BiDEx - A Screening System for Rapid Proactive Detection of Patients With Liver Fluke Infection Using a CNN Model To Detect Orphistorchis viverrini Eggs From Microscopic Fecal Images and a NN Model for Infection Risk Assessment

Litchiowong, Napassorn (School: The Prince Royal's College)
Tidtijumreonpon, Chris (School: The Prince Royal's College)
Uttayota, Wattanapong (School: The Prince Royal's College)

85% of Cholangiocarcinoma, a leading cause of mortality in Thailand and Asian countries, is caused by Orphistorchis viverrini (Ov) infection. “CASCAP” organization proactively diagnoses Ov infections to decrease the chances of citizens getting Cholangiocarcinoma. Standard Ov infection diagnosis is scanning for Ov eggs in stool samples, analyzing data from an assessment form, and allowing doctors to treat it before cancer develops. However, Ov infection diagnosis may take over 1 hour, causing possible delays in reaching more patients. “BiDEx” aims to develop a screening system to rapidly detect large numbers of patients with Ov infections. For phase-1, YOLO V.5 (CNN-based model) was used for Ov egg detection from microscopic fecal images, trained with datasets from 1,800 microscopic images, achieving 95% accuracy, and processing up to 83.33% faster than the original method. BiDEx further analyzed the egg’s structure, enhancing the architecture by modifying YOLO V.5, developing specific algorithms for Ov screening including Shoulder-Finder, Size-Measurement, and contour detection, achieving 98% accuracy, and better-identifying Ov eggs in more diverse conditions. Phase-2 aims to develop a patient clustering neural network model based on features from CCA-01 assessment forms, achieving 91% accuracy and further discovering key features affecting infection from partial dependence plots. BiDEx’s web application was developed afterward, containing AI models from previous phases, used to serve proactive screening protocols by analyzing and ordering patient priority. This system can reduce diagnosis delays whilst increasing speed and capability, causing patients to be treated on time, and finally preventing mortality from Cholangiocarcinoma.

Awards Won:
First Award of $5,000
Gordon E. Moore Award for Positive Outcomes for Future Generations