

Empowering Producers: How AI and Advanced Analytics Are Shaping the Next Era of Swine Health

Dr. Ben Blair, DVM, PhD



UNIVERSITY OF
ILLINOIS
URBANA-CHAMPAIGN

Introduction: AI in Swine Production

Introducing

Introducing Dr. Ben Blair:
Assistant Professor at the University of Illinois. Trained Epidemiologist, Veterinarian and Engineer

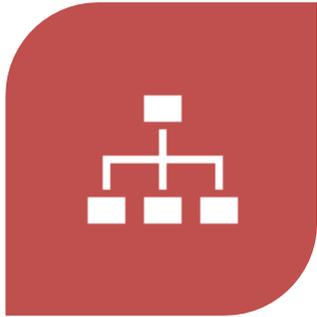
Exploring

Exploring Real-World Applications:
Focus on practical and impactful AI uses.

Sharing

Sharing Successes and Limitations:
Providing a balanced view of AI's role.

The Evolving Context of Swine Production



FROM TRADITIONAL TO MODERN:
UNDERSTANDING SHIFTS IN FARM
MANAGEMENT.



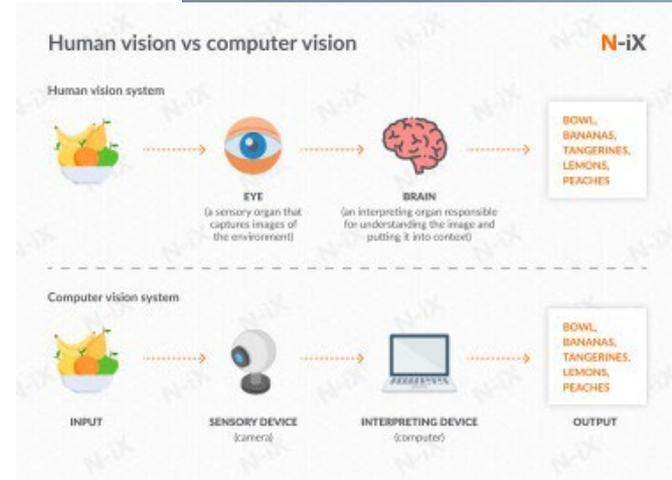
**NAVIGATING MODERN
COMPLEXITIES:** ADDRESSING DATA
VOLUME AND LABOR CHALLENGES.



MEETING REGULATORY DEMANDS:
ADAPTING TO EVOLVING
COMPLIANCE REQUIREMENTS.

What AI Really Means in Practice

- **AI as Pattern Recognition:** AI identifies trends and anomalies.
- **Key AI Technologies:** Machine learning, computer vision, LLMs.
- **Driving Data-Informed Decisions:** Leveraging data for better outcomes.





