

Classification of Pineapple Using Deep Learning

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Abstract: A pineapple is a tropical plant with eatable leafy foods most monetarily critical plant in the family Bromeliaceae. The pineapple is native to South America, where it has been developed for a long time. The acquaintance of the pineapple with Europe in the seventeenth century made it a critical social symbol of extravagance. Since the 1820s, pineapple has been industrially filled in nurseries and numerous tropical manors. Further, it is the third most significant tropical natural product in world creation. In the twentieth century, Hawaii was a prevailing maker of pineapples, particularly for the US, be that as it may, by 2016, Costa Rica, Brazil, and the Philippines represented almost 33% of the world's creation of pineapples. In this paper, machine learning based approach is presented for identifying type pineapple with a dataset that contains 1,311 images use 946 images for training, 197 images for validation and 168 images for testing. A deep learning technique that extensively applied to image recognition was used. use 70% from image for training and 30% from image for validation. Our trained model achieved an accuracy of 100% on a held-out test set.

Keywords: Deep learning, Pineapple, classification, CNN.

INTRODUCTION

Since the dawn of time, humans have been dependent on plants and edible vegetables for survival, but our ancestors have traveled long distances in search of food, and it is not surprising that the first human civilizations began after the invention of agriculture, without crops being able to survive. Modern technologies have given the human community the ability to produce enough food to meet the demand of more than 7.5 billion people. However, with the technological development in botany and the interference in the genetics of plants, a new species of the same plant species has been purified, but in various forms [1,2].

Pineapple is a tropical fruit available in any grocery store and a staple in many homes around the world. Christopher Columbus brought pineapples back to Europe after an expedition to South America. Pineapples became known as an extravagant and exotic fruit, served only at the most lavish of banquets. However, pineapples are now common, and people are able to enjoy them in solid, dried, and juice forms. In Central and South America, pineapple is not only valued for its sweet taste, it has been used for centuries to treat digestion problems and inflammation [3-5].

An Artificial Neural Network (ANN) is a mathematical model that is driven by the functional feature of biological neural networks. A neural network contains an interconnected set of artificial neurons, and it processes information using a connectionist form to computation. As a rule, an ANN is an adaptive system that adjusts its structure based on external or internal data that runs over the network during the learning process. Current neural networks are non-linear numerical data modeling tools [6-8].

Deep learning is an AI science that imitates the workings of the human brain in data processing and production of patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence that has networks of learning skills from uneducated or unstructured data [9-11].

Convolutional Neural Networks (CNNs / ConvNets): Convolutional Neural Networks which are inspired by human visual system are similar to classic neural networks. This architecture has been particularly designed based on the explicit assumption that raw data are two-dimensional (images) that enables us to encode certain properties and also to reduce the number of hyper parameters[12-15].

RELATED WORK

In the study of (Alajrami, Classification of Tomato Using Deep Learning) the model used deep learning to classify five tomato leaves diseases. They achieved a high accuracy in detecting the tomato disease[16].

In the study of (Saman Sarraf, Classification of Alzheimer's Disease using MRI Data and Deep Learning Convolutional Neural Networks model Using Convolutional Neural Network (CNN) and the famous architecture LeNet-5, we successfully classified functional MRI data of Alzheimer's subjects from normal controls where the accuracy of test data on trained data reached 96.85%[17].

in the study of Muttlag, the model has two types of Mango classification approach is presented with a dataset that contains approximately 1200 images using Convolutional Neural Network (CNN) algorithms, an applied to image recognition was used. The

results found that CNN-driven Mango classification applications when used in classification automation it enables people to know the type of mango properly. The trained model achieved an accuracy of 100% on test set [18].

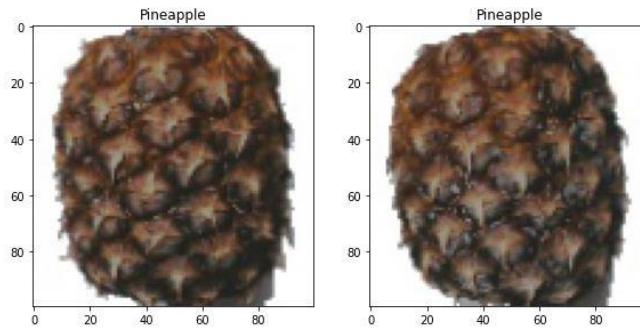
Study Objective

Demonstrating the feasibility of using deep convolutional neural networks to classify type Pineapple In this section we describe the proposed solution as selected convolutional network (ConvNet) architecture and discuss associated design choices and implementation aspects.

