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Patent Search

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Abstract:

[034] The present invention provides an automated system and method for detecting and classifying tumors in histopathological images using advanced artificial intelligence techniques. The system includes modules for image acquisition, pre-processing, tumor segmentation, feature extraction, and classification, all powered by deep learning. It automates the detection of tumor regions, extracts relevant morphological, textural, and architectural features, and classifies tumors into types and grades. The system generates visualizations such as heatmaps and annotated images to assist pathologists in validating AI-generated results, along with comprehensive diagnostic reports incorporating active learning, the system improves over time, providing highly accurate and efficient tumor analysis that enhances clinical decision-making and supports patient outcomes. Accompanied Drawing [FIGS. 1-2]

Complete Specification

Description:1. A system for automated tumor detection and classification in histopathological images, comprising an image acquisition module for capturing high resolution histopathological images, a pre-processing module for standardizing and enhancing the quality of the images, a tumor segmentation module utilizing deep learning-based methods for segmenting tumor regions, a feature extraction module for extracting morphological, textural, and architectural features from the segmented tumor regions, and a classification module for categorizing the tumor into types and grades based on the extracted features.

2. The system of claim 1, wherein the pre-processing module includes stain normalization, noise reduction, artifact removal, and color correction techniques to ensure the quality and consistency of histopathological images prior to tumor segmentation.

3. The system of claim 1, wherein the tumor segmentation module employs a convolutional neural network (CNN) or a Mask R-CNN architecture to accurately identify and isolate tumor regions from normal tissue regions in the histopathological images.

4. The system of claim 1, wherein the feature extraction module utilizes deep learning models trained on annotated histopathological datasets to automatically extract discriminative features, including morphological, textural, and architectural characteristics of tumor regions, without requiring manual feature engineering.

5. The system of claim 1, wherein the classification module employs machine learning techniques, including deep neural networks (DNNs) or support vector machines (SVMs), to classify tumors into multiple categories based on the extracted features, with an associated confidence score for each classification.

6. The system of claim 1, further comprising a post-processing and visualization module that generates heatmaps, overlays, and annotated images to visually highlight tumor regions and assist pathologists in validating the AI-generated predictions.

7. The system of claim 1, wherein the post-processing and visualization module also generates a comprehensive diagnostic report summarizing the tumor type and grade.

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