



DEPARTMENT OF BIOTECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING
SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade “A” by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

SHRIMPOPEDIA

Internal guide : Dr Thyagarajan Rajendiran
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External guide : Dr Vedanarayanan
(Dept of ECE)

A.P.PRANITHA (39230032)
L.SUCHITHRA (39230048)
VEDA , ECE III- year
NANNAN A, CSE II year

DECLARATION

I A.P.Pranitha and L.Suchithra hereby declare that the Project Report entitled SHRIMPOPEDIA done by us under the guidance of Dr Thyagarajan Rajendiran and Dr Vedanarayanan at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering / Technology degree in B.Tech-Biotechnology. .

DATE: 29-04-2022

PLACE: CHENNAI

PRANITHA , SUCHITHRA

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of SATHYABAMA for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to Dr.Y.SWARNALATHA,Dean, School of bio and chemical and Dr.V. Ramesh Kumar, Head of the Department, Dept. of Biotechnology for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide Dr Thyagarajan Rajendiran for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of who were helpful in many ways for the completion of the project.



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DEPARTMENT OF BIOTECHNOLOGY

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **A.P.PRANITHA (39230032)**,
L.SUCHITHRA (39230048) who carried out the project entitled "**SHRIMPOPEDIA**" under my /
our supervision from _____ to _____

Internal Guide
Dr.THYAGARAJAN RAJENDIRAN

External Guide (if Applicable)
Dr.V.VEDANARAYANAN

Head of the Department (Name in Capital letters with Seal & Signature)

Submitted for Viva voce Examination held on _____

Internal Examiner
(Name in Capital letters with
Signature)

External Examiner
(Name in Capital letters
with signature)

CONTENTS

- 1.TITLE
- 2.INTRODUCTION
- 3.OBJECTIVE
- 4.REVIEW
- 5.DISEASES CONSIDERED
- 6.DIAGRAMATIC ABSTRACT
- 7.WORKING
- 8.PROTOTYPE
- 9.FUTURE WORKS
- 10.RESULT
- 11.SUMMARY
12. BIBLIOGRAPHY

INTRODUCTION

- Advancement in technology , have hugely impacted aquaculture throughout time .
- Introducing farmers to cutting edge science and technology has enabled a holistic approach to the aquaculture and have proved to enhance the quality and quantity .
- Starting from sensors to monitor quality of water to UV transmission to disinfect water , innovations have improved yield in long run.
- Cementing the gap between native farmers and recent technology is what a sustainable development demands .

OBJECTIVE

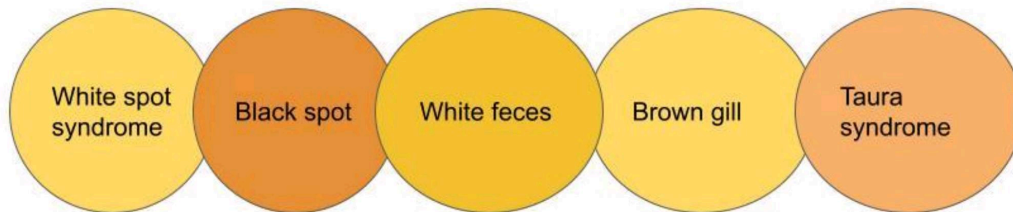
- Shrimp , a well known crustacean are generally affected by several pathogens - bacteria , fungi , virus.
- Shrimp rearing efficiency in general is exercised by many factors amongst those disease diagnosis and management has a huge role to play.
- Shrimpopedia app aims to provide a technical connect to the farmers , researches , entrepreneurs in this field . This is done in a better way by the application of image processing which optimizes and aids the users to arrive at a quick result .

Literature review : There are few existing apps for example.CIBA shrimp krishi , CIBA shrimp app, vannamei shrimp farming -that focuses on shrimps .

To make our app distinct and user friendly among the others:

- Image processing is used .
- Unlike other apps technicalities is not a issue ,
- Additionally users are not compelled to provide their personal information

Diseases considered



WHITE SPOT SYNDROME

What is it ? :

White spot syndrome (WSS) is a viral infection of penaeid shrimp. The disease is fairly lethal and contagious, and results in high mortality rate in the shrimp culture. Outbreaks of this sickness in Taiwan ,china , Japan , Korea ,India , and various other countries in the consecutive years between 1992 to 1995 have worn out the entire populations of several shrimp farms within days.

DISEASE CAUSING AGENT :

The pathogen responsible for white spot syndrome is white spot syndrome virus (WSSV) of the genus Whispovirus (white spot), family Nimaviridae. It is a large, nonoccluded, enveloped, rod-shaped to elliptical DNA virus with a tail-like extension at one end causing white spot syndrome in a wide range of crustacean hosts. WSSV multiplies in the nucleus and has a very broad host range among crustaceans.

Diagnosing white spot disease

Behavioural changes is observed in shrimps , they are prone to rubbing themselves against stones when the pathogen intervenes the skin. Swimming disorientation near the surface and are found to remain in the bottom of the culture area . Later appearance of small white cysts that is noticed .Loss of appetite within the affected shrimps is also common.

Transmission :

Since eggs to broodstock every stage is susceptible to disease Vertical transmission happens by infected broodstock and the horizontal transmission of disease is usually via cannibalism Transmission can be through vectors such as birds , they may catch an infected shrimp in a pond and release it in some unaffected pond .There are several other vectors for example rotifers, marine molluscs, polychaete worms and non-decapodal crustaceans for instance Artemia salina, the copepods, non-crustacean arthropods and insect larvae.

