B.L.D.E.A'S V.P. Dr. P.G.HALAKATTI COLLEGE OF ENGINEERING AND TECHNOLOGY BIJAPUR – 586103

Nephropathy Prediction Using Deep Learning Models

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Introduction

- ✓ The field of kidney cancer detection and treatment is undergoing significant changes due to advancements in medical imaging, data analysis, and personalized care.
- ✓ Combining medical images with information from blood tests and patient histories is improving early detection and prognosis prediction.
- ✓ Machine learning models play a crucial role in analyzing large amounts of medical data to predict diseases and outcomes accurately.
- ✓ Telehealth and remote devices increase access to expert care, particularly benefiting those in rural areas or with limited options.
- ✓ These technologies are transforming healthcare by making it more personalized and accessible to all.

Literature review

SL. NO	PAPER TITLE	AUTHOR	METHODOLOGY	ISSUE ADDRESSED	CONCLUSION
1	Machine Learning Hybrid Model for CKD Prediction	Hira Khalid, Ajab Khan, Muhammad Zahid Khan, Gulzar Mehmood, Muhammad Shuaib Qureshi	Hybrid machine learning approach	Develops a hybrid machine learning model for early CKD diagnosis, emphasising accuracy and addressing overfitting.	The hybrid machine learning model outperforms individual classifiers, achieving 100 accuracy in chronic kidney disease diagnosis.
2	Applying Machine Learning Techniques for Predicting the Risk of Chronic Kidney Disease	K. R. Anantha Padmanaban and G. Parthiban	Utilised machine learning methods for early detection of chronic kidney disease in diabetic patients	Early detection of chronic kidney disease, which is essential for timely intervention.	sThe study achieved 91% accuracy in predicting diabetic patients chronic kidney disease, stressing early intervention's significance.
3	Machine Learning Techniques for Chronic Kidney Disease Risk Prediction	Elias Dritsas and Maria Trigka	Machine Learning techniques, including class balancing, and features analysis.	Early prediction of Chronic Kidney Disease (CKD)	Rotation Forest achieved 99.2% accuracy in CKD prediction
4	Prevalence and risk factors of chronic kidney disease and diabetic kidney disease in a central Chinese urban population: a cross-sectional survey	Jia-Yu Duan, Guang-Cai Duan , Chong-Jian Wang , Dong-Wei Liu , Ying-Jin Qiao , Shao-Kang Pan, Deng-Ke Jiang , Yong Liu , Zi-Hao Zhao, Lu-Lu Liang , Fei Tianand Zhang-Suo Liu	Evaluation of CKD and DKD prevalence and risk factors in a central Chinese urban population	Prevalence and risk factors for CKD and DKD in a central Chinese urban population	The study found an overall adjusted CKD prevalence of 16.8% and DKD prevalence of 3.5%, with various risk factors identified for reduced eGFR and albuminuria
5	Backpropagation Neural Network-Based Machine Learning Model for Prediction of Blood Urea and Glucose in CKD Patients	JIVAN PARAB , MARLON SEQUEIRA , MADHUSUDAN LANJEWAR , CAJE PINTO , AND GOURISH NAIK	Non-invasive blood parameter monitoring (urea and glucose) using NIR spectroscopy and BP-ANN/PLSR	Non-invasive blood parameter monitoring for diabetes patients with CKD	The BP-ANN model significantly improved the prediction accuracy for blood urea and glucose, providing a non-invasive solution for diabetes patients with CKD

