International Journal of Multidisciplinary Engineering in Current Research
Volume 7, Issue 8, August 2022, http://ijmec.com/

Natural Date Fruit Environment Classification Using CNN

1Sampathi Rao Raju & 2Sk Saddam Hussain
1Assistant Professor, Department of CSE, Institute of Aeronautical Engineering (Autonomous) Dundigal, Telangana, Hyderabad. Email: - razsampath@gmail.com
2Assistant Professor, Department of CSE, Institute of Aeronautical Engineering (Autonomous) Dundigal, Telangana, Hyderabad. Email: - saddamhussainshaik573@gmail.com

Abstract
The date Fruit dataset was created to address the requirements of many applications in the pre- harvesting and harvesting stages. The two most important applications are automatic harvesting and visual yield estimation. The dataset is divided into two subsets and each of them is oriented into one of these two applications. The first dataset consists of 8079 images of more than 350 date bunches captured from 29 date palms. The date bunches belong to five date types: Naboot Saif, Khalas, Barhi, Meneifi, and Sullaj. The pictures of date bunches were captured using a color camera in six imaging sessions. The imaging sessions covered all date maturity stages: immature, Khalal, Rutab, and Tamar. The dataset is provided with a large degree of variations to reflect the challenges in natural environments and date Fruit orchards. These variations in images include different angels and scales, different daylight conditions having poor illumination images, and date bunches covered by bags. The dataset is fully labeled according to type, maturity, and harvesting decision. We can use this dataset in many applications including Fruit detection, segmentation, classification, maturity analysis, and automatic harvesting. The second dataset contains images, videos, and weight measurements to help in many applications such as yield estimation. In this dataset, we marked date bunches for selected palms, recorded 360° video for each palm, and measured their data (height, trunk circumference, total yield, number of bunches, and weight of bunches). We also captured images of each bunch from different angles before harvesting and on a graph paper after harvesting. Both datasets have been arranged with a coding scheme to simplify referring, linking, and facilitating future extensions.

Keywords: - CNN, Deep learning, Categorized dataset.

1.INTRODUCTION

In recent trends identification of food objects from the images is a popular and trending research topic, because of the food identification will help for the different purposes like name recognition, for calorie estimation, identification of the types of ingredients etc. In this paper focus on the identification of the calorie identification using CNN approach. Generally, in machine learning techniques are depends on the four level approaches. First step is collection of the Input data. In this step we collect the input records which are labeled and supervised data. In second step, Feature Extraction is the process of identify the features for classifications. We define the class labels and other attributes which are depend on the class labels, the analyzers will define the feature selections model. Next step classify with any Machine learning algorithm. Based on the classification in the classification algorithm we can predict the result according to the given test data. In Fig

International Journal of Multidisciplinary Engineering in Current Research
Volume 7, Issue 8, August 2022, http://ijmec.com/

1 described clearly about the basic Machine Learning technique.

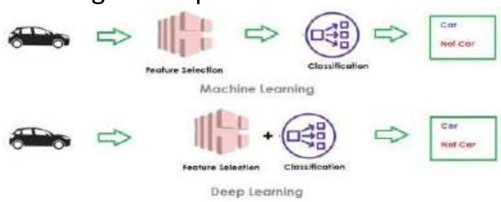


Fig 1. Machine Learning vs. Deep Learning

In our paper we demonstrated our prediction concept Deep Learning concepts. Deep Learning is the concept which includes three major steps. First one is same like Machine Learning, collection of the input data. But here we can also provide unstructured and unlabeled data like images, text etc. In second step we can combine the Feature Extraction and Classification algorithm. In Machine Learning the analyst define the features of the input data, but here the collection and extraction of the features of the input data no need to define, the features will automatically structured and extracted. In the last phase prediction will same as Machine learning, prediction of the result according to the classifications.

For object identification CNN models have achieved lot of goals by comparatively Machine Learning models. Many applications have implemented CNN models for object identifications like face recognitions, identification facial expression etc. By taking motivations of those literatures we are implementing food image identification for calories detection.

2. RELATED WORK

Miyazaki et al. [1] proposed dietary management application that can manage the user's meals of the every day by storing and analyzing images of the meals. In this concept authors proposed the Dietary Application which will collect the features from the images, and apply the classification algorithm of k-means to form the clusters. Here they used concept of BoF, it means it collect the Bag of Features mainly depends on the color and shapes of the food items, by the time of the prediction of the food it will convert it to the pixels and compare with the existing food category images. In this they taken the food images of five categories those are grains, meat, Fruit s, vegetables and dairy products.

