Using AI to evaluate CO$_2$ stunning in commercial settings

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AIM

The aim was to develop a method to assess pigs' response to gas stunning in a commercial environment.

At EU level, efforts are made to improve the welfare of pigs during the stunning process before slaughter in commercial slaughterhouses. The most common method used involves exposing pigs to high concentrations of carbon dioxide (CO$_2$ >80%). Research is focused on minimising aversive behaviour during CO$_2$ stunning and on exploring the use of alternative gases or gas mixtures. Various stressful events that occur before or during stunning can influence the stunning process. Therefore, to understand how pigs respond to gases under typical slaughterhouse conditions, it is essential to test the stunning methods in commercial settings. However, this presents challenges for using a traditional behavioural ethogram.

METHOD

A custom-made camera was placed with a top-down view in the centre of the gondolas in a commercial slaughterhouse. In each gondola, the level of activity per time unit was determined using an artificial intelligence model to evaluate the relative changes in pigs' position between video frames. The activity level was calculated from segmented frames isolating only pixels containing pigs.

CONCLUSION

The AI model was able to analyse the activity level (as indicator of pigs' response to CO$_2$ stunning) and can therefore be a useful tool to evaluate the CO$_2$ stunning. Furthermore, it can address the difficulty of evaluating pigs during the stunning process both during research and under commercial settings.

RESULTS

When aiming to achieve a calm stunning process, evaluating the level of activity was found to be an applicate method for assessing the sequences of events in the gondola. Since stunning per se is a stressful situation, positive behaviour is unlikely to occur during gas exposure. Thus, increased activity indicates negative responses.

Using the activity level to evaluate how pigs respond to the gas does not provide individual evaluation of each pig, and behaviour is not graded in relation to the severity for the pigs. Nonetheless, the method provides an objective way to analyse a large amount of data under commercial conditions. The method can be used when comparing different gases for stunning during high stocking densities or to evaluate if a given measure taken at a slaughterhouse has an impact on the stunning process.

The use of the method is illustrated in the article below. Use the QR code for more information.

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Effect of Stocking Density during CO$_2$ Stunning of Pigs on Induction Time and Activity Level Measured Using AI

