iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.80783

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Optimized Deep Learning-Based Ovarian Cancer Stage Prediction Using Normalization Techniques

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Abstract: ***Ovarian cancer is one of the most critical gynecological diseases, often diagnosed at advanced stages due to the lack of effective early detection methods. Accurate prediction of cancer stages using medical imaging and machine learning techniques can significantly improve treatment outcomes. This paper proposes an optimized deep learning-based system for ovarian cancer stage prediction using histopathology images. The system utilizes Convolutional Neural Networks (CNN) combined with normalization techniques to improve data quality and model performance. The proposed approach includes preprocessing steps such as image normalization, encoding, and outlier removal, followed by model training using advanced optimization techniques. The results demonstrate improved prediction capability and classification accuracy. The system provides a reliable and efficient solution for assisting medical professionals in early diagnosis and decision-making.***

Index Terms: Ovarian Cancer, Deep Learning, Convolutional Neural Network, Medical Imaging, Normalization, Cancer Prediction, Classification, Healthcare AI

I. INTRODUCTION

The Ovarian cancer is a leading cause of cancer-related deaths among women worldwide. Early detection and accurate classification of cancer stages play a crucial role in improving survival rates. However, traditional diagnostic techniques rely heavily on manual analysis and clinical expertise, which may lead to delayed detection and inconsistent results. With the advancement of artificial intelligence, machine learning and deep learning techniques have shown promising results in medical image analysis. In particular, Convolutional Neural Networks (CNNs) are highly effective in extracting features from histopathology images and identifying complex patterns associated with cancerous tissues. Despite these advancements, challenges such as data imbalance, improper feature scaling, and noise in medical datasets reduce the effectiveness of prediction models. Therefore, there is a need for an optimized system that incorporates normalization techniques and robust deep learning models to improve prediction accuracy. This paper proposes a deep learning-based ovarian cancer prediction system that focuses on data normalization, efficient model training, and accurate classification of cancer stages. The system aims to assist healthcare professionals by providing faster and more reliable diagnostic support.

