



# THESIS DEFENSE

**APRIL 4, 2025**



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**KRAN 758**

**Monitoring and Characterizing Micro- and Macro-environment for Sows and Piglets in Experimental Swine Farrowing Building using Precision Technology.**

The world is facing an increasing food demand and climate change. To enhance sow welfare and piglet survivability through precision microenvironment management using digital technology, a USDA-sponsored research project titled “Improving piglet survivability and sow welfare through microenvironment management using precision technology” started in 2021. A comprehensive, yet low-cost system was designed and developed for continuous and real-time micro- and macro-environment monitoring.

The system monitored three farrowing rooms in an experimental building at the Animal Sciences Research and Education Center, Purdue University. It consisted of two gas analyzers, which measured the concentrations of seven different pollutant gases, i.e., ammonia (NH<sub>3</sub>), carbon dioxide (CO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), methane (CH<sub>4</sub>), sulfur dioxide (SO<sub>2</sub>), total organic carbon (TOC), and ethanol (EtOH). The system also acquired data from more than 100 different sensors and a weather station. Four trials of the project were conducted from January 13, 2023 to April 1, 2024 in the three rooms at different temperatures that were controlled by heating and ventilation. Results during the trials revealed that the real-time monitoring system can perform comprehensive, continuous, and quality measurement of the indoor micro- and macro-environment and pollutant emission rates.



**Jun Ho Kim**

Ph.D. Candidate

ESE & ABE Student

**BIO**

M.S. in Civil  
Engineering, Purdue  
University (2021)

B.S. in Electrical and  
Computer Engineering,  
Purdue University  
(2019)

**DR. JI-QIN NI**  
Advisor

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