, saving money has been a lot easier with the evolving use of technologies such as mobile devices that helps peole keep track of daily expenses. It has been predicted that mobile devices will add up to 5.6 billion. (Wang et al, 2018) Mobile devices has become more engaging for users because of the installation of applications are now available. It has now may seem that an application has now taken over the job of many daily things such as writing down on notebook as a reminder, a planner, a tracker and many others. Therefore, it is best to intergrate mobile application and tracking expenses together for the combination of money management application that everyone needs

**ARTIFICIAL INTELLINGENCE:**

Artificial intelligence (AI) is the ability of a computer program or a machine to think and learn. It is also a field of study which tries to make computers "smart". As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. AI is an area of computer sciences that emphasizes the creation of intelligent machines that work and reacts like humans. Some of the activities computers with artificial intelligence are designed for include: Face recognition, Learning, Planning, Decision making etc.,

Artificial intelligence is the use of computer science programming to imitate human thought and action by analyzing data and surroundings, solving or anticipating problems and learning or self-teaching to adapt to a variety of tasks.

* **MACHINE LEARNING**

Machine learning is a growing technology which enables computers to learn automatically from past data. Machine learning uses various algorithms for building mathematical models and making predictions using historical data or information**.** Currently, it is being used for various tasks such as image recognition**,**speech recognition**,**email filtering**,**Facebook auto-tagging**,**recommender system, and many more.

Machine Learning is said as a subset of artificial intelligence that is mainly concerned with the development of algorithms which allow a computer to learn from the data and past experiences on their own. The term machine learning was first introduced by **Arthur Samuel**in **1959**. We can define it in a summarized way as: “Machine learning enables a machine to automatically learn from data, improve performance from experiences, and predict things without being explicitly programmed”.

A Machine Learning system learns from historical data, builds the prediction models, and whenever it receives new data, predicts the output for it**.** The accuracy of predicted output depends upon the amount of data, as the huge amount of data helps to build a better model which predicts the output more accurately.

Suppose we have a complex problem, where we need to perform some predictions, so instead of writing a code for it, we just need to feed the data to generic algorithms, and with the help of these algorithms, machine builds the logic as per the data and predict the output. Machine learning has changed our way of thinking about the problem. The below block diagram explains the working of Machine Learning algorithm.

**DEEP Learning:**In general, we will do two tasks all the time consciously or subconsciously, i.e., categorize what we felt through our senses (like feeling hot, cold mug, etc.)

And prediction, for example, predicts the future temperature based on the previous temperature data.

**We do categorization and prediction tasks for several events or tasks in our daily life such as below:**

Holding Cup of Tea/Water/Coffee etc., which may be hot or cold.

Email categorization such as spam/ not spam.

Day-light time categorization such as day or night.

Long-term planning of the future based on our current position and things we have – is called prediction.

Every creature in the world will do these tasks in their life, for example, consider animals like crow will categorize a place to build its nest or not, a bee will decide on some

Factors when and where to get honey, the bat will come during the night and sleeps during morning based on day and night categorization.

Let us visualize these tasks categorization and prediction, and they will look alike as in the below image; for categorization, we are doing categorization between cats and dogs

by drawing a line through data points, and in the case of prediction, we draw a line through data points to predict when it will increase and decrease.

**1. Categorization**

In general, to categorize between cats and dogs, or men and women, we don’t draw a line in our brains, and the position of dogs and cats is arbitrary for illustration purposes only,

And it is needless to say the way we categorize between cats and dogs in our brains is much complex than drawing a red line as above.

We will categorize between two things based on shapes, size, height, looks, etc., and sometimes it will be difficult to categorize with these features such as a small dog with fury

And a newborn cat, so it is not a clear-cut categorization into cats and dogs.

Once we are able to categorize between cats and dogs when we are children, then onwards we are able to categorize any dog or cat even we didn’t see it before.

**2. Prediction**

For prediction based on the line, we draw through data points if we are able to predict where it is most likely to go upward or downward.