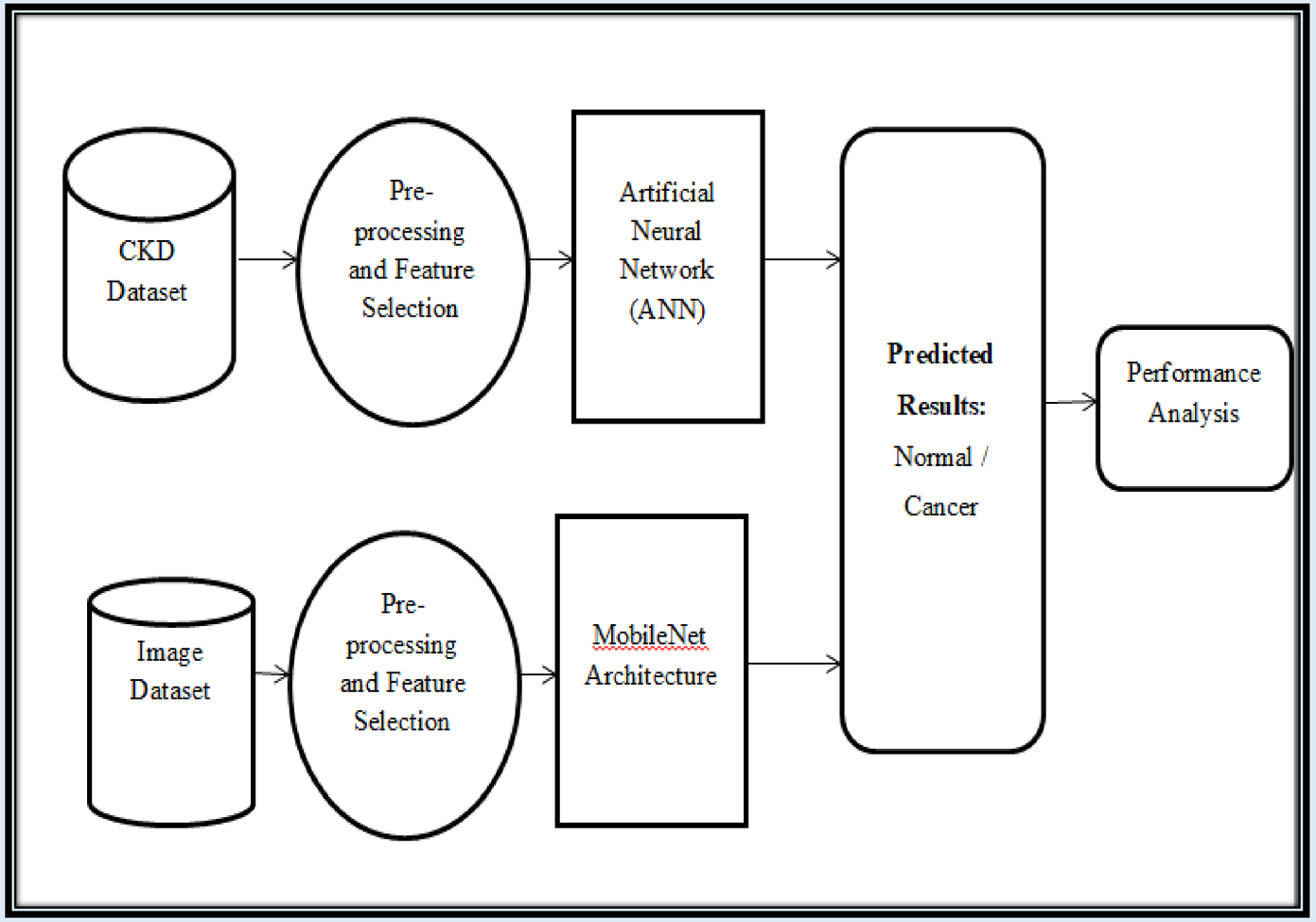
Problem Statement

- ✓ Kidney cancer detection challenge addressed using deep learning models
- ✓ Goal to enhance early detection accuracy by integrating CT scan and blood test data.
- ✓ Key challenges include low accuracy, limited data integration, and accessibility issues.
- ✓ Development of deep learning models for CT and blood test analysis, with a user-friendly web interface.
- ✓ Innovative solution to revolutionize kidney cancer diagnosis and improve patient outcomes.