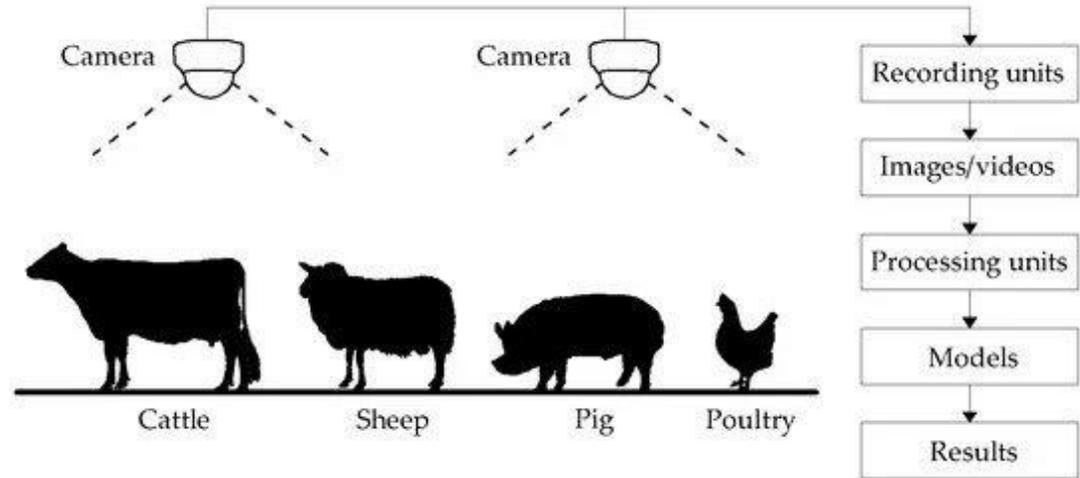
Decision Support: Reinforcing Expertise

- **AI as an Expert Assistant:** Augmenting, not replacing, human judgment.
- **Managing Micro-Decisions:** AI assists with daily operational choices.
- **Enhancing Farm Management:** Improving efficiency and accuracy.



