ADAL

AUTOMATIC DETECTION OF ABATTOIR LESIONS

New vision-based technologies

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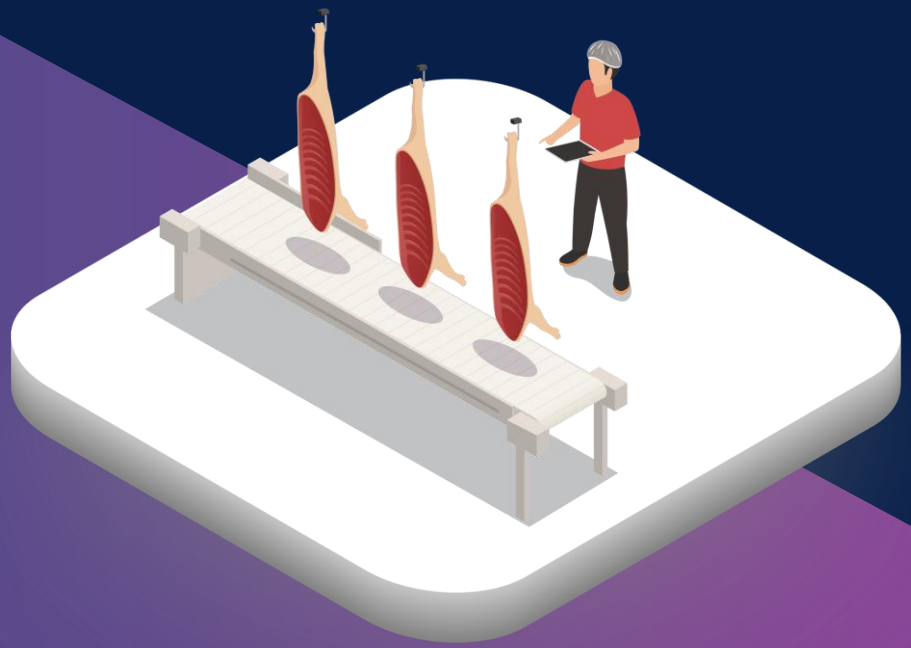
Current state of art of meat inspection

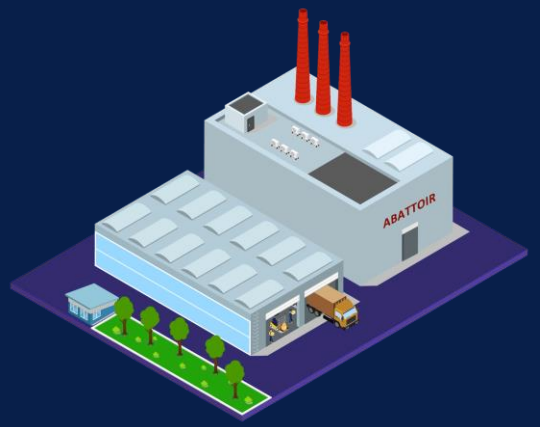
- The **veterinarians** serving the slaughter chain **manually perform lesions scoring** and other assessments.
- This is a time-consuming and **repetitive activity**
- **No standardised procedure** and **inconsistencies** among different abattoirs.



LUNG SCORING SYSTEM IN USE

- **Madec's grid**: each lobe is inspected and palpated, divided into quarters and scored from 0 to 4 points regardless of its size.
- **Madec's grid** is usually combined with a method to account for each lobe volume.

