

INFORMATICS INSTITUTE OF TECHNOLOGY

In Collaboration with

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HepAid

Advanced Liver Tumor Segmentation and Classification Using Deep Learning Techniques

A Dissertation by

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ABSTRACT

Liver cancer remains a critical global health concern, where early and precise diagnosis significantly impacts treatment effectiveness. Traditional methods for liver tumor segmentation and classification often suffer from issues such as image noise, unpredictable tumor morphology, and time-consuming manual processes, making them inefficient for clinical applications. This research aims to overcome these limitations by developing a robust deep learning-based system for automated liver tumor segmentation and classification using 2D CT images.

The project leverages a U-Net model with a MobileNetV2 backbone for segmentation and a custom CNN architecture for classification, distinguishing between malignant and benign tumors. Data preprocessing techniques, including normalization, augmentation, and noise reduction, have been employed to enhance image quality and improve model performance. The model is trained on manually labeled LiTS CT scan datasets, labeled in collaboration with a radiologist, addressing the lack of publicly available labeled data.

The initial segmentation results achieved a Dice score of 0.75–0.78 and an IoU of 0.45–0.50, demonstrating promising segmentation performance. The classification model achieved 93% validation accuracy, highlighting the need for further robustness testing on external datasets.

Segmentation results received 95% of accuracy.

Classification results received 93% of accuracy.

Subject Descriptors:

Computing methodologies -> Artificial intelligence-> Computer vision-> Computer vision problems → Life and medical sciences → Image segmentation

Computing methodologies -> Machine Learning-> Machine learning approaches-> Neural networks

Applied Computing-> Life and Medical Sciences-> Consumer Health

Computing methodologies -> Machine Learning-> Machine learning approaches-> Classification and regression trees

Keywords:

Tumor segmentation, Deep learning, Tumor classification, Neural Networks, Image Processing