



Artificial intelligence in medicine: virtual immunohistochemistry

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Abstract No.: 6000694

Abstract

Artificial intelligence (AI) is rapidly advancing medical practice, from disease diagnosis to gene editing. It is crucial for students of all disciplines to understand this trend. This project will focus on immunohistochemistry, an important tool in modern pathology. Traditional immunohistochemistry uses antibodies to label key proteins in tissue viewed under a microscope. The amounts and locations of these antibody-protein pairs, assessed from the images, are important for diagnosis. AI methods are now being developed to advance immunohistochemistry. Specifically, a neural network is trained to generate a traditional antibody-labelled image from an unlabeled image of the same tissue. After training, doctors only acquire the unlabeled image, and a computer with the neural network will generate the labelled image. This AI approach is faster than traditional methods, and can virtually “label” the tissue with multiple antibodies. For this project, we will create a neural network platform using Python that can be trained with unlabeled and antibody-labelled images. Students will train neural networks using different image sets and quantitatively compare the virtual images to actual antibody-labelled images. Through this project, students will gain knowledge and passion for neural networks and pathology. Students will also take part in innovating AI virtual immunohistochemistry. Therefore, this project develops novel teaching methods and supports the Discovery and Innovation-enriched Curriculum.