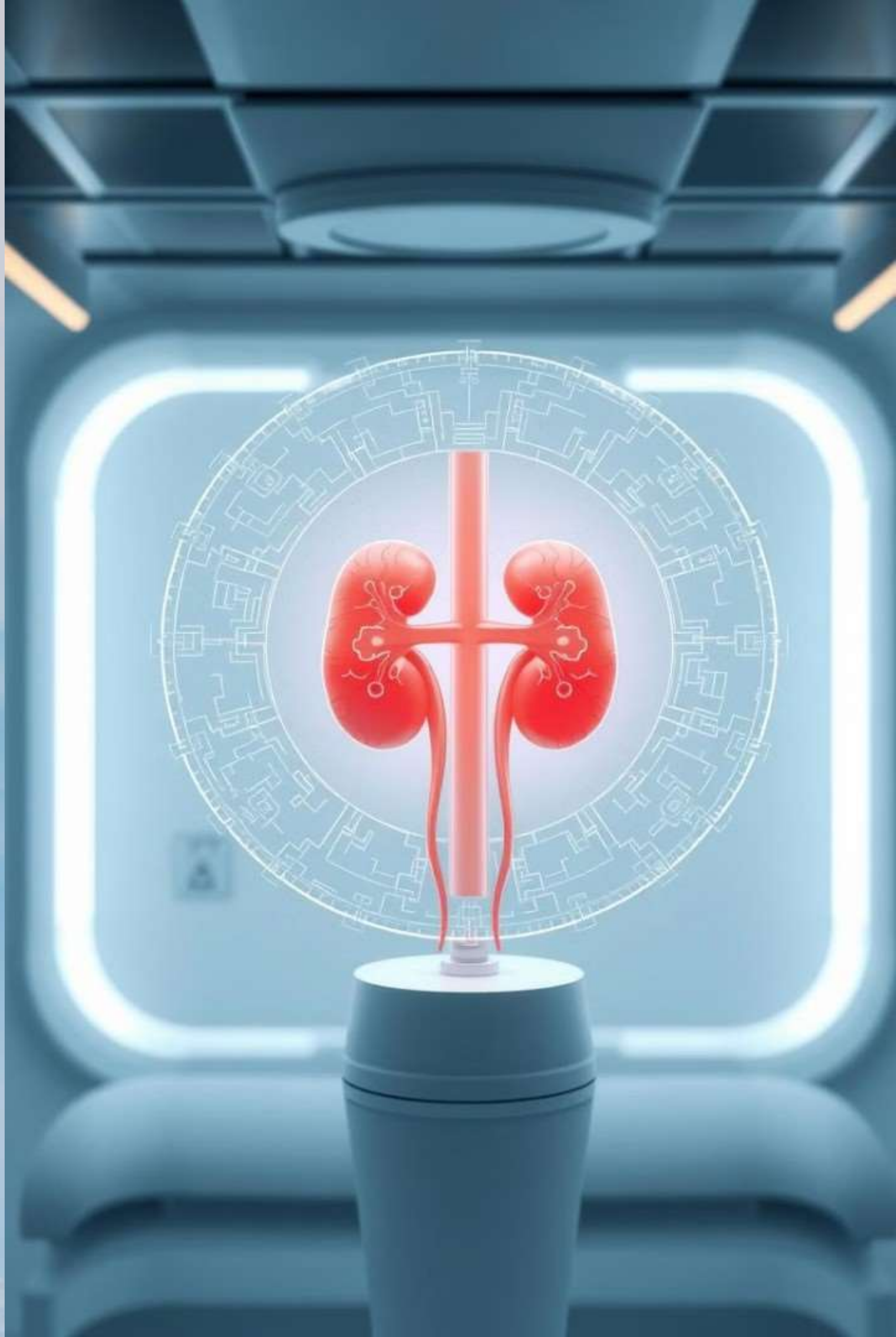
AI-Driven Prediction Model for Chronic Kidney Disease Diagnosis

This presentation details the application of Artificial Intelligence in diagnosing Chronic Kidney Disease (CKD). Our goal is to leverage deep learning models for rapid and precise identification, thereby enabling more effective treatment through early detection. This project focuses on developing an accurate and efficient AI system designed for the early diagnosis of CKD, promising a significant step forward in healthcare.



Motivation: Saving Lives Through AI

1. **Rapid Diagnosis**

   AI empowers healthcare with quick, accurate diagnoses.

2. **Early Intervention**

   Enables timely treatment and improves patient outcomes.

3. **Global Impact**

   Reduces the burden of CKD on healthcare systems.

Problem: Early CKD Detection

Accurate Prediction

Analyze patient data to predict CKD presence.

Timely Intervention

Crucial for preventing CKD progression.

Efficient Tool

Assist healthcare providers in early diagnosis.

Objective: Deep Learning for Early Diagnosis

Early Detection

Accurate Diagnosis

Improved Outcomes

Develop a deep learning model for early CKD detection. Leverage medical data to predict risk factors. Facilitate timely intervention and improve patient outcomes.

Scope: AI-Driven CKD Management

1

Early Diagnosis

Detect CKD in its initial stages.

