Project Report

G.Pavithra
2nd BCA (4th sem)
SSGS Degree college, Guntakal
gkrishnamurthy921@gmail.com
Team ID: LTVIP2025TMID32540

1.INTRODUCTION

1.1. Project Overview

🔍 Overview

This project aims to develop an intelligent and scalable system that leverages transfer learning to classify poultry diseases from images with high accuracy. The system provides an integrated web-based dashboard that enables poultry farmers, veterinary professionals, and administrators to detect diseases early, manage poultry health data, and take timely preventive actions.
By using pre-trained convolutional neural networks (CNNs) such as ResNet or MobileNet, the model can identify multiple poultry diseases with minimal training data and deployment cost. The application integrates a user-friendly interface, secure backend services, and real-time image classification APIs to ensure a seamless experience for different user roles.

1.2 Purpose

🎯 Purpose

The purpose of the project "Transfer Learning-Based Classification of Poultry Diseases for Enhanced Health Management" is to develop an intelligent, automated system that uses deep learning techniques to accurately identify poultry diseases from images. This system aims to assist poultry farmers, veterinarians, and farm managers in diagnosing diseases at an early stage, reducing bird mortality, improving animal welfare, and enhancing overall farm productivity.

2.IDEATION PHASE

Date	**16 July 2025**
Team ID	**LTVIP2025TMID32540**
Project name	**Transfer learning based classification of poultry diseases for enhanced Health management**
Maximum marks	**2 marks**

2.1 Problem statement

❗ Problem Statement

Poultry farmers often struggle to detect diseases early due to limited access to veterinary services and reliance on manual diagnosis. This leads to delayed treatment, increased bird mortality, and financial losses. There is a need for an automated, accurate, and accessible solution for rapid disease identification.

Problem statement	**I'm customer**	**I'm trying to**	**But**	**Because**	**Which makes me feel**
PS-1	A poultry farmer / health technician / veterinary researcher	Detect and diagnose poultry diseases accurately and quickly	Traditional diagnosis is time-consuming, error-prone, and depends heavily on expert availability	There is a lack of automated, accessible, and intelligent disease detection systems	Frustrated, worried about disease spread, and economically burdened
PS-2	An AI/ML engineer or academic researcher in agriculture tech	*Develop an effective machine learning model using limited poultry disease data*	Training deep learning models from scratch requires large datasets and high computational power	Poultry datasets are often scarce, imbalanced, and unstructured	Challenged, yet motivated to explore transfer learning as a promising solution

2.2 Empathy map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user'sbehaviours and attitudes.
It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

👤 Who are we empathizing with?

- Poultry Farmers
- Veterinary Health Workers
- Poultry Farm Managers
- Agriculture Extension Officers

🗣️ Says

- "I can't tell which disease is affecting my poultry."
- "Veterinary help takes too long to arrive."
- "I'm losing birds and money every day."
- "I wish there were a simple tool to help me identify diseases early."

🧠 Thinks

- Is this a serious disease or just a temporary issue?"
- "Will I be able to afford treatment in time?"
- "I need expert support but it's not available."
- "Technology might help me reduce losses."

👀 Sees

- Dead or sick poultry with visible but unclear symptoms
- Limited or no access to expert diagnostics

👂 Hears

- Advice from other farmers or local vets (not always accurate)
- News or rumors about disease outbreaks
- Success stories of farmers using technology
- Conflicting treatment suggestions

😟 Pains

- Delayed or wrong disease diagnosis
- High mortality and financial loss
- Lack of access to veterinary expertise
- Poor disease documentation and tracking

😊 Gains
- Early disease detection
- Reduced bird mortality and financial losses
- A mobile-friendly or easy-to-use tool
- Confidence in health

2.3 Brainstorming

Date	16 July 2025
Team ID	LTVIP2025TMID32540
Project name	Transfer learning based classification of poultry diseases for enhanced Health management
Maximum marks	4 marks

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Problem Overview :

To develop an AI-based model using transfer learning to classify poultry diseases accuratelyand quickly, supporting farmers and vets in early detection and improved health management.

