



Molecular biology & basic cellular physiology

Ethics, innovative research, businesses & IPR

Early Lung Cancer and Drug Response Prediction using Machine Learning

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Introduction



Lung cancer is a leading cause of death.



Early detection improves survival.



AI can help detect cancer and suggest the best drugs for treatment.

"Early detection is the key to survival."

- Dr. Eric Topol

Objectives



Use of CNN model to detect lung cancer from CT scans.



Predict how patients respond to different drugs



Improve cancer treatment using CNN model.



Literature Review

SL.NO	PAPER NAME	SOURCE	METHOD USED	LIMITATIONS
1	Deep Learning-Based Approach to Diagnose Lung Cancer Using CT-Scan Images	Intelligence-Based Medicine 2024	Enhanced CNN models (ConvNeXt, VGG16, ResNet50, InceptionV3, EfficientNetB0) for lung cancer classification.	Requires large datasets; potential risk of overfitting; validation needed on diverse populations.
2	Early Detection of Lung Cancer Using Deep Learning-Based Analysis of CT Scans	IEEE 2023	Combination of UNET (for segmentation) and LeNet (for classification) on CT scans.	Limited dataset; may not generalize well to real-world medical settings.
3	A Process Framework for Ethically Deploying Artificial Intelligence in Oncology	Journal of Clinical Oncology	Process-focused ethical framework	Challenges with balancing transparency, privacy, and stakeholder trust in oncology AI

Project Timeline for Lung Cancer Detection using CNN

Jan 2025, Week 1-2: Define scope & problem statement

Jan 2025, Week 3-4: Collect datasets & assess feasibility

Feb 2025, Week 1: Preprocess CT scan images

Feb 2025, Week 2: Select & implement ML models

Feb 2025, Week 3: Train & optimize models

Feb 2025, Week 4: Validate & refine models

Mar 2025, Week 1: Analyze & compare results

Mar 2025, Week 2: Integrate best model

Mar 2025, Week 3: Prepare documentation

Mar 2025, Week 4: Final submission & presentation

DATASETS

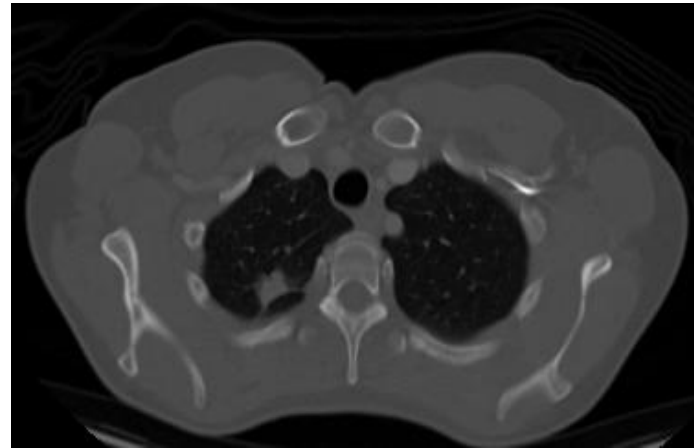


Fig : Adenocarcinoma CT scan

SOURCE OF DATASET:

The Cancer Imaging Archive (TCIA)

Lung Image Database Consortium (LIDC)

Objectives in Computational Aspects



CNN (Deep Learning): Finds lung cancer in CT scans.



SVM (Machine Learning): Predicts which drug works best.



Random Forest: Helps classify patient response to drugs.

Models building in CNN



Data Preprocessing: Remove noise, segment images, extract features.



Train AI Model: Use CNN for images



Evaluation: Check accuracy, sensitivity, and precision.

"Artificial intelligence will revolutionize healthcare by making diagnostics faster and more accurate."

- Fei-Fei Li

Ethics



Ethical Considerations in Oncology AI



Machine-Based Judgment and Black Box AI



A4R Ethical Framework



Empowerment and Stakeholder Involvement



Data Privacy: Protect patient data (HIPAA, GDPR rules).

PATENTS

US20230027734A1: System and Method for Predicting the Risk of Future Lung Cancer -2020

US20170159137A1: Methods for determining drug response of patient specific mutations. -2015

US11447830B2: Predict drug responses for cancer, by analysing tissue samples to determine the presence of altered gene expression associated with drug response. -2019

IPR Rules & Patents



Software & Algorithm Protection : Companies may choose patent protection for novel AI-driven methodologies or rely on proprietary data and algorithms as a competitive advantage.



FDA & WHO Approvals: AI in medicine must follow health regulations.



Licensing & Commercialization of AI Models : Companies must license third-party genetic datasets for research and ensure that data-sharing policies are complied with.

Future Scope



Improve AI model accuracy for early detection.



Use CNN for real-time cancer screening in hospitals.



Connect CNN model with wearable devices for monitoring.

Conclusion



This CNN model can detect lung cancer early and help doctors choose the best treatment.



More data and improvements will make CNN model more accurate.



AI should support, not replace, medical experts.

References

- ▶ Zhengxiang Jiang, Pengyong Li, DeepDR: a deep learning library for drug response prediction, *Bioinformatics*, Volume 40, Issue 12, December 2024, btae688
- ▶ Sangeeta. Pharmacogenomics: Personalized medicine and drug response prediction. *Pharma Innovation* 2019;8(1):845-848.
- ▶ Nesbitt, J.C.; Putnam, J.B., Jr.; Walsh, G.L.; Roth, J.A.; Mountain, C.F. Survival in early-stage non-small cell lung cancer. *Ann. Thorac. Surg.* 1995, 60, 466–472.



Thank
You!