Project Design Phase
Proposed Solution

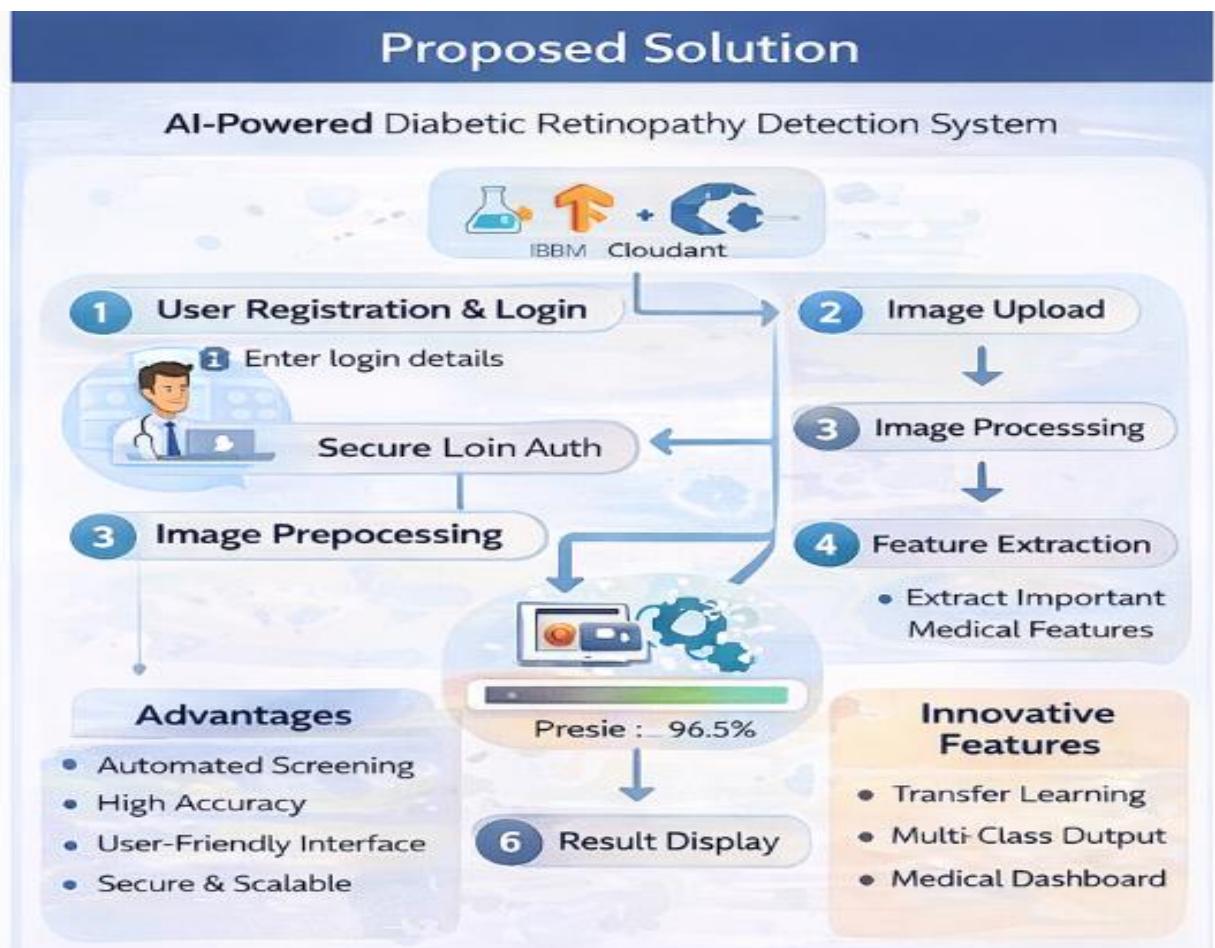| Date	15 February 2026
Team ID	LTVIP2026TMIDS81330
Project Name	Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy
Maximum Marks	2 Marks

Project Design Phase

Proposed Solution

1. Introduction

The proposed solution is an AI-powered web application that integrates a deep learning model with a secure web interface to detect Diabetic Retinopathy from retinal fundus images.

The system combines:

- Deep Learning Model (Xception CNN)

- Flask Backend

- Cloudant Database

- Medical Dashboard UI

2. System Overview

The proposed solution consists of three main components:

1. Frontend Interface
2. Backend Processing
3. Deep Learning Model

3. Working of Proposed Solution

Step 1: User Registration & Login

- User creates an account.
- Credentials stored in Cloudant database.
- Session-based authentication implemented.

Step 2: Image Upload

- Authenticated user uploads retinal image.
- Image stored temporarily in uploads folder.

Step 3: Image Preprocessing

The image undergoes preprocessing:

- Resize to (299 × 299)
- Convert to array
- Normalize pixel values
- Expand dimensions
- Apply preprocess_input()

Step 4: Feature Extraction

The Xception model extracts:

- Blood vessel patterns
- Lesions
- Hemorrhages
- Exudates
- Abnormal growth areas

Step 5: Classification

The model predicts probabilities for five classes.

Using:

np.argmax(predictions)

The highest probability class is selected.

Step 6: Result Display

The system displays:

- Predicted disease stage

- Confidence percentage

- Highlighted severity card

- Visual dashboard representation

4. Architecture of Proposed Solution

The architecture includes:

User → Flask Server → Preprocessing → Xception Model → Prediction → Display Result

Database handles:

User authentication and credential storage.

5. Advantages of Proposed Solution

- Automated screening

- Reduces manual workload

- Fast prediction (few seconds)

- User-friendly interface

- Scalable and deployable

- Suitable for telemedicine

6. Innovation in Proposed Solution

- Transfer learning approach
- Multi-class classification
- Medical-themed dashboard
- Real-time prediction
- Confidence visualization

7. Feasibility of Proposed Solution

Technical Feasibility:

Achievable using Python and TensorFlow.

Operational Feasibility:

User-friendly and practical.

Economic Feasibility:

Low cost compared to manual screening.

8. Future Scope of Proposed Solution

- Add Grad-CAM heatmaps
- Deploy on cloud server
- Integrate patient history system
- Mobile application version
- Multi-disease detection

Conclusion

The proposed solution effectively integrates Deep Learning and Web Technology to provide a reliable, automated, and secure Diabetic Retinopathy detection system. It demonstrates real-world applicability and potential for future healthcare deployment.