

智慧养猪：现状 - 瓶颈 - 机遇 Smart pig farming: Current situation - bottleneck - opportunity

李曼中国

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刘 凯
助理教授 / 博士生导师 / 独立PI
香港城市大学赛马会动物医学及生命科学院

教育背景与工作经历 Educational background and work experience



本科 2008-2012
生物系统工程
竺可桢学院神农班

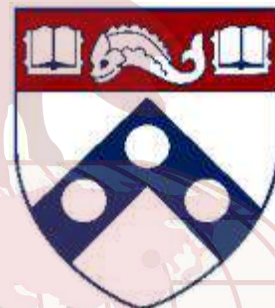
浙江大学



博士 2012-2017
农业与生物系统工程
导师: Hongwei Xin

爱荷华州立大学

#2 [USNews] 2024农业工程排名



博士后 2018-2019
生猪研究与教育中心
导师: Tom Parsons

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#11 [QS] 2025世界大学排名
#06 [QS] 2024世界兽医学排名



香港城市大學
City University of Hong Kong

助理教授 2019.03-至今
赛马会动物医学及生命科学院

香港城市大学

#01 [THE] 2024世界最国际化大学
#15 [THE] 2024亚洲大学排名
#62 [QS] 2025世界大学排名

研究领域 – 智慧动物管理 (畜禽行为学与智慧养殖)

Research Field - Smart Animal Management (Animal Behavior and Smart Breeding)

❑ 精准与智慧养殖 (PLF) Precision and Smart Farming (PLF)

📖 计算机视觉、动物可穿戴传感器、动物声频分析、深度学习等 Computer vision, wearable animal sensors, animal audio analysis, deep learning, etc

❑ 畜禽养殖设施与环境管理 Livestock and poultry breeding facilities and environmental management

📖 养殖环境监测、家禽照明、福利化系统等
Monitoring of breeding environment, poultry lighting, welfare system, etc

❑ 动物行为与动物福利 Animal behavior and animal welfare

📖 行为表征、福利评估等 Behavioral characterization, welfare evaluation, etc



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主要研究合作机构：宾夕法尼亚大学生猪教育与研究中心

Main research partner institution: Pennsylvania University Pig Education and Research Center



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☐ **Improving the Productivity, Efficiency, & Sustainability of Chinese Pork Producers** 提高中国猪肉生产商的生产力、效率和可持续性
(宾大中国养猪业者培训项目 2017-2020) (Pennsylvania University China Pig Farming Industry Training Program 2017-2020)

👉 讲座 - 疫病防治、营养管理、粪污资源化利用、猪舍设计、预算成本管理等

Lecture - Disease Prevention and Control, Nutritional Management, Fecal Resource Utilization, Pig House Design, Budget Cost Management, etc

👉 考察 - 饲料加工, 屠宰场, 养猪场 Inspection - Feed processing, slaughterhouses, pig farms



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后非瘟时代， 养猪业发展有哪些新趋势？

In the post ASF era,

What are the new trends in the
development of pig farming industry?

我国养猪业发展的新趋势 — 楼房养猪热火朝天

The new trend of pig farming development in China - the booming pig farming in high-rise buildings



我国养猪业发展的新趋势 — 福利养猪方兴未艾

The new trend of pig farming development in China - welfare pig farming is flourishing



我国养猪业发展的新趋势 — 智慧养猪如火如荼

The new trend of pig farming development in China - smart pig farming is booming



**当我们研究智慧养猪时，
我们在研究什么？**



**When we study smart pig farming,
What are we researching?**

生猪养殖中的核心要素和关键节点

Core elements and key nodes in pig farming

猪 Pig

- 母猪 / 后备母猪 Sow/Gilt
- 仔猪 Piglets
- 育肥猪 Fattening pigs
- 种公猪 Breeding boars

物 (猪舍、饲料、饮用水、各类养殖设备)