The curve is also a prediction of fitting new data points within the range of existing data points, i.e., how close the new data point is to the curve.

The data points which are in red color in the above image (right side) are examples of both within and beyond the range of existing data points, and the curve attempts to predict both.

Finally, both task categorization and prediction are ended at a similar point, i.e., drawing a curvy line from data points. If we are able to train the computer model to draw the curvy

Line based on data points we are done with, then we can extend this to apply in different models such as drawing a curvy line in three-dimensional planes and so on.

The above thing can be achieved by training a model with a large amount of labeled and unlabeled data, which is called deep learning.

**Deep learning**

**Examples of Deep Learning**

As we know, deep learning and machine learning are subsets of artificial intelligence, but deep learning technology represents the next evolution of machine learning.

Machine learning will work based on algorithms and programs developed by humans, whereas deep learning learns through a neural network model which acts similar to humans and allows

Machines or computers to analyze the data in a similar way as humans do. This becomes possible as we train the neural network models with a huge amount of data as data is the fuel or

Food for neural network models.

**Below are some of the examples in the real world:**

Computer Vision: Computer vision deals with algorithms for computers to understand the world using the image and video data and tasks such as image recognition, image classification,

object detection, image segmentation, image restoration, etc.

Speech and Natural Language Processing: Natural language processing deals with algorithms for computers to understand, interpret, and manipulate human language. NLP algorithms work

with text and audio data and transform them into audio or text output. Using NLP, we can do tasks such as sentiment analysis, speech recognition, language transition, and natural

language generation, etc.

Autonomous Vehicles: Deep learning models are trained with a huge amount of data for identifying street signs; some models specialize in identifying pedestrians, identifying humans, etc.,

**2.1. ALGORITHM**

**2.1.1 VGG16:**

Of all the configurations, VGG16 was identified to be the best performing model on the Image Net dataset. Let’s review the actual architecture of this configuration.

The input to any of the network configurations is considered to be a fixed size 224 x 224 image with three channels – R, G, and B. The only pre-processing done is normalizing the RGB values for every pixel. This is achieved by subtracting the mean value from every pixel.

Image is passed through the first stack of 2 convolution layers of the very small receptive size of 3 x 3, followed by ReLU activations. Each of these two layers contains 64 filters. The convolution stride is fixed at 1 pixel, and the padding is 1 pixel. This configuration preserves the spatial resolution, and the size of the output activation map is the same as the input image dimensions. The activation maps are then passed through spatial max pooling over a 2 x 2-pixel window, with a stride of 2 pixels. This halves the size of the activations. Thus the size of the activations at the end of the first stack is 112 x 112 x 64.

The activations then flow through a similar second stack, but with 128 filters as against 64 in the first one. Consequently, the size after the second stack becomes 56 x 56 x 128. This is followed by the third stack with three convolutional layers and a max pool layer. The no. of filters applied here are 256, making the output size of the stack 28 x 28 x 256. This is followed by two stacks of three convolutional layers, with each containing 512 filters. The output at the end of both these stacks will be 7 x 7 x 512.

The stacks of convolutional layers are followed by three fully connected layers with a flattening layer in-between. The first two have 4,096 neurons each, and the last fully connected layer serves as the output layer and has 1,000 neurons corresponding to the 1,000 possible classes for the ImageNet dataset. The output layer is followed by the Softmax activation layer used for categorical classification.

**Training VGG16 model**

Let’s review how we can follow the architecture to create the VGG16 model using Keras. A pre-trained VGG16 model is also available in the Keras Applications library. The pre-trained model has the ImageNet weights. We can use transfer learning principles to use the pre-trained model and train on your custom images. But let’s review how we can build it from scratch.

We will first define a sequential model object in Keras:

|  |  |
| --- | --- |
| 1 | model = Sequential() |

Now, let’s add the first stack of layers. As discussed earlier, this stack contains two consecutive convolutional layers with 64 filters of size 3 x 3, followed by a 2 x 2 max-pooling layer with stride 2. Also, the input image size is fixed at 224 x 224 x 3. Let’s build the first block.

