# CATTLE DISEASE DETECTION

# TEAM MEMBERS

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# ABSTRACT

1. Highly Contagious Cattle Diseases: Focuses on early detection of Foot and Mouth Disease (FMD).

2. Novel Deep Learning Model: Proposes a new model leveraging CNN architectures like conventional deep CNN, Inception-V3, and VGG-16 for disease detection.

3. Comprehensive Approach: Covers all steps from data collection to processing and outcome evaluation, achieving 95% accuracy in disease detection.

4. Enhanced Image Processing: Incorporates advanced techniques to capture high-quality images, improving reliability and precision in detecting diseases.

5. Significant Impact: Aims to aid in timely treatment and management of cattle health, reducing disease spread and economic losses in the livestock industry.

# INTRODUCTION

1. Significance of Livestock Industry: Essential for global agriculture, providing meat, milk, and leather, but faces challenges from contagious diseases like FMD, LSD, and IBK, causing economic losses and health threats.

2. Limitations of Traditional Diagnosis: Relies on visual inspection by veterinarians, which is time-consuming, prone to human error, and may miss subtle early symptoms.

3. Advanced Technologies in Detection: Image processing and machine learning, especially Convolutional Neural Networks (CNNs), offer automation and enhanced accuracy in disease detection.

4. Proposed Deep Learning Model: Utilizes CNN architectures like conventional deep CNN, Inception-V3, and VGG-16 for early and accurate detection of cattle diseases, improving precision and reliability.

5. Comprehensive Process: Involves data collection, preprocessing, model training, and evaluation, using high-quality images and advanced techniques to ensure optimal information for learning and reduce errors in disease diagnosis.

# LITERATURE SURVEY

1. Lowie et al :

- Developed decision trees for identifying pathogens causing bovine respiratory disease (BRD).
- Used semi-quantitative PCR and classification/regression tree analysis on samples from 201 outbreaks (2016-2019).
- Aimed to create a practical tool for BRD management.
- Results were promising but lacked sufficient sensitivity and specificity for reliable use.

2. Veerasak et al :

- Developed and compared prediction models for Foot and Mouth Disease (FMD) outbreaks in Thailand.
- Used classification tree (CT), random forests (RF), and Chi-squared automatic interaction detection (CHAID).
- Analyzed data from 225 FMD and 608 non-FMD farms.
- RF model showed the highest accuracy and performance, outperforming CT and CHAID.

3. Md. Rony et al :

- Proposed a deep learning-based system for early detection of external cattle diseases (FMD, LSD, IBK).
- Utilized CNN architectures: conventional deep CNN, Inception-V3, and VGG-16.
- Achieved 95% accuracy, reducing human errors and aiding veterinarians and farmers.

4. Dibyo Fabian Dofadar :

- Aimed to predict Lumpy Skin Disease (LSD) in cattle using machine learning models.
- Evaluated ten classifiers; Random Forest and Light Gradient Boosted Machine Classifiers performed best.
- Achieved an F1 score of 98%.
- Highlighted the effectiveness of these models in early LSD detection for timely intervention.

5. Md. Rony et al :

- Presented a novel deep learning system for early detection of common cattle diseases (FMD, LSD, IBK).
- Employed CNN architectures: conventional deep CNN, Inception-V3, and VGG-16.
- Achieved 95% accuracy, significantly reducing human error.
- Detailed the process from data collection to model outcomes, demonstrating practical application effectiveness.

# PROBLEM STATEMENT

- Foot and Mouth Disease (FMD) severely affects cattle, causing major economic losses and disrupting food supply chains. Its rapid spread leads to substantial costs for containment and eradication.

- Traditional FMD diagnosis methods are slow, resource-intensive, and prone to errors, which delays intervention and allows the disease to spread further.

- There is a pressing need for efficient, accurate, and accessible early detection tools for FMD. Utilizing deep learning and web technologies can improve disease management, minimize economic impact, and support global livestock health initiatives.

