MODIFIED CNN FOR IDENTIFYING THE DIFFERENT STAGES OF LUNG CANCER

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Introduction:

Lung cancer is one of the leading causes of death worldwide, and early detection plays a crucial role in improving survival rates. Traditional diagnostic methods rely on manual analysis of CT scan images, which can be time-consuming and prone to human error. With the advancement of Artificial Intelligence (AI), especially deep learning techniques, automated medical image analysis has become more efficient and reliable.

Convolutional Neural Networks (CNNs) are widely used in image classification tasks due to their ability to automatically extract relevant features from images. In recent years, CNN-based approaches have shown promising results in detecting and classifying lung cancer from CT scan images. This project focuses on developing a modified CNN model for classifying lung cancer types using medical images. The system aims to assist healthcare professionals by providing faster and more accurate predictions. By integrating AI into medical diagnostics, this project contributes towards improving healthcare efficiency and reducing diagnostic workload.

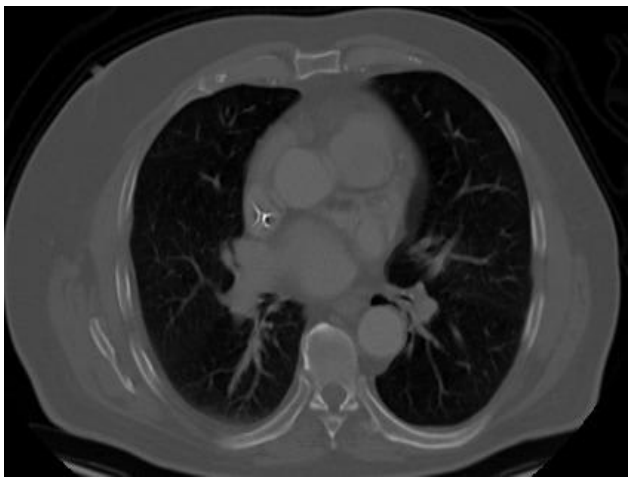

Figure 1: Sample CT Scan Image for Lung Cancer

Objectives:

1. To develop a deep learning model for lung cancer classification
2. To design and implement a modified CNN architecture for improved accuracy
3. To preprocess and analyze CT scan images effectively
4. To evaluate the model performance using standard metrics

Methodology:

1. The project follows an end-to-end AI pipeline for lung cancer classification. Initially, a dataset of lung CT scan images is collected from publicly available sources. The dataset consists of labeled images belonging to different classes such as adenocarcinoma, squamous cell carcinoma, large cell carcinoma, and normal.
2. Data preprocessing is performed to enhance the quality of images. This includes resizing images, normalization, and data augmentation techniques such as rotation and flipping to increase dataset diversity.
3. A modified CNN model is designed, consisting of multiple convolutional layers, pooling layers, dropout layers, and fully connected layers. The convolutional layers extract features from images, while pooling reduces dimensionality. Dropout is used to prevent overfitting.
4. The dataset is divided into training, validation, and testing sets. The model is trained using training data and optimized using an appropriate optimizer and loss function. Validation data is used to monitor performance, and testing data is used to evaluate final accuracy.
5. The trained model predicts the class of input images, thereby classifying lung cancer types.

Result and Conclusion:

The proposed modified CNN model successfully classifies lung cancer types with good accuracy. The model demonstrates strong performance in distinguishing between different cancer types and normal lung images.
The use of data preprocessing and dropout techniques helped in reducing overfitting and improving generalization. The results indicate that deep learning models can effectively assist in medical image analysis. In conclusion, this project highlights the potential of AI in improving the accuracy and efficiency of lung cancer diagnosis. The system can support healthcare professionals in making faster and more reliable decisions

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Working Model vs. Simulation/Study:

This project is developed as a working software model, where the modified CNN is trained and used to classify lung cancer types from CT scan images. The system performs real-time prediction based on input images.

Project Outcomes and Learnings:

1. The project resulted in the development of a functional AI-based model for lung cancer classification with good accuracy. The system is capable of identifying different lung cancer types from CT scan images efficiently.
2. Through this project, we gained strong knowledge in deep learning concepts and CNN architecture. We learned how to preprocess medical image data, train and optimize models, and evaluate their performance using appropriate metrics.
3. Additionally, we developed skills in Python programming and understood the real-world application of AI in healthcare systems.

Future Scope:

The future scope of this project includes:

1. Using larger and more diverse datasets to improve model accuracy
2. Extending the system for lung cancer stage classification
3. Applying advanced techniques like transfer learning and hybrid models
4. Developing a real-time application for hospital use
5. Integrating the system into web or mobile-based healthcare platforms