Prevention :

zinc-free malachite is used in the pond (0.1ppm) to prevent the release of parasites but should be carefully regulated to prevent toxicity.

It is advised to quarantine new shrimps for two weeks before introduction into environment to avoid disease .

Disinfectants can be used in shrimp farms and hatcheries to prevent an outbreak.

Stocking of uninfected shrimp seeds and rearing them away from environmental stressors with extreme care to prevent contamination are useful management measures.

Site selection play a crucial role as shrimp cultured in areas with relatively low temperature alterations and at temperatures above 29°C had escalated resistance to WSSV.

TREATMENTS :

No treatments for WSS are currently available.



TAURA SYNDROME

Taura syndrome virus belongs to Dicistroviridae family, genus Cripavirus, and has since been reallocated to a second genus in the same family - the Aparavirus. TSV is a 32 nm non enveloped substance with an icosahedral morphology. The genome is single-stranded positive-sense rna. The capsid composed of three major proteins: CP1 (40 kDa), CP2 (55 kDa) and CP3 (24 kDa) alongside a minor protein of 58 kDa.[4]

Diagnosis

Affected shrimp exhibited anorexia, lethargy and erratic swimming.

Opacification of the tail musculature, soft cuticle and, a red tail as a result of the expansion of the red chromatophores. Higher Mortality rate of 95%.

Diseased ponds attract predatory birds that feed heavily on the dying shrimp.

The distinct signs such as the cuticular melanized spots can also be observed.

In general pathognomonic histopathological lesions are the first step in confirmatory diagnosis.

Prevention “

Culturing more resistant species such as the Western blue shrimp (*Penaeus stylirostris*) and stocking of specific pathogen free (SPF) has helped manage disease. The resistant shrimp lines have achieved almost complete resistance to some TSV variants

Selective breeding despite low to moderate heritability for this trait. Can also improve resistance to TSV.

Strategy implemented to reduce the impact of TS is the application of stocking postlarval shrimp at higher stocking density. Applying this process, farms would witness mortality due to TS at an early stage of the production cycle, much before substantial feeding started and the surviving shrimp would be resistant to further TSV challenges.

Treatment :

These methods are dependent on the total depopulation of infected stocks, disinfection of the culture facility, avoidance of re-introduction of the virus from other nearby culture facilities, wild shrimp, etc. and re-stocking with TS-free postlarvae that have been produced from TS-free broodstock.



BLACK SPOT

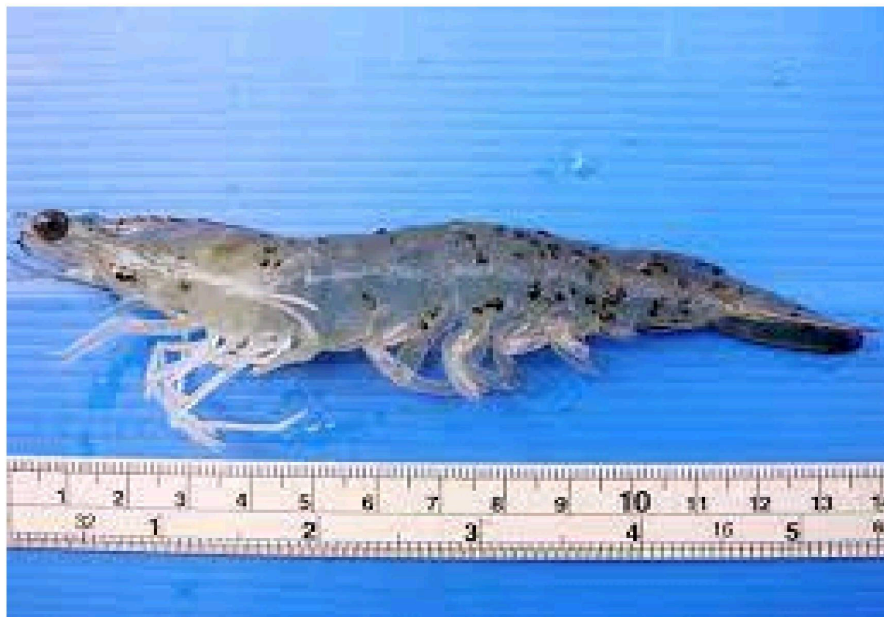
Black spot is said to occur when the shell on the shrimp starts to turn black within hours or days after harvesting.

This darkening phenomenon is because of an enzyme activity causing oxidation in the shrimp, similar to those found in apple and potatoes

It's not lethal and doesn't indicate spoilage, but it's not pleasant

Prevention:

Blackspot in shrimp has traditionally been prevented and controlled by the use of sodium sulfites, known as dip or powder. When used correctly at the proper dip solution and soak time and on the vessel soon after harvest and rinsing, sulfites are very effective in preventing blackspot from forming during storage.



BLACK/BROWN GILL:

Black gill syndrome is caused due to *Fusarium Solano* in shrimp. Associated diseases such as Vibriosis, as well as Mitosis, the presence of heavy metals such as copper and cadmium can cause the incidence of the disease. The immune system is weakened by stress and the effect of these factors, so the disease happens.

How it affects shrimp?