Objectives

- ✓ Develop advanced deep learning models for kidney cancer detection using both CT scans and blood test data.
- ✓ Create a user-friendly web interface for seamless data submission and rapid analysis.
- ✓ Achieve high accuracy and reliability in cancer detection through comprehensive analysis of medical images and patient data.
- ✓ Improve accessibility to expert care by leveraging remote monitoring devices.
- ✓ Contribute to the transformation of healthcare by making diagnosis and treatment more personalized and accessible to all, irrespective of geographical location or resource constraints.

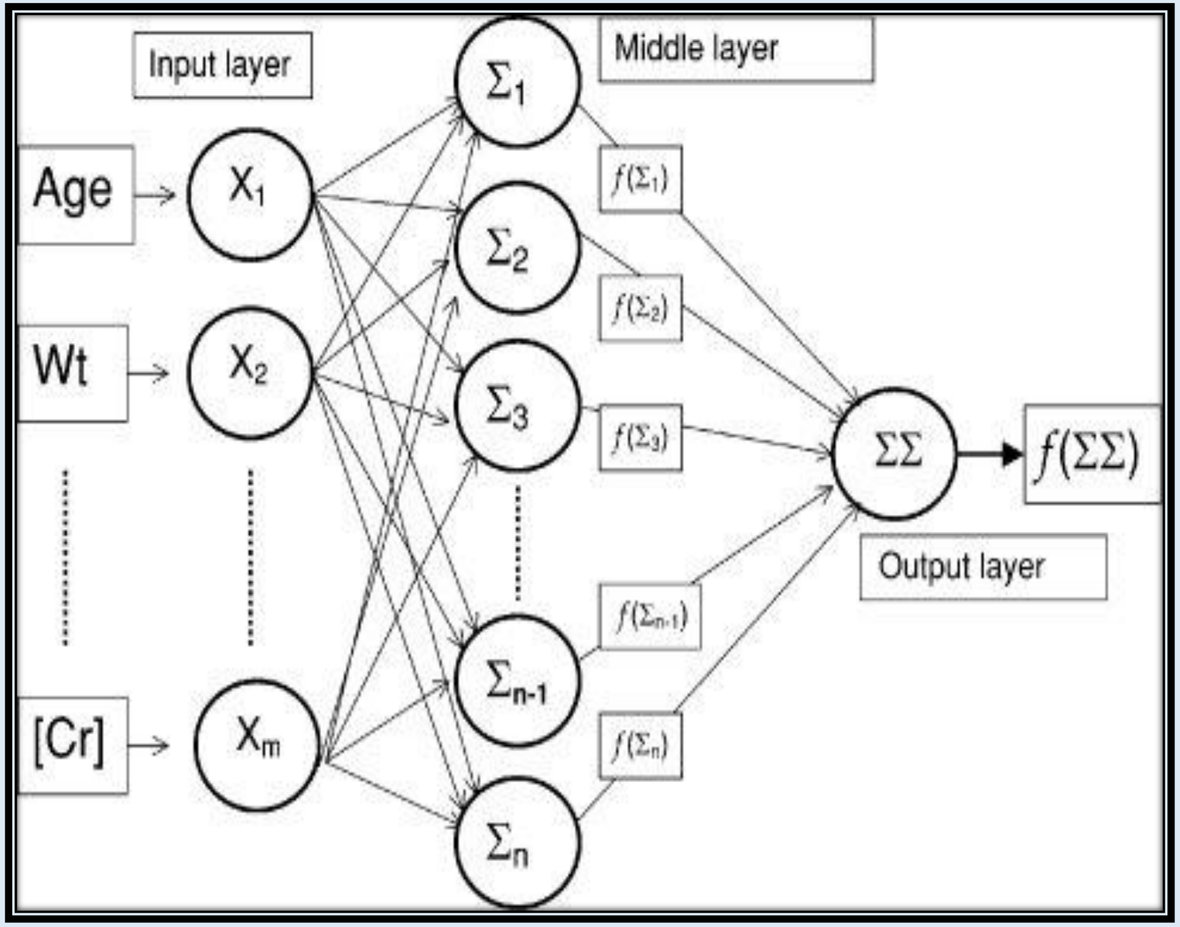
