Convolutional neural network for the detection of pancreatic cancer on CT scans

We applaud Kao-Lang Liu and colleagues[1] for the development of a convolutional neural network (CNN) to classify CT image patches into cancerous and non-cancerous pancreatic tissue groups. Specifically, the patients with abnormal images were those who had histologically confirmed or cytologically confirmed pancreatic adenocarcinoma. In this study, the pancreas and tumours were segmented by two experienced abdominal radiologists followed by joint review because pancreatic cancer on CT scans tends to be infiltrative and can be subtle. We fully concur with this observation and with the rigorous methodology. We request the authors to share the inter-observer variability in tumour segmentations or the corrections that might have occurred as part of their joint review because this information will be very helpful for future studies on this topic.

Further, the authors also tested their CNN on the publicly available Medical Segmentation Decathlon external dataset.[2] The authors state that this external dataset included CT images of 281 patients with pancreatic cancer. However, we believe that this figure is likely to be an oversight. Indeed, this external testing dataset includes 281 training and 139 testing CT scans for a total of 420 cases. However, these cases include a mix of pancreatic cancer, pancreatic neuroendocrine tumours, and intraductal mucinous neoplasms. The exact numbers of those different pathologies in this external dataset and the clinical information of individual cases are not known. On the basis of our assessment of the references linked to this external dataset, we believe that only 161 (38%) of the 420 cases had the diagnosis of pancreatic cancer,[3] and the remaining 259 (62%) cases had either neuroendocrine tumours or intraductal mucinous neoplasms. Therefore, we posit that the subset of 281 cases used by the authors for external validation is likely to have been a combination of pancreatic neuroendocrine tumours, intraductal mucinous neoplasms, and cancers. The Cancer Imaging Archive has made available to the research community the radiology and pathology images of 74 patients with pancreatic cancer.[4] Because this dataset comprises entirely patients with pancreatic cancer, these patients might be of interest as an external dataset for deep learning work on pancreatic cancer detection. However, this dataset comprises a mix of imaging modalities, not only CT scans. Thus, there is a crucial need for carefully curated, well annotated, and multi-institutional imaging datasets in the public domain with data transparency and pertinent clinical information for successful testing and eventual clinical deployment of artificial intelligence algorithms.

Again, we congratulate the authors on this important work, which is highly informative for groups such as ours who are involved with similar initiatives in this domain.

We declare no competing interests.

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1 Liu K-L, Wu T, Chen P-T, et al. Deep learning to distinguish pancreatic cancer tissue from non-cancerous pancreatic tissue: a retrospective study with cross-racial external validation. *Lancet Digital Health* 2020; **2:** e303–13.

2 Simpson AL, Antonelli M, Bakas S, et al. A large annotated medical image dataset for the development and evaluation of segmentation algorithms. *arXiv* 2019; published online Feb 25. http://arxiv.org/abs/1902.09063 (preprint).

3 Attiyeh MA, Chakraborty J, Doussot A, et al. Survival prediction in pancreatic ductal adenocarcinoma by quantitative computed tomography image analysis. *Ann Surg Oncol* 2018; **25:** 1034–42.

4 National Cancer Institute Clinical Proteomic Tumor Analysis Consortium. Radiology data from the clinical proteomic tumor snalysis consortium pancreatic ductal adenocarcinoma (CPTAC-PDA) collection. The Cancer Imaging Archive. 2018. https://doi.org/10.7937/k9/tcia.2018.sc20fo18 (accessed June 15, 2020).