Black gill is a condition that, as the name suggests, blackens the gills of shrimp. The melanization of the tissue is the shrimp's immune response to an offending invader or toxin. The parasite is not harmful to people and it's safe to eat, even raw.

What is it?

Black gill is a parasitic infection affecting shrimp on the Georgia coast. UGA Marine Extension and Georgia Sea Grant are leading efforts to investigate the causes and impacts of black gill, a parasitic infection affecting many shrimp in Georgia waters.

Treatment:

The disease agent is *Fusarium*, and mortality caused by these diseases, especially *Penaeus Japonicus* shrimps is very high and currently there is no way to treat it. Only prevention steps can be taken.



WHITE FECES SYNDROME:

White Feces Syndrome (WFS) is an emergent disease of penaeid shrimp (*Penaeus monodon* and *P. vannamei*) that is identified by the presence of floating white fecal strings on pond water in grow-out ponds. Although the clinical manifestations of WFS are well defined, the underlying etiology remains obscure.

What causes white feces disease in shrimp?

The white gut disease (WGD) observed in shrimp farms and Vibriosis is one of the major disease problems agent in aquaculture. Vibriosis is a bacterial disease responsible for mortality of cultured shrimp worldwide. Vibriosis is caused by gram-negative bacteria in the family Vibrionaceae.

Treatment:

Sustainable approaches to modulate the gut microflora in farmed shrimps for preventing gut diseases.

The use of selected bacteria to inoculate the gut (probiotics)

Specific nutrients promoting the development of selected bacterial strains (prebiotics) in gut.

Specific natural compounds (mostly derived from yeast and herbal extracts, so called “phytobiotics”) capable of modulating the microflora towards a favorable composition.

Favoring the development of beneficial bacteria and inhibiting potentially pathogenic micro-organisms in gut.

PREVENTION STEPS GENERAL:

PCR screening of brood stock before spawning and PCR screening of larvae (PL) before stocking can help to avoid the entry of pathogens into aquaculture system.

Mortalities are precipitated by sudden stress from the changes of wide fluctuation of climatic condition.

Total disinfection and sanitization to the whole culture system have a chance to eradicate the pathogens and other diseases.

Feeding of shrimps with immunostimulants has been shown to help overcome diseases / infection

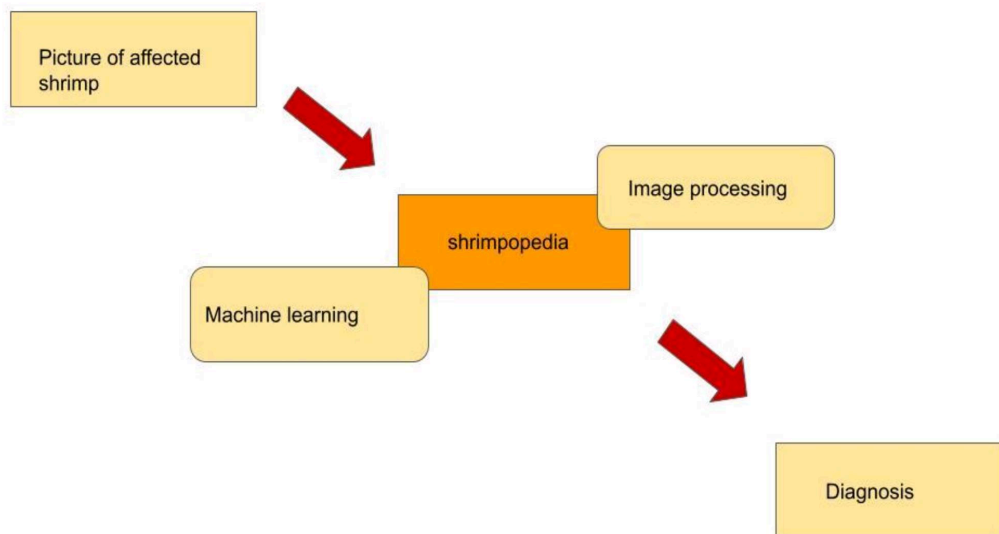
Application and mode of probiotic culture system will reduces the chances of diseases.

Bacterial and other diseases can be treated and hold under control with application of various chemicals and other biological products.