Limitation of traditional and current systems



Postmortem evaluations at slaughterhouses are outdated and inherently flawed

PARTIAL INSPECTION RATE

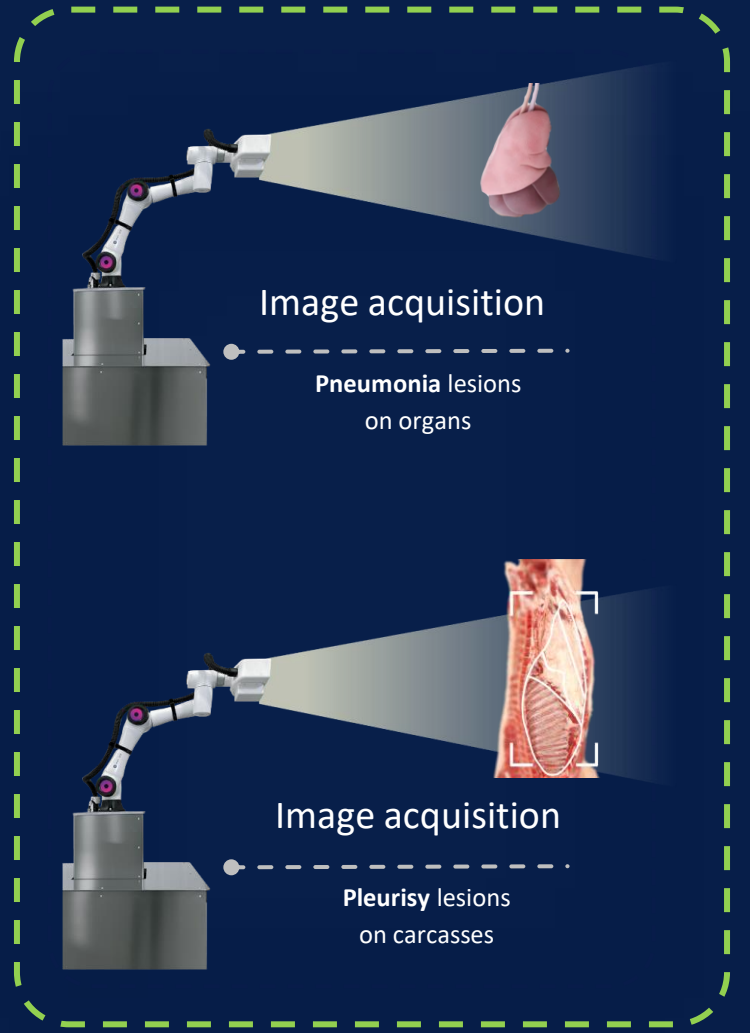
NON FULLY RELIABLE DATASETS FOR EPIDEMIOLOGICAL ANALYSIS

SUBJECTIVE SCORING BETWEEN OPERATORS

EXPENSIVE AND ERROR PRONE MANUAL DATA RECORDING

Potential and Advantages of Computer Vision Systems (CVSs)

- **Digital transformation of MI** enhances quality, efficacy, and feedback to farmers
- CVSs support risk-based meat inspection by accurately detecting lesions, abnormalities, and contamination
- **Greater consistency and speed compared to human inspectors**, reducing intra- and inter-rater variation
- **Facilitates trace-back systems, outbreak investigations, and recall of food batches**
- Remote AM and PM inspections are possible, improving efficiency and access
- Enables efficient reporting of findings from inspections and facilitates food chain information (FCI) exchange
- Contributes to reducing food waste through **improved partial condemnation capabilities**
- **Harmonized detection and condemnation criteria** can lead to fairer economic outcomes for livestock producers
- Supports future integration of new technologies in risk-based meat safety assurance systems (RB-MSAS)



Farm4trade

*The **ADAL** system is the **first automated image acquisition and analysis system** based on Artificial Intelligence (**AI**) capable of objectively identifying and quantifying the lesions of slaughtered animals in real time.*

ADAL Technology innovates the animal inspection process at the slaughterhouse by introducing automated quantified risk assessment tools.