**LITERATURE SURVEY**

# **[1] TITLE:** Rice Classification and Quality Analysis using Deep Neural Network

# **AUTHOR:** [V. Lakshmi](https://ieeexplore.ieee.org/author/37089628670); [K. Seetharaman](https://ieeexplore.ieee.org/author/37975005700)

# **DESCRIPTION:**

Rice is one of the most extensively cultivated grain cereals in the world and comes in a vast range of genetic variants. It is expensive and time consuming. In this research, five different kinds of rice grains were used. The types were Arborio rice, Basmati rice, Ipsala rice, Jasmine rice, and Karacadag rice. The collection includes 75,000 grain samples and 17 features were extracted, namely 13 morphological as well as 4 shape features. Models for classifying procedures as well as their Aspect ratio for quality analysis efficiency were established by ResNet50 and Xception. Canny Edge Detection is used for preprocessing. Focusing on thresholds, rice quality is divided into three categories: best, good, and fine. The systems’ confusion matrix data were also used to produce summary statistics for sensitivity, specificity, F1 score, and accuracy, and the findings for the two models are shown in the table. The systems’ classifying efficiency scores are 98.90 percent for ResNet50 as well as 98.32 percent for Xception. The findings show that systems employed in this research for rice variety identification and quality assessment can be implemented successfully in this area.

# **[2] TITLE:** Image Processing for Classification of Rice Varieties with Deep Convolutional Neural Networks

# **AUTHOR**: [Mathuros Panmuang](https://ieeexplore.ieee.org/author/37085652298); [Chonnikarn Rodmorn](https://ieeexplore.ieee.org/author/37085645643); [Suriya Pinitkan](https://ieeexplore.ieee.org/author/37089243277)

# **DESCRIPTION:**

This research applied the Deep Convolutional Neural Networks and used the VGG16 model to screen rice varieties by images. The rice varieties selected in the experiment include five varieties: KorKhor 23, Suphanburi 1, Pathum Thani 1, Chainat 1, and Hom Mali Rice 105, totaling 1,500 images. The results of the experiments and model testing showed that the accuracy obtained by training the images of rice seeds is 85%, which is highly reliable. Therefore, the model was used to develop a website that can be accessed via web browsers and mobile apps where farmers or related persons can upload rice seed images to the system so that the system can predict what variety of rice it is and according to the testing of the system, it was found that it can make an accurate forecast of rice varieties.

# **[3] TITLE**: Determination of the Varieties of Rice Kernels Based on Machine Vision and Deep Learning Technology

# **AUTHOR:** [Ping Lin](https://ieeexplore.ieee.org/author/37088985994); [Yongming Chen](https://ieeexplore.ieee.org/author/37086315497); [Jianqiang He](https://ieeexplore.ieee.org/author/37086314686); [Xiaorong Fu](https://ieeexplore.ieee.org/author/37086421288)

# **DESCRIPTION:**

# In this paper, we present a model of a convolutional neural network for automatic extraction of several features of the rice kernels from a gray image. The system developed convolutional neural network which is consisted of 7 layers and receives a gray image that measures 200 × 200 pixels as its input. Therefore, there are 40000 neurons on the network at the input level. The following layer is convolutional with the set of 6 filters. Next is the subsampling layer with the maximumvalue function. Then, we have one more convolutional layer of 12 filters and the subsampling layer with the maximumvalue function. The final is the fully connected layer of 3 neurons. The convolutional Neural Networks detector developed were able to identify the grain samples at overall average accuracies of 99.52%. The study results have demonstrated the capability and potential of machine vision with well-trained convolutional neural network detector for varietal types identification of rice grain samples. With the comparably high accuracy of classification obtained, a machine vision together with the developed neural network architectures could be used as a tool to achieve better and more objective rice quality evaluation at trading points within the rice marketing system, and it also provide a superior alternative for other research.