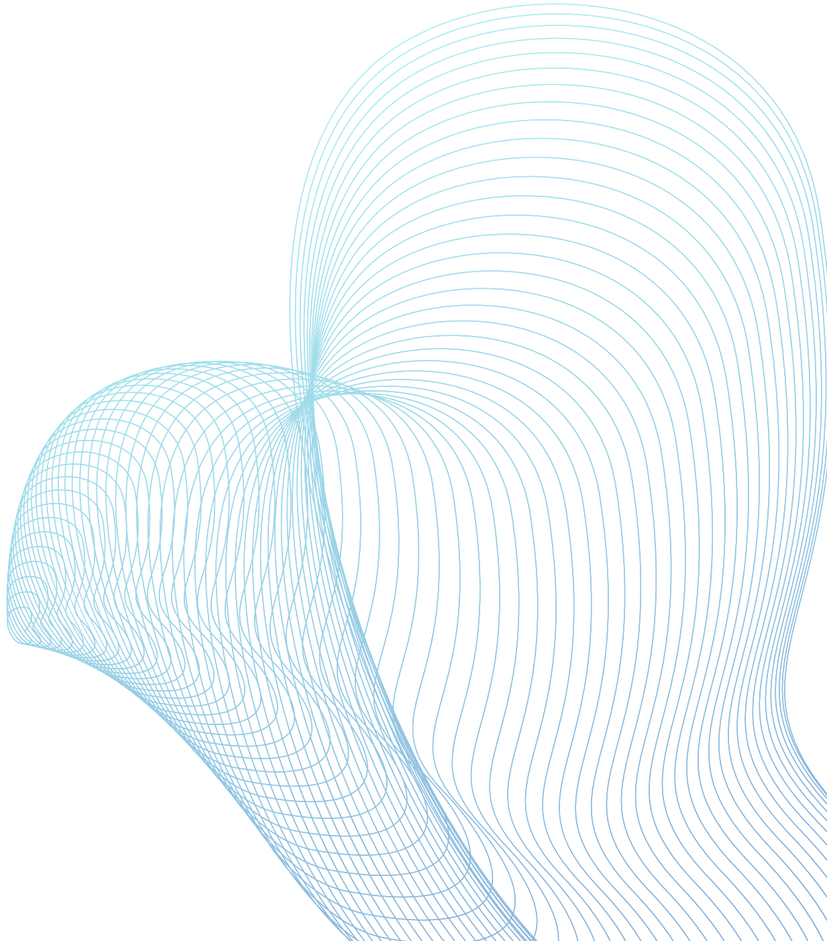
# OBJECTIVES

1. Early Disease Detection

2.Accurate Disease Classification

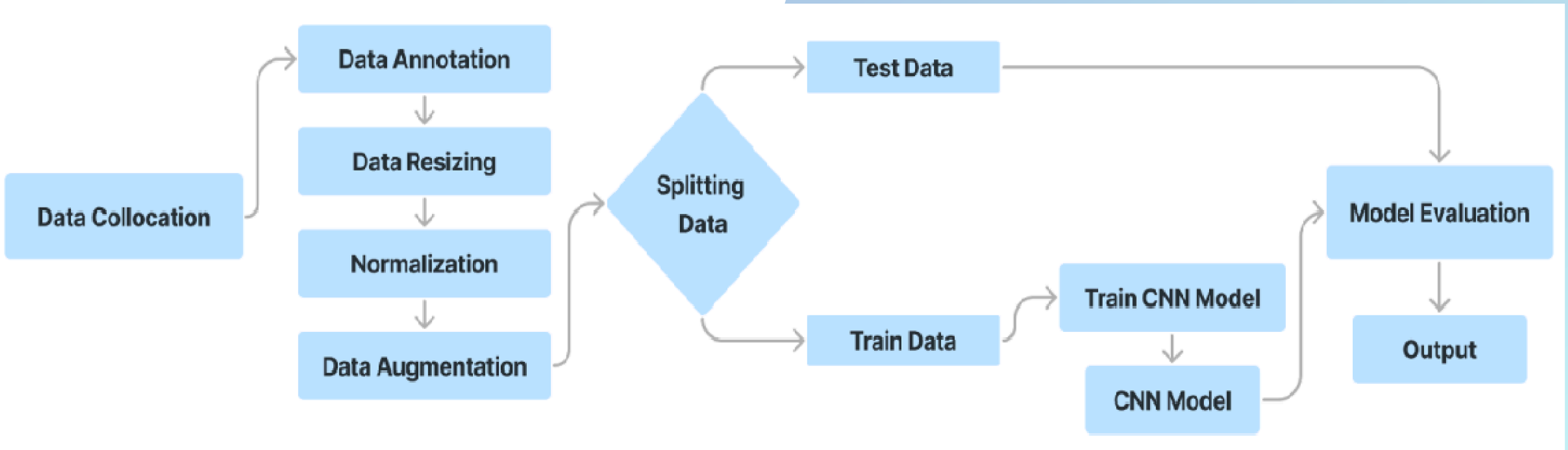
3.Identification of Subtle Indicators

4.Integration with Management Systems



# METHODOLOGY AND IMPLEMENTATIONS

Overview