Figure 3 White feces with shrimp

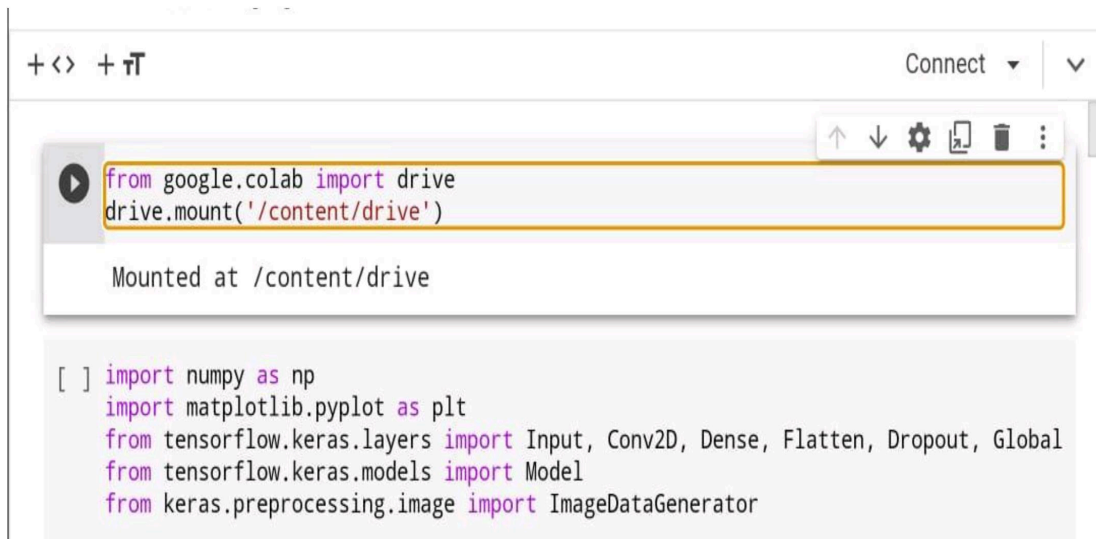
Working



- When a picture of a shrimp is captured or uploaded, the right disease diagnosis will be the result.
- Overview of the disease, remediation to be carried will also be mentioned.
- This will enable early detection of the disease followed by quick harvest, limiting financial loss of farmers.

Methods

- 1) Initially the affected shrimp datasets, is uploaded into the drive.

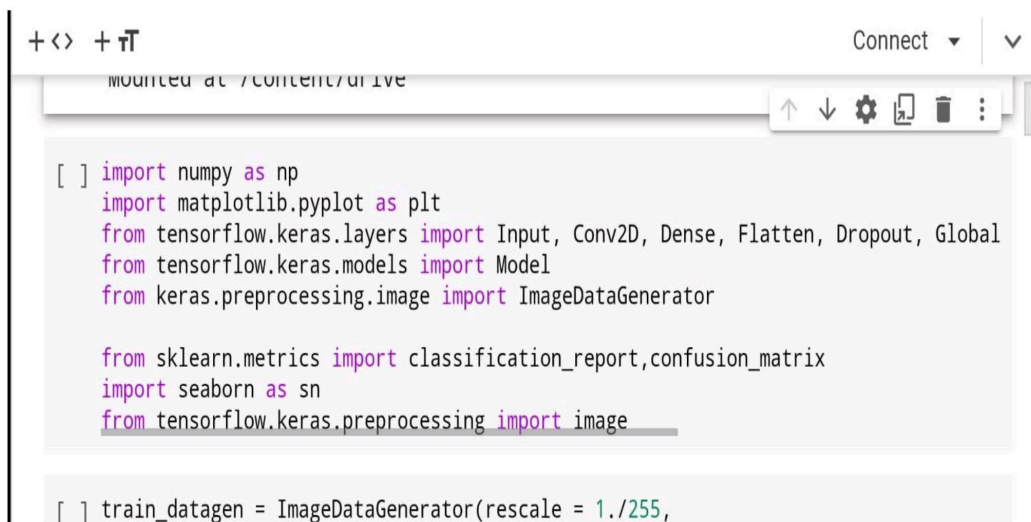


```
from google.colab import drive
drive.mount('/content/drive')
```

Mounted at /content/drive

```
[ ] import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.layers import Input, Conv2D, Dense, Flatten, Dropout, Global
from tensorflow.keras.models import Model
from keras.preprocessing.image import ImageDataGenerator
```

2) All the necessary modules and libraries involving numpy , matplotlib, tensorflow , keras are imported for the convolution neural network to work



```
import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.layers import Input, Conv2D, Dense, Flatten, Dropout, Global
from tensorflow.keras.models import Model
from keras.preprocessing.image import ImageDataGenerator

from sklearn.metrics import classification_report, confusion_matrix
import seaborn as sn
from tensorflow.keras.preprocessing import image
```

```
[ ] train_datagen = ImageDataGenerator(rescale = 1./255,
```

3) The dataset uploaded is divided into training and testing datasets. The model is trained using the training datasets and tested using testing datasets.

```
+<> +T Connect ▾ ▾  
[ ] train_datagen = ImageDataGenerator(rescale = 1./255,  
                                       shear_range = 0.2,  
                                       zoom_range = 0.2,  
                                       horizontal_flip = True)  
  
test_datagen = ImageDataGenerator(rescale = 1./255)  
  
[ ] training_set = train_datagen.flow_from_directory('/content/drive/MyDrive/veda samh  
                                                    target_size = (150, 150),  
                                                    batch_size = 32,  
                                                    class_mode='categorical')  
  
Found 44 images belonging to 3 classes.
```

```
+<> +T Connect ▾ ▾  
Found 44 images belonging to 3 classes.  
  
[ ] test_set = test_datagen.flow_from_directory('/content/drive/MyDrive/veda samhita/T  
                                                    target_size = (150, 150),  
                                                    batch_size = 32,  
                                                    shuffle=False,  
                                                    class_mode='categorical')  
  
Found 13 images belonging to 3 classes.  
  
[ ] i = Input(shape=(150,150, 3))  
u = Conv2D(64, (3, 3), activation='relu', padding='same')(i)
```