II. LITERATURE REVIEW

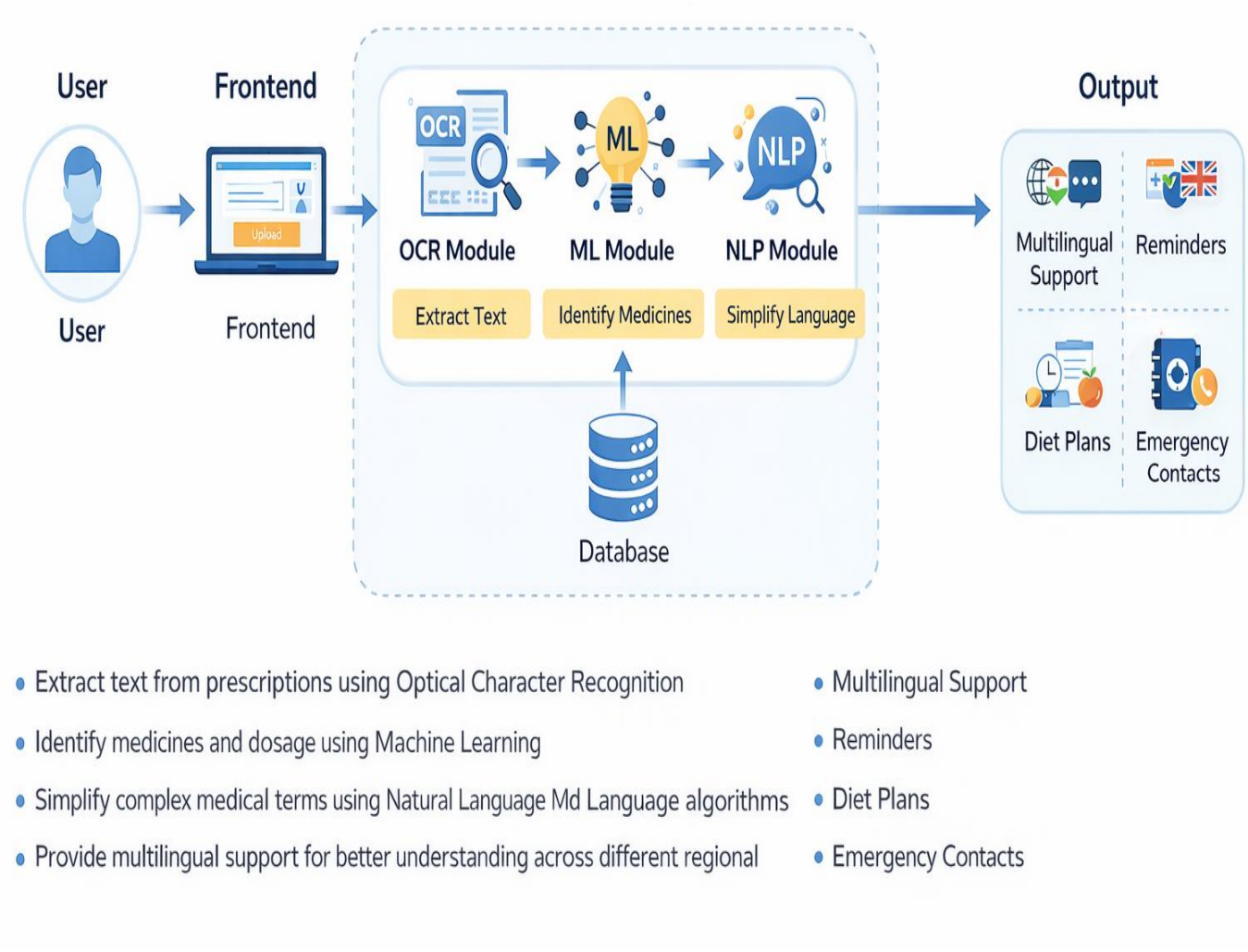
Several Several studies have explored the use of machine learning techniques for ovarian cancer detection. Traditional approaches used algorithms such as Support Vector Machines (SVM), Random Forest, and Logistic Regression to analyze clinical data and biomarkers such as CA-125 levels. These models achieved moderate accuracy but were limited in handling complex image data. Recent research has focused on deep learning techniques, particularly CNNs, for analyzing histopathology images. These models automatically extract features and provide improved accuracy compared to traditional methods. However, many existing models suffer from limitations such as overfitting, poor generalization, and reduced performance due to unbalanced datasets. Normalization techniques have been introduced to improve model performance by scaling input data and reducing variance. However, their impact on ovarian cancer prediction has not been fully explored. This paper builds upon existing research by integrating normalization strategies with CNN-based classification to enhance prediction accuracy and reliability.

III. SYSTEM ARCHITECTURE

The proposed system architecture consists of four main components: data preprocessing, model training, prediction module, and user interface. The data preprocessing module handles image cleaning, normalization, encoding, and outlier removal. This ensures that the dataset is consistent and suitable for training. The model training module uses a Convolutional Neural Network (CNN) to extract features and classify ovarian cancer stages. The model is trained using optimized parameters and normalization techniques to improve learning efficiency. The prediction module takes input images and processes them through the trained model to generate classification results. The user interface allows users or healthcare professionals to upload images and receive predictions in a simple and interactive manner.

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Fig. 1. Proposed System Architecture



IV. PROPOSED METHODOLOGY

The proposed methodology focuses on developing a secure cryptocurrency wallet system that enhances transaction safety through offline signing and advanced cryptographic techniques. The system follows a structured workflow beginning with user input, where transaction details such as recipient address and amount are provided through the wallet interface. Upon receiving the input, the system generates a pair of cryptographic keys consisting of a public key and a private key. The private key is securely stored using encryption techniques, while the public key is used for transaction verification.