# Data Preprocessing

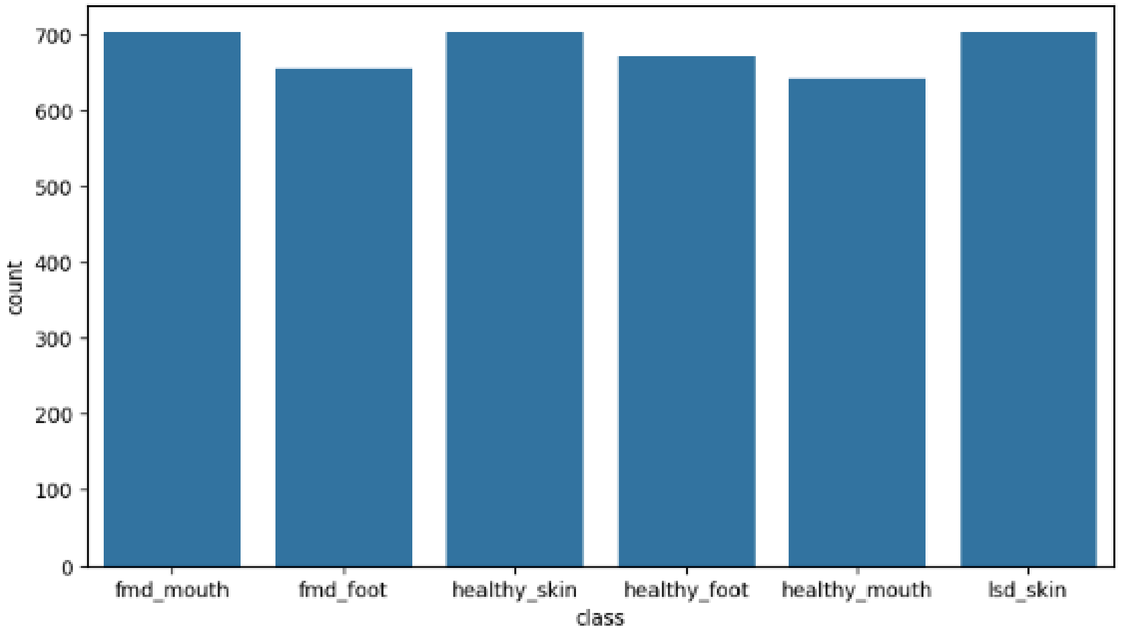
Collected Image

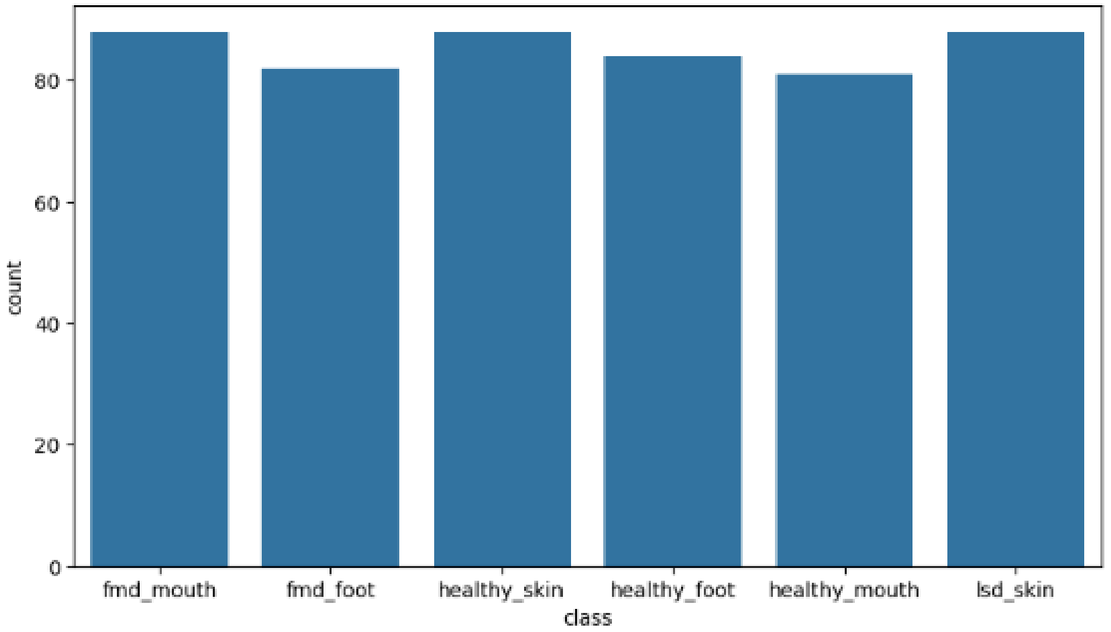
Pre-processed image

# Splitting the data into Training and Test Cases

```
plt.show()
```

```
Number of images in the train set :  4083
Number of images in the test set ;  511
Number of images in prediction set :  6
```