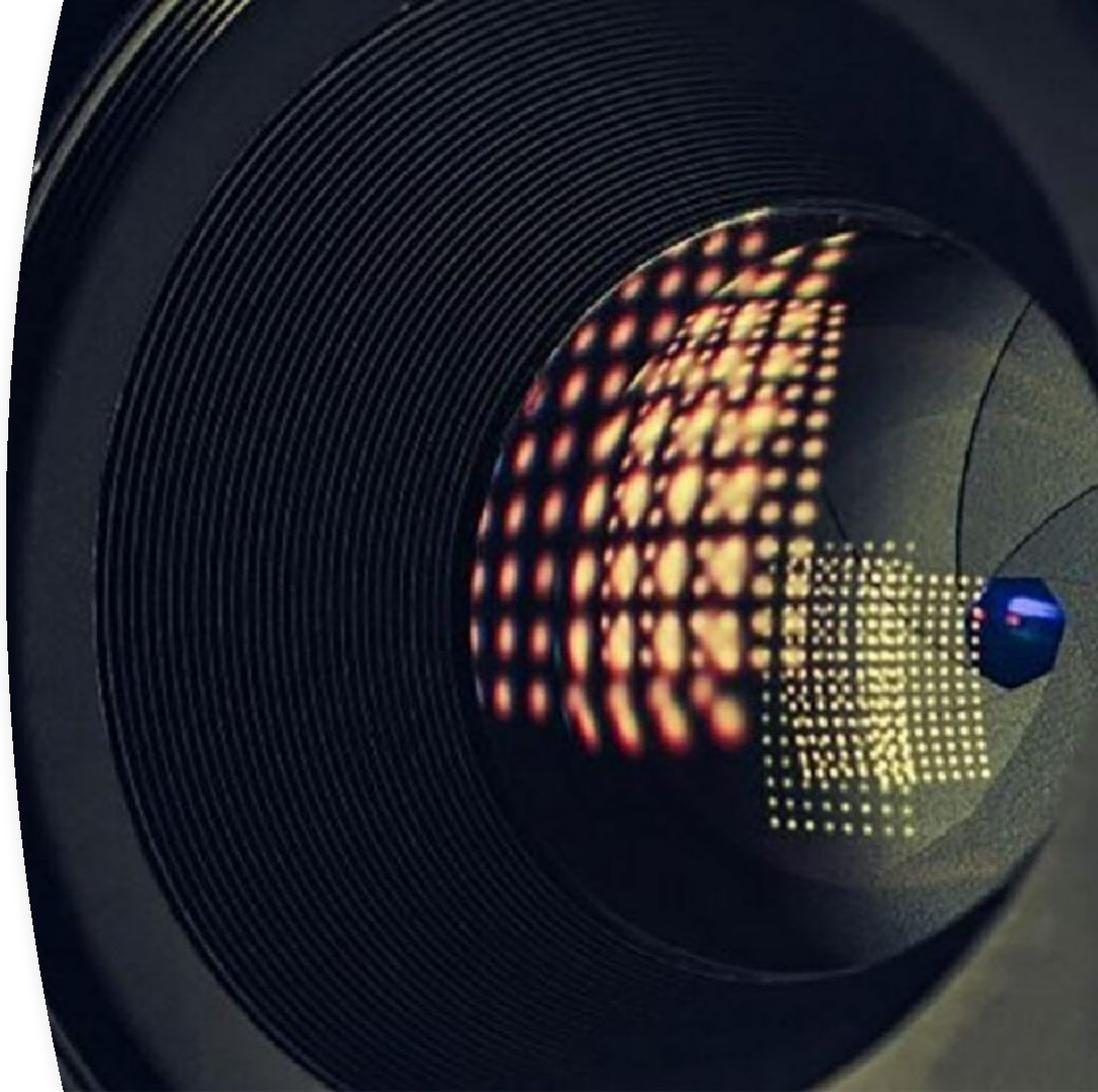
Computer Vision in Action

- **Continuous Behavioral Monitoring:** AI observes and analyzes pig activity.
- **Early Detection of Issues:** Identifying health or welfare concerns.
- **Automated Pig Counting:** Improving inventory management accuracy.



Lessons Learned from Vision Systems

- **Data Quality is Paramount:** High-quality images are essential for accuracy.
- **Importance of Training Data:** Robust datasets improve model performance.
- **Seamless Workflow Integration:** Ensuring AI fits existing farm practices.



Introducing Large Language Models (LLMs)



PROCESSING UNSTRUCTURED TEXT: LLMs UNDERSTAND AND GENERATE HUMAN LANGUAGE.



DRAFTING PROTOCOLS AND CONTENT: AUTOMATING THE CREATION OF DOCUMENTS.



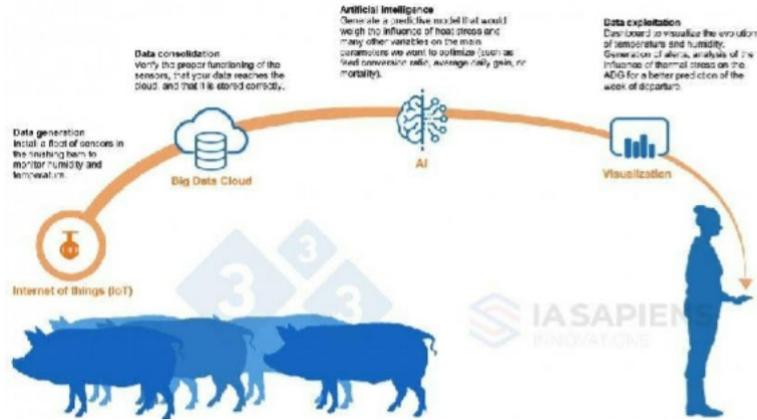
ENHANCING KNOWLEDGE SHARING: MAKING INFORMATION MORE ACCESSIBLE.

Automating Administrative Work

- **Reducing Documentation Burden:** AI minimizes manual data entry.
- **Gaining Efficiency:** Freeing up time for critical tasks.
- **Streamlining Record Keeping:** Improving data accuracy and consistency.



