# DEEP LEARNING APPROACH FOR RECOGNITION OF HAOR FISHES IN BANGLADESH

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY**

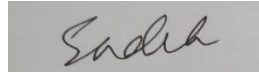**DHAKA, BANGLADESH**

**SEPTEMBER 2021**

# APPROVAL

This Intern titled **"Deep Learning Approach for Recognition of Haor Fishes in Bangladesh"** submitted by Md Shahadat Ali Mridha, ID No: 151-15-5107 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 09-09-2021.

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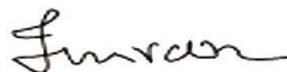
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# DECLARATION

It is hereby declared that the work presented in this internship report is done by me under the supervision of **Abdus Sattar, Assistant Professor, Department of CSE**, Daffodil International University, in partial fulfilment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.
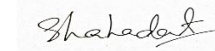
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# ABSTRACT

This thesis titled "Deep Learning Approach for Recognition of Haor Fishes in Bangladesh" is a vital point in Computer Science & Engineering a lot as well as Fisheries. We think about the food arrangement of Bangladeshi propensities requires different fishes. There we have the species centered at Haors. This species Acknowledgment of various fishes with high precision provides so many detail facts to all. Despite, the result of the perplexing picture of haor fishes, the comparability between the various types of fishes, and the distinctions among similar types of haor fishes, there are a few difficulties in the acknowledgement of fish pictures. This haor fish acknowledgement is essentially founded on the three elements: head, body and tail, which look for peoples to get acknowledgement for choosing highlights. Also, about exactness, that need not extremely lofty. For the pledge, I take the advantage of this exchange studying alternatives for training again haor fish classification datasets in perception of version 3.0 Inception model of TensorF1ow period. which can extraordinarily work on the exactness of fish acknowledgement. I have utilized Google's Inception-v3 model prepared on 3500 pictures covering 135 unique fishes. I retrained the Inception model to characterize the fish pictures, utilizing the TensorF1ow Library and accomplished a general exactness of close to 99% on the pictures.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Preface

A rummer or the saucer-shaped superficial wetland called for a back swamp is the Haor. This is the wetland environment of the northeastern Bangladeshi side. Normally Haors are gotten its surface raised in the rainstorms become tremendous expansions of violent waters from the flood of waterways. They change into the immense profounds inwardly, which shows the whole areas having like some tiny islands. This haor area in Bangladesh have the huge expansion of green crops field during the winter. Which lie in the floodplain of three incredible waterways in Bangladesh. The Bengali language has a little term to separate between those lakes, including haor, baor, beel and jheel. Each of the four is a sort of comparative freshwater wetlands. The line of contrast between a haor, a baor and a beel is normally exceptionally meagre.

The fishes from various origins for various biodiversity and wetland areas around the world have various identification. Here, we have searched for the Haor. Because this helps to balance the species of fish and also in the wetland biodiversity. Haors are a significant residency for sustaining biodiversity. About 1.99 million ha (19,998 sq km) of the area and 19.37 million people are accommodating this unique hydro-ecological characteristic. This provides direct and indirect benefits to human activities.

In Bangladesh, people are quite familiar with the species of Haor fishes. Every haor fish has different attributes and appearances. These haor fishes vary significantly from each other. It is really a problem for non-Waterland people to identify haor fishes. People of the different areas tend to identify themselves with their own.

## 1.2 Motivation

The method involved with perceiving haor fishes and the extraction of data from the fish image is very intriguing as Sick like difficult disclosure. Humans have begun to look for the capacity of programmed haor fish acknowledgement utilizing computer technology by the improvement of technology innovation, also in advanced innovation processing of image. For this purpose, I have decided to research this topic and I think this research knowledge will help us in future to make a better and accurate support system that will help our people and all over the world. A definitive objective of our examination is to foster another procedure to recognize haor fishes consequently by using new methods of PC Vision and AI and further developing precision. The principle mechanical advancement is a study-based profound for fish image acknowledgement calculations is known for this proposition.

## 1.3 The Rationale of the Study

In our thesis, Inception-v3 of TensorF1ow is called for the transfer learning technique is used to keep the method over the data set as an example of five haor fish species, locally known as Kalibaush, Nandina, Khoksa, Gajal Mach, Chela Mach.