# Training the Data on CNN Models

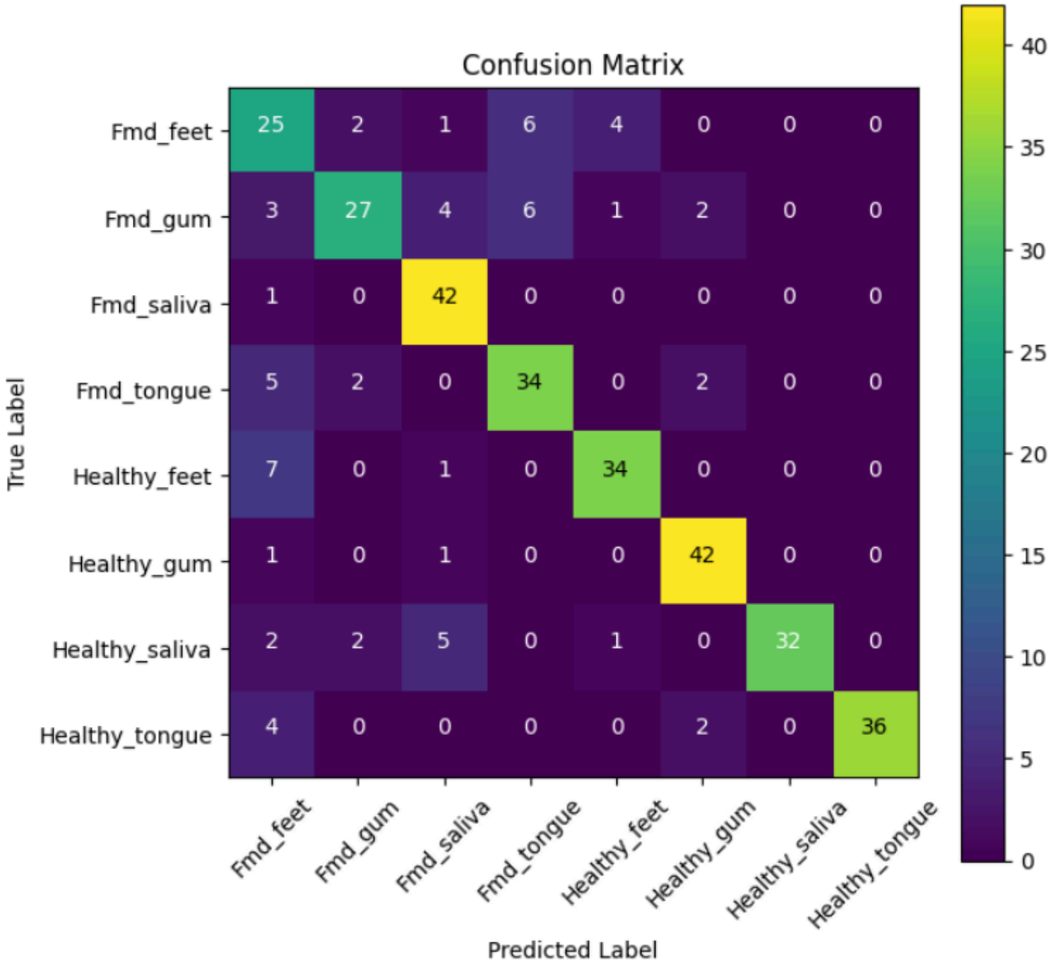
## Models Used

- Inception V-3
- VGG-16
- ResNet-50

# Inception V3

Utilizes inception modules with varying kernel sizes to capture multi-scale features. Designed to improve computational efficiency and performance in image recognition tasks. Introduced by Google Research as part of the Inception series for deep convolutional networks.