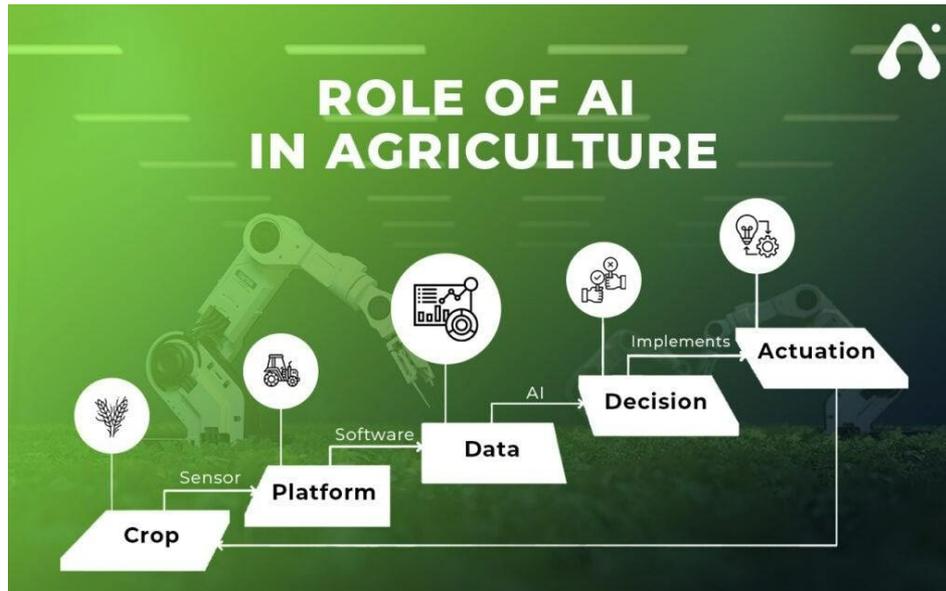
Real-World Workflow Example



*****.pig333.com/articles/smart-farming-the-future-of-technology-is-already-here_15851/

- **Activity Decline Flagged by Vision:** Computer vision detects reduced pig movement.
- **LLM Creates Treatment Logs:** Automated documentation of interventions.
- **Complete Record Generation:** Integrated AI systems ensure comprehensive data.

Why Decision Support Matters



- **Reducing Cognitive Load:** AI helps manage information overload.
- **Minimizing Errors:** AI provides consistent analysis.
- **AI as a Second Opinion:** Enhancing accuracy and confidence.

*****agrowtimes.com/how-ai-and-automation-will-affect-the-processing-of-agricultural-products-in-the-future/

Limitations and Caveats



Dependence on Data Quality: AI is only as good as its data.



Integration Challenges: Technical hurdles in implementation.