## 1.4 Research Questions

How to choose the best topic that may suits best to one's ability and desire and how to involve students with new research trending topics?

## 1.5 Expected Outcome

Universities and research institutions can discover the papers, which are most pertinent to their thesis or research projects, which will be the main outcome of this research. So,

searching for the exact papers to read becomes a very significant part of their academic studies and introducing trending and upcoming research topics impacts their thought. 'Deep Learning Approach for Recognition of Haor Fishes of Bangladesh' help these people to find out the most pertinent papers and saving their valuable time. In addition, it can explore more talked buzz, used the topic in recent times, which motivates them to work with new problems, finding new solutions, and help the students who are confused about their field of interest. There are many algorithms and techniques to extract the best information and knowledge from a massive number of collected data in computer vision. However, when I conduct them for the classification, I have to calculate the accurate result. For this research, I am using here one model for our data set and find out the best result but this is the prediction and a continuous process or result which totally depends on the data set and attribute.

## 1.6 Report Layout

In chapter 1, the Introduction is discussed of haor fishes, the rationale of the study, motivation, research questions and the expected result of the thesis. And later on, it is followed by the report layout.

The residuum of this report arrangement is as follows as-

In the second chapter, the Background of my research topic is discussed. This chapter also deals with the literature review, concise of research, problem scoping and the challenges.

In chapter three, I will explain the methodologies that are employed in my study.

In chapter four, I will explain the obtained results and discussion.

At last, chapter five have some work scopes for the future, conclusion & recommendations are explained

# CHAPTER 2
# BACKGROUND

## 2.1 Preface

I have opened a version 3.0 Inception strategy for using TensorF1ow stage, which is utilized by Convolutional Neural Network. The Google's GBT (google brain team) creates the TensorF1ow, which is a free source package library. For the purpose of accurate and faster studying machine in numerical computing, This is developed with examined relationship of the Machine Learning technology from Google. TensorF1ow meets by gathering improvement methods in polynomial math. Also simplifying the estimation of numerous numerical articulations. Because, of a time expected issue for achieving required computation.

Google developed the Inception artifice of version 3.0 during 2015, which immeasurably utilize picture by distinguishing proof organization technique for introducing and after getting more about 78.1 exactness rate. This also follows the dataset of image-net. This basically combines all of the cycles pre and post error result. That's why, this extraordinary model is created by the top scientists with extreme and exceptional thoughts through a long term. "Rethinking the Inception Architectre for Computer Vision" by Christian Szegedy published the first research paper ever, based on the version 3.0 Inception model.
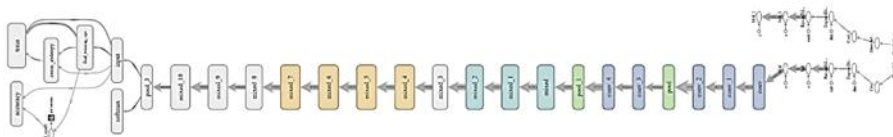


Figure 2.1.1: TensorF1ow Inception-v3 model main graph

Move learning is the utilization of information acquired from doing one job to help in tackling an alternate yet related issue. Algorithm development helps the process of TL(Transfer Learning), which gets the technicians attempts of machine learning. The ML (Machine Learning) technicians usually try to get most accurate making as possible as similar with human for the ML (machine learning). As an instance, A ML perceives buses or cars by collecting all information. After acquiring, that will change into other

ML models, which perceive different kinds of vehicles, for example, truck. Contrasted and Conventional NN (neural organization), this should be utilized the base measure among information for the sake of prepare Inception V3 to gain the most noteworthy exactness with little time preparing.

The CNN is the profound counterfeit artificial organization models, basically used essentially for separating pictures, bouquet them as per comparability, and achieve object identity inside scenes. A Convolutional neural organization (CNN) comprises single or various convolutional layers and afterwards it is trailed with the standard numerous layer neural organization by single or different tiers. That also gains picture information particularly. The neural organization can be ready to do picture examination assignments including object identification, arrangement, division, and picture preparing.