Dataset

The dataset used, provided by Kaggle contains a set of 1311 images, for testing belonging to 2 species from pineapple, these images were Splitting into 946 for training ,197 for validation and 168 for testing, there are 2 classes as follow:

- Pineapple Class 0



- Pineapple Mini class 1

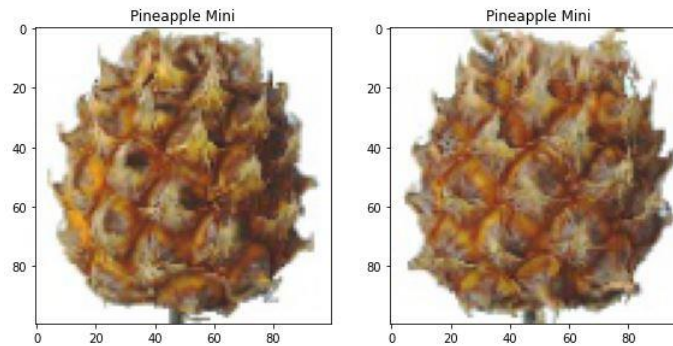
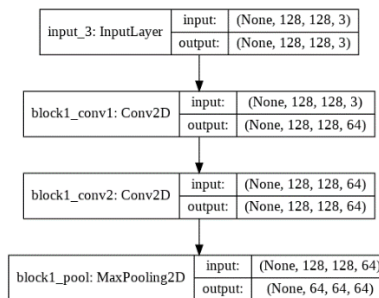


Figure1: Sample of Pineapple images

Model

We used Convolutional Neural Networks - VGG16 application, and for optimizers: Adam and activation: softmax. As following



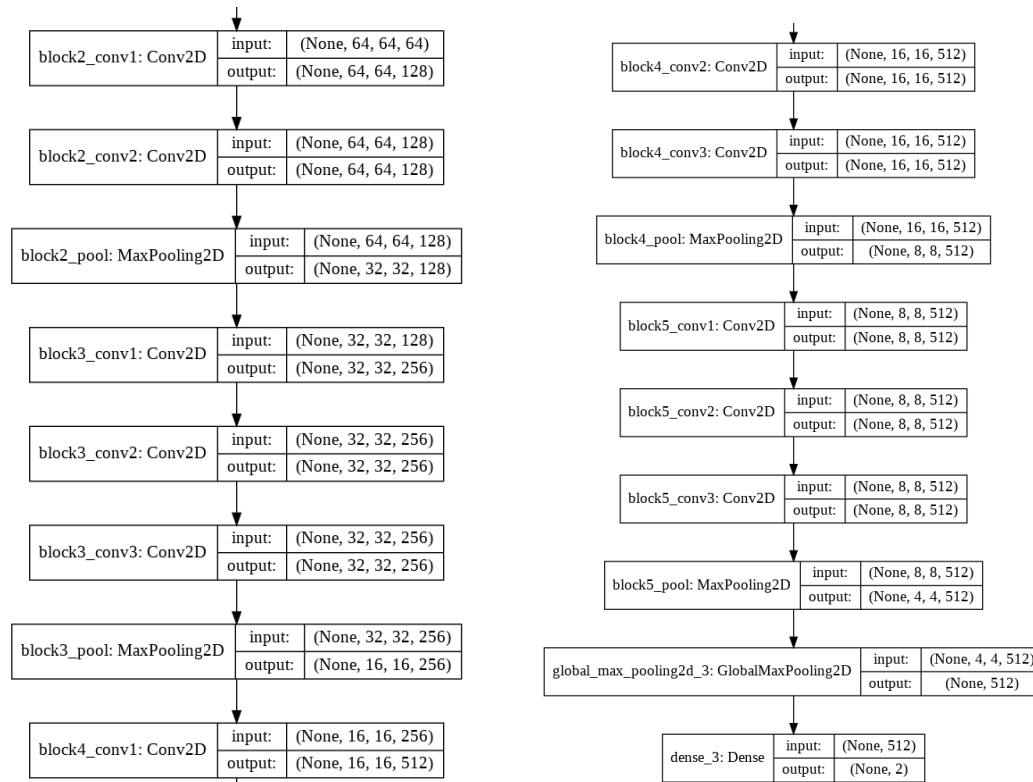


Figure 2: Architecture of VGG 16 model

Results

We used the original Pineapple dataset that consists of 1,311 images after resizing the images to 128x128 pixels. We divided the data into training (70%), validation (30%). The results comes as following. After training this model the result was 100% training Accuracy, 0.0 training loss, 100% Validating Accuracy, 0.0 Validating loss