Methodology



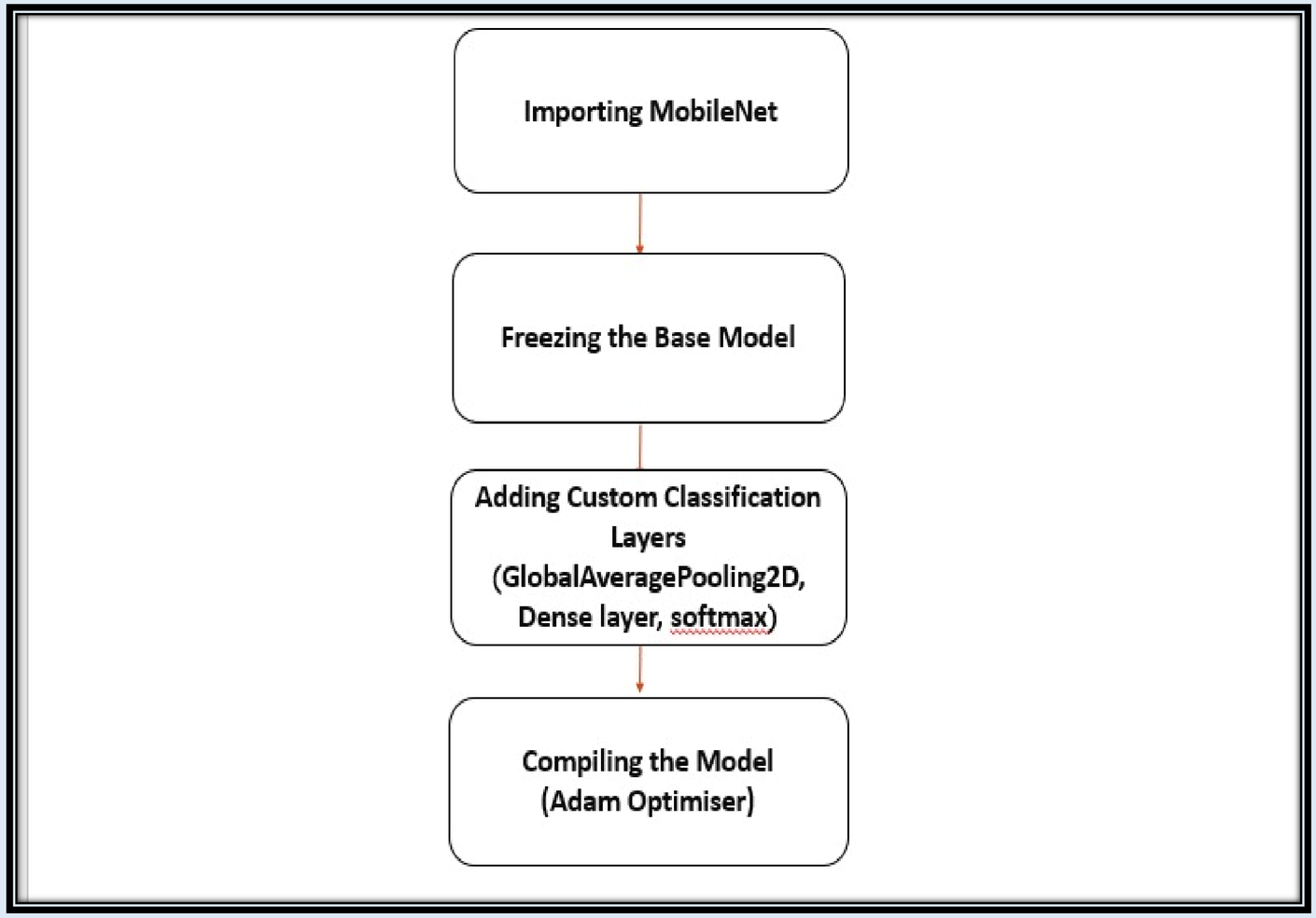
ANN Architecture

FEATURES

- Age
- blood_pressure
- Albumin
- sugarred_blood_cells (numeric after conversion)
- pus_cell (numeric after conversion)
- pus_cell_clumps (numeric after conversion)
- bacteria (numeric after conversion)
- blood_glucose_randomblood_ureaserum_creatininepotassiumhaemoglobin (dropped during feature selection)
- white_blood_cell_counthypertension (numeric after conversion)
- diabetes_mellitus (numeric after conversion)
- coronary_artery_disease (numeric after conversion)
- peda_edema (numeric after conversion)
- anemia (numeric after conversion)