Step 2 :Idea Generation :

Idea no.	Idea Description

1	Use pre-trained CNN models like **ResNet**, **VGG**, or **MobileNet** for image classification to leverage transfer learning.
2	Create a mobile app that allows users to capture and analyze poultry images on the spot.
3	Utilize drone imagery for monitoring poultry health in large-scale farms
4	Integrate real-time alerts and updates via SMS to notify farmers immediately.
5	tCollect additional data such as symptoms, temperature, behavior and use multi-modal learningion
6	Collaborate with local poultry farms to gather real-world data for model training and testing.leverage transfer learning.
7	Predict **disease spread trends** using **geolocation-based mapping and clustering**.
8	Include **voice-guided diagnosis** and instructions in **local languages** for accessibility.
9	Apply Explainable AI (XAI) techniques to show why a certain disease is predicted, increasing trust and usability.

Step-3: Idea Prioritization

High Priority:

- Pre-trained CNNs (1)
- Mobile App (2)
- Farm Dataset (3)
- Image + Symptoms (5)
- Vet Collaboration (10)

Medium Priority:

- Multilingual Support (4)
- Explainable AI (6)
- SMS Alerts (7)

● Dashboard (8)

Low Priority:

● Spread Prediction

3.Requirement Analysis

3.1 customer journey map

Stage	Goal	Action	Painpoint	Oppertunity
Awareness	Identify signs of illness	Browse online, hear from peer farmers or agri-dealers	Limited awareness, tech hesitation	Awareness campaigns, offline demo sessions
Consideration	Find a diagnosis tool	Ask for reviews, compare with manual methods	Trust in AI-based results	Multilingual UI, clear benefit
Diagnosis	Detect Disease	Download app, register, explore UI	Complex UI, unclear flow	Simple UX, step-by-step tutorial, voice guidance
Action	Act on diagnosis	Take photos, upload, get results	Poor connectivity, unclear resultss	Offline support, confidence score, visual reportsse
Feedback	Confirm outcome	Follow recommendations, buy meds, isolate birds	Confusion in medical terms, availability issues	Offline support, confidence score, visual reports
Retention	Use app regularly	Rate app, contact support, share	Lack of trust in accuracy	Integrate local vet guidance, nearby store

		in farmer		links

3.2 solution requirement

Date	16 July 2025
Team ID	LTVIP2025TMID32540
Project name	Transfer learning based classification of poultry diseases for enhanced Health managem
Maximum marks	4 marks

Functional Requirements:

Following are the functional requirements of the proposed solution

FR No.	**Functional Requirement (Epic)**	**Sub Requirement (Story / Sub-Task)**
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	User Confirmation Confirmation via Email

		Confirmation via OTP
FR-3	Disease Prediction Using Transfer Learning	- Load pre-trained model (e.g., ResNet/VGG) - Predict disease from uploaded image - Display disease name and probability
FR-4	Result Visualization	- Show prediction confidence score - Display highlighted image (if Grad-CAM used) - Give disease description
FR-5	Disease Management	- Show symptoms and treatment tips - Link to expert advice or veterinary contact
FR-6	User Feedback	- Allow user to confirm prediction accuracy

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution

NFR	**Non-functional requirement**	**Description**
NFR-1	Usability	Interface must be user-friendly for farmers and ve
NFR-2	Security	Image uploads and user data must be securely stored and transmitted

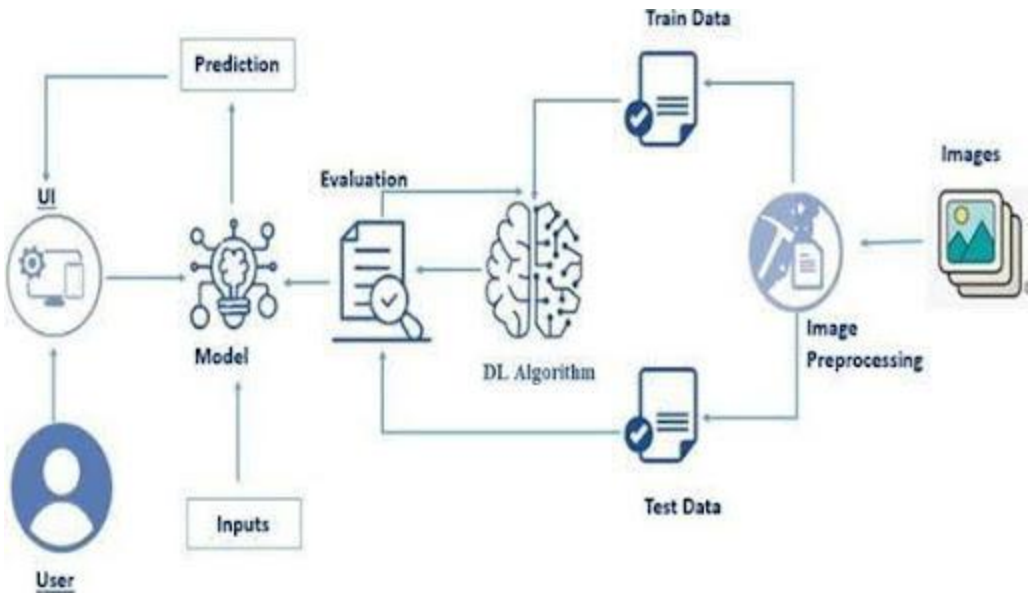
NFR-3	Reliability	Model should give consistent outputs for similar
NFR-4	Performance	Model inference time should be < 3 seconds per image
NFR-5	Availability	The system must be available 24x7, especially during outbreaks