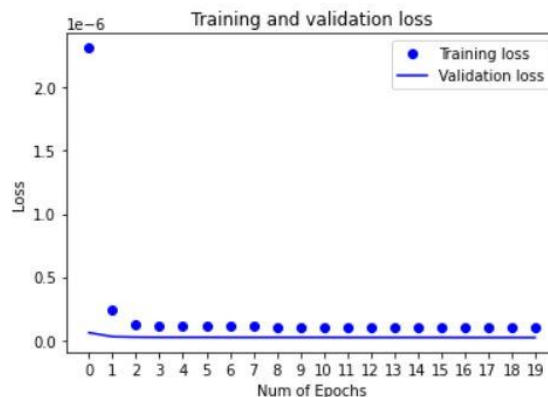


Figure 3: Training and validation Loss

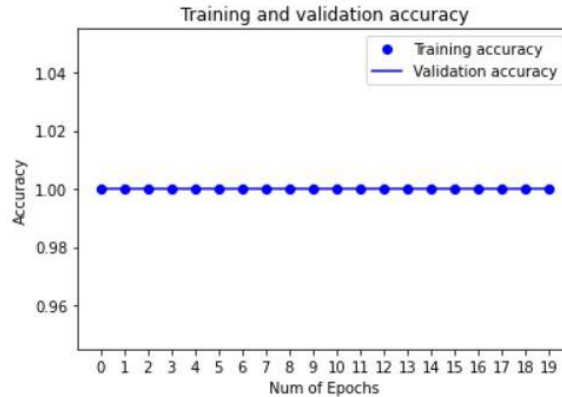


Figure 4: Training and validation Accuracy

After testing this model, the result

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↳ 168/168 [=====] - 1s 8ms/step
Testing Final loss: 0.0000, Testing final accuracy: 1.0000
CPU times: user 852 ms, sys: 11.9 ms, total: 864 ms
Wall time: 1.29 s
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Figure 5: Results of Testing the model

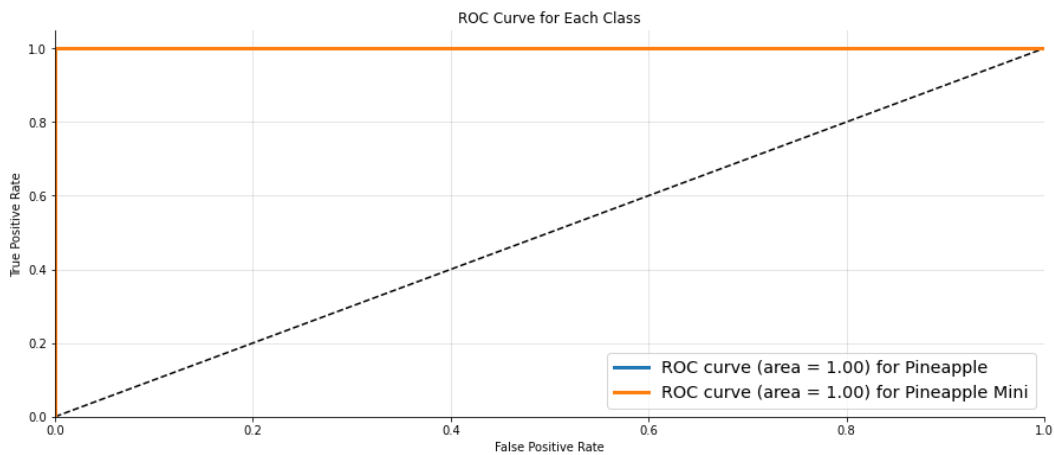


Figure 6: Roc curve

CONCLUSION

We proposed a solution to help people determine the type of Pineapple for more accurately. We have built a model using deep learning (convolutional neural networks), trained, validated tested it. Furthermore, we used this trained model to predict the type of (previously unseen) images of Pineapple. The testing accuracy was 100%.

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