



Automatic Detection of Abattoir Lesions (ADAL): an innovative technology for animal disease monitoring

Estimated reading time: 10 minute(s)

## **MONITORING LIVESTOCK DISEASE AT THE ABATTOIR**

The slaughterhouse is widely seen as an important checkpoint for monitoring the health status of farm animals, especially in pigs.

This role is traditionally carried out by veterinary experts, using standardized lesion scoring systems. In general, such systems assign a score to each slaughtered animal for the disease being monitored. The scores are based on the absence or presence as well as the extent of gross lesions observed.

A large number of systems have been developed over the years to recognize and score a variety of diseases. However, respiratory conditions, such as pleurisy and pneumonia, have always been given particular importance due to their impact on the swine industry, with up to 50% prevalence rates being regularly observed in herds.

### **SLAUGHTERHOUSE ANIMAL DISEASE MONITORING TODAY**

Despite the important role of the abattoir for monitoring key diseases in the swine industry, **scoring is currently only performed on a small percentage** of slaughtered pigs. This is due to the **significant costs** needed to monitor all carcasses by trained experts physically present along the slaughter line.



Automatic Detection of Abattoir Lesions (ADAL): an innovative technology for animal disease monitoring

## **FUTURE PERSPECTIVES OF SLAUGHTERHOUSE ANIMAL DISEASE MONITORING**

Because of the costs involved for manual scoring and the benefit of providing systematic data, efforts are being made to develop new and innovative scoring methods. Such methods must be simple, fast, easily standardizable and provide suitable data from animal disease monitoring for statistical analysis.

**Image analysis-based systems improve the feasibility of the task.** Such systems make it possible to **score pictures of slaughtered animals** without the presence of a human scorer in the abattoir, cutting back on time and costs. More recently, **artificial intelligence technologies** have been developed to completely automate slaughterhouse animal disease monitoring, completely removing the need for a trained scorer.

**Automated systems** would make it possible to systematically monitor all slaughtered animals for key diseases. Together with “on the farm” disease monitoring techniques, they would permit stakeholders, such as livestock veterinarians and farmers, to **better manage herds health**.

## **WHAT IS ADAL**

The Automatic Detection of Abattoir Lesion system or “ADAL” is an **innovative image analysis tool**, developed using **artificial intelligence technology**, capable of **automatically scoring disease** in slaughtered pigs.

The system was [developed by Farm4Trade](#), in collaboration with the



Automatic Detection of Abattoir Lesions (ADAL): an innovative technology for animal disease monitoring

[Department of Veterinary Medicine of the University of Teramo](#) (UNITE), and the [AiMagelab, research laboratory](#) of the Department of Engineering Enzo Ferrari of the University of Modena and Reggio Emilia (UNIMORE).

ADAL consists of a **system of convolutional neural networks** (CNNs), trained to automatically analyze and score images of slaughtered pigs for pleurisy. The system works by **analyzing photographic images** of porcine half carcasses, assigning them a score ranging from 0 (unaffected animals) to 3 (severely affected animals), based on the absence or presence as well as the extent of pleurisy detected.

The technology was developed using a large number of images of half carcasses photographed in commercial slaughterhouses. The images were each scored and segmented by veterinary specialists in order to train the CNNs to recognize and score the disease. Assigned scores are then used to gauge the prevalence values and extension of the disease in the slaughtered batch of animals.

ADAL has proven very capable of recognizing and scoring pleurisy in slaughtered pigs. In fact, it has shown an **average accuracy rate of 85.5 %** for its capacity to distinguish between the classes. Healthy carcasses are recognized by the system with a 96% accuracy, while diseased ones (regardless of the score) were recognized with 92% accuracy.

Research is currently being carried out to expand the ADAL technology to other key disease conditions. In fact, newly developed CNNs, trained to recognize and score porcine pneumonia, already show promising although preliminary, results.



Automatic Detection of Abattoir Lesions (ADAL): an innovative technology for animal disease monitoring

In time, ADAL technology will be developed for a range of diseases and **can be adopted on a large scale** in commercial slaughterhouses, contributing to more robust animal health monitoring strategies.

## **BENEFITS OF AUTOMATED SLAUGHTERHOUSE SCORING SYSTEMS**

A widespread use of automated slaughterhouse data collection, using the ADAL system, would provide a **massive quantity of information** to stakeholders about the health of farm animals.

The main advantages such a system include:

- Makes it possible to **carry out routine scoring** of all slaughtered carcasses for key diseases
- Provides **enormous quantities of data**, suitable for statistical analysis, appropriate for integration with health data collected on the farm, to optimize herd health management
- Slaughterhouse data can be used in **prevention and treatment programs**, leading to improved vaccination strategies, and a more correct use of antimicrobials on farms
- Such data can be used by stakeholders such as large animal veterinarians and farmers to **better manage the health** of pig herds
- The data can also be used by official government animal health monitoring agencies to **better manage animal diseases** and to streamline national livestock health monitoring and control strategies.



Automatic Detection of Abattoir Lesions (ADAL): an innovative technology for animal disease monitoring

## **PUBLICATIONS**

For more details, consult the scientific publication published in the scientific journal "Veterinary Research": [Scoring pleurisy in slaughtered pigs using convolutional neural networks.](#)

## **CONFERENCES**

Results of the research project were presented at the following international conferences:

1. International Conference on Image Analysis and Processing 2019;
2. The 51st Annual Meeting of the American Association of Swine Veterinarians, in 2020.