# Confusion matrix of Inception V3



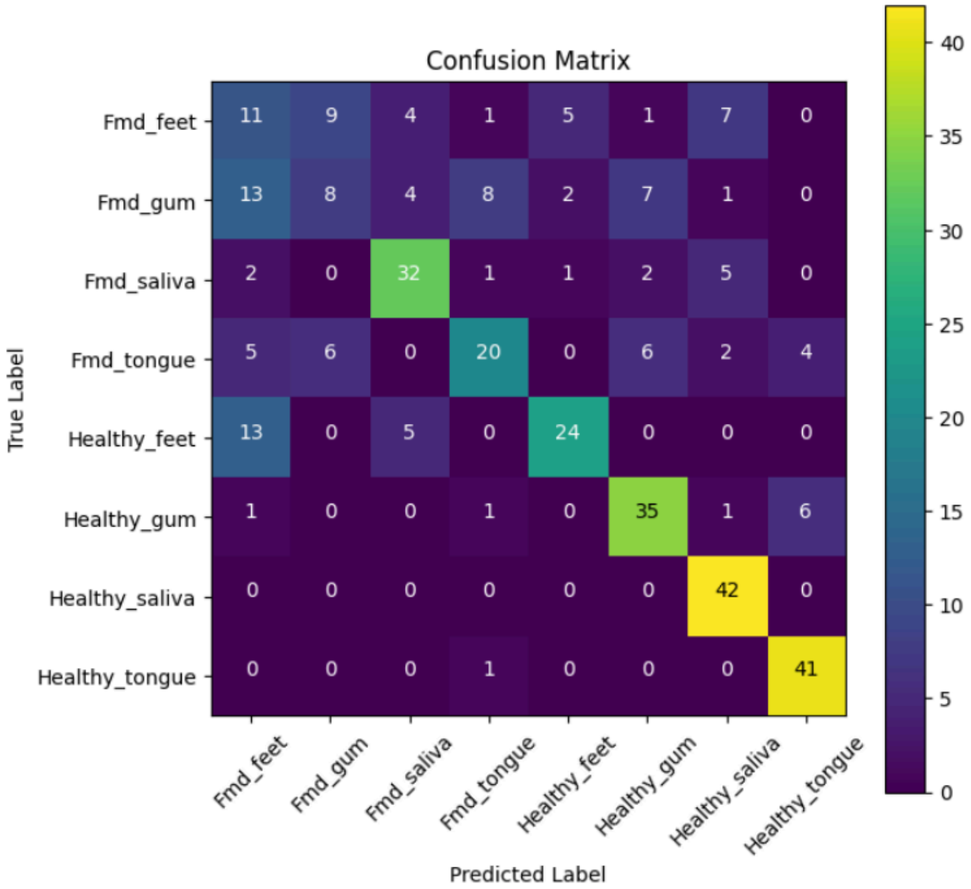

**Val_ accuracy :- 0.89**

# MODELS USED:

## VGG - 16

Features a deep architecture with 16 layers of 3x3 convolutional filters. Known for its simplicity and effectiveness in learning detailed features from images. Achieved state-of-the-art results in the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) 2014.