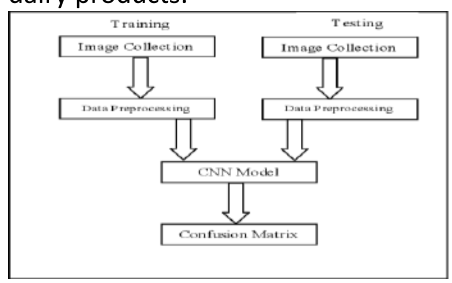


Fig 2: Overview of Dietary Application

In this survey food image will convert into pixels and it turns to futures like colors and shapes like circle area etc. Application will store the images and data of the images in the form of the SV means servings. As per we discussed in the introduction this concept was depend on the features classification the will developer has to be set.

Chen et al. [1] proposed dietary management concept by using machine learning classification that can identification of the food for calories estimation by analyzing images of the food. In this concept authors proposed the Dietary Application which will collect the features from the images, and apply the classification algorithm of Support Vector Machine.

3. PROPOSED FRAMEWORK

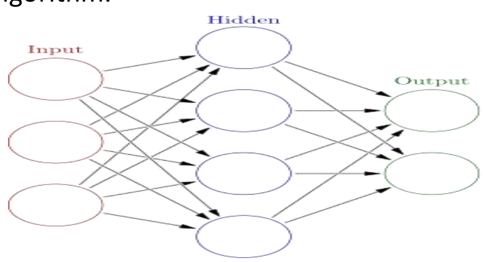
Deep Learning is a part of the Artificial Intelligence that will used to build neural model features for prediction of the data from the unstructured data. In this model we are using CNN (Convolutional Neural Networks) for prediction of the food item from the image.

International Journal of Multidisciplinary Engineering in Current Research
Volume 7, Issue 8, August 2022, http://ijmec.com/

Based on the food name from the image we calculate the calories of the of food item. Based on the collection of the image dataset for training using CNN we can get the accurate results.

4. METHODOLOGY

Convolution Neural Networks or covnets are a dynamic type of neural networks concepts which are most useful for image processing and natural language processing. It was unique and completely different than neural networks algorithm.



In normal neural networks algorithm consist 3 layers, those are input, hidden and output layer. In the input layer it will collect in input data, and in the hidden layers, a process or calculations done for the prediction, in output layer result will generate. For training and prediction we need set the features of the data in hidden features. But in the CNN Features will automatically calculate according the input data.

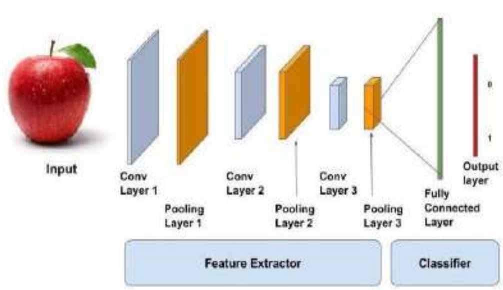


Fig. 4: CNN block diagram

Types of layers in CNN:

- **Input Layer**:

In this layer it holds the raw data for

Fig 3. Model of Neural Networks

input.

•Convolution Layer

In this layer, we can build the core block of the input data, this layer have a set of kernels means learnable filters using the small blocks of the data, and learn features of the data.

•Activation Function Layer

This layer will apply element wise activation function to the output of convolution layer. Some common activation functions are RELU, Sigmoid, Tanh, Leaky RELU, etc.

- **Pool Layer**

Pooling layers are used extract the features from the single size of the data splitting to multiple layer. We can get the features of the data and reduce computation cost.

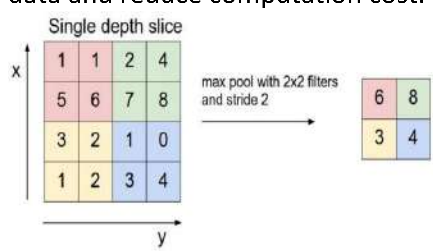


Fig 6: Pooling Layer

In this above example the data [1,1,5,6] convert to one set as 6, and [2,4,7,8] also convert to 8.

For input layer, we have taken 10,000 images of 10 categories of the food items.

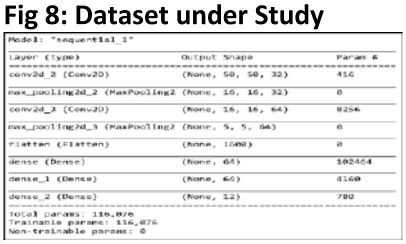
Fig 7: Snapshot of Images of the 'beignets' category images of training dataset.