To build Convolution Network architectures like Non-Linearity Layer, Convolutional Layer, Rectification Layer, Dropout Tier and many more are regularly using.
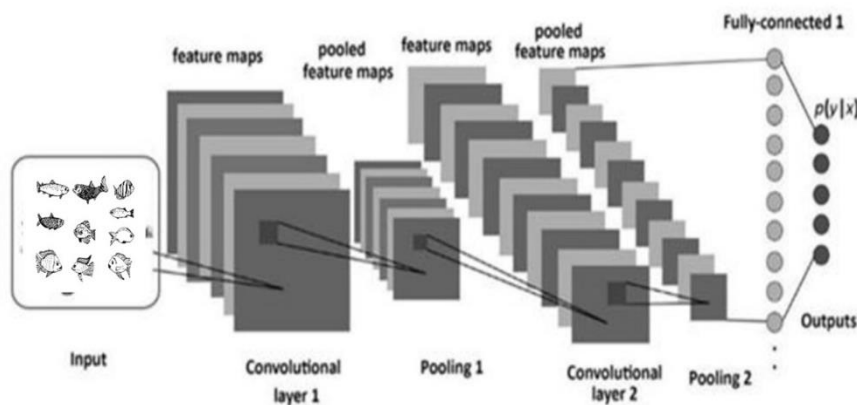


Figure 2.1.2: Convolutional neural networks (CNN) architecture

The folding tiers principle work defines for recognizing previous neighborhood tier components synchronism. Also, for arranging the countenance for producing a component map. For creating local receptive fields with the CNN, the picture is divided into perception's and at last, shorten into perceptions with a feature map size $m_2 \times m_3$. So, the map stores the collected data, there the property happens on those pictures and how I'll meet this to a strainer. Thus, every one of the channels is prepared locally regarding the portion situation, where that driven to.

Every tier contains the $m_1$ shaft channels, Complete channels engaged with single phase, which equals with portion output elevation maps. Every channel recognizes a fix component to each position for the input. The tier output comprises and include guide size. $i^{th}$ include a map, denoted $Y_i^{(l)}$, is processed as-

$$Y_i^{(l)} = B_i^{(l)} + \sum_{j=1}^{m_1^{(l-1)}} K * Y_j^{(l-1)} \qquad \text{.............. [i]}$$

There $B_i^{(l)}$ is the bias matrix. And $K_{i,j}^{(l)}$ is the filter size $2h_1^{(l)} + 1 \times 2h_2^{(l)} + 1$ attaching $j^{th}$ characteristic map in the layer $(l-1)$ with the $i^{th}$ included location to the tier.

Common tier shows liablity about diminishing the enactment location's local size. Common tier has 2 hyper parameters, channel's spatial degree $F^{(l)}$ & $S^{(l)}$. This has been taken input property as $m_1^{(l-1)} \times m_2^{(l-1)} \times m_3^{(l-1)}$. Also, it serves by giving a bounty property value as $m_1^{(l)} \times m_2^{(l)} \times m_3^{(l)}$. where-

$$m_1^{(l)} = m_1^{(l-1)} \qquad \text{.......... [ii]}$$

$$m_2^{(l)} = m_2^{(l-1)} - F^{(l)}) / S^{(l)} + 1 \qquad \text{.......... [iii]}$$

$$m_3^{(l)} = (m_3^{(l-1)} - F^{(l)}) / S^{(l)} + 1 \qquad \text{.......... [iv]}$$

The point of the absolute completely associated design need to tally light boundaries for making mathematical contribution probability portrayal for every group which normally depends on actuation locations. Thats produced with a convolutional link, correction, nonlinearity, and common tiers. In case, totally associated tier $l-1$;

$$y_i^{(l)} = f\left(z_i^{(l)}\right)$$

$$\text{With } z_i^{(l)} = \sum_{j=1}^{m_1^{(l-1)}} w_{i,j}^{(l)} y_i^{(l-1)} \qquad \text{........[v]}$$

In a different way,

$$y_i^{(l)} = f(z_i^{(l)} \text{ with } z_i^{(l)} = \sum_{}^{m_1^{(l-1)}} \sum_{}^{m_2^{(l-1)}} \sum_{}^{m_3^{(l-1)}} w_{i,j,r,s}^{(l)}\left(Y_i^{(l-1)}\right)$$

There, j=1, 4=1 & s=1

## 2.2 Related Works

In most recent years, many new featured works created for computer vision to facilitate the work of programmed object acknowledgement, among which fish picture acknowledgement has as of late acquired a lot of significance. Thus, a lot of work could not perceive a best work about haor fishes.