3.3 Data flow diagram

Date	16 July 2025
Team ID	LTVIP2025TMID32540
Project name	Transfer learning based classification of poultry diseases for enhanced Health management
Maximum marks	4 marks

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is



3.4 Technology stack :

Date	16 July 2025
Team ID	
Project name	Transfer learning based classification of poultry diseases for enhanced Health management
Maximum marks	4 marks

Technology used

1	User Interface	HTML, CSS, JavaScript, AngularJS / ReactJS
2	Application Logic-1	React Router, Redux / Context API, Recharts / Chart.js, Axios
	Application Logic-2	Node.js, Express.js, JWT for authentication

3	Application Logic-3	Python, FastAPI / Flask, connects to trained ML model
4	Database	PostgreSQL
5	Cloud Database	AWS RDS, Google Cloud SQL, Azure PostgreSQL
6	File Storage	AWS S3, Google Cloud Storage, Azure Blob Storage
7	External API-1	SendGrid, Mailgun, or SMTP
8	Machine Learning Model	Tawk.to, Firebase Cloud Messaging, OneSignal
9	Infrastructure	TensorFlow / Keras / PyTorch using MobileNet / ResNet

4. Project Design

4.1 problem solution fit

🧩 **Problem–Solution Fit**

🔍 **Problem**

Who's affected:

Poultry farmers, especially in rural or low-resource regions.

What's the problem:

Farmers struggle to detect poultry diseases early due to:

- Lack of veterinary access
- Inability to recognize symptoms visually
- Delayed or inaccurate treatment
- High poultry mortality and income loss

Current methods:

- Manual inspection or expensive vet consultations are slow and inconsistent.

💡 Solution

Proposed System:

- An AI-powered mobile and web application using transfer learning models (e.g., ResNet, VGG) that:
- Allows farmers to upload poultry images
- Automatically predicts disease with confidence score
- Displays highlighted infection zones using Grad-CAM
- Offers treatment tips and expert links
- Supports feedback for model correction and learning

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs,marketers and corporate innovators identify behavioral patterns and recognize what would work and why

Purpose:

❑ Solve complex problems in a way that fits the state of your customers.
❑ Succeed faster and increase your solution adoption by tapping into existing mediums and
channels of behavior.
❑ Sharpen your communication and marketing strategy with the right triggers and messaging.
❑ Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
❑ Understand the existing situation in order to improve it for your target group.

4.2 Proposed solution:

1**. Target Customer Segment** :

Poultry farmers, especially in rural and semi-urban areas, with limited access to timely veterinary care or diagnostic tools.

2.Problem Description :

Farmers are unable to detect poultry diseases early, leading to high bird mortality, economic losses,and potential spread of infections across flocks.

3**.Evidence of the Problem :**

- Field reports and case studies show up to 20–30% poultry loss due to undetected disease
- .Farmer interviews reveal delays in identifying symptoms and reaching vets.
- Current disease identification methods are manual, slow, and often inaccurate.

4.Existing Behavior / Current Solutions :

- Farmers rely on visual inspection or wait for vets, often reacting too lat

5.The Solution :

- An AI-powered mobile application using transfer learning to classify poultry diseases from images uploaded by the farmer in real-time.

6.Why It Works

- Uses pre-trained CNN models fine-tuned on poultry disease images.
- Works with low-end smartphones and supports local languages.
- Enables fast, accurate identification, lowering mortality rates and treatment delays.