2

Risk Assessment

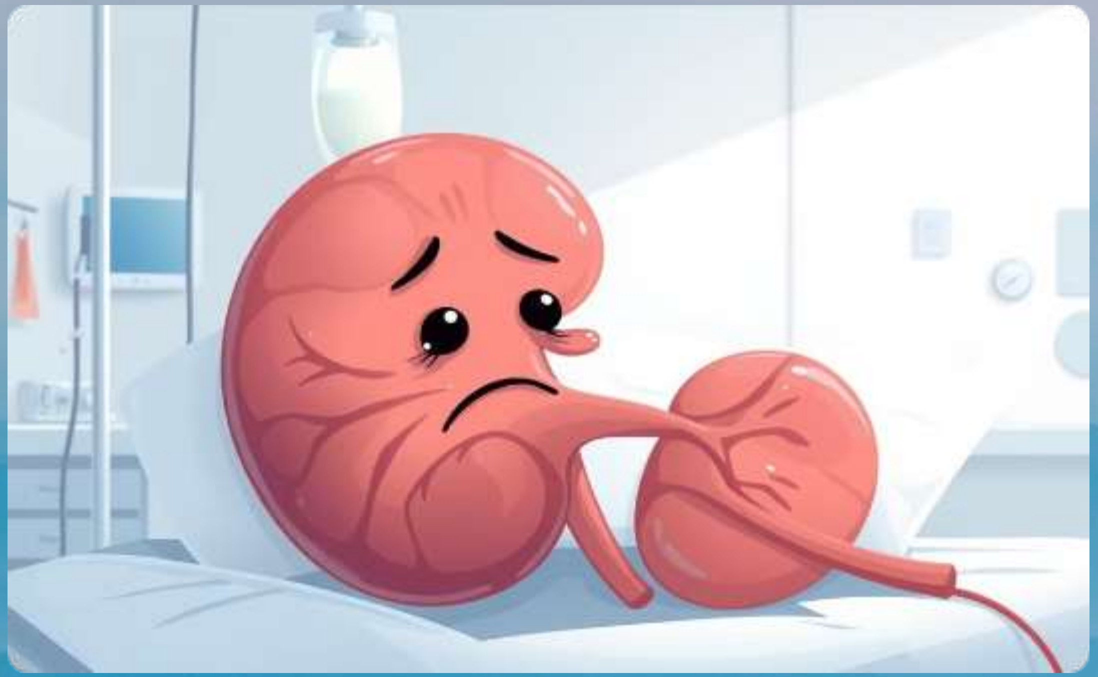
Evaluate individual CKD risk levels.

3

Treatment Optimization

Tailor treatments for better results.

The Challenge: Diagnosing CKD Early



Progressive Condition

CKD leads to gradual kidney function loss.

Late Symptoms

Often shows no symptoms until advanced stages.

Traditional Methods

Time-consuming and may miss early CKD.

AI Solution: Advanced Deep Learning Models

1. **CNN**

   Automatic feature extraction

2. **MobileNet**

   Powerful classification

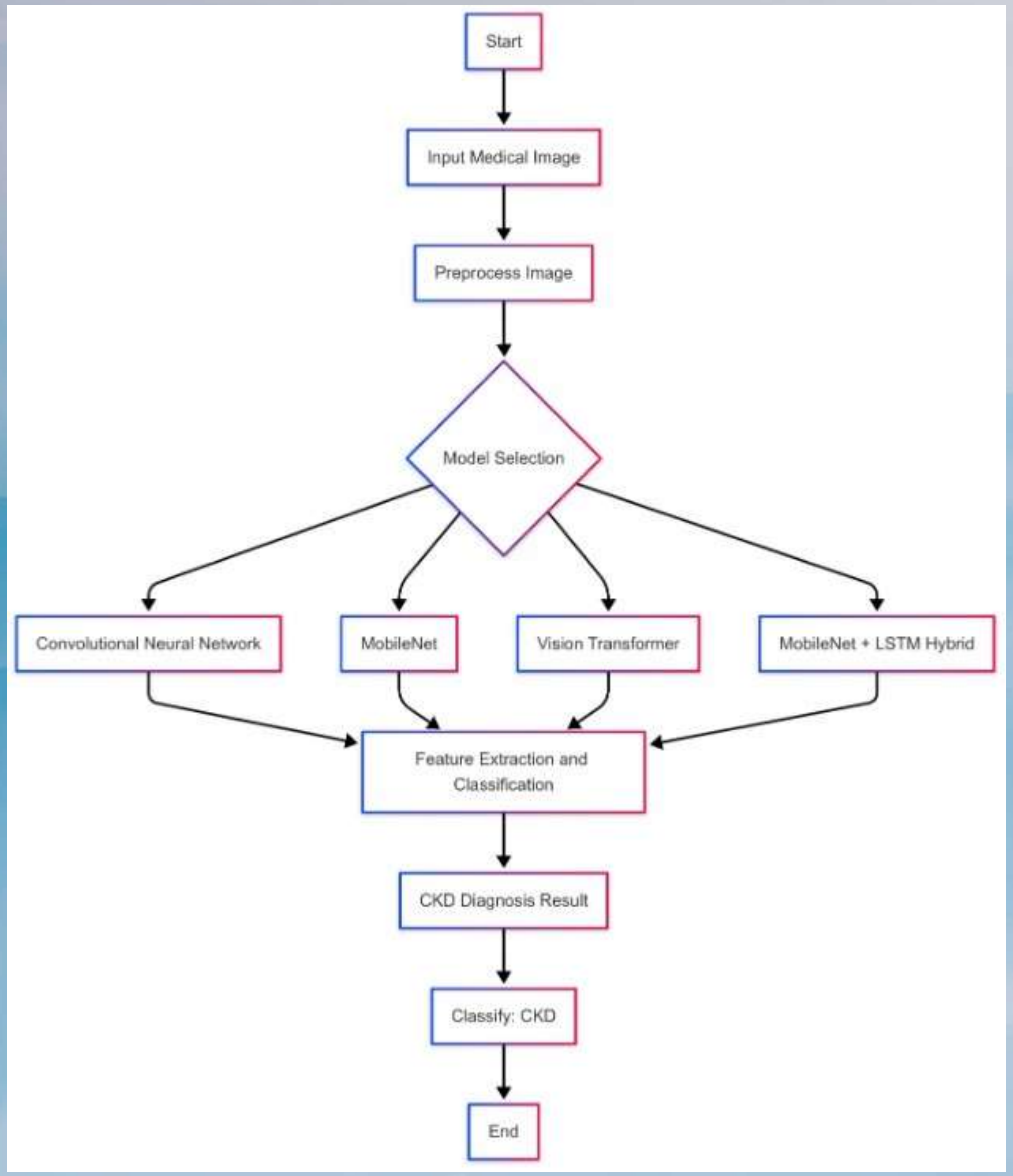
3. **MobileNet + LSTM**

   Enhances performance

4. **ViT**

   Captures complex relationships

Architecture of the model:



