AUTOMATED DETECTION AND CLASSIFICATION OF PIG BEHAVIOUR USING COMPUTER VISION

The goal of the collaborative projects between the Norwegian University of Life Sciences (NMBU) and the Ambient Intelligence Lectorate (AmI) is to develop robust, precise and trustworthy detection and classification of pig behaviour, using open-source software. Farmers are interested in the benefits that AI/machine learning supported system solutions can bring to the welfare of their animals

while increasing the sustainability and economics of their farms. However, farmers currently engaging in precision livestock farming (PLF) need to fall back to costly black-box commercial software solutions.

The goal of this project is to develop an open-source software solution for enabling accurate automated detection and classification of pig behavior using machine learning supported computer vision.

Monitoring of animal welfare-related processes and responses is vital in assessing and managing of welfare-related factors. With the current development in information technologies, computer vision has become a promising tool in the real-time automation of animal monitoring systems in PLF due to its non-intrusive and non-invasive properties, and its ability to present a wide range of information.

Joint development of an automated, mainly camera-based pig behavior detection and classification system solution has recently been proposed by AmI and NMBU project partners.

Using open-source software, the system should, in the end, be able to detect and discern between different behaviors of pigs. While several steps are important for the system to perform these tasks, crucial steps would be that i) the system automatically segments video images, by detecting where the pigs can be seen in the video feed, followed by ii) accurately determining/discerning between different behaviours of pigs, e.g. whether the animals are happy or stressed and iii) providing the information to the end-user, close to real-time.
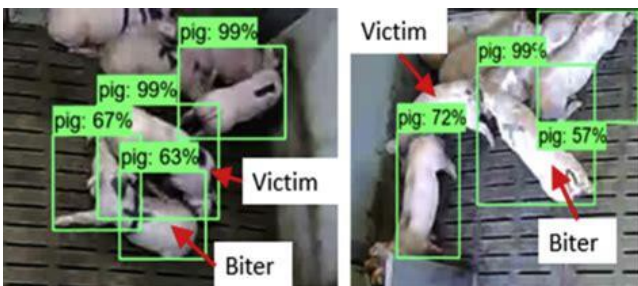
For accurate behavior detection post-video analysis of daily video feeds by humans can be used, but is time-consuming, expensive and delays appropriate interventive action. However, designing a system based on computer vision, using a 2D/3D camera, possibly combined with IR thermal cameras, supported by machine learning for computer vision, more accurate detection and classification of pig behaviour would be possible.

To fulfill the requirements of accurate operation, the final product should be able to accurately detect and classify pig behavior with an accuracy of at least 90%.

TASK DESCRIPTION:
- Developing a computer vision-based software solution for enabling accurate detection and classification of pig behavior.

- Critically reviewing computer vision processing algorithms (e.g. YOLOv5, Faster RCNN) on their suitability for implementation in automated detection and classification of pig behavior, taking into account specific programming frameworks (e.g. Matlab, ImageJ, OpenCV).
- Enabling a real-time connection of the machine learning supported 2D/3D computer vision output to be simultaneously processed with signals from any other sensors.
- Validating these solutions and make it open source.

PRACTICAL INFORMATION

- **Student profile:** HBO-ICT, Applied Computer Science, MSc computer science. Knowledge of machine learning, computer vision algorithms and frameworks is a plus.
- **Contact person:** Miha Lavric (**m.lavric@saxion.nl**).
- **Lectoraat Ambient Intelligence: saxion.nl/ami**