A Deep Learning-Base Approach for Ovarian Cancer Subtype Classification

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Ovarian cancer is the fifth leading cause of cancer-related mortality in women worldwide. This high mortality rate is largely due to late-stage diagnosis, which is a significant challenge given the often vague and inconsistent initial symptoms. Traditional diagnostic methods, reliant on histopathology image analysis by pathologists using microscopic examination, face complexity, and inconsistency; leading to moderate agreement among specialists. This study introduces a histotype-based ovarian cancer subtype classification framework employing multiple Instance learning and deep learning algorithms on histopathology images. The proposed approach aims to classify the ovarian cancer subtypes accurately detecting outliers and segmenting each image into tumor, healthy cell, or dead cell categories aiding pathologists in diagnostics. Various models were trained to automatically classify hematoxylin and eosin-stained whole slide images and tissue microarrays yielding promising results. Performance was assessed based on a cross-validation split of the training data and 206 external slides from another source. The best-performing model utilized an ensemble technique averaging the best six transformer models to achieve a state-of-the-art balanced accuracy of 98%; showcasing the potential for an improved diagnostic precision. Moreover, segmentation enabled the model to label each slide with a tricolored theme, where each color corresponds to a specific tissue category. Red signifies the presence of a tumor; green indicates stroma; and blue represents necrosis, which denotes dead non-cancerous tissue. In conclusion, the performance characteristics of the classifiers indicate a promising avenue for improved diagnostic performance if used as an adjunct to conventional histopathology.

Awards Won:
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