Various examination and research for various classifications are utilized for the Inception v3.0. At the year of 2017, 'Xiaoling Xia' & 'Cui Xu' from computer science colleges and Donghua University utilized changing study strategy for retraining TensorF1ow Incption v.3.0 structure for the blossom class data sets in Oxford as O-(17&102) Bloom Characterization. The model order accuracy reflects 96% in O-(17) bloom data set, also 95% in the O-(102) blossom data set.

During 2017, Alwyn Mathhew, Jimson Mathew from VTPL (vuelogix technolgies pvt ltd) used the TensorF1ow profound studying system for preparing, approving and testing organization to Interruption Recognition. Structure accuracy shows 96.3% result. The brought in net is observed for getting more earnestly prepare because of disappearing slope and debasement issues. Brady Kieffer, Morteza Babaie utilized Convolutional Neural Network with Origin version-3 structure in Picture Order. A11 investigations are completed with the data set of KP24(kimia_Path24). Following structure shown for 55.99% accuracy result.

Xiao-Ling xiia, Cui Xu worked during 2017 in the TensorF1ow. Worked for the face Express illusion acknowledgement based in version 3.0 Inception structure. Cohn_Kanade (CK+) data set is used for the choosed 1090 pictures face express illusion. Accuracy for the nondynamic series showed 98%, though it affects other dynamic series.

Bat-Erdene. B & Ganbat.Ts dealt with Successful PC Model at 2016 for Perceiving Identity from the Front facing Picture. Both are utilized Support Vector Machine, Active Appearance Model, Active Shape Model. Accuracy result reflects 87.5%. Investigation behaved physically. The pictures face needs to front-facing, also having of low & cool light, need to ensure that doesn't getting turning point.

Main point of my examination is for giving an appropriate strategy to precise mechanization of Identification of Haor fishes as the first work of its kind.

## 2.3 Research Concise

For doing our research, I studied several research papers, articles, books, and conference papers. In this section, I explained the forethought of others research and their outcome. Also, I discussed the problem scope with the challenges and the background overview. Many researchers applied the same algorithms on the same dataset in computer vision. Sometimes the same dataset and same algorithms can give different types of results. Therefore, it is very confusing. Many researchers used the Inceptn-v3 model on distinct datasets.

Some authors, in a paper they did not write enough information about the method and algorithm they used. It creates a critical situation for re-implement or re-used the algorithm. Later, different embodiments are used in the same method that might create varieties in output. A little change in datasets, methods or user inputs prophesies creates a bigger change in the representation of the methods. Therefore, selecting the perfect approaches is a significant task.

## 2.4 Scope of the Problem

While doing my research, I found that selecting the actual research field from the huge ocean of knowledge fields for an unacquainted person is quite difficult. There are numerous knowledge fields where a researcher needs to do research. However, that could not able to choose most of the cases. Therefore, in colleges, universities and research institutions, professors, graduate students, and other researchers got to find the papers that are most pertinent to their research projects. In their academic lives, looking for the exact papers to read becomes a very significant part. This research paper 'Deep Learning Approach for Recognition of Haor Fishes in Bangladesh' from Fish Images will help these people in utilizing their precious time and the most pertinent papers. There are many related works. However, no works have taken enough pertinent information about research papers into the solicitation. In addition, most of the researcher's research on the data set is the same.

## 2.5 Challenges

Distinguishing proof of haor fishes from pictures is quite difficult for Computer Vision analysts with applications in various areas. Specifically, haor fish acknowledgement is turning out to be increasingly more critical due to the key job that it plays in the field of Fisheries. In this research paper, I address the investigation of haor fishes picture preparing according to the viewpoint of the Computer Vision. The haor fish recognizable proof is a difficult errand since the fish presents high changeability and natural deformability. The picture portrayal used to naturally comprehend haor fish pictures assumes the main part. To track down a reasonable portrayal of haor fish pictures it is important to have agent datasets with a high assortment of animal varieties. Basically, in an exploration paper/field like conspicuous verification, the structure needs to use a significant dataset.