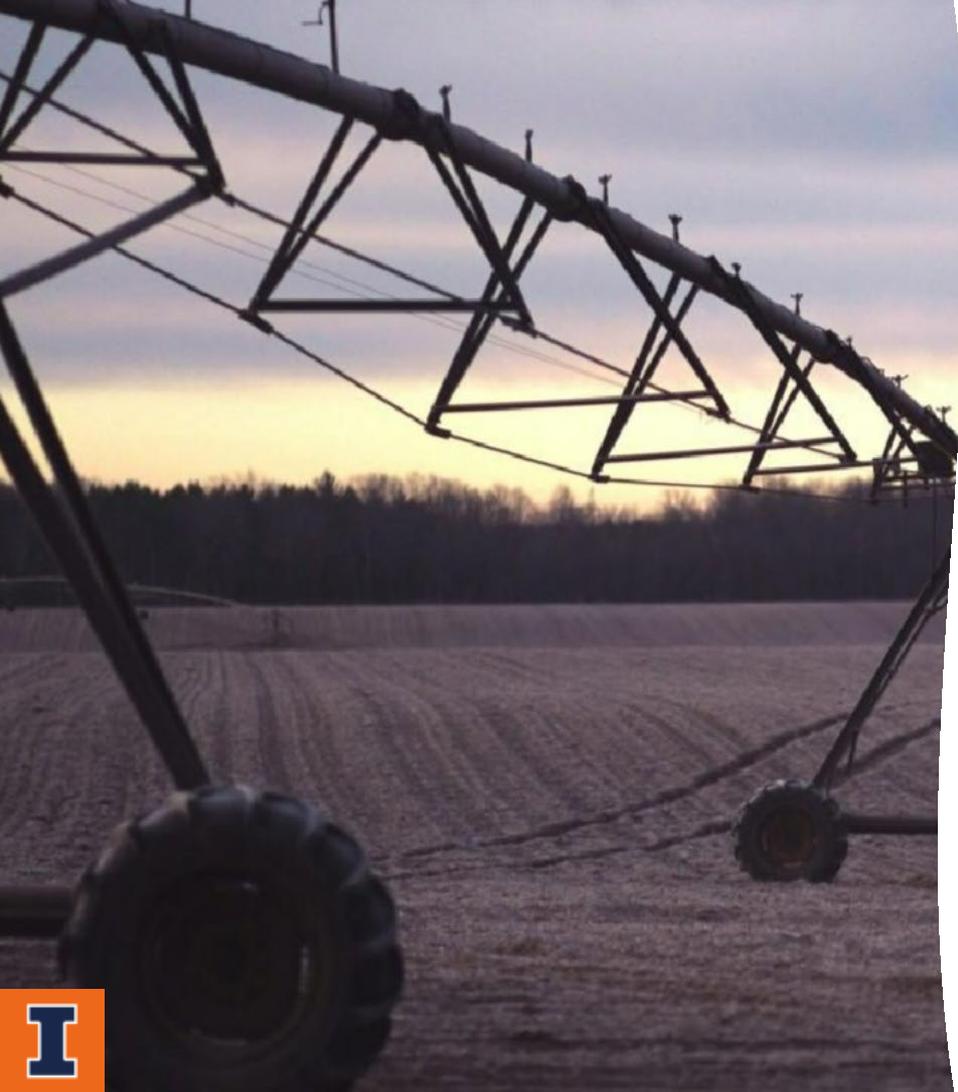


Building User Trust: Addressing concerns about AI reliability.



Building Trust and Transparency

- **Explaining AI Outputs:** Showcasing how decisions are made.
- **Clear Accountability:** Defining responsibility for AI actions.
- **Fair and Equitable AI:** Ensuring unbiased system performance.



Where to Start: A Phased Approach

- **Begin with Pilot Projects:** Test AI on a smaller scale first.
- **Iterative Expansion:** Gradually implement and refine.
- **Focus on Specific Needs:** Address key farm challenges.

The Role of Human Expertise

- **AI as a Collaborative Partner:** Humans and AI working together.
- **Primacy of Human Judgment:** Final decisions rest with experienced personnel.
- **Interpreting AI Insights:** Leveraging human knowledge to understand data.



Looking A



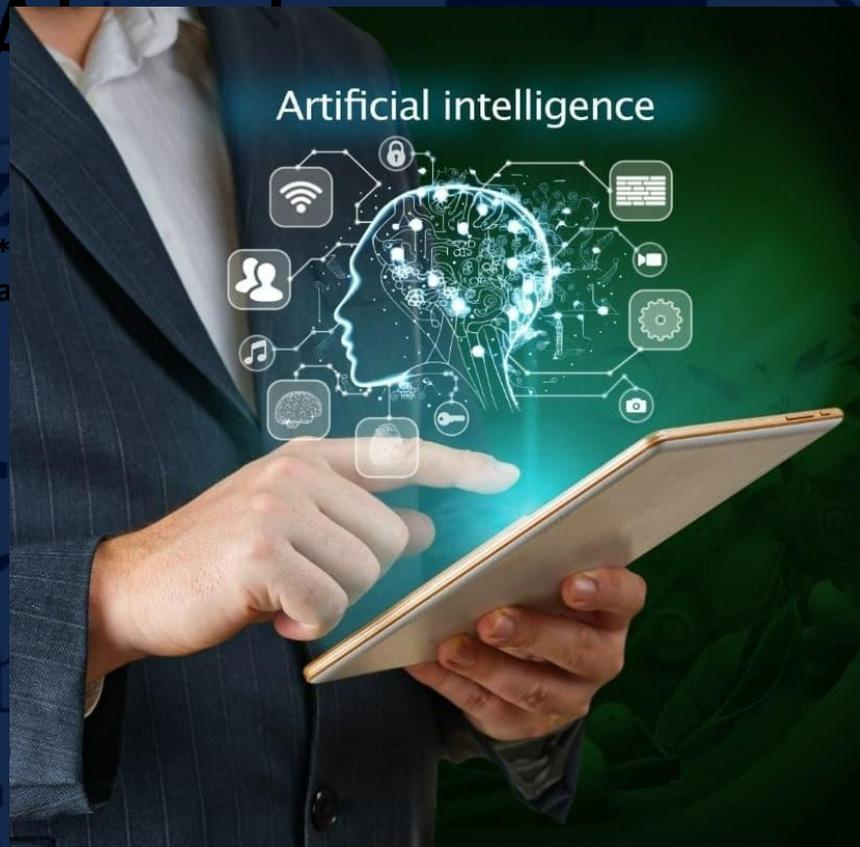
Key Trends to Watch:
Integration, transparency,
and training.