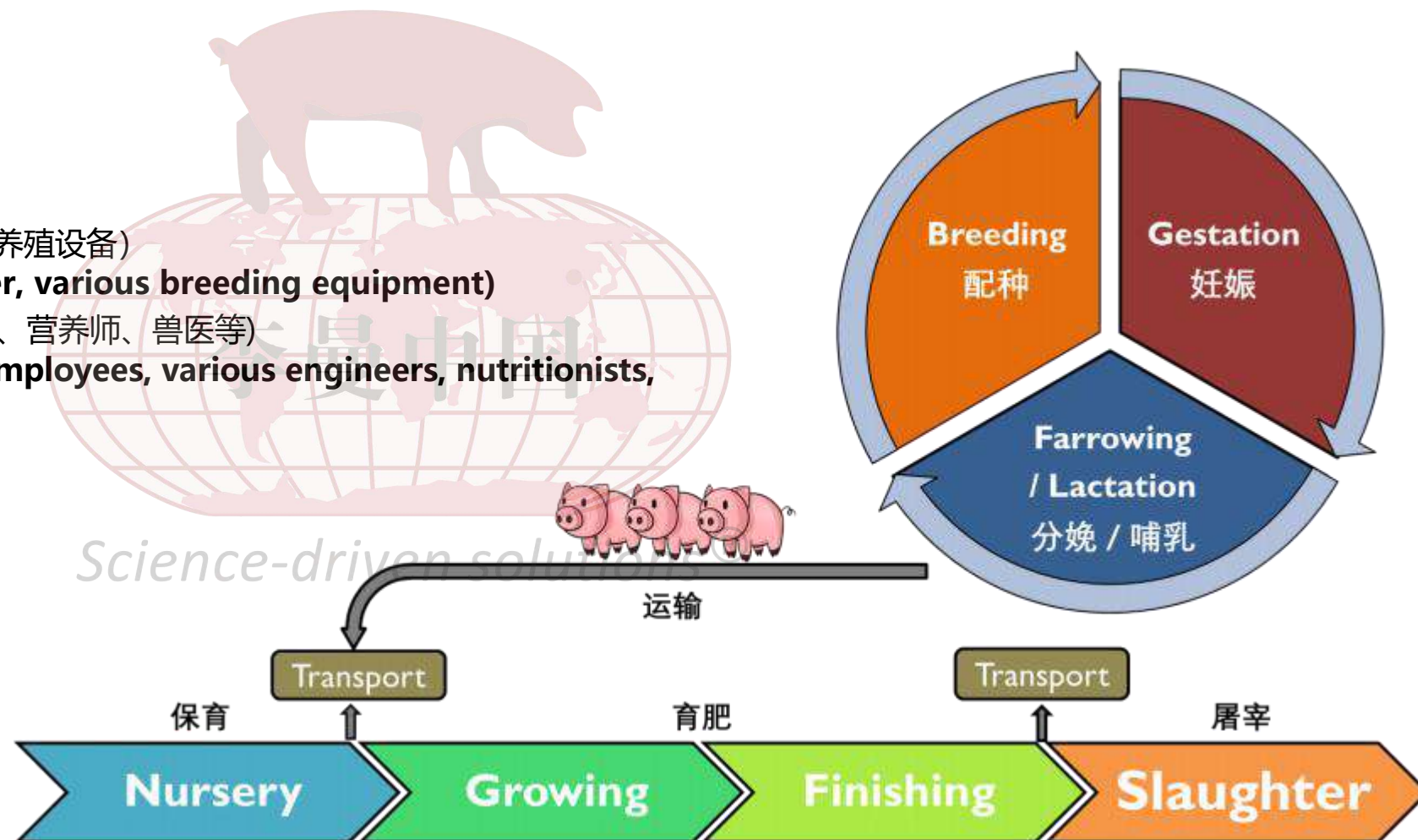
Items (pigsty, feed, drinking water, various breeding equipment)

人 (养殖生产员工、各类工程师、营养师、兽医等)

People (aquaculture production employees, various engineers, nutritionists, veterinarians, etc.)

管理 Administration

- 育种 Breeding
- 环控 Environmental control
- 营养 Nutrition
- 疫苗 Vaccines
- 生物安全 Biosafety
- 及其他 and others



智慧养猪：(个人见解)

Smart pig farming: (personal opinion)

通过智慧赋能的各类养殖设备(物), 帮助或替代人实现对生猪养殖各环节的高效精准管理, 进而改善提高生猪生产效率(如生长、健康、福利等), 最终实现生猪产业的降本增效。

Through intelligent empowerment of various breeding equipment (materials), it helps or replaces people to achieve efficient and precise management of various aspects of pig farming, thereby improving and enhancing pig production efficiency (such as growth, health, welfare, etc.), and ultimately achieving cost reduction and efficiency improvement in the pig industry.