MobileNet


Importing MobileNet
Freezing the Base Model
Adding Custom Classification Layers (GlobalAveragePooling2D, Dense layer, softmax)
Compiling the Model (Adam Optimiser)

Hardware and Software Requirements

HARDWARE REQUIREMENTS:

- System: Pentium i3,i5 Processor
- Hard Disk 500 GB.
- Monitor:15’’LED
- Input Devices: Keyboard, Mouse
- Ram:8GB

SOFTWARE REQUIREMENTS:

- Operating system: Windows 10,11
- Coding Language: Python
- Web Framework: Flask
- Frontend: HTML, CSS, JavaScript

Results

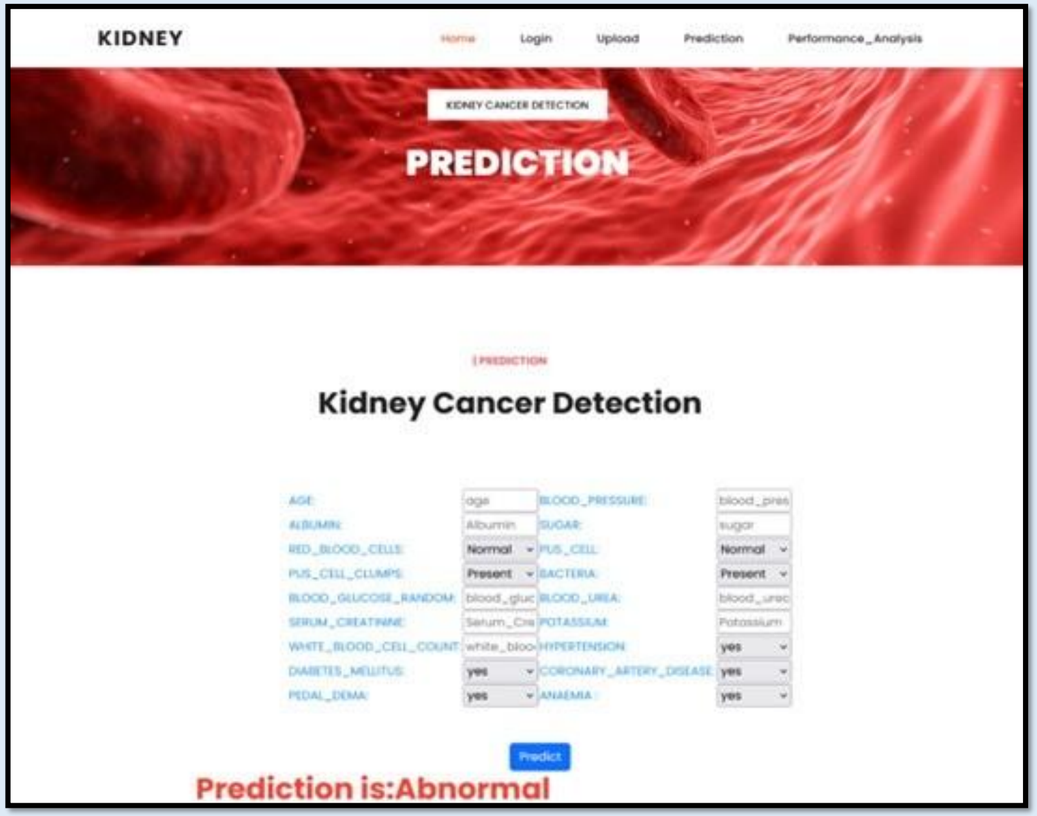


Fig. 1. Prediction Result

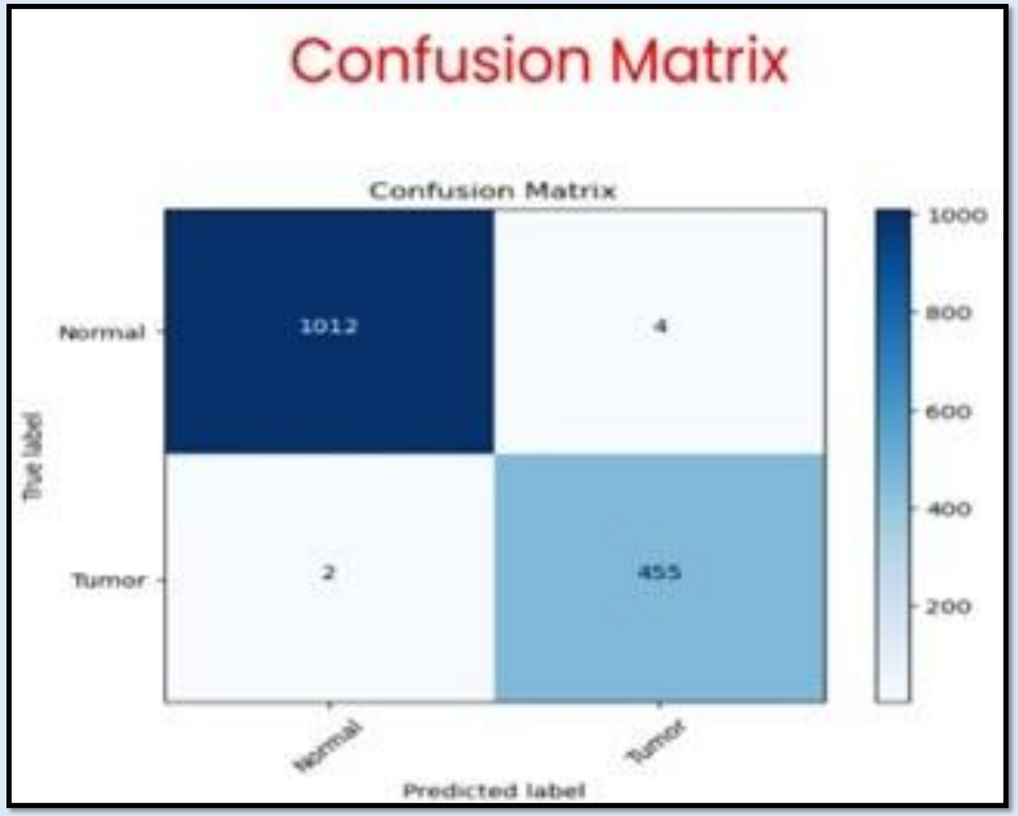


Fig. 2. Confusion Matrix of the Predicted Model

Results

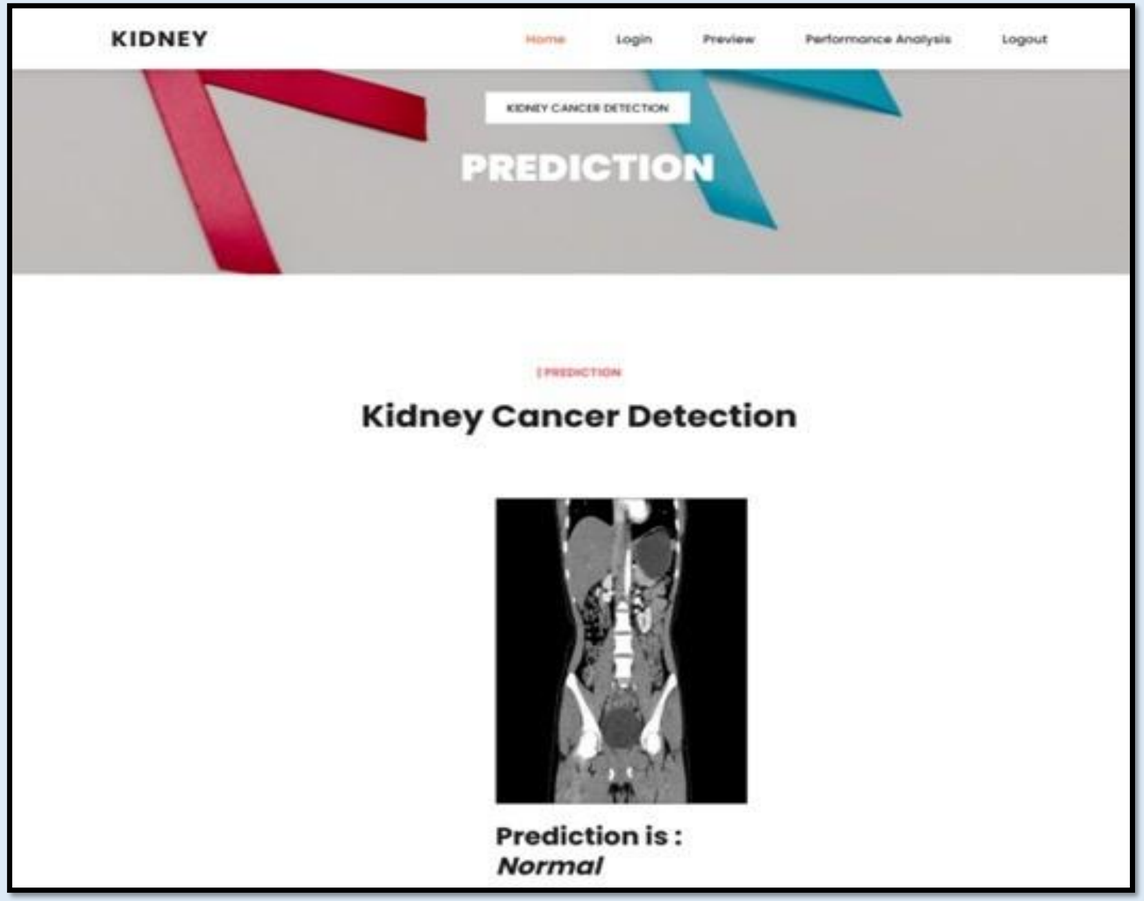


Fig. 3. Prediction Result

Results

