RESEARCH**ABSTRACT**

ANIMAL SCIENCE

Title: Developing an automated, real-time pig counting technology - **NPB # 19-080**

Investigator: M. D. Tokach

Co- Investigators: J. C. Woodworth, A. B. Lerner, K. F. Coble, S. Blazevich, J. M. DeRouchey, S. S. Dritz, R. D. Goodband, K. Duggal

Institution: Kansas State University

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Scientific Abstract: Three prototypes were developed and evaluated to assess the accuracy of an automated pig-counting solution. Key components of these prototypes consisted of hardware (camera and edge compute device), software (image processing, object detection, object tracking, and object counting), and a supporting mobile application. Prototype 1 utilized a YOLOv3 model ran on an NVIDIA Jetson TX2. While the model was functional, the edge device was not powerful enough to process images in real-time. Prototype 2 utilized an edge device with greater processing capability (NVIDIA AGX Xavier) with an SSD MobileNetV2 model. With this hardware, inferences were completed in real time. This second prototype also evaluated three cameras, of which the iPhone X was selected as the image gathering hardware due to its image quality and ability to adjust to various lighting scenarios, which improved overall accuracy of the model. Due to the fact that multiple cameras were still being evaluated, this prototype was only tested on a limited number of pigs. For the final and third prototype, additional model training was completed, and the model was optimized for the edge device and camera chosen. Percent of pigs counted ranged from <50 to >100% with an average of 79%. Several suggestions are detailed within this report to resolve challenges that decreased accuracy. With the rapid advancement of machine learning models and sophistication of hardware, we believe that an accurate pig counting solution is feasible, and that the prototype developed within this project can serve as a foundation for the development of that solution.