智慧赋能的关键：数据驱动、实时反馈、自主决策、动态调节

The key to intelligent empowerment: data-driven, real-time feedback, autonomous decision-making, and dynamic adjustment

智慧养猪发展现状的一点点个人愚见

A little personal opinion on the current development status of smart pig farming

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智慧养猪现状：行业里常见的“智能化”产品

Current situation of smart pig farming: common "intelligent" products in the industry

- ☐
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智能环控 Intelligent environmental control

精准饲喂 Precise feeding

测膘估重 Fat measurement and weight estimation

生猪盘点 Pig inventory

咳嗽监测 Cough monitoring

发情监测 Estrus monitoring

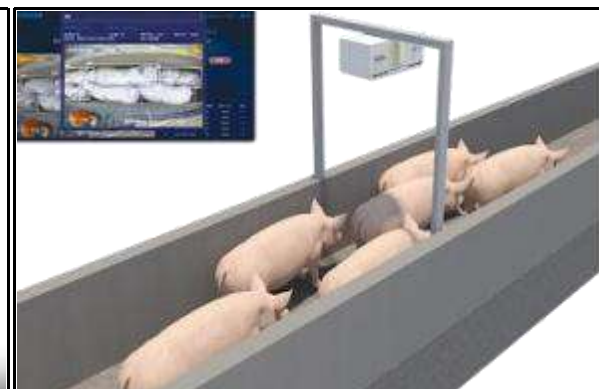
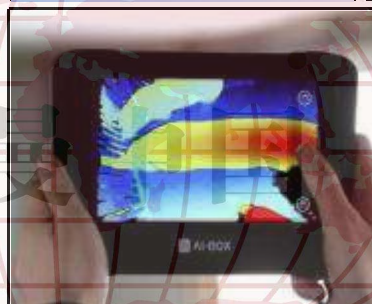
智能花洒 Intelligent showerhead

巡检机器人 (集成：环境、猪群及猪只个体)

Inspection robot (integrated: environment, pig herd, and individual pigs)

物联网/云平台 (大数据及可视化)

Internet of Things/Cloud Platform (Big Data and Visualization)



智慧养猪现状：行业里常见的“智能化”产品

Current situation of smart pig farming: common "intelligent" products in the industry



智慧赋能的关键：数据驱动、实时反馈、自主决策、动态调节

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智能环控：猪舍精准环控成熟已久，远早于“智能环控”概念的提出

Intelligent environmental control: Precise environmental control in pig pens has been mature for a long time, far before the concept of "intelligent environmental control" was proposed



物联网/云平台：多源高维数据的深度整合和可视化展示，提高综合管理效率

Internet of Things/Cloud Platform: Deep integration and visualization display of multi-source high-dimensional data to improve overall management efficiency



测膘估重：机器视觉，软硬件技术成熟，应用场景单一，需与其他产品配套使用

Weight measurement: Machine vision, mature software and hardware technology, single application scenario, needs to be used in conjunction with other products



生猪盘点/估重：机器视觉，软硬件技术成熟，卖猪好帮手，但还有哪些应用场景呢？

Pig inventory/weight estimation: Machine vision, mature software and hardware technology, good helper for selling pigs, but what other application scenarios are there?



发情监测：机器视觉或其他传感器，应用场景可能不符合批次化同步发情管理逻辑

Estrus monitoring: machine vision or other sensors, application scenarios may not comply with batch based synchronous estrus management logic



咳嗽监测：音频分析，有预警价值，但往往无法直接追踪到异常个体

Cough monitoring: audio analysis, with warning value, but often unable to directly track abnormal individuals



智能花洒：各类传感器，有助于生物安全，但这个行业痛点本就不应该存在

Smart showerhead: Various sensors contribute to biosafety, but pain points in this industry should not exist in the first place



精准饲喂：旨在个性化营养管理，但真的智慧赋能了吗？

Precision feeding: aimed at personalized nutrition management, but is it really empowered by intelligence?



巡检机器人：多应用场景不同功能的集大成者，但无法实时持续监测同一群体、个体

Inspection robot: a culmination of multiple application scenarios and different functions, but unable to continuously monitor the same group or individual in real-time



行业现象：几乎所有的产品研发都避开了哺乳期的母猪和仔猪

Industry phenomenon: Almost all product development avoids lactating sows and piglets

规模化母猪场采用的主要分娩栏类型

The main types of delivery pens used in large-scale pig farms



主要问题: 分娩产程过长、仔猪断奶死亡率高(10-20%)、母猪福利水平低、人工巡查难度大等
Main issues: Long delivery process, high mortality rate of piglets weaned (10-20%), low welfare level of sows, difficulty in manual inspection, etc

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