# Confusion matrix of VGG - 16

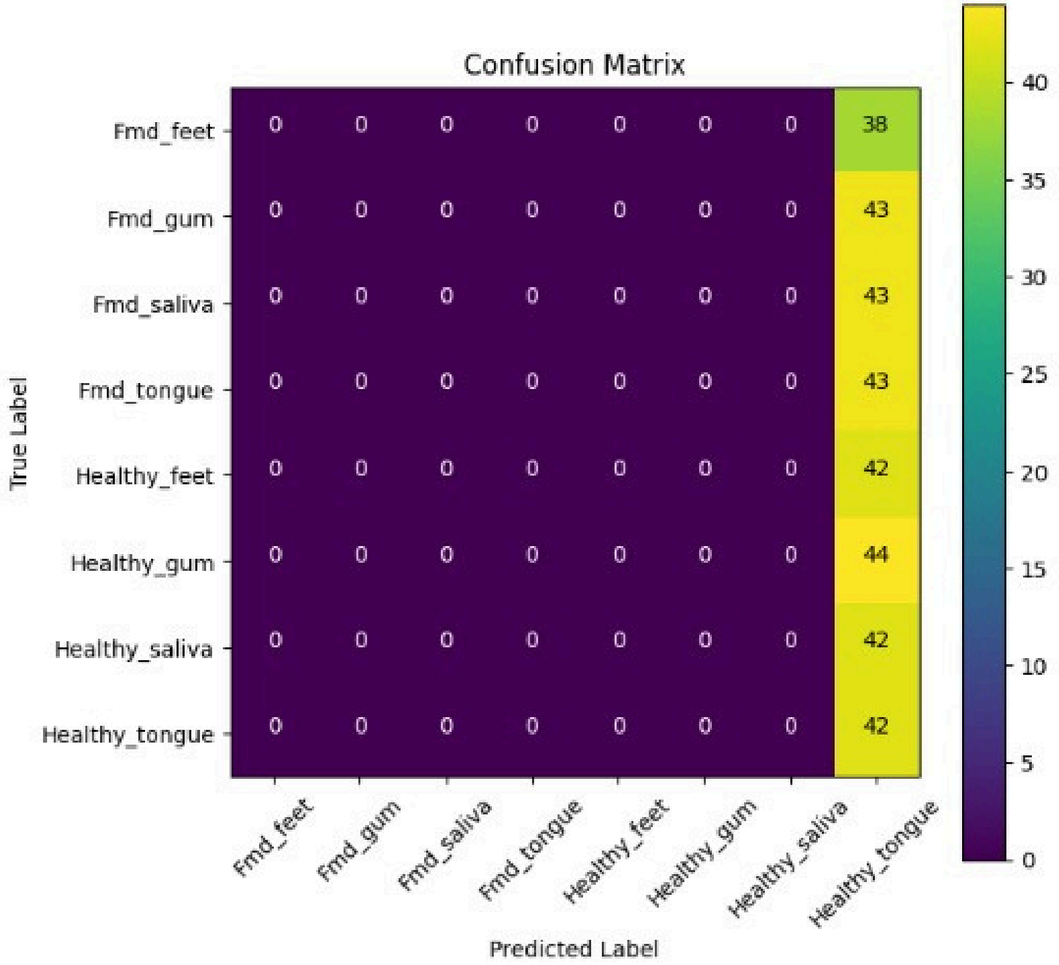



**Val_ accuracy :- 0.70**

# Resnet - 50

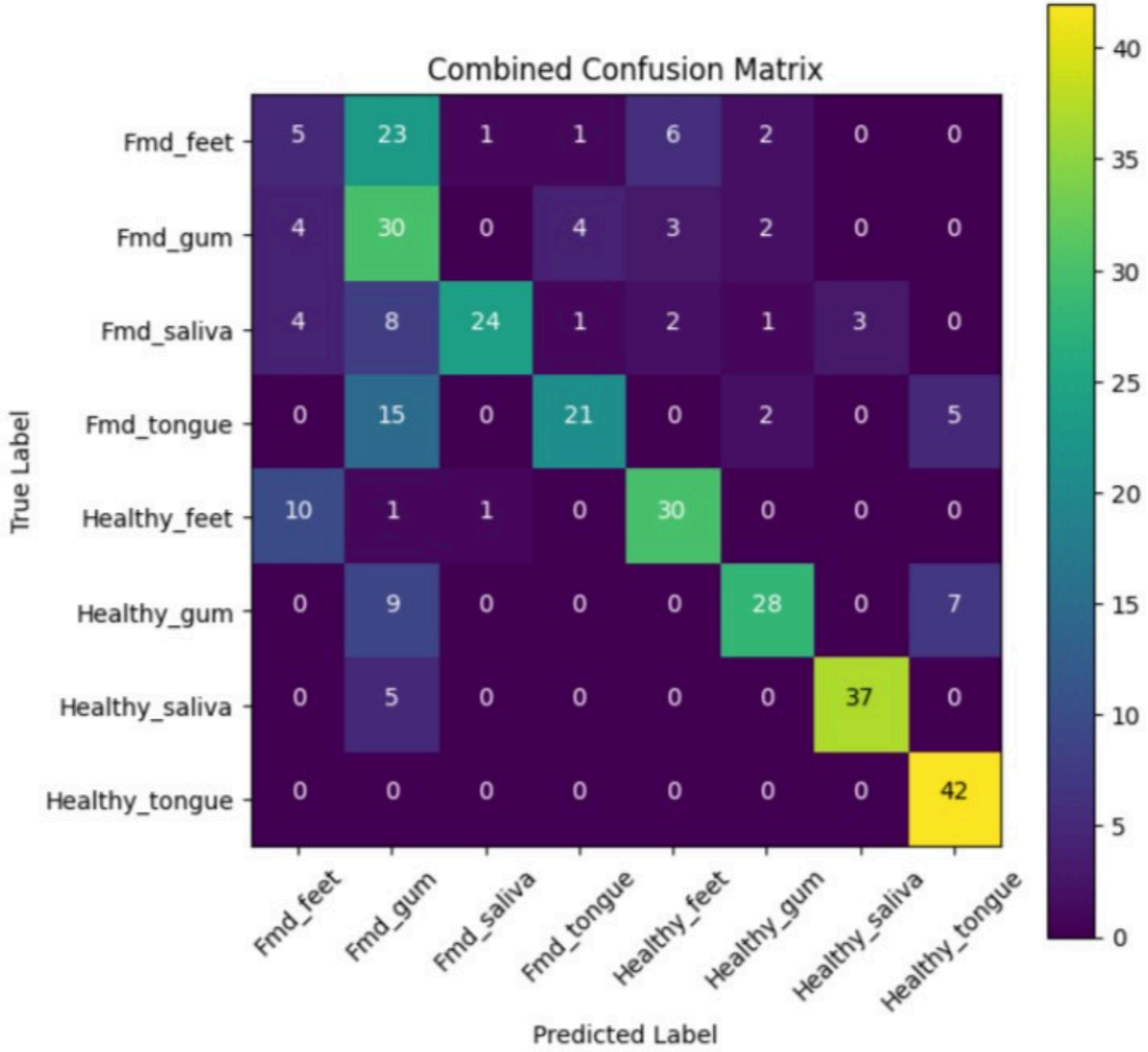
Innovated with residual learning blocks that include shortcut connections. Addresses the vanishing gradient problem in very deep neural networks. Allows training of deeper networks (up to 152 layers in ResNet-152) with improved accuracy and efficiency.

