PANCREAS.AI: Novel Deep Learning-based Screening Towards Precision Applications for Pancreatic Cancer

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Pancreatic cancer is a devastating and incurable disease with a 5-year survival rate of just 10%. Due to genetic alterations known as mutations, certain cancer-inhibiting and cell vitality genes are affected, allowing cancer to rapidly metastasize across the body. Today, three main treatments exist for pancreatic cancer: radiotherapy, chemotherapy, and immunotherapy. Precision medicine aims to tailor treatments to patients based on their genetic mutations; this yields better survival-rates than conventional methods. However, for pancreatic cancer, current diagnostic tools can lose up to one month of valuable treatment time in turn-around procedures. My research aims to solve the problem of lost treatment time and provides a highly confident artificial-intelligence tool enabling precision medicine treatments for pancreatic cancer. By classifying genetic mutations of patients, this research enables doctors to use targeted treatments potentially improving patient survivability by up to 13%. My research utilizes deep learning to accurately predict the genetic mutations of patients, based on the tissue from their biopsy. Using over 450 pancreatic cancer biopsy images, radiomics allowed me to quantify imaging features such as density and texture from cancer tissue. I utilized the MATLAB environment to train a “custom build” of the Inception-v3 deep learning network on the dataset. The network was able to successfully predict five pancreatic cancer mutations including KRAS, TP53, and CDKN2A. This research will allow oncologists to recommend targeted therapies yielding a higher probability of success -- while saving up to 30 days of turn-over time. Future work will explore feature-based prediction of progression for pancreatic cancer.