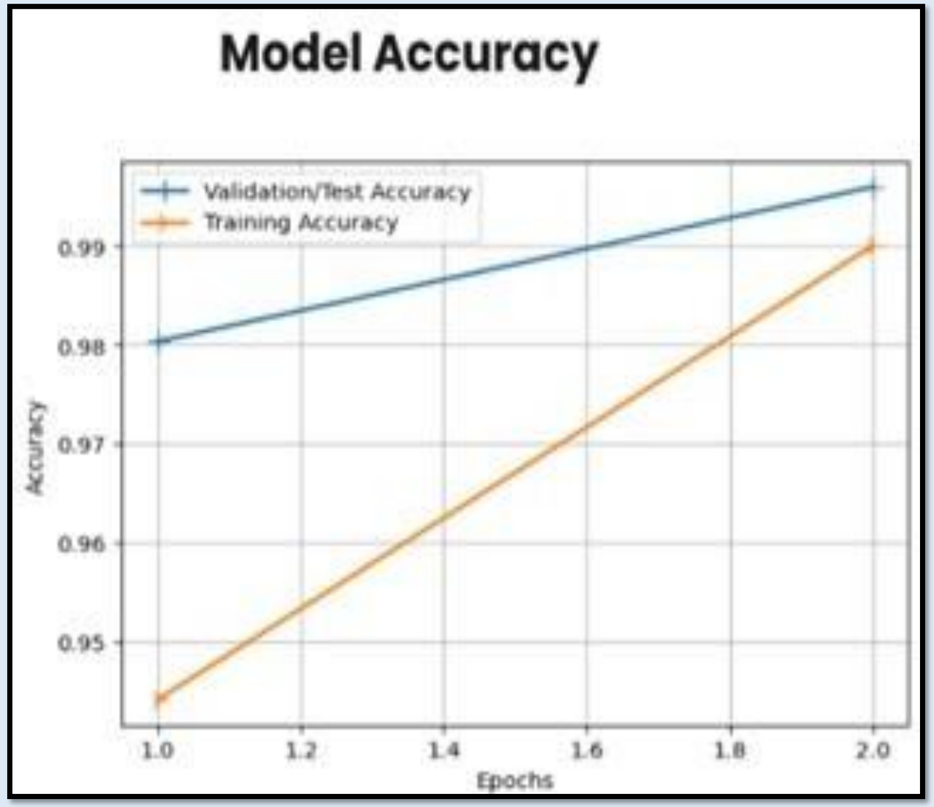


Fig. 4. Model Accuracy

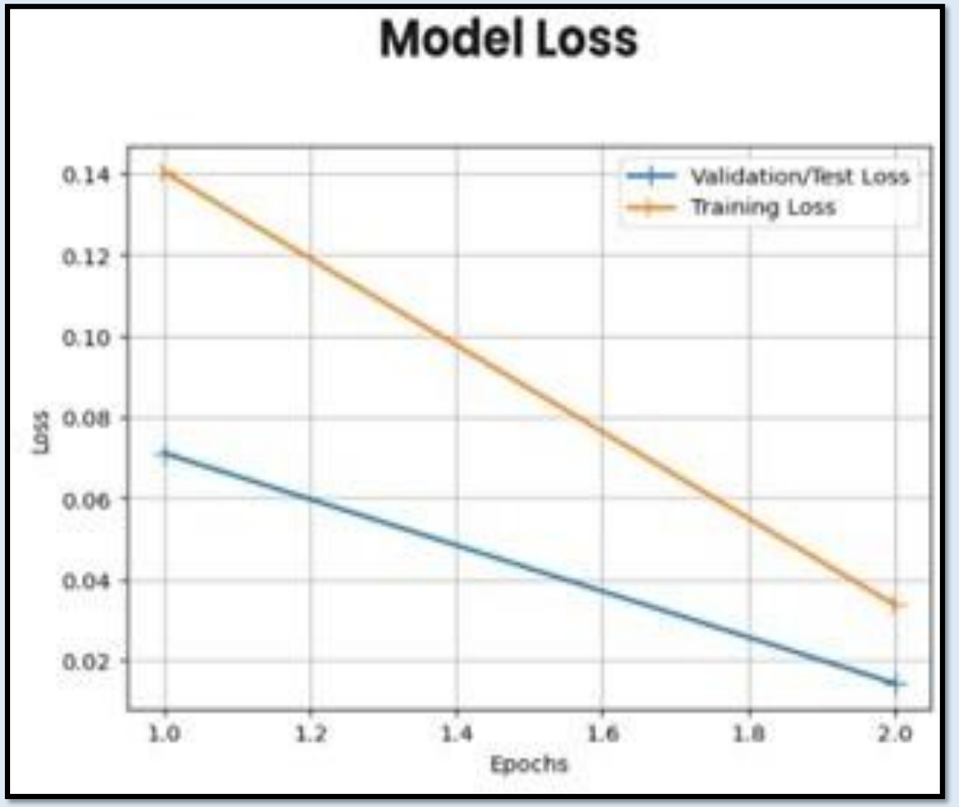


Fig. 5. Model Loss

Conclusion

- ✓ The project introduces a pioneering approach to kidney cancer detection, leveraging deep learning models, advanced imaging technologies, and telehealth solutions.
- ✓ Results demonstrate the feasibility and effectiveness of combining multiple data sources for enhanced diagnostic accuracy and personalized treatment strategies in kidney cancer detection.
- ✓ The user-friendly web interface facilitates easy access to expert care.
- ✓ By integrating innovative technologies and data-driven approaches, the project contributes to advancing the field of kidney cancer detection.

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