IMPLEMENTATION:

1

Data Collection

Kidney-related medical images are sourced from public datasets like Kaggle or medical repositories. The dataset is compiled and prepared for processing, ensuring diverse and representative samples for training and testing.

2

Data Preprocessing

Images are resized to 224x224 and normalized to [0, 1]. Feature extraction is performed using CNN, MobileNet, ViT, or MobileNet+LSTM for spatial or sequential data analysis.

3

Data Splitting

The dataset is split into 80% for training and 20% for testing. This ensures models are trained on sufficient data while retaining a subset for unbiased performance evaluation.

4

Model Training

CNN, MobileNet, ViT, and MobileNet+LSTM models are trained. Cross-validation (e.g., Stratified K-Fold) ensures robustness. Sequential data uses LSTM to capture temporal patterns.

IMPLEMENTATION:

5 Ensemble Model

Predictions from multiple models are combined using soft voting to enhance accuracy and reliability, leveraging the strengths of each model for better kidney disease detection.

6 Model Evaluation

Performance is assessed using metrics like accuracy, precision, recall, F1-score, and AUC-ROC. This ensures the model effectively classifies kidney disease stages.

7 Model Saving

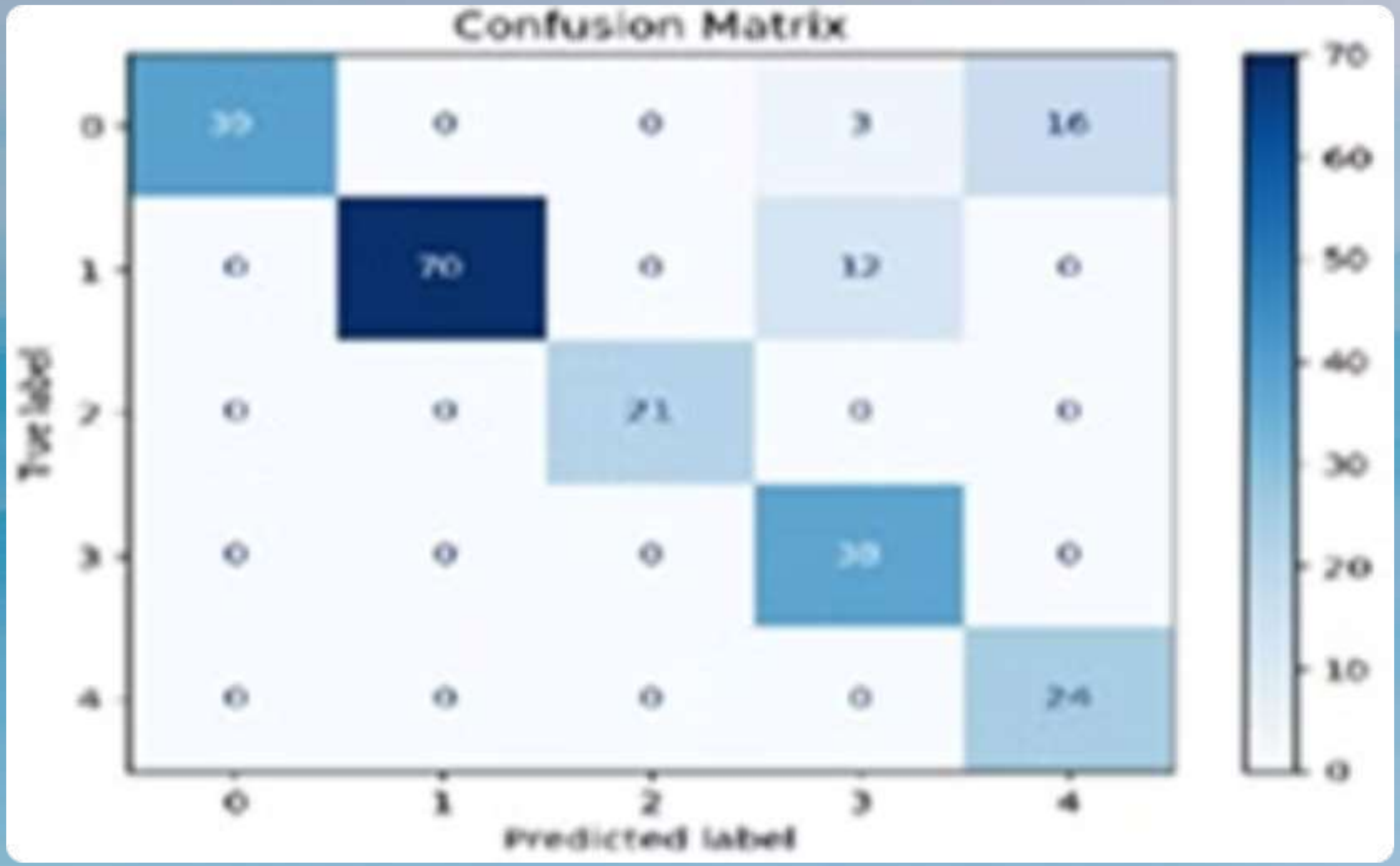
The best-performing model is saved as a .pkl file, preserving learned weights for future use without retraining, ensuring efficiency in deployment.