Numerous haor fish datasets are made out of pictures gathered through the Web (e.g., downloaded from Interpersonal organizations) have typically low goals and have been handled by the clients with imaginative or improvement channels. The enormous test for this exploration is gathering information from the web. A large portion of the crude information is boisterous. Furthermore, there is additionally some unusable information.

After collecting the data, the main challenge is processing these.

# CHAPTER 3
# RESEARCH METHODOLOGY

## 3.1 Preface

Models are most significant fact for the classification. Choosing the appropriate model is very difficult. In this chapter, I am going to describe the models used for this project in the implementation requirement part. I will also discuss the phases of my working process and the data collection method. In addition, the chapter elaborates on the statistical analysis. Research subject and instrumentation are additionally remembered for this section. The working method of the two models is shown with simple block diagrams.

## 3.2 Research Subject and Instrumentation

Inception-v3, the method of the TensorF1ow platform is the base of this research project.

Computer vision has some advantages:

- Simpler and faster processes

- Reliable

- Higher accuracy

- Wide range of use

- Reduction of costs

**Efficiency and scalability of computer vision models-**

They are:

- insanely small

- insanely fast

- remarkably accurate

- easy to tune for resources vs. accuracy

**Tools or instruments-**

For this research, I am using a 2GHz Intel i5 processor, 4GB memory, 1600MHz DDR3, Operating System- 64 bit and Processor- x64 based.

## 3.3 Working Process Steps

I used to retrain the model named Inception-v3 in a specific way. I've shown the diagrammatic representation of my working model below, which explains the required methodology:



Figure 3.3.1: Flowchart of the proposed models

The whole working method is something like this, I cropped images according to the specific parts of the fish that I want to train, then I resized images 500x500px and separated the dataset with the same label.

## 3.4 Data Collection Procedure

**Dataset**

Bangladesh has several species of haor fish. North East area has in total of 83 species of fishes have been recorded from the study site belonging to 55 genera, 28 families and 9 orders were accounted. We have found Our dataset is composed of the five most known haor fishes. They are locally known as Kalibaush, Nandina, Khoksa, Gajal Mach, Chela Mach. I collected the data from the internet. The images below represent a little part of my dataset.
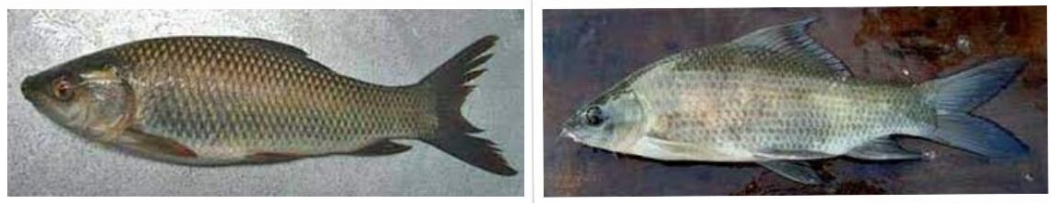
Kalibaush *(Labeo calbasu)*



Gajal Mach



Chela Mach

Nandina



Khoksa

Figure 3.4.1: A portion of my dataset of Haor fishes Identification

**Pre-processing of Data**

Picture pre-preparing is a huge stage to advance the impact of picture grouping. The learning technique for CNN coordinates the execution of my action in move learning, in this way in the picture pre-preparing move I have named and resized the pictures for preparing and testing from chosen clear pictures.

