Automated prediction of health and welfare in captive fish using behaviour from video

Supervisory team:
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Host institution: University of Bristol, Swansea University
Submit applications for this project to the University of Bristol

Project description:

This project aims to develop a new approach to assessing and predicting poor health and welfare in captive fish, with potential application in aquaculture, laboratories and aquariums to help inform management decisions. Although video can allow animals to be monitored continually and at low cost, extracting relevant information is labour intensive and hence costly, prone to human error and biases, and is insensitive to subtle changes that could provide early-warning indicators of future poor health and welfare. This project will instead apply the power of computing to extract behaviour from video (using computer vision) and advanced statistical approaches (using machine and deep learning) to predict the health and welfare status of fish in captive conditions. By doing so, the long term aim is to develop software readily available for research and industry that analyses video footage from holding tanks of fish in close to real-time, particularly to act as an early-warning monitoring system that can allow staff to intervene before problems occur.

Standard protocols for measuring health and welfare of fish and behavioural data extracted from video will be used to train machine/deep learning methods to generate models that can accurately predict the health of fish from only the video. The project will suit a student with a background in biology as the project requires handling animals and analysing samples under laboratory conditions. The student will also have a strong interest in data analysis and programming, including the willingness to learn new computational methods. Hence the student will gain extensive experience in assessing animal health and welfare, automated methods for extracting data from video, and analysis of 'big data' using well-established machine/deep learning methods.

The farming of fish, i.e. aquaculture, has the potential to meet the growing demand for animal protein across the globe, and can be more sustainable than traditional livestock farming on land. Additionally, fish are well-established as model laboratory organisms in medical and biological research. However, monitoring captive fish to maintain their health and welfare is much more difficult than monitoring their terrestrial counterparts, and detection of adverse health and welfare in fish often occurs when it is too late, with individuals or whole groups often needing to be culled. This project seeks to provide a low cost and low maintenance early-warning system for captive fish.