8 Model Prediction

Saved models predict kidney disease in new images, providing real-time diagnostics to aid healthcare decisions, improving early detection and treatment.

RESULTS:

MODEL 1: CNN



Confusion Matrix

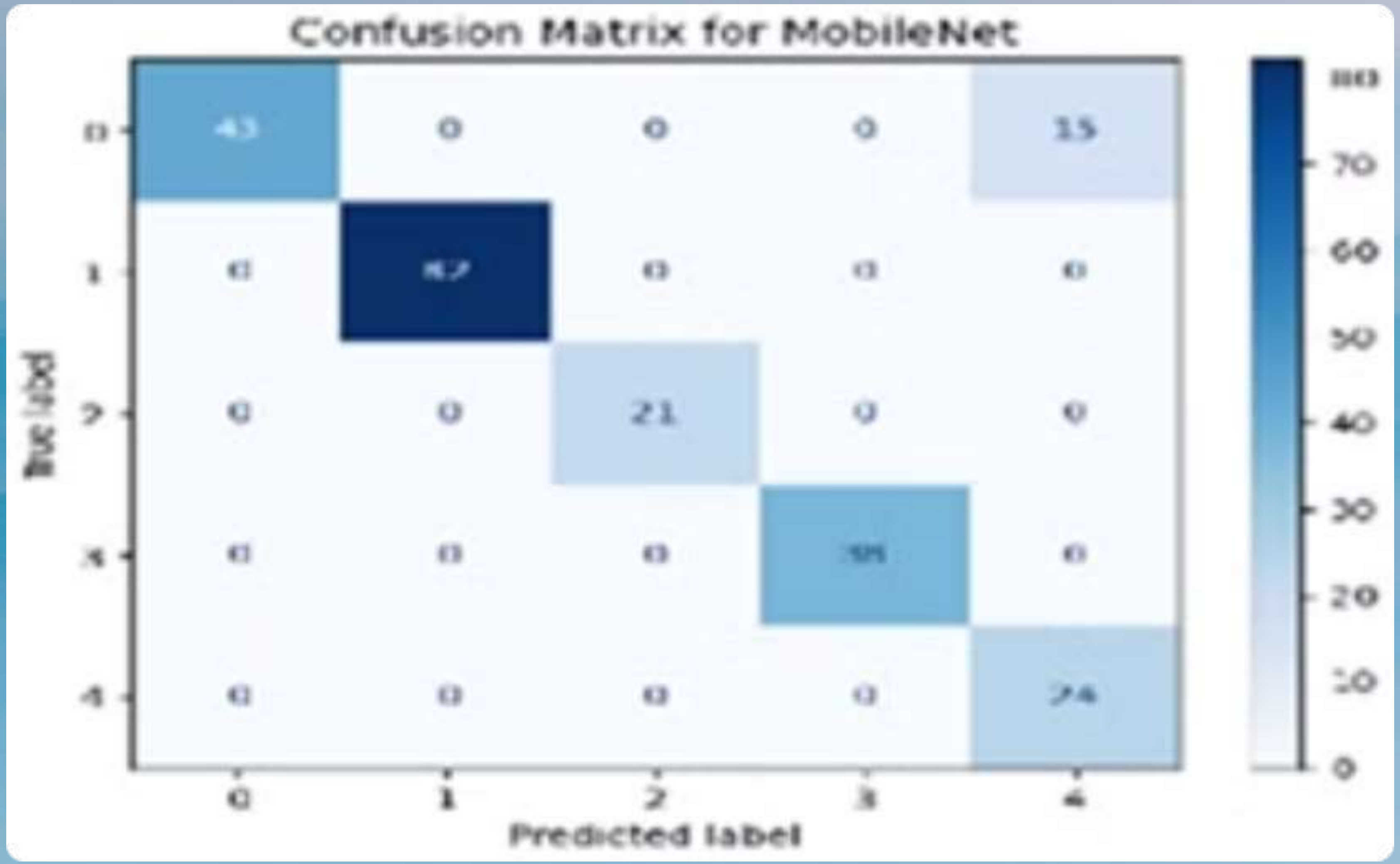
assification Report:

	precision	recall	f1-score	support
0	1.00	0.67	0.80	58
1	1.00	0.85	0.92	82
2	1.00	1.00	1.00	21
3	0.72	1.00	0.84	38
4	0.60	1.00	0.75	24
accuracy			0.86	223
macro avg	0.86	0.91	0.86	223
ighted avg	0.91	0.86	0.87	223

Classification report

RESULTS:

MODEL 2: MobileNet



Confusion Matrix

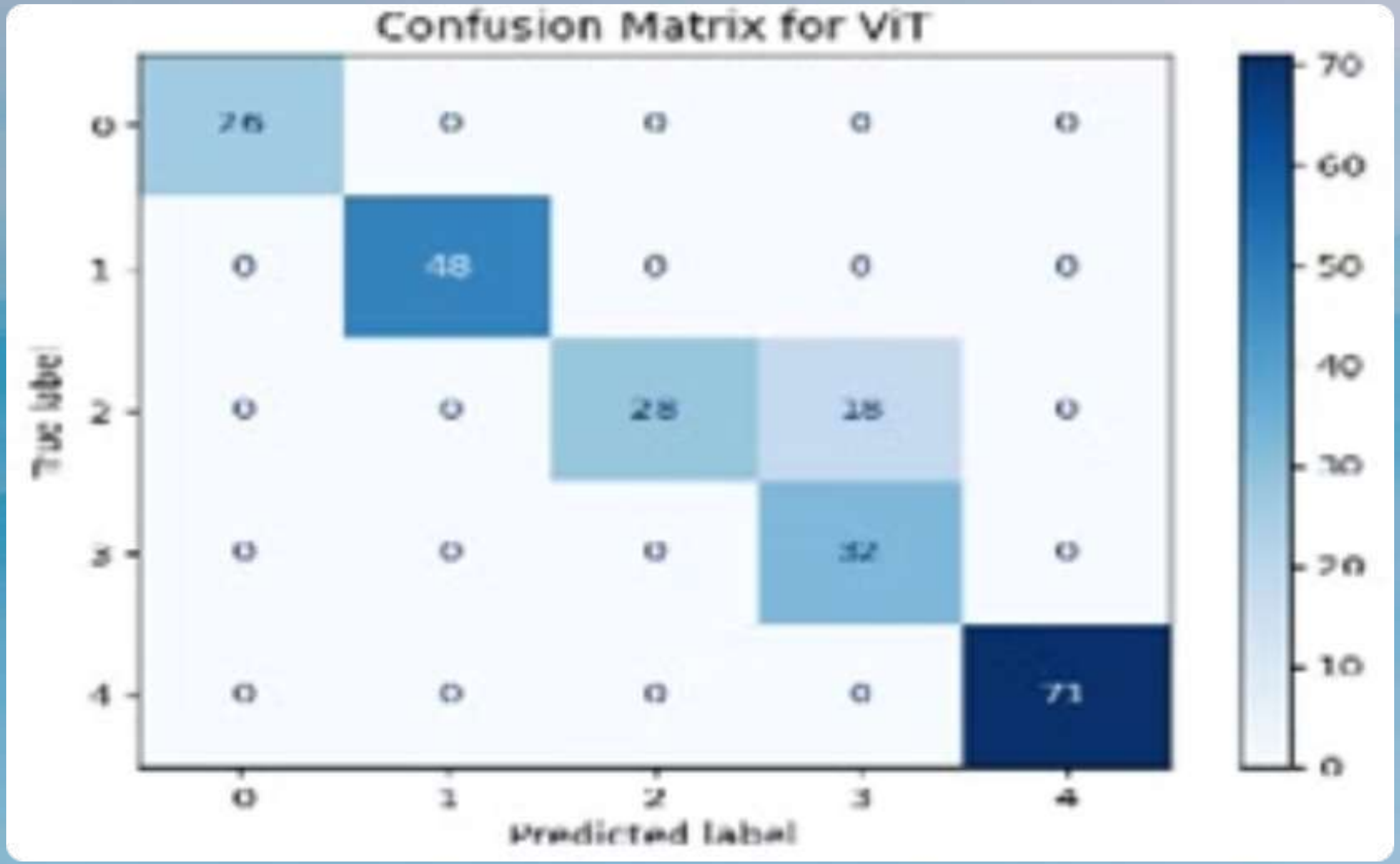
Classification Report:

	precision	recall	f1-score	support
0	1.00	0.74	0.85	58
1	1.00	1.00	1.00	82
2	1.00	1.00	1.00	21
3	1.00	1.00	1.00	38
4	0.62	1.00	0.76	24
accuracy			0.93	223
macro avg	0.92	0.95	0.92	223
weighted avg	0.96	0.93	0.94	223

Classification Report

RESULTS:

MODEL 3: ViT



Confusion Matrix

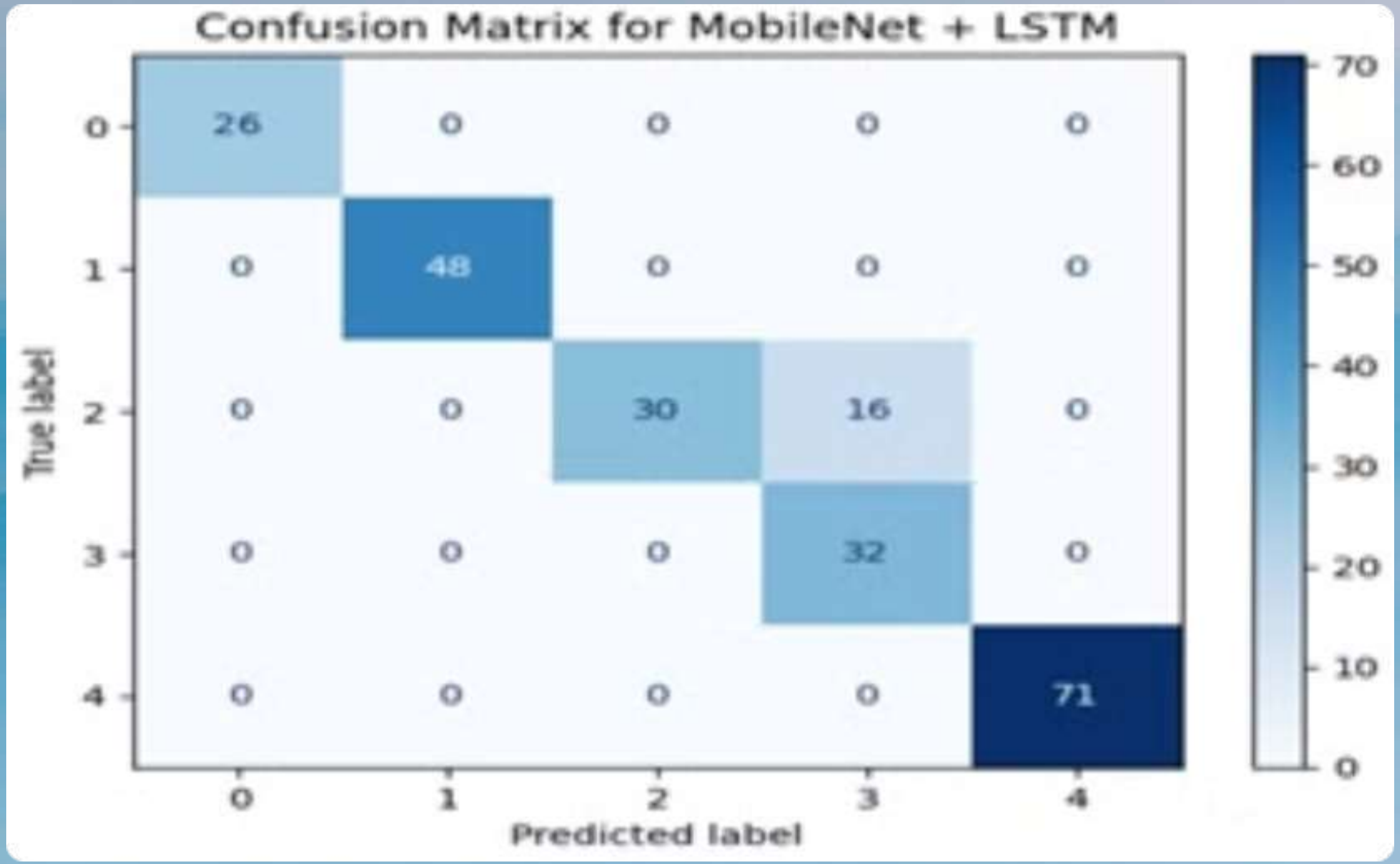
Classification Report:

	precision	recall	f1-score	support
0	1.00	1.00	1.00	26
1	1.00	1.00	1.00	48
2	1.00	0.61	0.76	46
3	0.64	1.00	0.78	32
4	1.00	1.00	1.00	71
accuracy			0.92	223
macro avg	0.93	0.92	0.91	223
weighted avg	0.95	0.92	0.92	223

Classification Report

RESULTS:

MODEL 4: MobileNet + LSTM



Confusion Matrix

Classification Report:

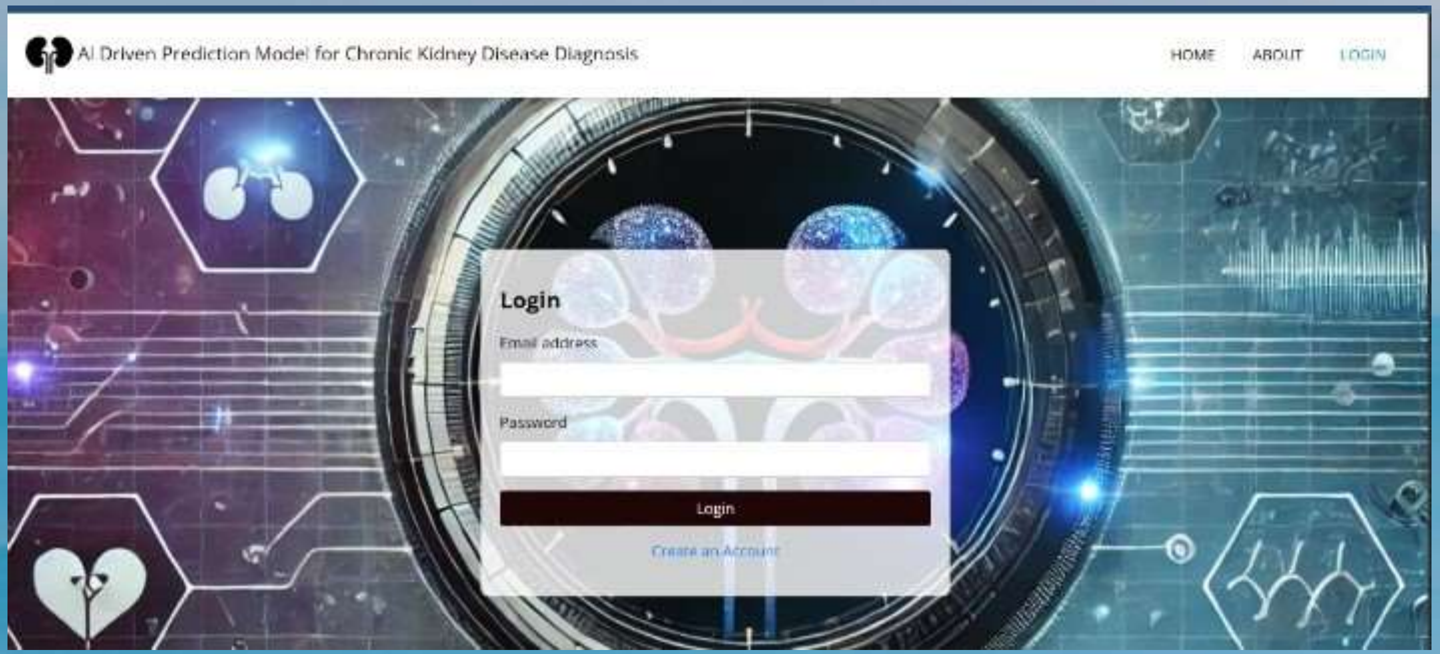
	precision	recall	f1-score	support
0	1.00	1.00	1.00	26
1	1.00	1.00	1.00	48
2	1.00	0.65	0.79	46
3	0.67	1.00	0.80	32
4	1.00	1.00	1.00	71
accuracy			0.93	223
macro avg	0.93	0.93	0.92	223
weighted avg	0.95	0.93	0.93	223