4) Convolutional neural networks is used and layers are built .

```

Found 13 images belonging to 3 classes

[ ] i = Input(shape=(150,150, 3))

x = Conv2D(64, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(64, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

x = Conv2D(128, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(128, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

x = Conv2D(256, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(256, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

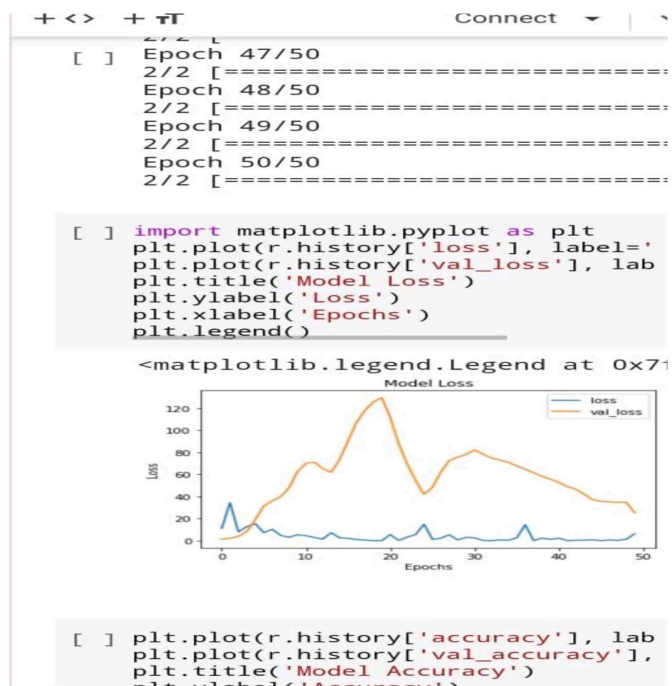
#x = GlobalMaxPooling2D()(x)
x = Flatten()(x)
x = Dropout(0.4)(x)
x = Dense(512, activation='relu')(x)
x = Dropout(0.4)(x)
x = Dense(3, activation='softmax')(x)

model = Model(i, x)

[ ] opt = tf.keras.optimizers.Adam(learning_rate=0.001)

```

5)The graph depicts the accuracy , as of how the model has worked the losses and the prediction accuracy while identifying the disease.



Future works :

Bilingual

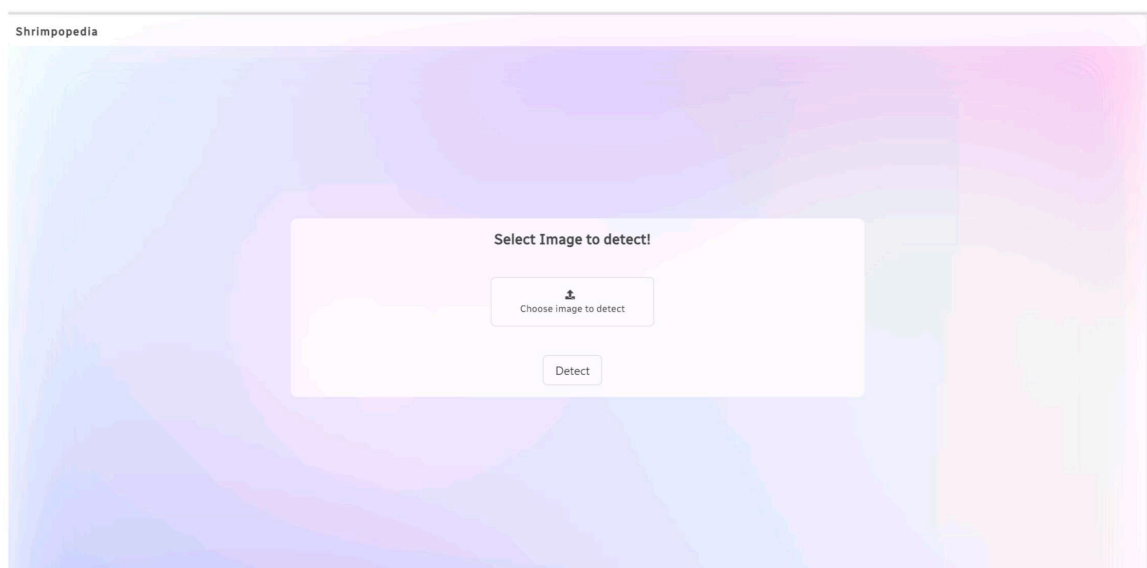
Localites may find it difficult to access the app if it is in other foreign languages, shrimpopedia focuses to reach all including the native farmers to international students Thus tamil and english will be our app user language.

