ding of neural network outputs (Fig. 1).

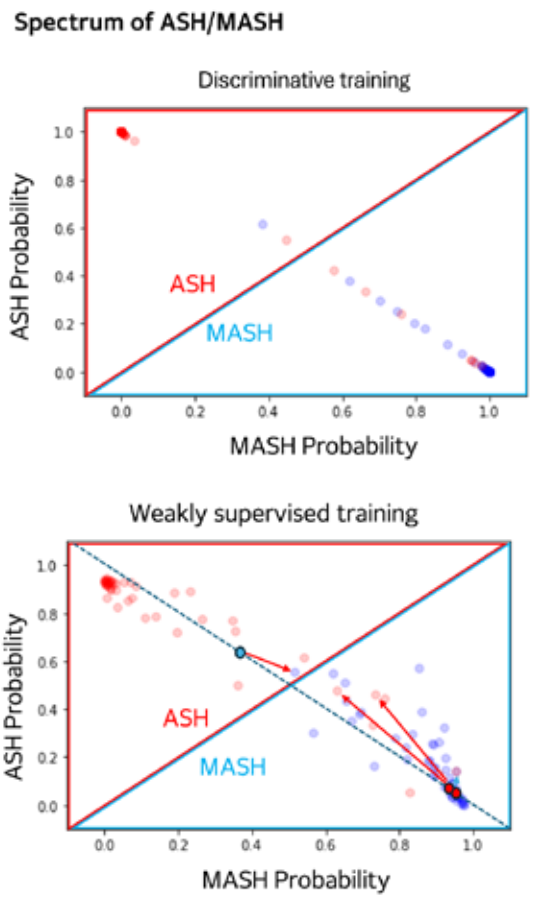

Figure 1. Results of conventional discriminative and weakly supervised training. Compared to conventional discriminative training, weakly supervised learning demonstrates a clearer spread of data across the spectrum between ASH and NASH. It alleviates some instances of extreme misclassification.

Conclusions: Our CNN-based experiment demonstrated the coexistence of ASH and MASH in patients labeled with only one, achieving 0.915 prediction accuracy for slide level classification after considering the coexistence. PU learning with weak supervision and its output spectrum confirmed the coexistence.

Keywords: Alcoholic steatohepatitis, Metabolic dysfunction-associated steatohepatitis, Weakly supervised learning, End-to-end classification, Patch-based classification

G2-06

Clinical application :
Gastrointestinal and hepatobiliary

Automated NASH CRN Scoring Pipeline Through Lesion Segmentation for Alcohol-Associated Liver Disease

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Background: The prevalence of alocohol-associated liver disease is increasing. The diagnosis usually relies on invasive and non-invasive methods, including liver biopsies. The quantification of disease activity of ALD relies on scores derived from the NAFLD activity score NAS based on NASH-CRN scoring system. However, there are significant inconsistencies in SLB scoring among human experts, which are considered a major issue. In addition, most machine learning (ML) NAS scores relies on NAFLD cases and are not sufficiently reproducible in ASH. An automated pipeline using artificial intelligence that provides a consistent NAS score for patient with ALD is imperative.

Methods: We obtained 120 H&E-stained liver biopsy images from patients with ASH at the Mayo Clinic (Rochester, MN, USA). Annotations of steatosis, lobular inflammation and ballooning areas have been provided by QRITIVE and verified by a gastrointestinal pathologist. NAS scores have been collected from pathology reports. A fully convolu-

tional network (FCN) was trained to automatically segment these lesion areas, as shown in Fig. 1, followed by the counting and measuring the area of the lesion contours to calculate NAS scores.

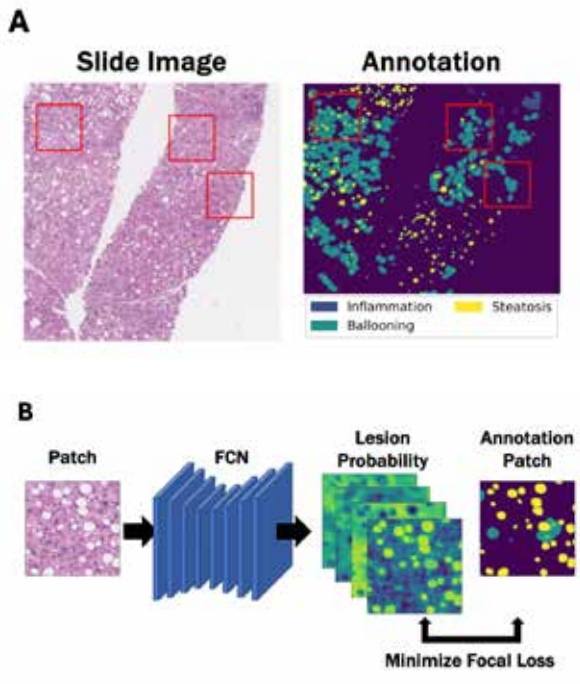

Figure 1. Lesion detection using Fully Convolutional Neural Networks (FCN). A. Example of sampled patches from an annotated slide. Randomly sampled 1024x1024 patches and their annotations were used for training. B. Example of an input and the output of the FCN. The FCN output is the pixel-wise probabilities for an input patch. The FCN was trained to minimize the difference between output and the annotated patch.

Results: Our automated pipeline prediction model achieved accuracies of 62.5%, 60.6%, and 66.7%, and Pearson correlations of 0.715, 0.491, and 0.533 for the steatosis, lobular inflammation and ballooning scores of the NAS scoring, respectively. The low scores primarily reflect inconsistencies in human scoring. Even though the annotations are incomplete with many missing annotations, FCN successfully identified most of lesions. Further investigations have shown that the predicted results could be used to augment NAS scores with an objective and reproducible ML-derived NAS scores. **Conclusions**: The demonstrated fully automated scoring system consistently provided accurate predictions for NAS scoring. Using partially annotated lesions, FCN successfully segmented most of the lesion regions, yielding robust and trustworthy results NAS scoring. The model can even identify slides that are obviously mislabelled by human experts.

Keywords: Alcohol-associated liver disease, Metabolic dysfunction-associated steatohepatitis, Scoring pipeline, NAFLD activity scoring (NASH CRN).

G2-07

Clinical application :
Gastrointestinal and hepatobiliary

Pancreatic Cancer Classification Using Weakly Supervised Approach to Aid the Diagnosis of Fine Needle Aspirates Cytology from Whole Slide Images

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Background: Pancreatic cancer is an aggressive malignancy with high mortality rate, attributed to its late detection. The current diagnostic approach involves pathologists manually examining tissue biopsies under a microscope, a time-consuming process. In Malaysia, the shortage of pathologists specialised in hepatobiliary diseases, particularly in rural areas, exacerbates these delays. This study proposes an automated detection system for pancreatic cancer using whole slide images to enhance diagnostic efficiency and expedite treatment decisions.

Methods: Cell block glass slides were obtained