

## Automating the identification of liver fluke (*Fasciola hepatica*) and rumen fluke (*Calicophoron daubneyi*) eggs from faecal samples using digital image analysis and machine learning

### Summary

#### The challenge

Liver and rumen flukes are parasites that infect grazing livestock and are documented across the globe yet are a particular challenge in Wales given the mild and wet climate. Active infection is traditionally diagnosed by observing fluke eggs in the host faeces; a method that requires a skilled technician and is both a laborious and time-consuming process, which are likely factors that limit the urgently required uptake of fluke faecal diagnostics on farms and by other end users.

#### The solution

A series of deep neural networks were trained on 156 images of faecal samples containing fluke eggs taken with Techion Ltd.'s FECPAK<sup>G2</sup> diagnostic platform. These were based on the YOLOv5 model. Training took place on NVIDIA V100 and A100 GPUs from the Sunbird and AccelerateAI systems that are part of Supercomputing Wales. The best performance was from an ensemble model using the YOLOv5 extra-large model with a 10-fold cross validation. Training required approximately 8000 hours of GPU time. This gave very good performance with an average precision of 0.868 at 0.5 confidence on liver fluke eggs. Preliminary results for rumen fluke suggest performance will be comparable.

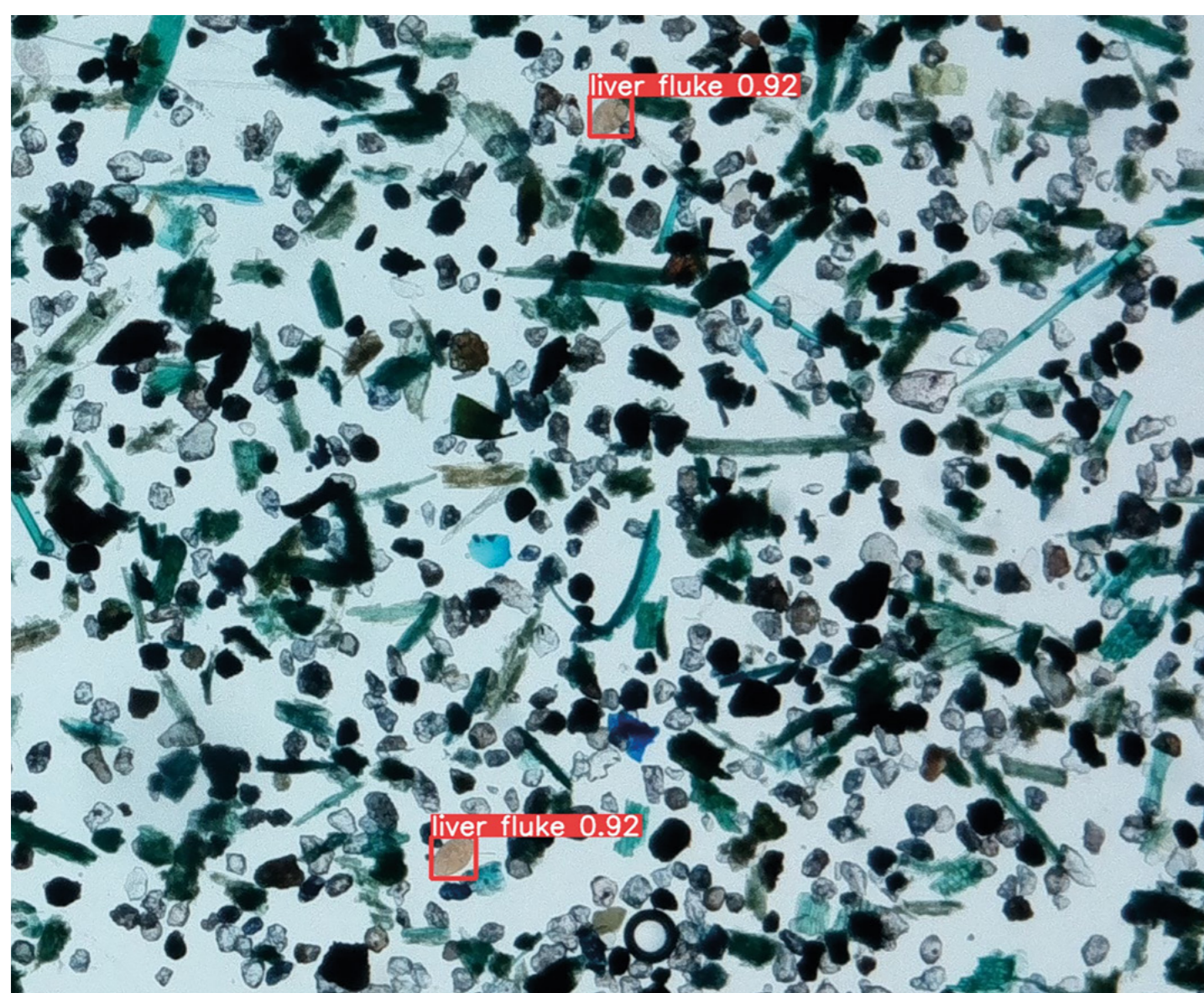


Figure 1: An example output from the image classifier identifying some liver fluke eggs.

### Benefits

- Significant step forward in automating and increasing the effectiveness of diagnosing fluke infections in livestock
- Negates the need and cost of specialised skills for identifying fluke eggs in images
- Will make fluke diagnosis more accessible and attractive to end users

### Further exploitation/next steps

Techion Ltd., in conjunction with Aberystwyth University, will now deploy the developed algorithms on samples submitted by farmers in the UK and beyond. This will allow a wider evaluation of the performance of the developed algorithms and allow Techion to build an evidence base for marketing the capability to end users.

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#### Project group