Partners

UNITE UNIVERSITÀ DEGLI STUDI DI TERAMO

AImage Lab

MM SYSTEMS srl

#Research

#Artificial Intelligence

#Automation

ADAL

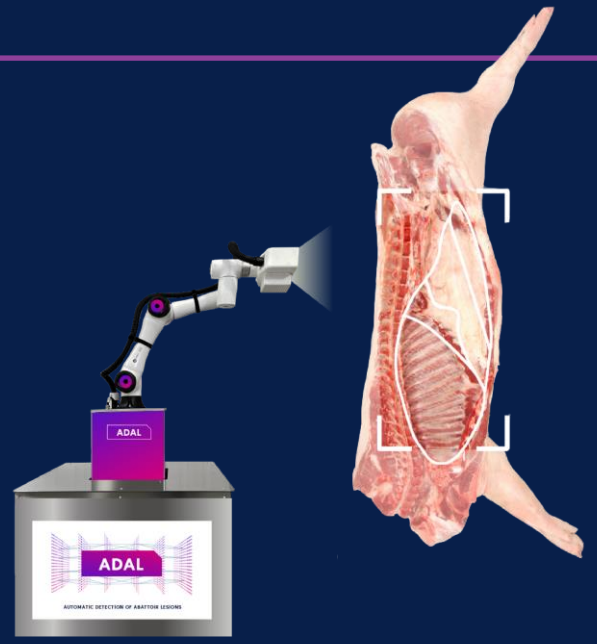
How it works

We have developed an automatic imaging acquisition system capable of recognizing and evaluating lesions on slaughtered animals. The data acquired by a Robot and processed by the IA Software are made available locally and remotely through the ADAL Web platform.

1. Robot
For image acquisition

2. Software AI
For local image processing

3. ADAL web Platform
For remote cloud access and storage



ADAL Prototype

It is a workstation designed for different use, capable of acquiring images at any point in the slaughtering chain.

Current application

State of the art of the technology

ADAL

HEALTH SURVEILLANCE TOOL

- Scoring of Pneumonia
- Scoring of Pleurisy

ReaDOP

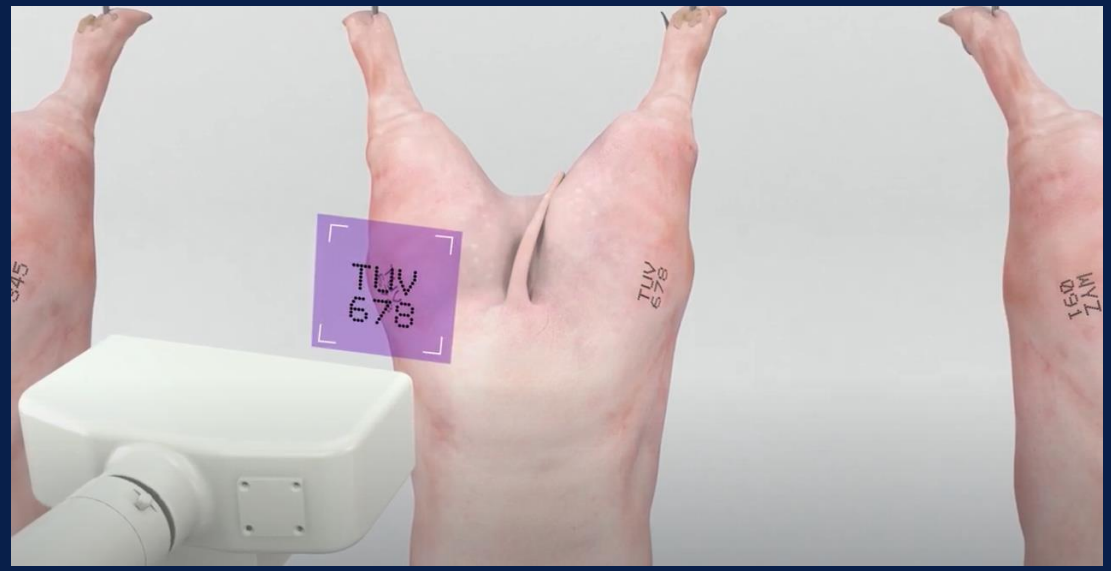
ANIMAL TRACEABILITY

- Automatic Tattoo Reading

FIRST CASE STUDY SPECIES: PIG

ReaDOP

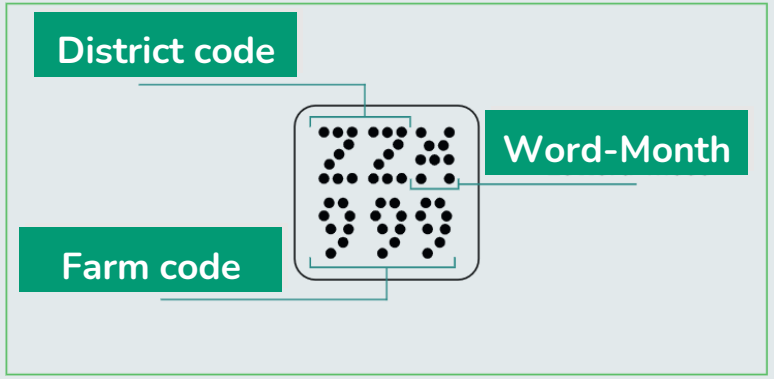
A flexible and safe automation solution for streamlining operations at the slaughterhouse



ReaDOP is an automated animal tattoo code reading system supporting real-time traceability of hams in the supply chain. It can digitally read the producer's code on each pig.