# **[4] TITLE:** Identification of Rice Varieties Using Machine Learning Algorithms

# **AUTHOR:** [Naresh Kumar Trivedi](https://ieeexplore.ieee.org/author/37089029164); [Vinay Gautam](https://ieeexplore.ieee.org/author/37089029052); [Abhineet Anand](https://ieeexplore.ieee.org/author/37085432727); [Raj Gaurang Tiwari](https://ieeexplore.ieee.org/author/37089000556); [Prabhneet K. Sohanpal](https://ieeexplore.ieee.org/author/37089725141)

# **DESCRIPTION:**

Rice, one of the world’s most extensively produced grain crops, has numerous genetic variants. These kinds are differentiated from one another based on their characteristics. Typically, these characteristics include texture, form, and color. It is possible to classify and evaluate the quality of seeds based on these qualities. Five types of rice produced often in Turkey were used for the research: Arborio, Basmati, Ipsala, Jasmine, and Karacadag. The dataset contains a total of 7424-grain pictures. Several classification methods were applied with the pre-trained deep architectures. Using the models’ confusion matrix values, statistical results of sensitivity, specificity, prediction, F1 score, accuracy, false positive rate, and false negative rate were calculated and tabulated for each model. The classification success rates were 99.7% for VGG16 CNN with logistic regression classifier. Based on the findings, it is evident that the classification models utilized in the study for rice varieties can be successfully applied in this field.

# **[5] TITLE:** Rice Grain Classification using Image Processing & Machine Learning Techniques

**AUTHOR:** [Biren Arora](https://ieeexplore.ieee.org/author/37088419163); [Nimisha Bhagat](https://ieeexplore.ieee.org/author/37088417906); [L.R. Saritha](https://ieeexplore.ieee.org/author/37089222942); [Sonali Arcot](https://ieeexplore.ieee.org/author/37088418971)

# **DESCRIPTION:**

Rice Grain Classification becomes very important as there are multiple rice grain types available in the market today. Classifying rice grains as per rice types manually is not feasible nor efficient. Classification can be a really tedious task when it comes to doing it manually instead of automatically. This would consume a lot of efforts as well as a lot of time would be wasted. There is a need for an intelligent and smart system which can overcome this difficulty by automating this process. It should be able to identify and classify individual rice grains according to the respective type automatically. The collection of data set should be the primary process. This includes extraction of various parameters of individual rice grains like major axis, minor axis, eccentricity, length, breadth, just to name a few. The system will utilize this information to train the computer. Each rice grain or image would be allocated to its respective class. Classes used in this project are surti kolam, idli rice, long grain basmati and boiled rice. Any rice sample that has been encountered in the system will be first classified and then will be segregated into its respective class. This would keep the entire system organized and segregated. Managing and keeping a track of different rice types is important and its proper classification in an industrial environment becomes crucial. Automating the system would encourage the industry to have future scope for its implementation according to the changes required as per the industry requirements.

# **[6] TITLE:** Rice Blast Disease Detection and Classification Using Machine Learning Algorithm

# **AUTHOR:** [S. Ramesh](https://ieeexplore.ieee.org/author/37089361304); [D. Vydeki](https://ieeexplore.ieee.org/author/37086212335)

# **DESCRIPTION:**

Rice blast disease is the major problem in all over the world of agriculture sector. The early detection of this disease will prevent the huge economic loss for the farmer. This paper proposes a machine learning algorithm to find the symptoms of the disease in the rice plant. Automatic detection of plant disease is carried out using machine learning algorithm. Images of healthy and blast disease affected leaves are taken for the proposed system. The features are extracted for the healthy and disease affected parts of the rice leaf. The total data set consists of 300 images and divided for training and testing purposes. These images are processed with the proposed method and the leaf is categorized as either infected or healthy. The simulation results provide an accuracy of 99% for the blast infected images and 100% for the normal images during the training phase. The testing phase accuracy is found to be 90% and 86% for the infected and healthy images respectively.