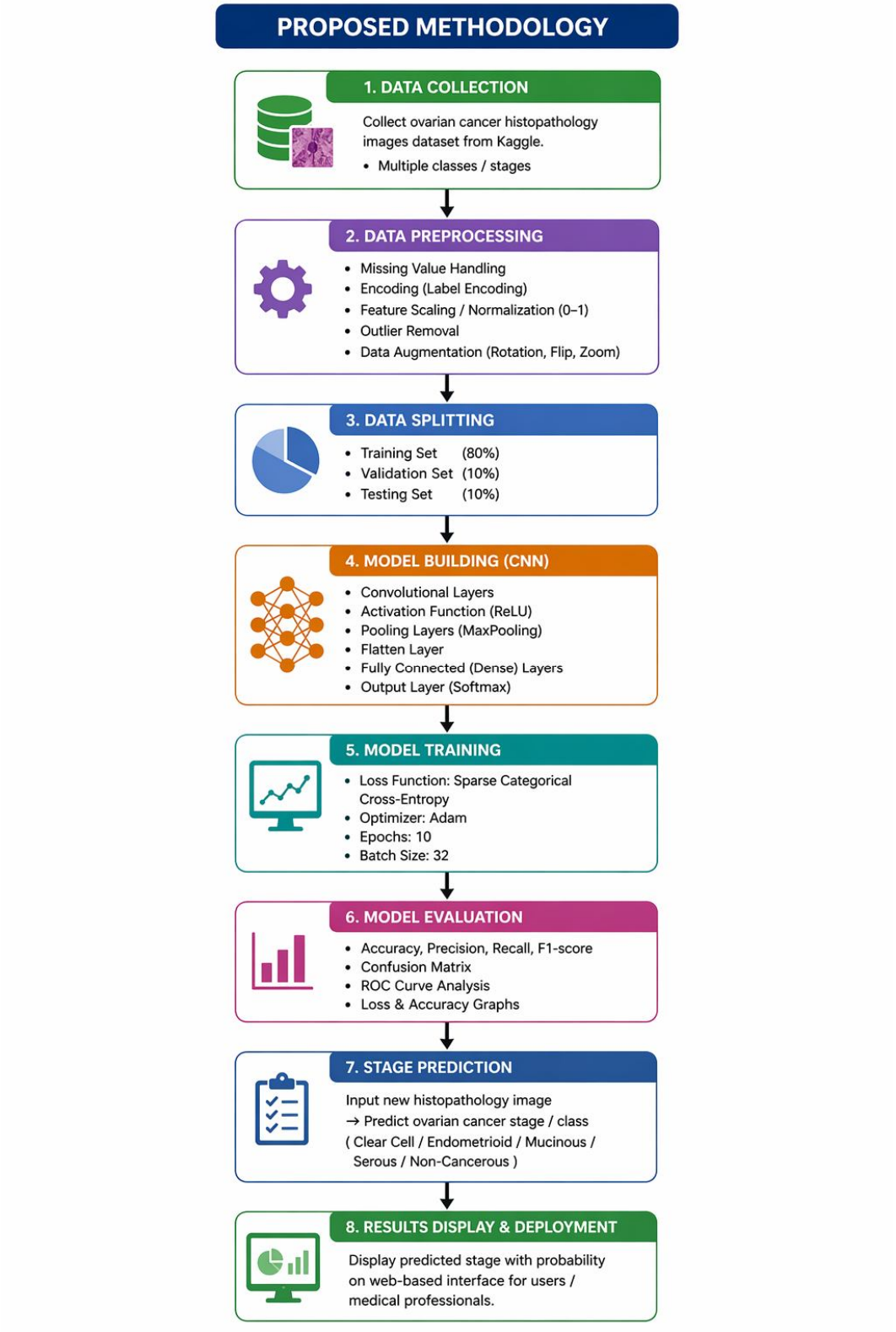
Once the keys are generated, the system proceeds to create transaction data, which includes essential details required for processing the transaction. This transaction data is then transferred to the offline signing module, where the transaction is signed using the private key in an isolated offline environment. This step ensures that sensitive key information is not exposed to online threats, thereby improving the overall security of the system.

After successful signing, the transaction is encrypted and broadcasted to the blockchain network. The network nodes then verify the transaction using cryptographic validation techniques. A consensus mechanism is applied to confirm the transaction, ensuring agreement among participating nodes. Once verified, the transaction is permanently recorded in the distributed ledger.

The proposed methodology integrates security mechanisms such as encryption, digital signatures, and secure key management to protect user data and ensure transaction integrity. By incorporating offline transaction capability, the system minimizes vulnerabilities associated with traditional online wallets and provides a secure and efficient solution for cryptocurrency transactions.

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Fig. 2. Proposed Methodology Flow Diagram



V. CONCLUSION

This paper presented an optimized deep learning-based system for ovarian cancer stage prediction using histopathology images. The proposed system integrates normalization techniques and CNN models to improve prediction accuracy and reliability. experimental results demonstrate that the proposed system is capable of effectively classifying ovarian cancer stages based on histopathology images. The model achieved an accuracy of approximately 67.3% during initial training. Performance metrics such as precision, recall, and F1-score were evaluated to assess the effectiveness of the model. The confusion matrix provided insights into classification performance across different classes. Although the current accuracy is moderate, the results indicate that normalization techniques and CNN-based models significantly improve prediction performance compared to traditional methods.