ReaDOP technology has been developed to be able to fulfill the requirements set by Italian Ham Consortiums

(Prosciutto di Parma and San Daniele)



ADAL

A complete system

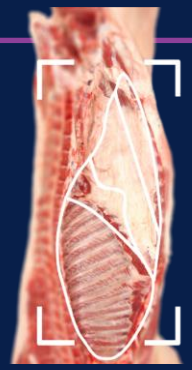
To fully express its potential and accomplish the tasks mentioned, the ADAL system needs different robotic stations capable of continuously identifying each animal with the batch of origin and associating the results of all the analysis carried on each animal

ReaDOP

Tattoo

Alphanumeric tattoo reading on pigs' thighs

1



Pleurisy

Evaluation of pleurisy lesions on carcasses

2

Pneumonia

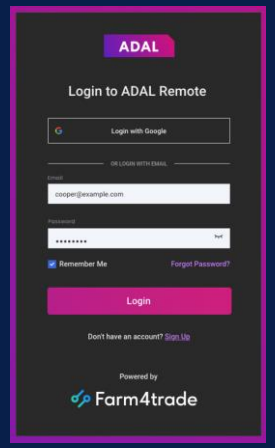
Evaluation of pneumonia lesions on organs

3

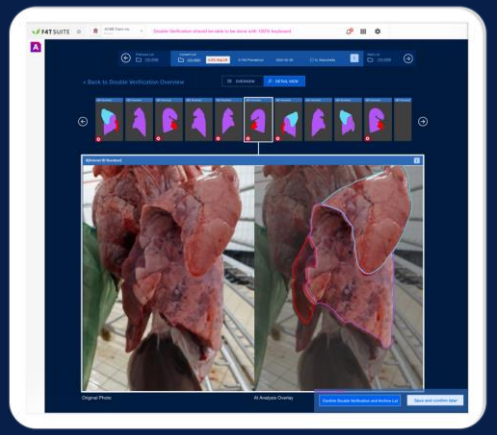
ADAL *Web Platform*

Allows the complete and centralized management of all the analysis carried out by the workstations on each individual and on batch of animals.

REMOTE ACCESS



MULTI-USER WEB APP



Access data in real time for:

Manage batches
Double verification
Access to annotations details
Manage Metadata

Registered data can be integrated with third parties application and/or Farm4trade SUITE