Market analysis

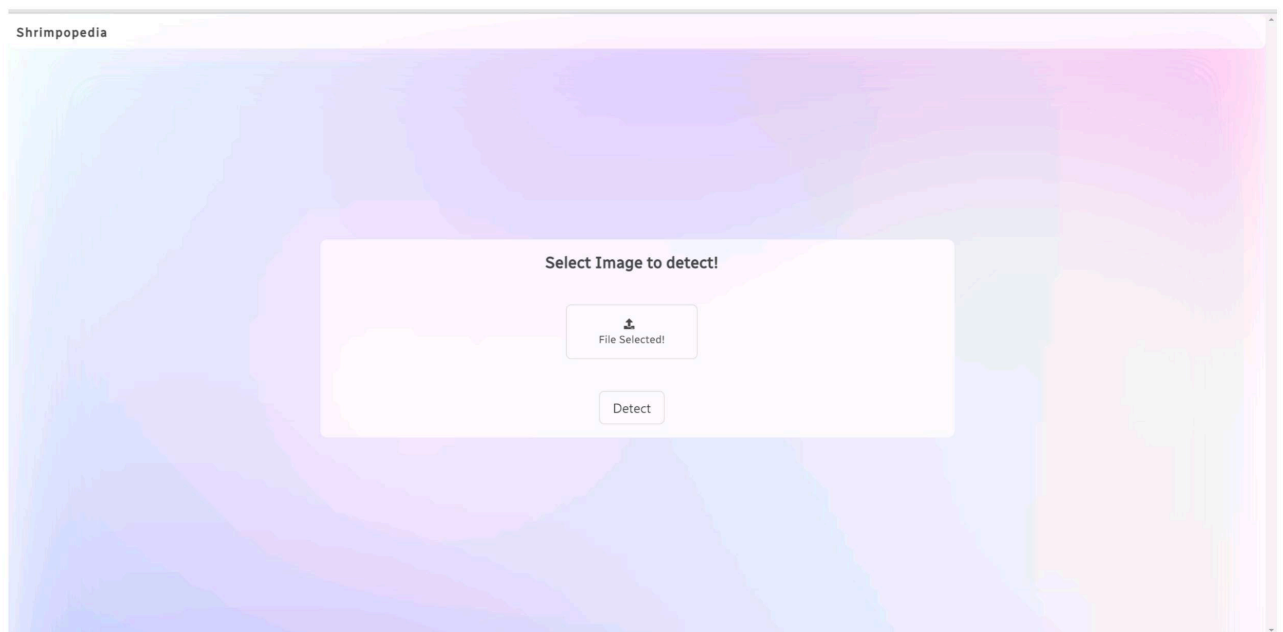
- Shrimps day to day local and international market price will be added.
- Price comparison chart and also export price of the shrimps to be included

RESULT:

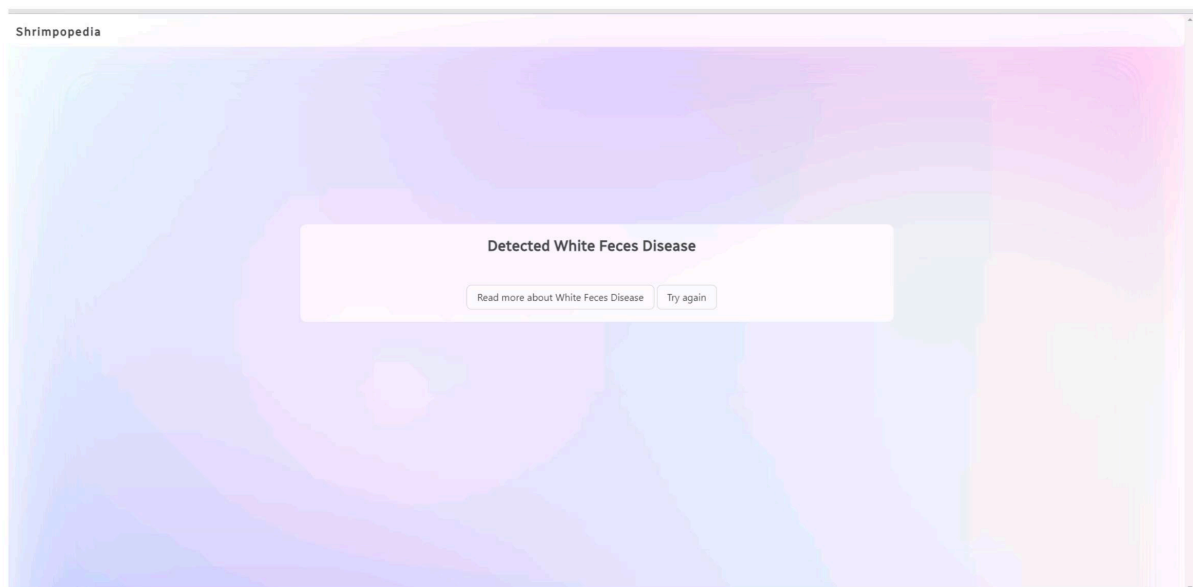
1)Into the shrimpopedia the picture of the shrimp is uploaded.



2) The file uploaded is detected



3)The disease is diagnosed



4)Insight to the disease is also displayed along with several pictures of the infected shrimps for our reference.

a) White feces disease

Shrimpopedia | White Feces Disease

Causes

Accompanying acute hepatopancreatic necrosis disease (AHPND) in cultivated shrimps has been an increasing prevalence of vermiform, gregarine-like bodies within the shrimp hepatopancreas (HP) and midgut. In high quantity of these bodies result in white fecal strings and a phenomenon called white feces syndrome (WFS).WFS appears in shrimps from approximately 2 months of culture onwards and caused by gregarines .The vermiform bodies formations are consisting of Aggregated Transformed Microvilli (ATM).The ATM have originated by sloughing from epithelial cells of the shrimp hepatopancreatic tubules. They accumulate at the HP-midgut junction before being discharged within feces via the midgut.

Prevention

Effective management of the health of shrimp requires consideration of delicate balance between the host, pathogen and environment. Disease and production problem are vary during the different phase of shrimp culture. Production shortages resulting from shrimp mortality, slow growth and high FCR occur and affect the economics of shrimp farms.