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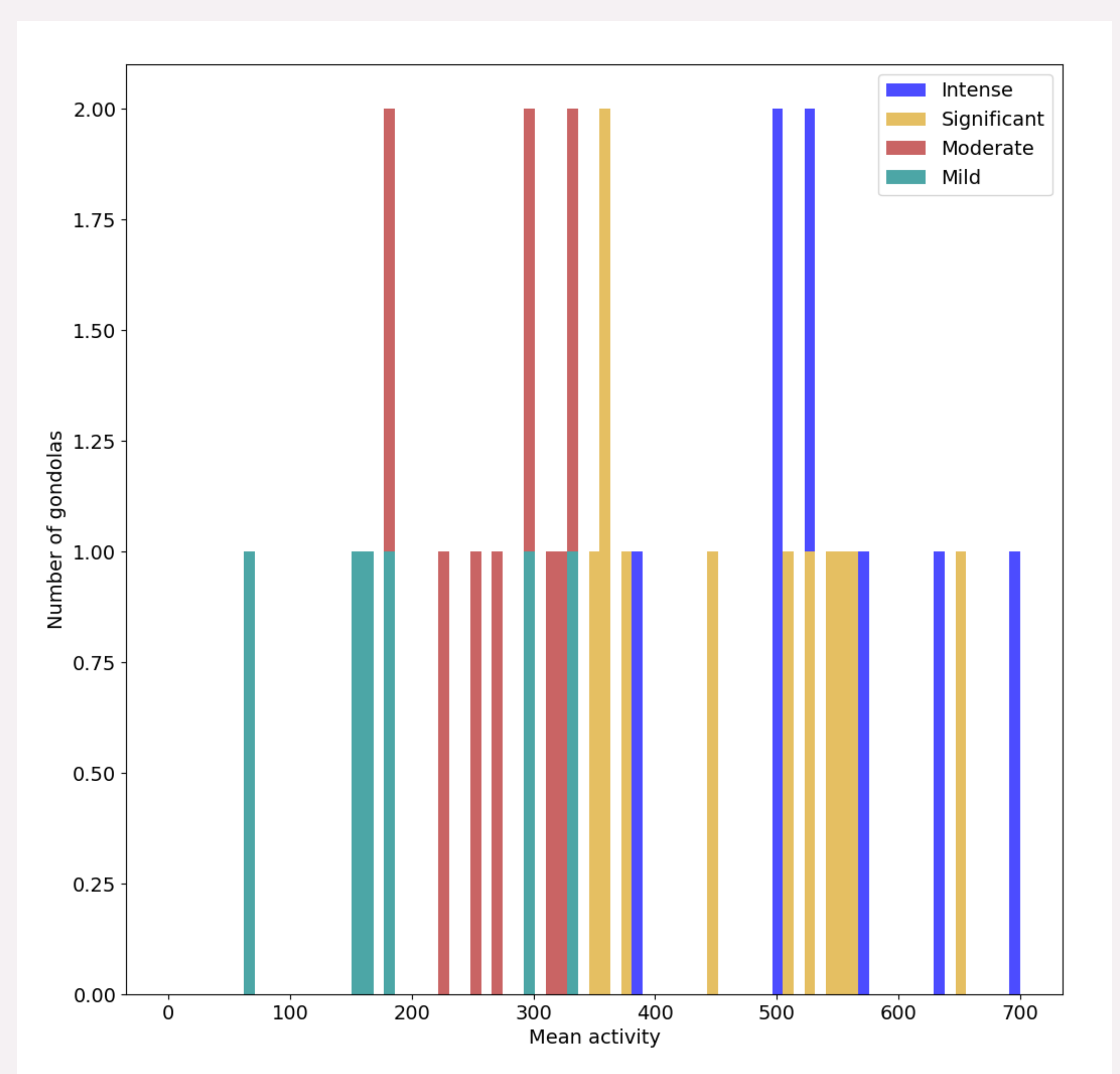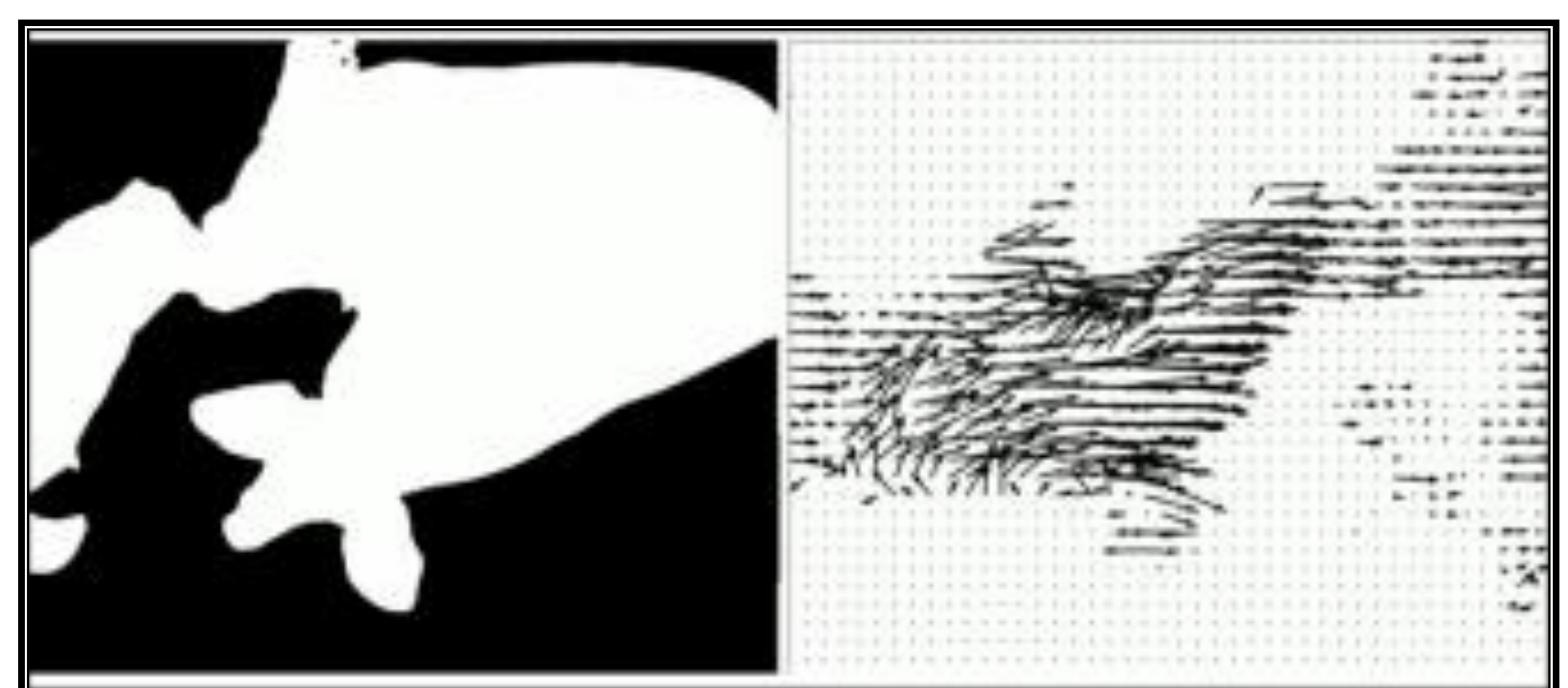
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Method validation: AI model outputs were compared to video observations covering high, intermediate and low activity levels. Trained observers categorised the severity of the activity as mild, moderate, significant or intense. The AI model's activity measurements aligned with the observers' severity gradings.

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