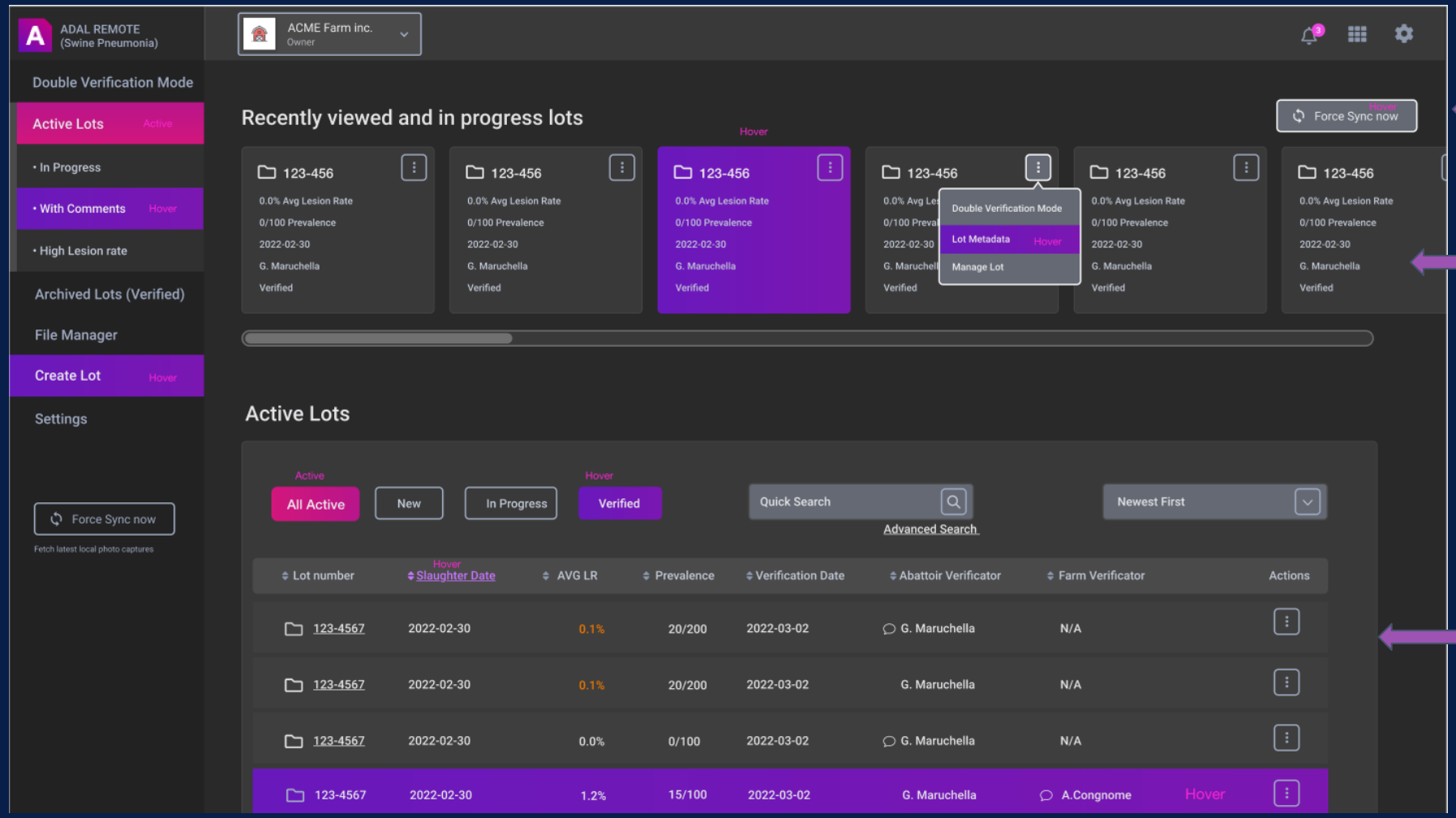
3rd THIRD-PARTY APPLICATION

Farm4trade SUITE

Collection of applications dedicated to farmers and other stakeholders

farm4tradesuite.com

Remote Web App
Dashboard



Manage batches

Manually upload a new batch of images

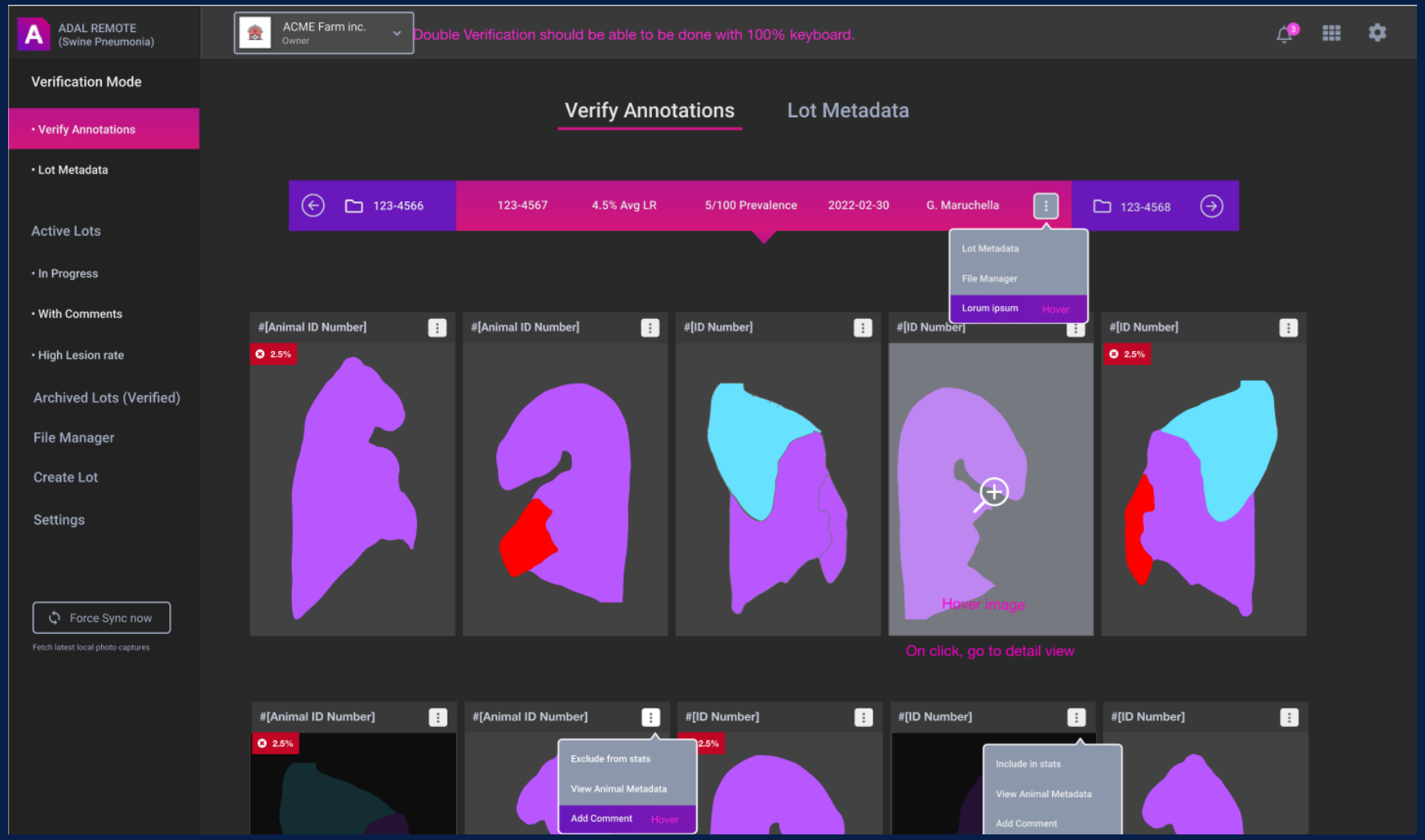
Download images batches from the cloud

Access to all batches

Batches waiting to be double - verified

Remote Web App

Double verification

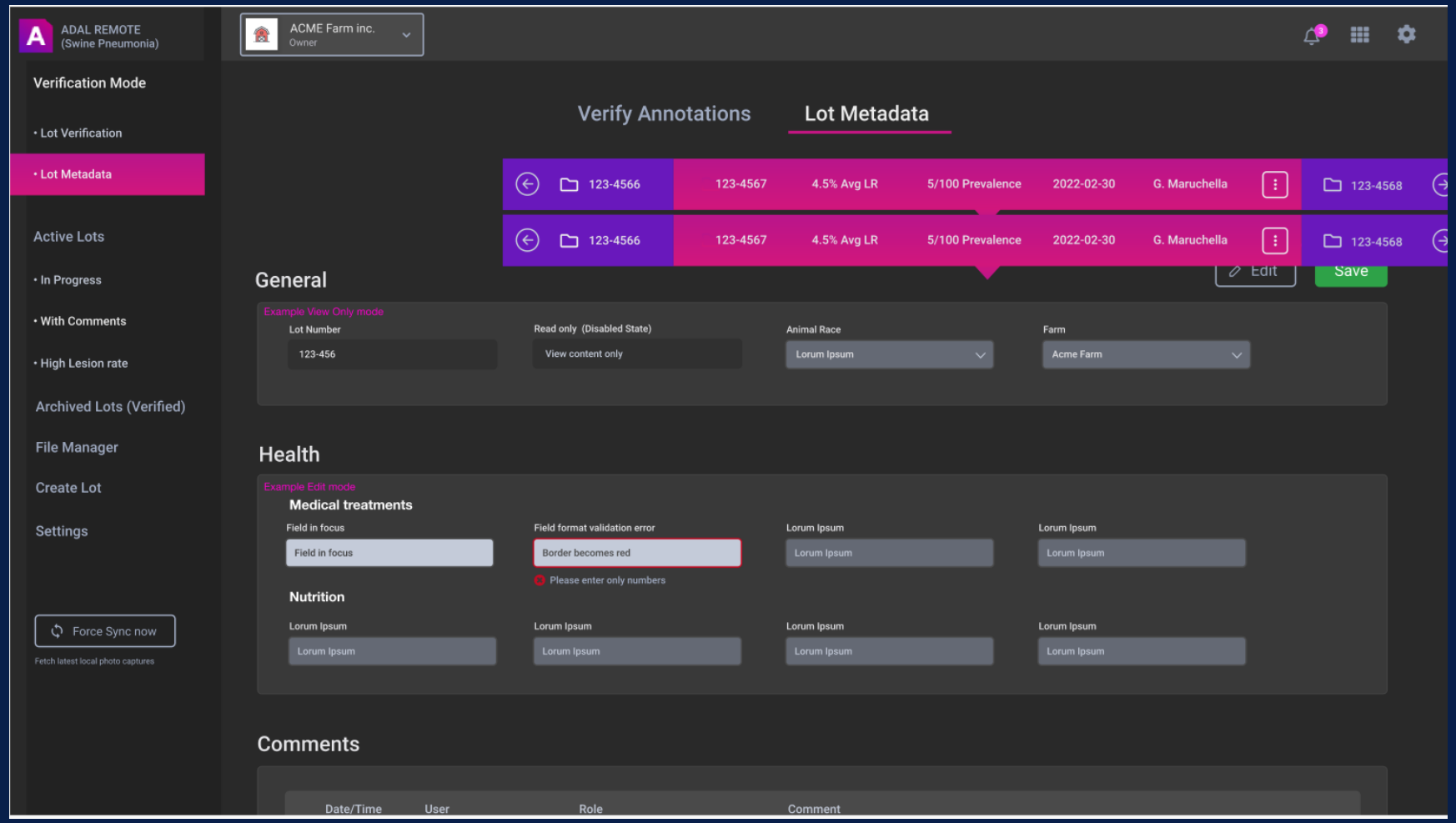


Veterinarians will have access to double verification of annotated images.
If they disagree with the analysis, they can decide to exclude it from the stats.

All actions can be performed using a keyboard

Remote Web App

Batch Metadata



Farmers, Slaughterhouses and all final users will be allowed to add important information to the batch of images, such as general animal data, health history and others.