7. Unique Value Proposition

- Offline diagnosis capability
- User-friendly interface for low-tech users
- Scalable and customizable to multiple poultry breeds

- Includes vet suggestions and treatment support

8. Behavioral Fit

- Farmers already use smartphones and take pictures of sick birds.
- The app fits into their daily workflow with minimal training needed.
- Can be easily integrated with poultry co-ops and farm supply chains.

9. Adoption Strategy

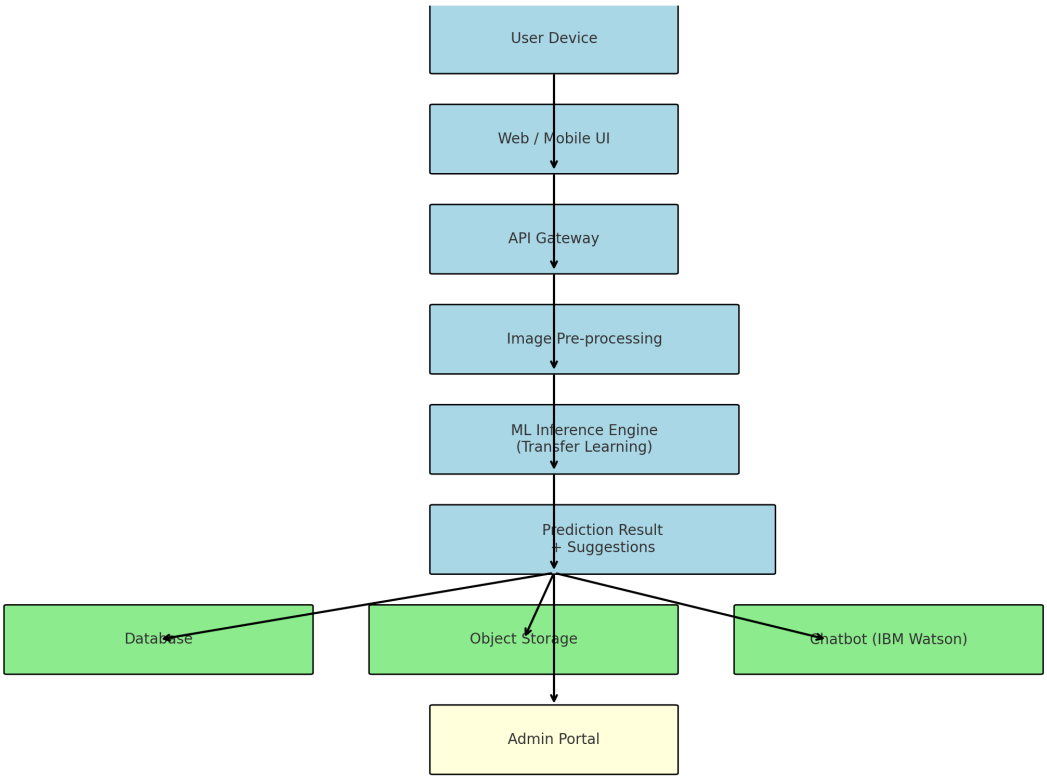
- Pilot in key poultry farming clusters
- Partner with NGOs, veterinary colleges, and government agri-departments
- Offer free trials and success stories to build credibility
- Promote via agricultural extension officers and farming expos

10. Metrics to Measure Fit :

- Number of active users per month
- Number of disease images analyzed
- Accuracy of predictions (validated by experts)
- Decrease in poultry mortality rates
- Farmer feedback and satisfac

4.3 Solution architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:



● Find the best tech solution to solve existing business problems.
● Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
● Define features, development phases, and solution requirements.
● Provide specifications according to which the solution is defined, management

5.Project planning and scheduling

5.1 project planning

📅 **Project Planning** :

The project planning phase involves defining the objectives, scope, timeline, resources, and deliverables required to successfully develop and implement the Transfer Learning-Based Poultry Disease Classification System. The primary

goal of this project is to build an intelligent system that enables poultry farmer.detect diseases early using image-based predictions powered by deep learning models.
The first step in planning is to clearly outline the project scope, which includes designing a mobile/web platform for image upload, integrating a pre-trained model for disease classification, enabling result visualization (such as Grad-CAM), and providing treatment recommendations. Out of scope for the current version are hardware integrations such as IoT sensors or real-time video surveillance.
Next, stakeholders such as poultry farmers, veterinary experts, AI engineers, UI/UX designers, and project managers are identified. Roles and responsibilities are assigned to ensure accountability at each stage of development. The requirements gathering phase focuses on both functional (e.g., user registration, prediction service, result display) and non-functional requirements (e.g., usability, security, scalability)