Most often pathogens are present in association with the environment and shrimp are apparently healthy and show normal growth. Often conditions such as high stocking density, poor water quality, and sudden changes in environmental factors precipitate diseases in shrimps. Some of the important strategies for gut health management have been outlined below:

Sustainable approaches to modulate the gut microflora in farmed shrimps for preventing gut diseases.

The use of selected bacteria to inoculate the gut (probiotics)

Specific nutrients promoting the development of selected bacterial strains (prebiotics) in gut.

Specific natural compounds (mostly derived from yeast and herbal extracts, so called "phytobiotics") capable of modulating the microflora towards a favorable composition.

Favoring the development of beneficial bacteria and inhibiting potentially pathogenic micro-organisms in gut.



b) White spot syndrome

Shrimpopedia | White Spot Syndrome

Causes

White spot syndrome (WSS) is a viral infection of penaeid shrimp. The disease is fairly lethal and contagious, and results in high mortality rate in the shrimp culture. Outbreaks of this sickness in Taiwan ,china , Japan , Korea ,India , and various other countries in the consecutive years between 1992 to 1995 have worn out the entire populations of several shrimp farms within days.

The pathogen responsible for white spot syndrome is white spot syndrome virus (WSSV) of the genus Whispovirus (white spot), family Nimaviridae. It is a large, nonoccluded, enveloped, rod- shaped to elliptical DNA virus with a tail-like extension at one end causing white spot syndrome in a wide range of crustacean hosts. WSSV multiplies in the nucleus and has a very broad host range among crustaceans.

Prevention

zinc-free malachite is used in the pond (0.1ppm) to prevent the release of parasites but should be carefully regulated to prevent toxicity.

It is advised to quarantine new shrimps for two weeks before introduction into environment to avoid disease.

Disinfectants can be used in shrimp farms and hatcheries to prevent an outbreak. Stocking of uninfected shrimp seeds and rearing them away from environmental stressors with extreme care to prevent contamination are useful management measures.

Site selectionplay a crucial role as shrimp cultured in areas with relatively low temperature alterations and at temperatures above 29°C had escalated resistance to WSSV.



Summary

- The picture of the affected shrimp sample was uploaded and the targeted disease diagnosis was obtained.
- The model predicted the infected shrimp with 90% accuracy and with 10% losses , which can be improved by increasing the datasets .
- This feature can be utilised to gain an insight of the common shrimp diseases
- This technology will surely bridge the tech gap for farmers , they already face enough challenges with climate change and several other unknown factors that crops up very frequently .

Bibliography

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NANNAN A, CSE II year

Problem statement:

To cement the tech gap between native farmers and the cutting edge technology to bring a sustainable development in field of aqua culture thereby increasing the quality and quantity of the yield



OBJECTIVE

- ❑ Shrimp , a well known crustacean are generally affected by several pathogens - bacteria , fungi , virus.
- ❑ Shrimp rearing efficiency in general is exercised by many factors amongst those disease diagnosis and management has a huge role to play.
- ❑ Shrimpopedia app aims to provide a technical connect to the farmers , researches , entrepreneurs in this field . This is done in a better way by the application of image processing which optimizes and aids the users to arrive at a quick result .

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To make our app distinct and user friendly among the others:

☐ Image processing is used .

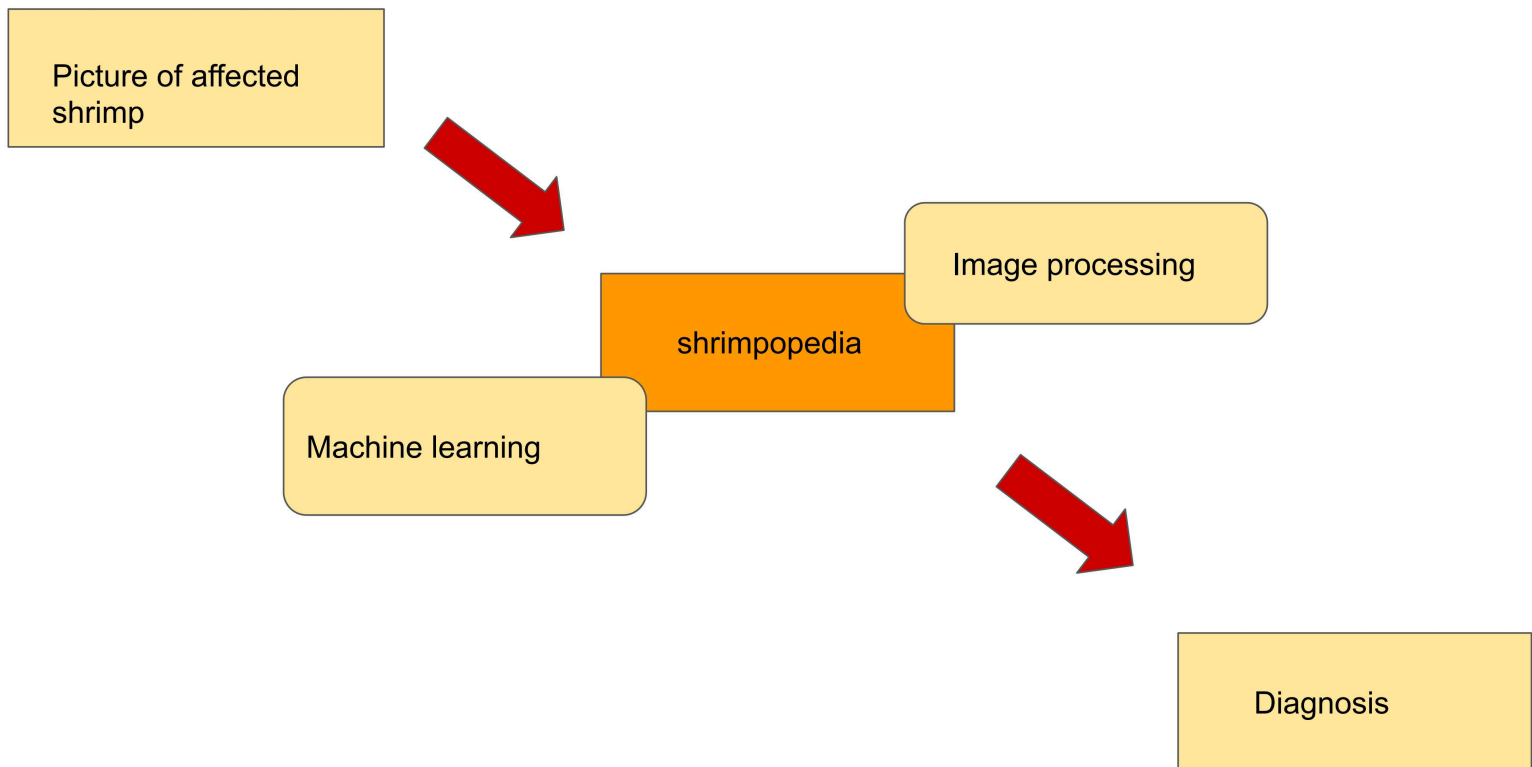
☐ Unlike other apps technicalities is not a issue ,