Such information can be acquired by automatic integration with animal management systems, national databases, etc...

ADAL

Advantages

The technology, in addition to produce benefits in terms of improving the working conditions of the operators involved along the slaughtering chain, has the following advantages compared to traditional methods of detecting pathologies at the slaughterhouse:

- **Automatic data acquisition**

- **Automatic scoring of animal lesions**

- **Inspection of all animals delivered to the slaughterhouse**

- **Big data management in the cloud and BI systems**

ADAL

EyeAM Project

On September 04, 2022, Farm4Trade launched the first pilot project of ADAL technology in the FatLand slaughterhouse in Norway, within the innovative meat inspection project at the slaughterhouse called EyeAM and funded by "The Research Council of Norway".

Actually the **ADAL robot** is performing the task of half-carcasses pictures acquisition and evaluation in order to detect pleurisy prevalence in slaughtered pigs.

In coming months we will test the technology on lungs to detect and assess pneumonia for which an automated scoring system has been already developed (see DEMO)

MAIN PARTNERS

EyeAM Project

ANIMALIA
Norwegian Meat and Poultry Research Centre

Fatland

MEATS

Norfura
bondens selskap

ADAL

NEXT STEPS

We aim to expand the fields of application of the technology developed to other pathologies both of health interest and related to animal welfare. The first ones we have started to work on are the following:

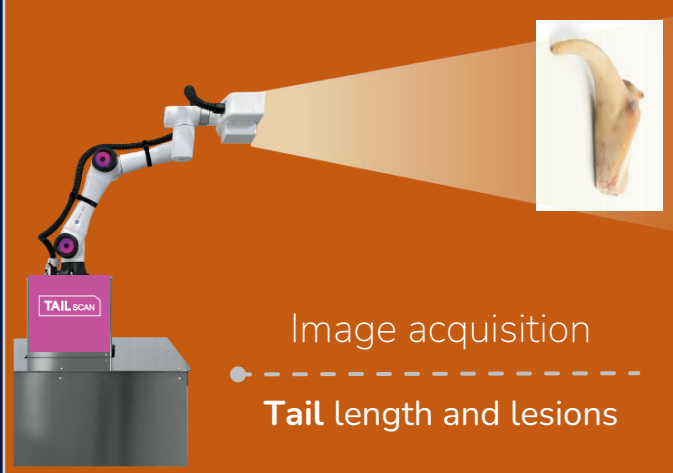
Skin Lesions

Evaluating skin lesions, which can be of infectious or traumatic origin, helps to provide information on the welfare of animals on farm, during transport and during slaughtering operations. These injuries can significantly affect product quality and processing, with repercussions on the productivity and profitability of the entire supply chain.

Liver lesions

Evaluating and assigning a score to parasitic hepatitis which is the main parasitic pathology found in intensive pig breeding is one of the best indicators of the health status within livestock farms.

Tail lesions



Current Applications and Future Perspectives of CVSs in MI

- **CVSs** primarily support inspection in poultry, with potential for expansion to bovines and pigs
- **EU Regulation 2017/625** encourages the adoption of new technologies in meat inspection, subject to member state approval
- **High-speed processing** challenges addressed by CVSs, enabling **more accurate and consistent inspections**
- **Minimizes human inspector fatigue and ensures reliable inspection** for extended periods
- Increased **uniformity** in inspection findings and condemnation criteria benefits livestock producers
- **Technological advancements to enable individual carcass tracing and routine handling** of different meat categories
- Investigating the efficacy of CVSs in detecting lesions and carcass contamination for bovines, pigs, and broiler chickens
- Exploration of remote inspection capabilities through augmented reality and live-stream video software
- **Continuous development of CVS technologies to improve meat inspection and align with evolving legislation**

More info

Two journal articles

Training Convolutional Neural Networks to Score Pneumonia in Slaughtered Pigs

Animals

vol. 11, article 3290 (2021)

Scoring pleurisy in slaughtered pigs using convolutional neural networks

Veterinary Research

vol. 51, article 51 (2020)

Online Live demo

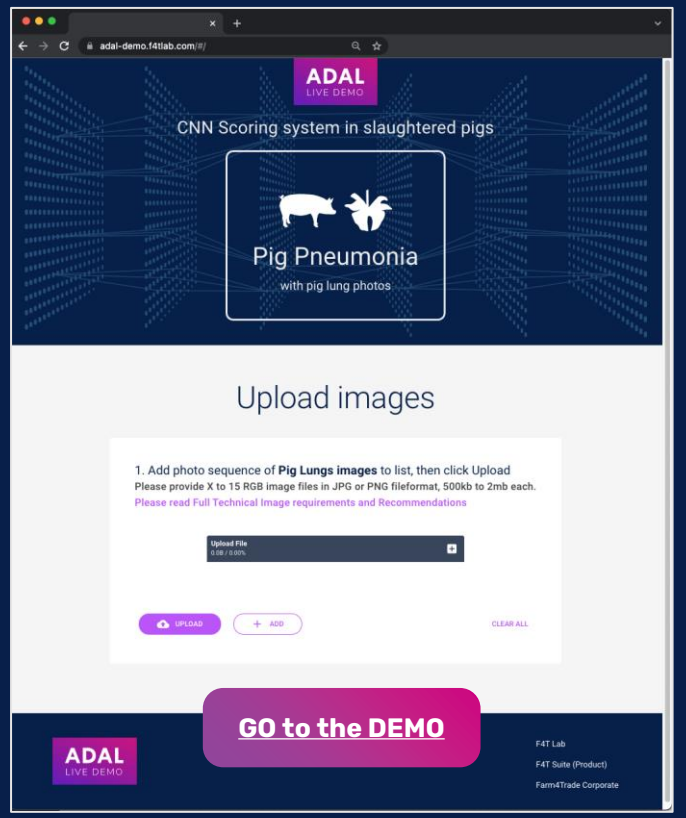


Photo capture robot

View on YouTube

ADAL Video

View on YouTube

Contact

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Farm4trade

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