Customized CNN for Precise Lung Cancer Classification

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INOVATION & MOTIVATION

- **Improved Lung Cancer Categorization using Personalized CNNs**: Tailored Convolutional Neural Nets (CNNs) solve important diagnostic issues by effectively detecting lung cancer subtypes, outperforming generic models in this regard.
- **Precision Health Care Using Diagnostics**: Driven by AI: Tailored CNN designs enhance the accuracy and speed of lung cancer subtype diagnosis, enabling more focused therapies and improved patient outcomes.
- **Clinical Practice Integration of Advanced AI**: This research promises to improve accuracy and efficiency in lung cancer detection and treatment planning by utilizing customized CNN models as a sophisticated diagnostic tool for real-world clinical settings.

OBJECTIVE

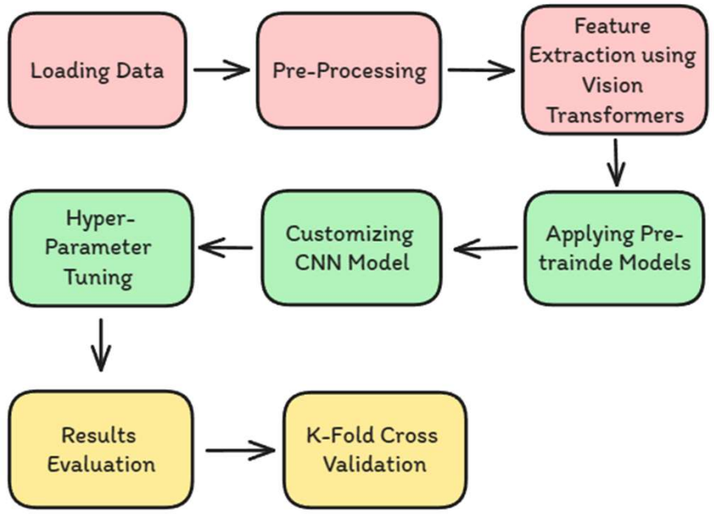
- Create specialized CNNs that are tuned to accurately classify lung cancer by focusing on minute histological details unique to each subtype.
- Improve diagnosis precision by using careful neural network engineering to outperform generic and trained models.
- Utilize customized CNN architectures to accelerate training procedures so that subtle patterns suggestive of different subtypes of lung cancer may be quickly identified.
- Enhance patient care and treatment results in the categorization of lung cancer, contribute to the advancement of AI-driven diagnostic techniques

SCOPE OF THE PROJECT

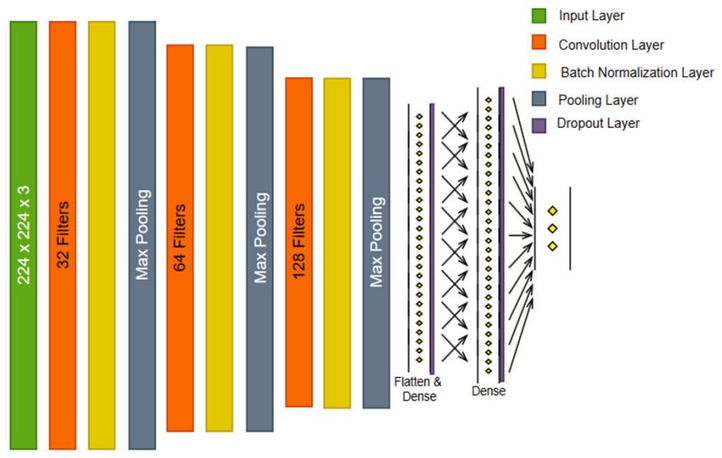
- The creation and assessment of customized CNN for the classification of lung cancer is the main goal of our study. Our goal is to fine-tune neural network models to capture small histological properties specific to each subtype, outperforming generic and pre-trained techniques in accuracy. Furthermore, we use custom CNN architectures to expedite training procedures to advance AI-driven diagnostic techniques and enhance patient care in the detection of lung cancer.

METHODOLOGY

Our process creates and assesses customised CNNs to accurately classify lung cancer. Using dimensionality reduction, ViTs for feature extraction, and data preprocessing, we construct models that capture tiny histological properties. Comparative analyses using trained models evaluate diagnostic performance with the goal of improving clinical outcomes and the accuracy of lung cancer categorization.



ARCHITECTURE



RESULTS

- A comparison of the custom CNN model with pre-trained models (ResNet, VGGNet, GoogLeNet, DenseNet) for the classification of lung cancer.
- To evaluate the performance of the model, metrics including accuracy, precision, recall, and F1 score are examined.
- Pre-trained models use general feature recognition skills to show strong baseline performance.
- With a significant decrease in training time, the bespoke CNN model performs on par with pre-trained models.

Model Name	Accuracy	Precision	Recall	F1 Score	Training Time
ResNet	97.33	1.00	1.00	1.00	887 sec
Google Net	98.17	1.00	1.00	1.00	1621 sec
Dense Net	97.67	1.00	1.00	1.00	8848 sec
Customized CNN	94.67	98.92	98.92	98.92	788 sec

CONCLUSION

- A custom CNN model performs better for classifying lung cancer in terms of accuracy, precision, recall, F1 score, and learning time than a pre-trained model.
- A focus on the pressing requirement for enhanced instruments to differentiate between various forms of lung cancer in order to speed proper therapy.
- Tailored CNN outperforms pre-trained models built on general picture datasets in identifying minor indicators of lung cancer.
- The work emphasizes how custom-built CNN architectures, have the potential to revolutionize lung cancer detection and classification in clinical settings using AI-driven diagnostics.