☐ Additionally users are not compelled to provide their personal information

Diseases considered





Working :

- ☐ When a picture of a shrimp is captured or uploaded , the right disease diagnosis will be the result .
- ☐ Overview of the disease , remediation to be carried will also be mentioned .
- ☐ This will enable early detection of the disease followed by quick harvest , limiting financial loss of farmers .

1) Loading dataset from the drive

```
+<> +T Connect ▾ ▾  
mounted at /content/drive  
[ ] from google.colab import drive  
    drive.mount('/content/drive')  
Mounted at /content/drive  
[ ] import numpy as np  
    import matplotlib.pyplot as plt  
    from tensorflow.keras.layers import Input, Conv2D, Dense, Flatten, Dropout, Global  
    from tensorflow.keras.models import Model  
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+<> +T Connect ▾ ▾  
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    from tensorflow.keras.layers import Input, Conv2D, Dense, Flatten, Dropout, Global  
    from tensorflow.keras.models import Model  
    from keras.preprocessing.image import ImageDataGenerator  
  
    from sklearn.metrics import classification_report, confusion_matrix  
    import seaborn as sn  
    from tensorflow.keras.preprocessing import image  
  
[ ] train_datagen = ImageDataGenerator(rescale = 1./255,
```

2) Importing all the necessary modules and libraries for the convolution neural networks to work

3) Creating training and test set for the model

```
+<> +T Connect ▼
[ ] train_datagen = ImageDataGenerator(rescale = 1./255,
    shear_range = 0.2,
    zoom_range = 0.2,
    horizontal_flip = True)

test_datagen = ImageDataGenerator(rescale = 1./255)

[ ] training_set = train_datagen.flow_from_directory('/content/drive/MyDrive/veda samhita',
    target_size = (150, 150),
    batch_size = 32,
    class_mode='categorical')
```

Found 44 images belonging to 3 classes.

```
+<> +T Connect ▼
Found 44 images belonging to 3 classes.

[ ] test_set = test_datagen.flow_from_directory('/content/drive/MyDrive/veda samhita/T',
    target_size = (150, 150),
    batch_size = 32,
    shuffle=False,
    class_mode='categorical')
```

Found 13 images belonging to 3 classes.

```
[ ] i = Input(shape=(150,150, 3))
```

4) Convolutional neural networks and building its layers

```
Found 13 images belonging to 3 classes.

[ ] i = Input(shape=(150,150, 3))

x = Conv2D(64, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(64, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

x = Conv2D(128, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(128, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

x = Conv2D(256, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = Conv2D(256, (3, 3), activation='relu')
x = BatchNormalization()(x)
x = MaxPooling2D((2, 2))(x)
# x = Dropout(0.2)(x)

#x = GlobalMaxPooling2D()(x)
x = Flatten()(x)
x = Dropout(0.4)(x)
x = Dense(512, activation='relu')(x)
x = Dropout(0.4)(x)
x = Dense(3, activation='softmax')(x)

model = Model(i, x)

[ ] opt = tf.keras.optimizers.Adam(learning_rate=0.001)
```



5) Plot for the accuracy defining the loss for each epoch in the layering

Future works :

Bilingual

Localites may find it difficult to access the app if it is in other foreign languages, Shrimpopedia focuses to reach all including the native farmers to international students. Thus Tamil and English will be our app user language.

English

Tamil

Market analysis

- ☐ Shrimp day to day market price
- ☐ Price chart - comparison
- ☐ Monthly export price

IN TIMES OF CORONAVIRUS 	Type of Vannamiei	Price per Kg
	30-count	₹430
	40-count	₹310
	50-count	₹260
	70-count	₹220
	80-count	₹200
	90-count	₹190
	100-count	₹180