# Confusion matrix of Resnet -50



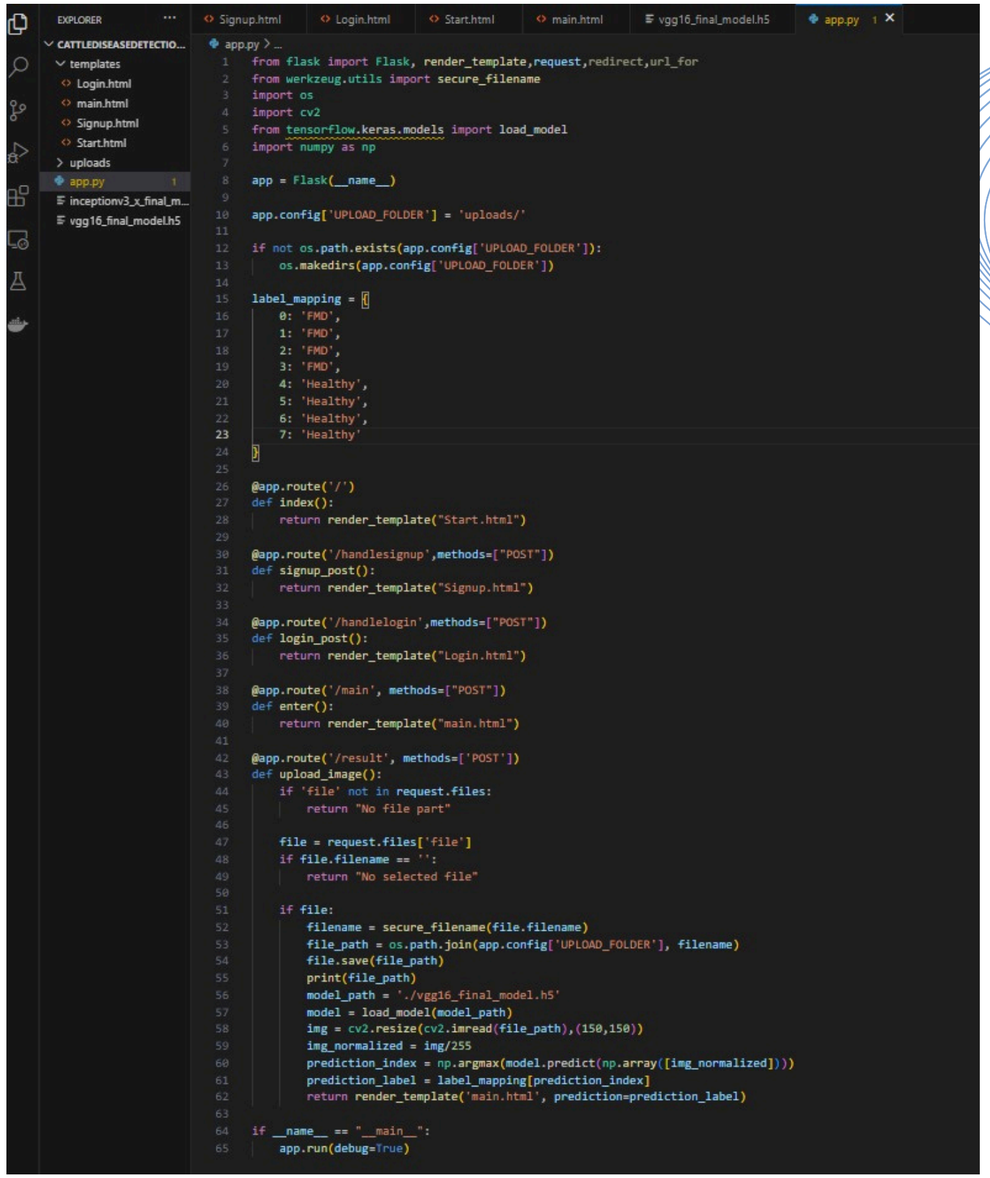

**Val_ accuracy :- 0.694**

# Confusion matrix of combined model

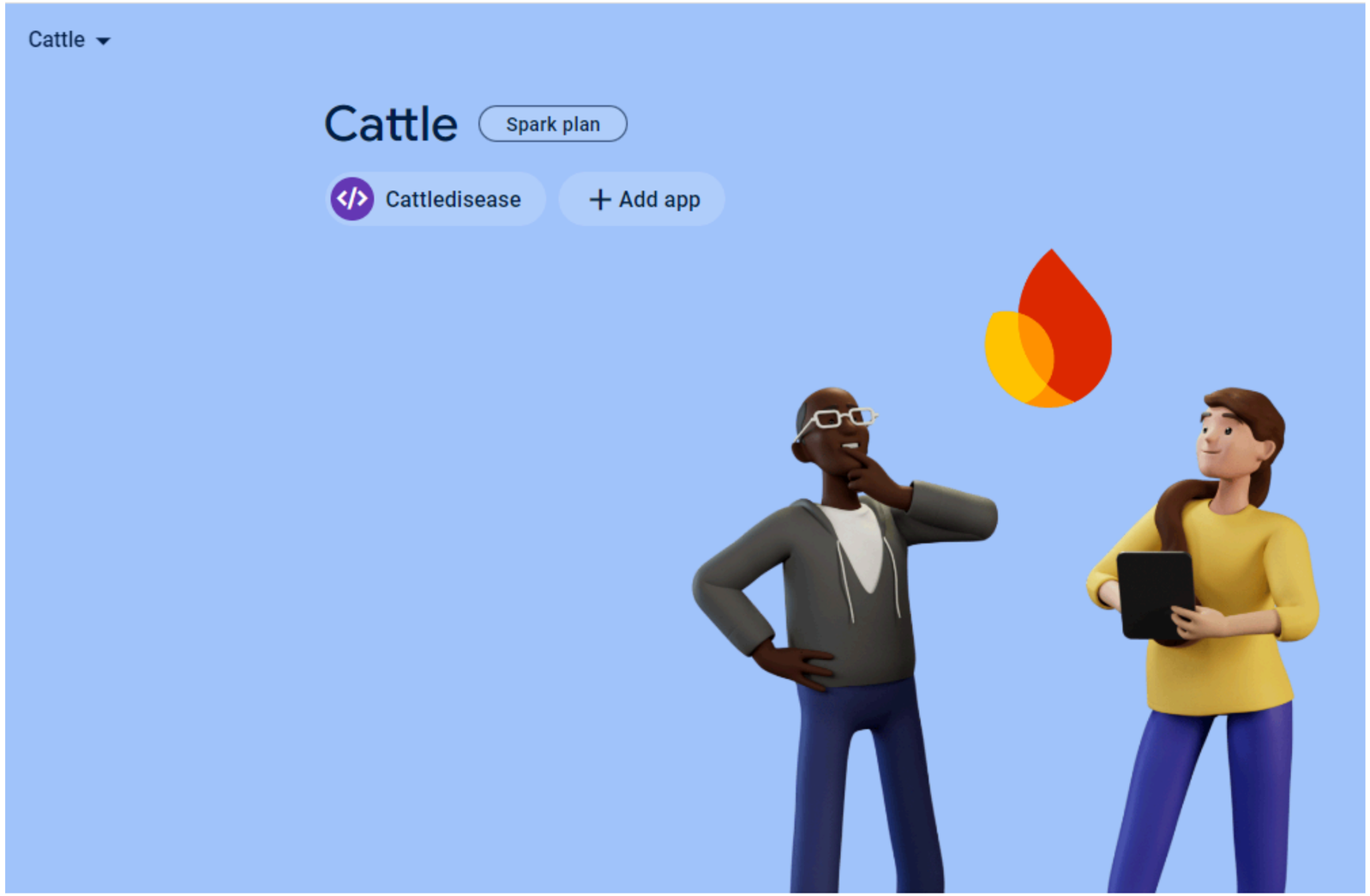



**Model accuracy 64%**

# Intergration of Front-End and ML



# INTEGRATION OF FIREBASE



Cattle

# Authentication

Users | Sign-in method | Templates | Usage | Settings | Extensions

Cross-origin redirect sign in on Google Chrome M115+ is no longer supported and will stop working on 24 June 2024.

Search by email address, phone number or user UID

Add user

| Identifier | Providers | Created | Signed in | User UID |
|---|---|---|---|---|
| me@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | VCBZGC0yrgYKI8090yqs3Wsy... |
| rj@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | YXGRpnqFXJa6WsEfLW3kRX... |
| manu@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | 6XcSW98yjiaAALJA9vCBkjBY... |
| san@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | b3KMt17pt9Xl3EeMzE19GfD7... |
| ran@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | lmyH0jP0fwVHEwlrOQ5oeQwt... |
| abcd@gmail.com | | 31 Jul 2024 | 31 Jul 2024 | 5Dqbo3Gy3IhRScGUtYc0PrJc... |

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Cattle

# Authentication

Users | Sign-in method | Templates | Usage | Settings | Extensions

## Sign-in providers

Add new provider

| Provider | Status |
| --- | --- |
| Email/Password | Enabled |
| Phone | Disabled |

Cattle

# Authentication

Users | Sign-in method | Templates | Usage | Settings | Extensions

## Settings

User account management

- User account linking
- User actions
- Blocking functions
- User activity logging
- Sign-up quota

Domains

- Authorised domains

### Authorised domains

For security, to use Phone, Google or third-party authentication, domains need to be authorised for OAuth redirects. Learn more

Add domain

| Authorised domain | Type |
| --- | --- |
| localhost | Default |
| cattle-c2489.firebaseapp.com | Default |
| cattle-c2489.web.app | Default |
| 127.0.0.1 | Custom |