## 3.5 Statistical Analysis

Statistical analysis is a component of data analytics. For recognizing different haor fishes, I gathered around 80 images per of 134 haor fishes. Each of the items contains around 120 images. I have extended those images into 3500 images by image augmentation.
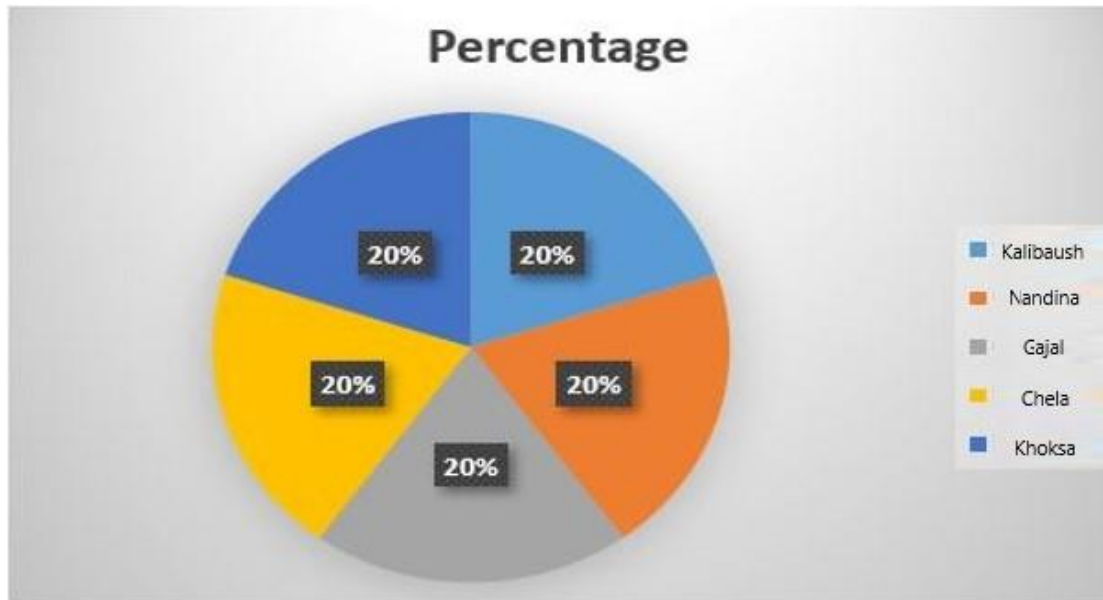
Figure 5: Image percentage per label

Figure 3.5.1: Image percentage per label

## 3.6 Implementation Requirements

**Model installation**

For the implementation, firstly I have downloaded and installed TensorF1ow. Hence, I have downloaded the Inception-v3 model and installed it. I have likewise utilized the exchange learning model which takes itself a previous tier system with having ousted last Incption version-3.0 structure. At that point, then need to train again for the last tier.

**Dissection of Model**

I need to utilize some Library and modules of "Python" with "TensorF1ow" Framework to fabricate and run the models. For example, "numpy"," hashlib", "OS", "datetime", "sys" and so on.

The use of those libraries and module on the python code are shown in the figure given below:

```
 93  from __future__ import absolute_import
 94  from __future__ import division
 95  from __future__ import print_function
 96
 97  import argparse
 98  import collections
 99  from datetime import datetime
100  import hashlib
101  import os.path
102  import random
103  import re
104  import sys
105  import tarfile
106
107  import numpy as np
108  from six.moves import urllib
109  import tensorflow as tf
110
111  from tensorflow.python.framework import graph_util
112  from tensorflow.python.framework import tensor_shape
113  from tensorflow.python.platform import gfile
114  from tensorflow.python.util import compat
```

