Lung and Colon cancer image classification

Using a Convolutional Neural Network

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Advanced Data Analytics, Machine Learning

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# Introduction

Cancer remains one of the leading causes of death globally, with lung and colon cancers being among the most prevalent forms. Lung cancer alone accounts for approximately 2.4 million new cases and 1.8 million deaths annually worldwide.

Histopathological image classification holds a crucial role in cancer diagnosis, where pathologists examine tissue samples obtained through biopsy to identify cellular morphology, tissue architecture, and specific patterns indicative of malignant or benign conditions. Traditional manual analysis of histopathological images is time-consuming, labour-intensive, and subject to human error and inter-observer variability. This limitation has created an urgent need for automated, accurate, and efficient diagnostic tools.

Convolutional Neural Networks (CNNs) have demonstrated remarkable success in medical image classification, particularly in histopathological image classification. CNNs can automatically learn hierarchical features from raw image data, capturing complex patterns and structures that are crucial for accurate cancer detection and classification. Recent studies have shown that CNN-based approaches can achieve diagnostic accuracies comparable to or even exceeding human pathologists in certain cancer detection tasks (Li, M, et al, 2023).

## 1.2 Project Objective and Scope

This project addresses the practical challenge of developing a Convolutional Neural Network model for classifying lung and colon cancer from histopathological images. The primary objective is to build and evaluate a deep learning model that can accurately distinguish with minimising false positives between different types of lung and colon tissues, including both malignant and benign cases.

**Specific Goals:**

* Design and implement a self-defined CNN architecture for multi-class histopathological image classification.
* Training the CNN model using two different strategies: fixed learning rate versus learning rate scheduling.
* Using this model to increase speed of diagnosis and reducing the risk of death by early treatments.

# References

Li, M., Jiang, Y., Zhang, Y., & Zhu, H. (2023). Medical image analysis using deep learning algorithms. *Frontiers in public health*, *11*, 1273253. <https://doi.org/10.3389/fpubh.2023.1273253>