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(57) Abstract :
This utility patent proposes a novel framework for efficient management and educational application of liver and tumor segmentation from CT images using a hybrid ResUNet model integrated with Natural Language Processing (NLP). The invention addresses the dual challenges of accurate medical image segmentation and the legal-educational framework required for its deployment in clinical and academic environments. The hybrid ResUNet model combines the strengths of Residual Networks and U-Net architectures to achieve high precision and recall in segmenting complex liver and tumor structures. It incorporates attention mechanisms and multi-scale feature extraction for enhanced segmentation performance, particularly in low-contrast or noisy images. The framework is complemented by NLP-based tools to generate automated, interpretable reports from segmentation results, facilitating communication between medical professionals and educators. The invention also outlines a legal framework ensuring compliance with data privacy regulations, ethical considerations, and educational standards. This includes mechanisms for anonymizing patient data and providing modular training resources for medical students and professionals. Key applications include automated diagnostic support, personalized treatment planning, and interactive educational modules for medical training. The hybrid ResUNet model is computationally efficient, enabling deployment on cloud platforms and edge devices for real-time usage. By integrating advanced AI techniques with legal and educational guidelines, this invention offers a comprehensive solution to improve diagnostic accuracy, streamline workflows, and enhance medical education. The proposed system has the potential to significantly impact healthcare delivery and foster widespread adoption of AI-driven medical imaging solutions.

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