Figure 3.6.1: Used libraries and modules

To separate "training" "testing" and "validation" data from our dataset used a function named "create_image_list()". It breaks down the subfolders in the gave picture registry, isolates all of them for preparing, approval, offers back and static checking information formation clarifying all pictures quantities with both every tag and the methodologies. Code of separating directories and Image formats for reading images are given below:

```python
125  def create_image_lists(image_dir, testing_percentage, validation_percentage):
126    if not gfile.Exists(image_dir):
127      tf.logging.error("Image directory '" + image_dir + "' not found.")
128      return None
129    result = collections.OrderedDict()
130    sub_dirs = [
131      os.path.join(image_dir,item)
132      for item in gfile.ListDirectory(image_dir)]
133    sub_dirs = sorted(item for item in sub_dirs
134                      if gfile.IsDirectory(item))
135    for sub_dir in sub_dirs:
136      extensions = ['jpg', 'jpeg', 'JPG', 'JPEG']
137      file_list = []
138      dir_name = os.path.basename(sub_dir)
139      if dir_name == image_dir:
140        continue
141      tf.logging.info("Looking for images in '" + dir_name + "'")
142      for extension in extensions:
143        file_glob = os.path.join(image_dir, dir_name, '*.' + extension)
144        file_list.extend(gfile.Glob(file_glob))
145      if not file_list:
146        tf.logging.warning('No files found')
147        continue
148      if len(file_list) < 20:
149        tf.logging.warning('WARNING: Folder has less than 20 images, which may cause issues.')
150      elif len(file_list) > MAX_NUM_IMAGES_PER_CLASS:
151        tf.logging.warning('WARNING: Folder {} has more than {} images. Some images will '
152              'never be selected.'.format(dir_name, MAX_NUM_IMAGES_PER_CLASS))
153      label_name = re.sub(r'[^a-z0-9]+', ' ', dir_name.lower())
154      training_images = []
155      testing_images = []
156      validation_images = []
157      for file_name in file_list:
158        base_name = os.path.basename(file_name)
159
160        hash_name = re.sub(r'_nohash_.*$', '', file_name)
161        hash_name_hashed = hashlib.sha1(compat.as_bytes(hash_name)).hexdigest()
162        percentage_hash = ((int(hash_name_hashed, 16) %
163                            (MAX_NUM_IMAGES_PER_CLASS + 1)) *
164                            (100.0 / MAX_NUM_IMAGES_PER_CLASS))
165        if percentage_hash < validation_percentage:
166          validation_images.append(base_name)
167        elif percentage_hash < (testing_percentage + validation_percentage):
168          testing_images.append(base_name)
169        else:
170          training_images.append(base_name)
171      result[label_name] = {
172          'dir': dir_name,
173          'training': training_images,
174          'testing': testing_images,
175          'validation': validation_images,
176      }
177    return result
```

Figure 3.6.2: Dataset parting and Image design characterizing

The function reflect this following scenario- (create image lists) creates a image list (validation percentage) shows the validation, (testing percntage) shows the test and (image dir) shows image directory"

Arguments:

Picture dir: String way to an organizer containing subfolders of pictures.

Testing rate: Whole number level of the pictures to save for tests.

Approval rate: Whole number level of pictures saved for approval.

Returns:

A word reference containing a section have name, pictures within a sub-folder dividation into preparing, checking, ensuring and approval inside every mark.

**Model train**

In this movement, firstly I kept all last tier boundaries, secondly at that point I removed end tier. Thirdly sent info to the data batch for retraining upcoming end tier. The Back-propogation calculation prepares the structure's end. By computing blunder within softmaax tier yield for maintaining incorporate value boundary usually driven by cost work of cross entropy, where also have required mark vactor classification

# CHAPTER 4
# EXPERIMENTAL DISCUSSION AND RESULT

## 4.1 Preface

I have implemented an efficient fish species by little teaching period for the acknowledgement model, also acquired the maximum validity. At the bottom of this chapter, one will understand the reason behind choosing the proposed model and its function in this project. I can find out the best model with the best accurate result by using different types of datasets. Hope next researchers will follow it and research on new data.

## 4.2 Experimental Results

The varieties in precision dependent on cross-entropy in our prepared dataset for the Inception-v3 model are shown in Figure VIII and Figure IV respectively.
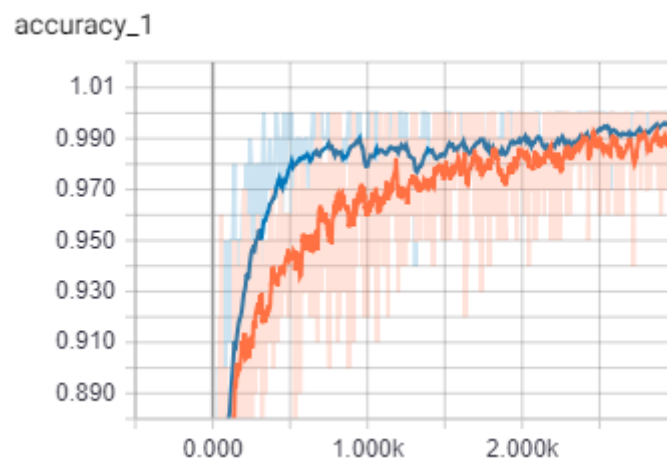