A timeline is established using a milestone-based approach. The project is divided into several sprints:

Sprint 1: Requirement analysis and system design

Sprint 2: Frontend and backend setup

Sprint 3: ML model integration and API development

Sprint 4: Testing, feedback, and deployment

Sprint 5: Final evaluation and documentation

Throughout the planning phase, careful attention is paid to risk assessment, such as data privacy, inconsistent model predictions, or limited connectivity in rural areas. Mitigation strategies, including secure cloud storage, confidence scoring, and offline mode support, are incorporated into the development roadmap.

Tools such as JIRA or Trello may be used for task tracking, while GitHub and Docker will support code management and deployment. Regular project reviews and stand-ups are scheduled to ensure the team stays aligned with goals and timelines.
In conclusion, the project planning phase lays the foundation for a structured, efficient, and collaborative development process, ensuring timely delivery of a

solution that meets the needs of end users while maintaining technical excellence

6.Functional and performance testing

6.1 performance testing

1.Inference Time

- Target: Less than 3 seconds per image.
- Tested under different image sizes and internet conditions.

2.**API Response Time**

- Time taken from image upload to displaying prediction results

3.System Throughput

- Number of images processed per minute during peak usage

4.Reliability

- Consistent output for identical or similar input images.

5.Resource Utilization

- Monitored CPU, GPU, and memory usage during operations

6.System Availability

- Ensured 24x7 uptime for farmers, especially during outbreaks

7. Result

7.1 output Screenshot

8.Advantages and Disadvantages

Advantages:

- Early Disease Detection
- AI-Powered Accuracy
- User-Friendly Interface
- Visual Explanations (Grad-CAM)
- Offline/Remote Access Potential
- Scalable and Cloud-Based
- Real-Time Results

- Feedback Loop
- Veterinary Integration
- Cost-Effective Solution

Disadvantages

- Dependence on Image Quality
- Limited to Visual Symptoms
- Connectivity Requirements
- Model Generalization Risk
- Trust Barrier with AI
- Need for Regular Updates
- Security & Privacy Concerns
- Initial Setup Cost (for Cloud)

9.Conclusion :

The proposed system offers an AI-powered solution for early and accurate detection of poultry diseases using transfer learning. By enabling farmers to upload images and receive instant predictions with treatment suggestions, it addresses key challenges like limited vet access and delayed diagnosis. With a user-friendly interface, Grad-CAM visualizations, and feedback features, the platform is both accessible and reliable. Despite minor limitations, the system is scalable, secure, and well-suited for real-world deployment, promising to improve

10: 🔭 Future Scope

- Add multilingual voice interface for ease of use
- Enable offline disease prediction support
- Expand model to cover more poultry diseases
- Integrate real-time video analysis for live monitoring
- Use IoT sensors for multimodal detection (e.g., temperature, sound)
- Build a farmer community and expert consultation platform

11. Appendix

Source code

```
poultry-disease-classifier/
│
├── frontend/                # React or Angular frontend
│   ├── public/
│   ├── src/
│   │   ├── components/
│   │   ├── pages/
│   │   ├── services/
│   │   └── App.js
│   └── package.json
│
├── backend/                 # Node.js + Express API
│   ├── controllers/
│   ├── routes/
│   ├── middleware/
│   ├── app.js
│   └── server.js
│
```

```
├── ml-model/                # ML model code
│   ├── model/               # Pre-trained model (ResNet/VGG)
│   ├── predict.py           # Inference script (FastAPI or Flask)
│   ├── requirements.txt
│   └── train_model.ipynb    # (Optional) training notebook
│
├── database/                # PostgreSQL schema
│   └── schema.sql
│
├── docker/                  # Docker deployment files
│   ├── Dockerfile
│   └── docker-compose.yml
│
└── README.md
```

Dataset link :

https://www.kaggle.com/datasets/andrewmvd/chicken-disease-dataset

Git hub and project demo link :

https://github.com/GoddetiPavithra/transfer-learning_based-classification-of-poultry-diseaeses-for-enhanced-health-management