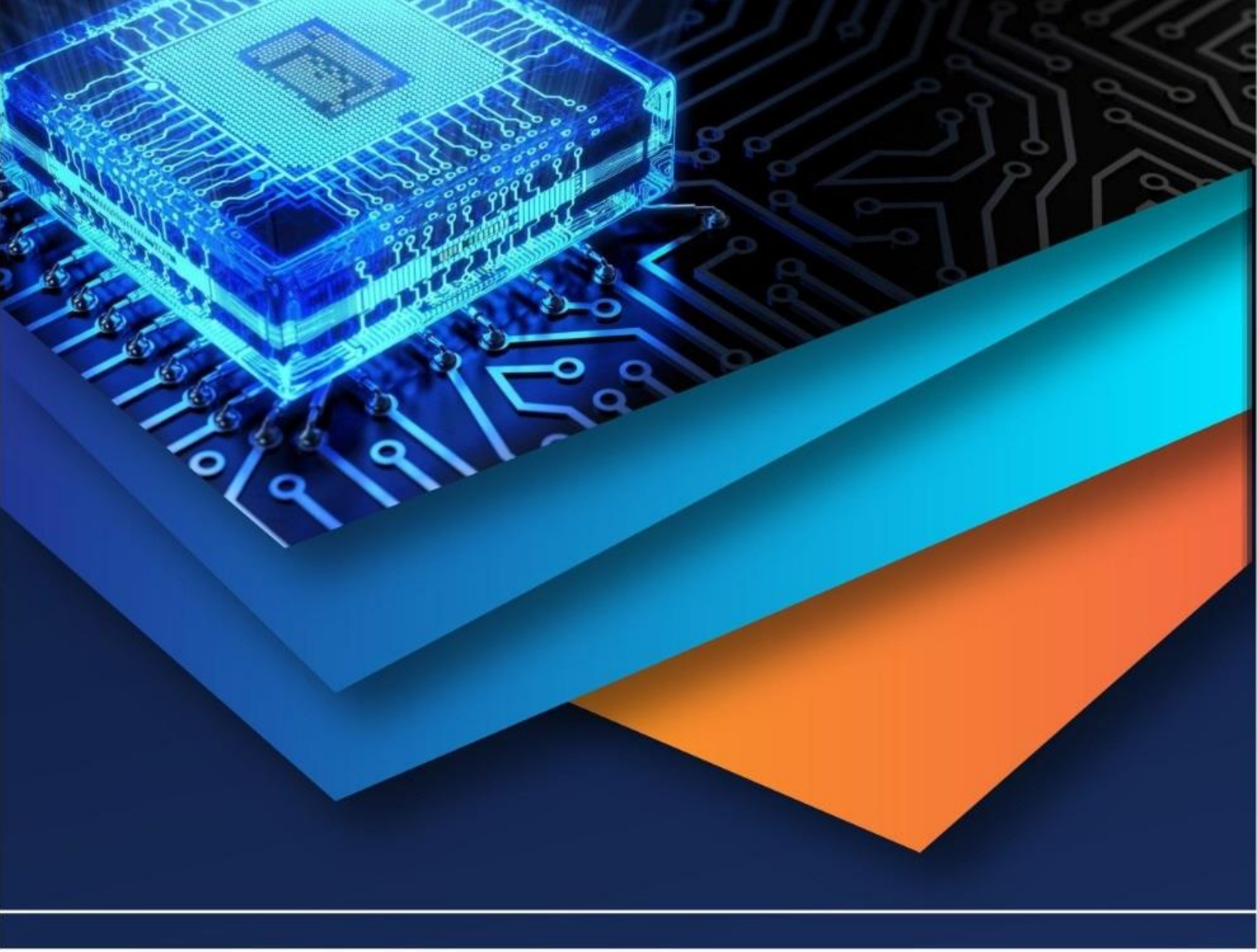
VI. ACKNOWLEDGMENT

The authors express their sincere gratitude to the Department of Computer Applications, Aditya University, for providing support and guidance. Special thanks to the faculty members and project guides for their valuable insights and encouragement.

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