Based on dataset we create training model using CNN

5. EXPERIMENTAL RESULTS

Class No.	Class Name	Training Image Dataset	Testing Image Dataset
0	OverRipeBanana	811	151
1	OverRipeGuava	1219	328
2	OverRipeMango	573	152
3	OverRipePapaya	433	108
4	RawBanana	1073	237

Fig 8: Dataset under Study



Model: "sequential_1"

Layer (type)	Output Shape	Param #
conv2d_2 (Conv2D)	(None, 50, 50, 32)	416
max_pooling2d_2 (MaxPooling2	(None, 16, 16, 32)	0
conv2d_3 (Conv2D)	(None, 16, 16, 64)	8256
max_pooling2d_3 (MaxPooling2	(None, 5, 5, 64)	0
flatten (Flatten)	(None, 1600)	0
dense (Dense)	(None, 64)	102464
dense_1 (Dense)	(None, 64)	4160
dense_2 (Dense)	(None, 12)	780

Total params: 116,076
Trainable params: 116,076
Non-trainable params: 0

Fig 9: Model of CNN

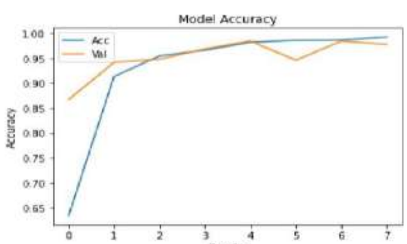


Fig:10 Model Accuracy

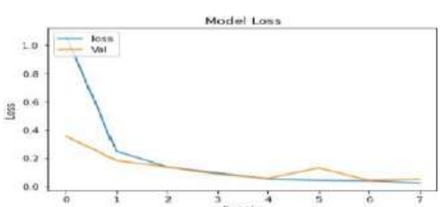


Fig:11 Model Loss Accuracy

6.CONCLUSION

Over proposed based on deep learning. The framework consisted of three models used to classify date fruit bunches according to their type, maturity, and harvesting decision. Transfer learning with fine-tuning was used in the classification tasks. Two pre-trained CNN models were investigated, namely AlexNet and VGG-16. To build a robust machine vision system, we used a rich image dataset of five date types for all maturity stages. The dataset was designed with a large degree of variation that represents the challenges in natural environments and date fruit orchards.

7.FUTURE WORK

As for future work, we will improve the dataset by including testing images captured from different date orchards. We will also investigate more recent CNN models to minimize the usage of memory and lower computational complexity. One more area to investigate is the confusion in the maturity detection of date fruit, including labeling rules, and the interference among maturity stages.

REFERENCES

[1] Food and Agriculture Organization Corporate Statistical. (2016). FAO- STAT. Accessed: Oct. 18, 2018. [Online]. Available: http://www. fao.org/faostat/en/#data/QC

[2] Z. Abdelouahhab and E. Arias-Jimenez, Date Palm Cultivation, 1st ed.Rome, Italy: FAO, 2002.

[3] A. Al-Janobi and A. Abdulwahed, ``Evaluation of eld test of harvesting system for picking dates fruits based on robotic arm,'' in Proc.Int. Conf. Robot. Associated High-Technol. Equip. Agricult., Sep. 2012,pp. 183188.

[4] K. Kapach, E. Barnea, R. Mairon, Y. Edan, and O. Ben-Shahar``Computervision for fruit harvesting robotsState of the art and

challenges ahead,''Int. J. Comput. Vis. Robot., vol. 3, no. 1, pp. 434, Apr. 2012.

[5] P. Rajendra, N. Kondo, K. Ninomiya, J. Kamata, M. Kurita, T. Shiigi,S. Hayashi, H. Yoshida, and Y. Kohno, ``Machine vision algorithm for robots to harvest strawberries in tabletop culture greenhouses,'' Eng. Agricult., Environ. Food, vol. 2, no. 5, pp. 2430, Dec. 2008.

[6] S. S. Mehta and T. F. Burks, ``Vision-based control of robotic manipulator for citrus harvesting,'' Comput. Electron. Agricult., vol. 102, pp. 146158 Mar. 2014.

[7] D. M. Bulanon, T. Kataoka, H. Okamoto, and S. Hata, ``Development of a real-time machine vision system for theapple harvesting robot,'' in Proc. Annu. Conf., Aug. 2004, pp. 595598.

[8] A. I. Hobani, A. Thottam, and K. Ahmed, ``Development of a neural network classier for date fruit varieties using some physical attributes,'' in Proc. Res. Bull. Agric. Res. Center, 2003, pp. 518.

[9] M. Fadel, ``Date fruits classication using probabilistic neural networks,'' Agric. Eng. Int. CIGR J., vol. 9, p. 1989, Dec. 2007.

[10] G. Muhammad, ``Date fruits classication using texture descriptors and shape-size features,'' Eng. Appl. Artif. Intell., vol. 37, pp. 361367, Jan. 2015.