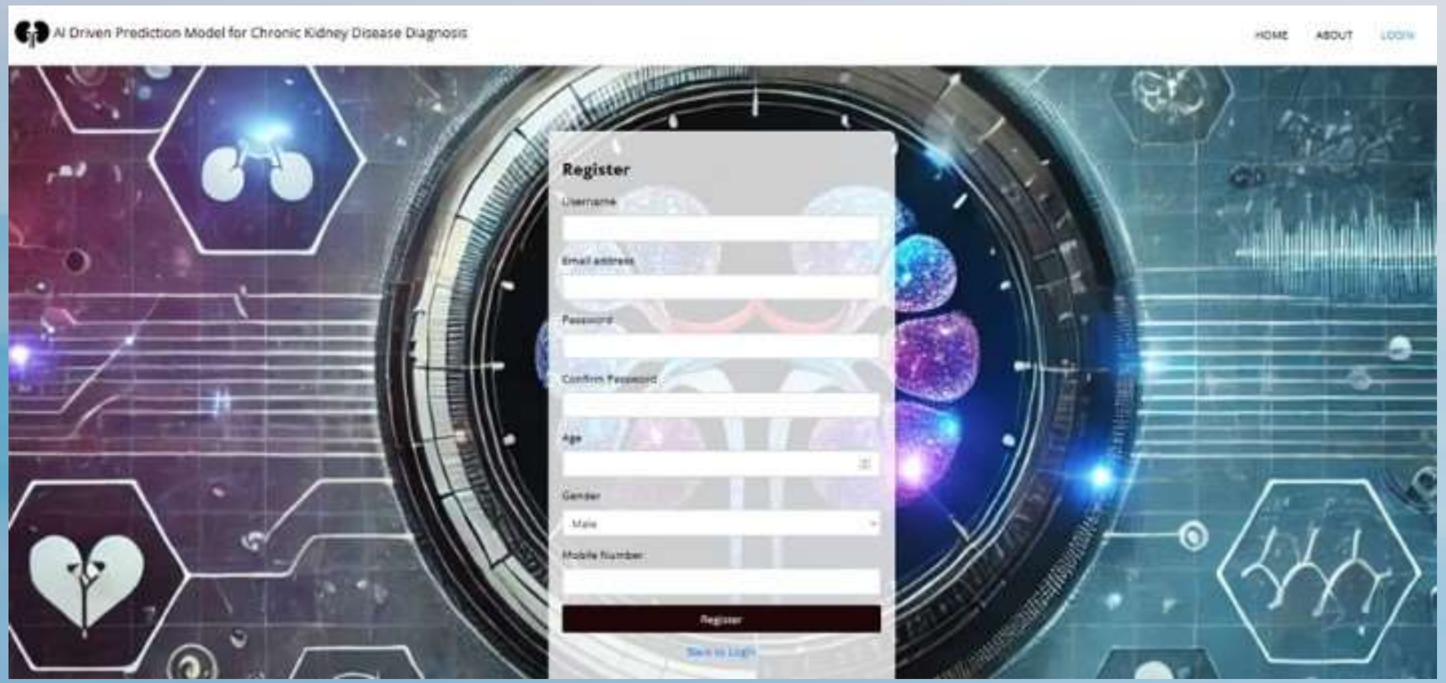
Classification Report

RESULTING ACCURACY SCORES:

Model 1 (Convolutional Neural Network - CNN)	**0.86**
Model 2 (MobileNet)	0.93
Model 3 (Vision Trsansformers - ViT)	0.92
Model 4 (MobileNet + LSTM)	0.93

Output Screen:





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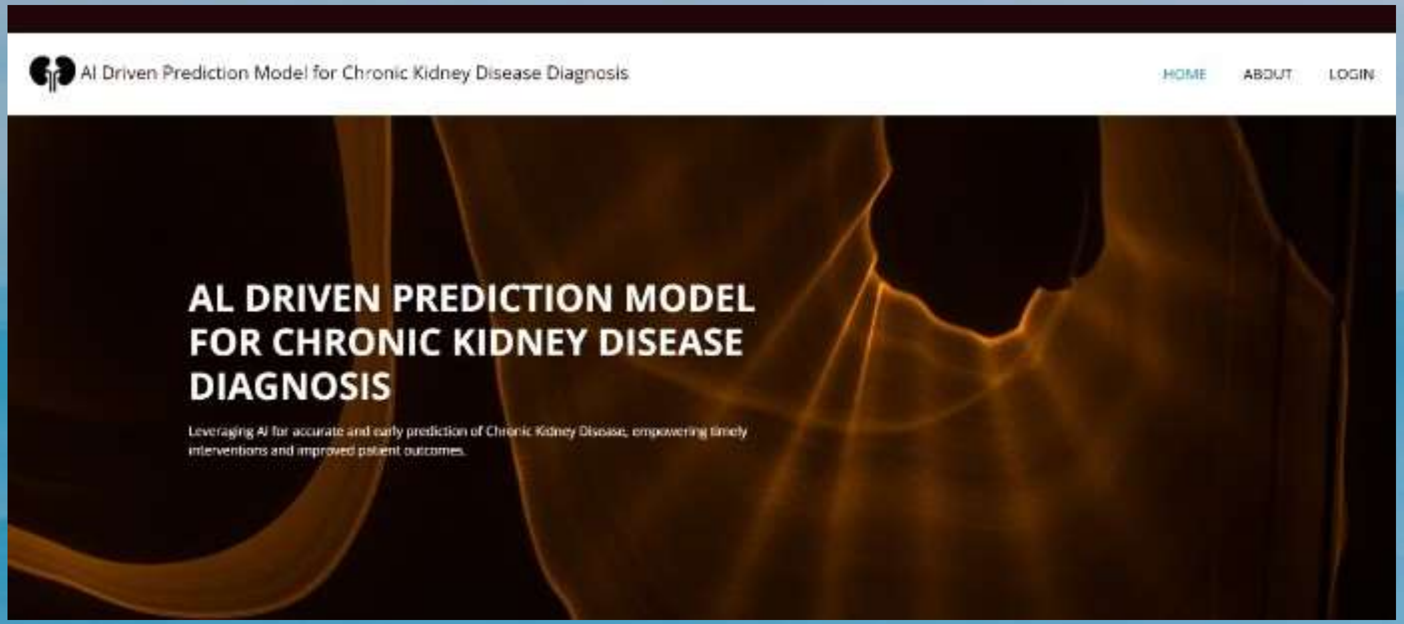
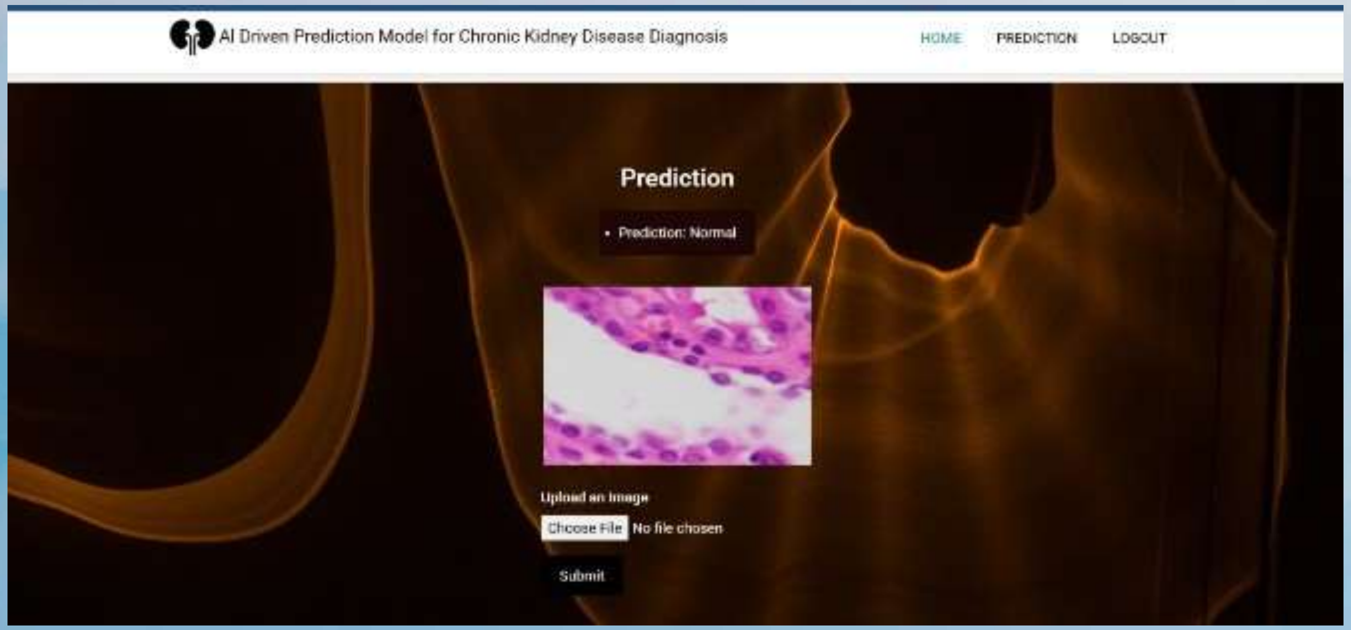




Future Enhancements in Kidney Disease Detection

Future improvements focus on boosting model accuracy and generalization.

Using diverse, larger datasets covering all disease stages will strengthen learning.

Advanced techniques like transfer learning and hybrid models will enhance performance.

Real-time predictions and multi-modal data integration will expand clinical utility.

Data Expansion

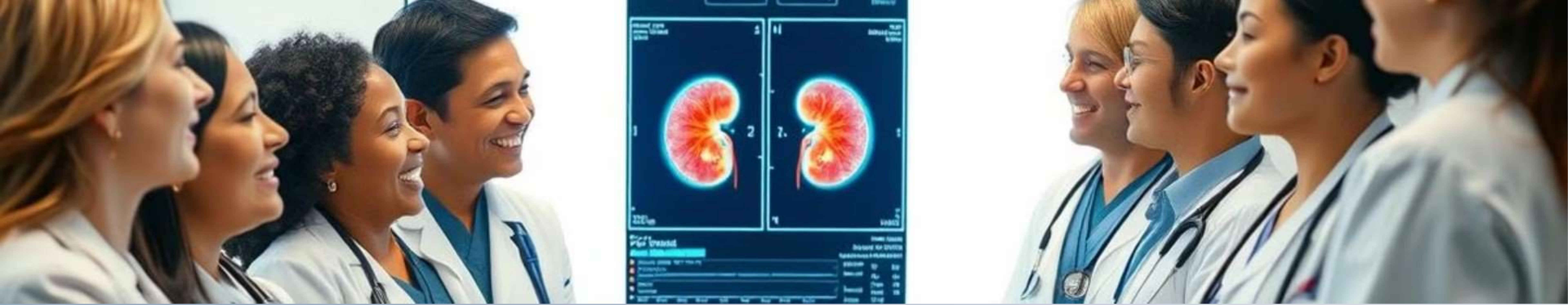
Include varied stages and types of kidney diseases for comprehensive learning.

Advanced Techniques

Apply transfer learning and combine deep learning with traditional diagnostics.

System Capabilities

Enable real-time predictions and integrate clinical plus imaging data.



Impact: Revolutionizing CKD Diagnosis

90%

Accuracy

Expected accuracy in early CKD detection

50%

Faster Results

Reduction in diagnostic time

Easy

Accessibility

User-friendly tool for clinicians

AI-powered solution for early CKD detection. High accuracy and faster results. Accessible tool for improved patient care.

Thank You