# RESULTS AND DISCUSSION

- Overall Performance: All three models (VGG-16, Inception, ResNet50) detected FMD with different accuracies that is Resnet50 with 12% validation accuracy , InceptionV3 with 13% validation accuracy ,VGG-16 with 70% validation accuracy and VGG-16 showing the best overall performance.
- Efficiency and Reliability: The VGG-16 model achieved highest validation accuracy of 70% which efficiently classified cattles with FMD and without FMD.
- Practical Benefits: The system significantly aids in early detection and management of FMD, reducing economic losses and improving cattle health management.
- Storage : Usage of Firebase for authentication purpose of users.
- Effective connection of web application and Ml : Usage of Flask for this purpose with routing between web pages

# DISCUSSIONS

- Developed a comprehensive web application using HTML, CSS, Javascript, Flask to provide a user-friendly interface for real-time disease detection.
- Examined multiple ML models such as Resnet500, VGG-16, InceptionV3 to compare and identify the most effective model for FMD detection, demonstrating the practical application of machine learning in veterinary diagnostics.
- Usage of Firebase which can be easy integrated with web application and implement user authentication
- Usage of Flask to integrate ML and web application which is mainly used for routing between web pages.

# CONCLUSION

This project focused on developing a robust system for early detection of cattle diseases like FMD, LSD, and IBK by combining advanced image processing techniques with CNN architectures, including conventional deep CNN, Inception-V3, and VGG-16. High-quality images were collected and preprocessed to ensure data consistency, improving model accuracy. The CNN models successfully extracted relevant features from the images, enhancing disease detection reliability. This automated system not only mitigates the spread of contagious diseases but also offers significant economic benefits to farmers through early intervention and treatment. Additionally, the data generated can aid further research in veterinary science. Overall, the project represents a significant advancement in veterinary diagnostics, promising healthier livestock and more efficient farming practices.