Applying Deep Learning in Recognizing Endometrial Carcinoma

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Endometrial Carcinoma is the fifth most common type of cancer in women. Analyzing the morphology of tissue samples is essential for diagnosing endometrial cancer. Deep learning can be used to assist pathologists in diagnosing endometrial carcinoma more objectively, efficiently, and accurately. However, a large obstacle in applying deep learning to pathology is the lack of datasets available for reference. In this study, epithelium-stroma-lumen annotated images at different magnifications were used to train three models with artificial neural networks. These models extracted mean intensity, eccentricity, solidity, and other features from each class during training. From the segmentation of a test image by the three models, it was found that the 20x trained model was the most accurate. With the 20x model, the remaining test images with different magnifications were segmented. For test images with the 20x magnifications, the model accurately identified 86.84% of normal glands and 96.63% of cancer glands. It mistakened 3.98% of the background for normal glands and 3.02% of the background for cancer glands. The results indicated that even with a limited data set, the model objectively identified normal and cancer glands with an accuracy comparable to pathologists. Additionally, 20x magnification with epithelium-stroma-lumen annotations was found to be the optimal parameter for building data sets and accurately segmenting glands. Further training the model with algorithms such as glandular distribution would increase accuracy and decrease errors.

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