Figure 4.2.1: Inception-v3 changing of training & validation set

The preparation & approval group addressed with the Lakshmi and Anil linear color respectively
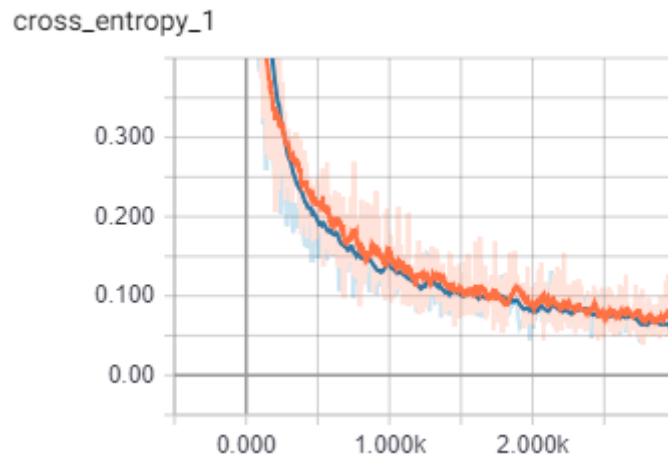
Figure 4.2.2: Inception-v3 cross entropy variation

The figure portrayal displayed an accompanying tablebox:

TABLE 4.2.1: FIGURE DESCRIPTION

| Set of Data | Exponent | Inception-v3 Performance |
|---|---|---|
| Set of Data | Training batch accuracy | 98% |
| | Validation batch accuracy | 93% to 96% |
| | Cross entrpy of accuracy batch | 23 |
| | Cross entrpy of formulation batch | 0.07 |

## 4.3 Descriptive Analysis

For my dataset, the preparation exactness for Inception-v3 came to close to 100%, and the approval precision was kept up within highest 95% and lowest 92%. The preparation cross entrpy reflects result as 0.06. Also, the approval cross entrpy shows the batch as 22.

## 4.4 Concise

At the end of the experiment, I can decide that the Inception-v3 model performing better. And hopefully, this research paper will help the student and the researcher who wants to research more on this topic.

# CHAPTER 5
# SUMMARY, RECOMMENDATION, CONCLUSION AND IMPLICATION FOR FURTHER RESEARCH

## 5.1 Reading Concise

I concentrated on applying CNN for an assignment detailed about distinguishing and perceiving haor fish pictures. I focussed on classification models of computer vision used in data recognition. Different classification techniques of computer vision have merits and demerits for data classification and knowledge extraction. Furthermore, the Inception-v3 model was helpful in classification.

## 5.2 Recommendations

It is recommended:

- that appropriate model selection is a significant part of any classification;
- that a clear and bloomy picture should be used;
- that an increase of data diversity will help to predict more accurately;
- that the creation of a bottleneck is significant.

## 5.3 Conclusions

I have exhibited a thorough pathway to distinguish BD haor fishes with performing fish pictures. The main task for sorting it, get much focused on this paper. My research paperwork getting as my first publication, outcome shows very acceptable by sick like empowering. I likewise accept this work will rouse analysts from different nations to chip away at their customary things.

## 5.4 Implication for Further Study

I kept proposal with 1nception version-3.0 framework for an order structure dependent about 138 or more unique haor fish species. Ideally, later on, I could expand this project by including bigger data batch, ensuring the things assortments. I additionally propose an arrangement for carring out other Convolutional Neural Network structure for analyzing precision above equivalent data batch.

## Appendices

## Appendix A1: Research Reflection



```
INFO:tensorflow:2019-03-18 22:31:07.535543: Step 2999
INFO:tensorflow:Final test accuracy = 99.0% (N=590)
WARNING:tensorflow:From C:\Users\Mr. Lazy\Desktop\mar
```

Figure A.1: Screenshot of Final test accuracy

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