Future Opportunities:
New applications for AI in
swine.



**Sustainability and
Efficiency:** AI's role in
future farming.



Final Reflections & Thank You



AI AS EVOLVING TOOLS:
CONTINUOUSLY IMPROVING
TECHNOLOGIES.



**THOUGHTFUL ADOPTION
ENCOURAGED:** EMBRACING
AI STRATEGICALLY.



**QUESTIONS AND
DISCUSSION:** OPEN FOR
AUDIENCE ENGAGEMENT.

References

- Alameer, A., Kyriazakis, I., & Bacardit, J. (2020). Automated recognition of postures and drinking behaviour for the detection of compromised health in pigs. *Scientific Reports*, 10(1), 13665. *****doi.org/10.1038/s41598-020-70688-6
- Distante, D., Albanello, C., Zaffar, H., Faralli, S., & Amalfitano, D. (2025). Artificial intelligence applied to precision livestock farming: A tertiary study. *Smart Agricultural Technology*, 11, 100889. *****doi.org/10.1016/j.atech.2025.100889
- Eli-Chukwu, N. C. (n.d.). *Applications of Artificial Intelligence in Agriculture: A Review*.
- Kumar, M. G. V., Kalaivani, K., Sunanda, Y., Boobalan, M., Kumar, S. A., & Kannan, R. (2024). Vision-Based AI Technologies for Efficient Pig Farming. *2024 International Conference on Communication, Computing and Energy Efficient Technologies (I3CEET)*, 1199–1204. *****doi.org/10.1109/I3CEET61722.2024.10994141
- Matthews, S. G., Miller, A. L., Clapp, J., Plötz, T., & Kyriazakis, I. (2016). Early detection of health and welfare compromises through automated detection of behavioural changes in pigs. *The Veterinary Journal*, 217, 43–51. *****doi.org/10.1016/j.tvjl.2016.09.005
- Mia, N., Sarker, T., Halim, M., Alam, A., Ali, M., Rahman, M., & Hashem, M. (2025). Machine learning overview and its application in the livestock industry. *Meat Research*, 5(1). *****doi.org/10.55002/mr.5.1.109
- Ruzzante, S., Labarta, R., & Bilton, A. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature. *World Development*, 146, 105599. *****doi.org/10.1016/j.worlddev.2021.105599
- Wang, S., Jiang, H., Qiao, Y., Jiang, S., Lin, H., & Sun, Q. (2022a). The Research Progress of Vision-Based Artificial Intelligence in Smart Pig Farming. *Sensors*, 22(17), 6541. *****doi.org/10.3390/s22176541
- Wang, S., Jiang, H., Qiao, Y., Jiang, S., Lin, H., & Sun, Q. (2022b). The Research Progress of Vision-Based Artificial Intelligence in Smart Pig Farming. *Sensors*, 22(17), 6541. *****doi.org/10.3390/s22176541
- Wolfert, S., Ge, L., Verdouw, C., & Bogaardt, M.-J. (2017). Big Data in Smart Farming – A review. *Agricultural Systems*, 153, 69–80. *****doi.org/10.1016/j.agsy.2017.01.023