An ICT-based real-time advisory tool to minimise tail biting in fattening pigs

Prof. Tomas Norton

2022 Joint Call
Kick-off Projects Seminar
31st January 2024

HORIZON 2020

Involved countries and partners

KU Leuven, Belgium – project coordinator
- ❑ *Engineers, data scientists*
- ❑ Prof Tomas Norton
- ❑ Dr Dong Liu (post doc)

Aarhus University, Denmark
- ❑ *Ethologists*
- ❑ Prof Lene Juul Pedersen
- ❑ Dr Mona Lilian Vestbjerg Larsen (post doc)
- ❑ Dr Guilherme Amorim Franchi (post doc)

Teagasc, Ireland
- ❑ *Animal scientists*
- ❑ Dr Laura Boyle
- ❑ Dr Keelin O'Driscoll

**Experience within
Precision Livestock
Farming research**

Duration: Feb. 1st, 2021 – Jul.31st, 2024 (3 years + 6 months)
Overall Budgets: 798.7k €

Objective

Tail biting: one of the major welfare challenges, but also…

… affects growth

… increase antibiotic use

… increase condemnations at slaughter

… an economic problem for the farmer

GOAL: to aid the farmer in the prevention of damaging tail damage by developing a data-driven decision support tool based on remote detection of tail biting behaviour ~~and intervention advice~~ based on other remotely detected parameters

New focus:
Evaluate the emerging tail-biting behaviour: data being collected, intact vs docked, with vs without enrichment + standard management practices (Teagasc)*

Main project activities

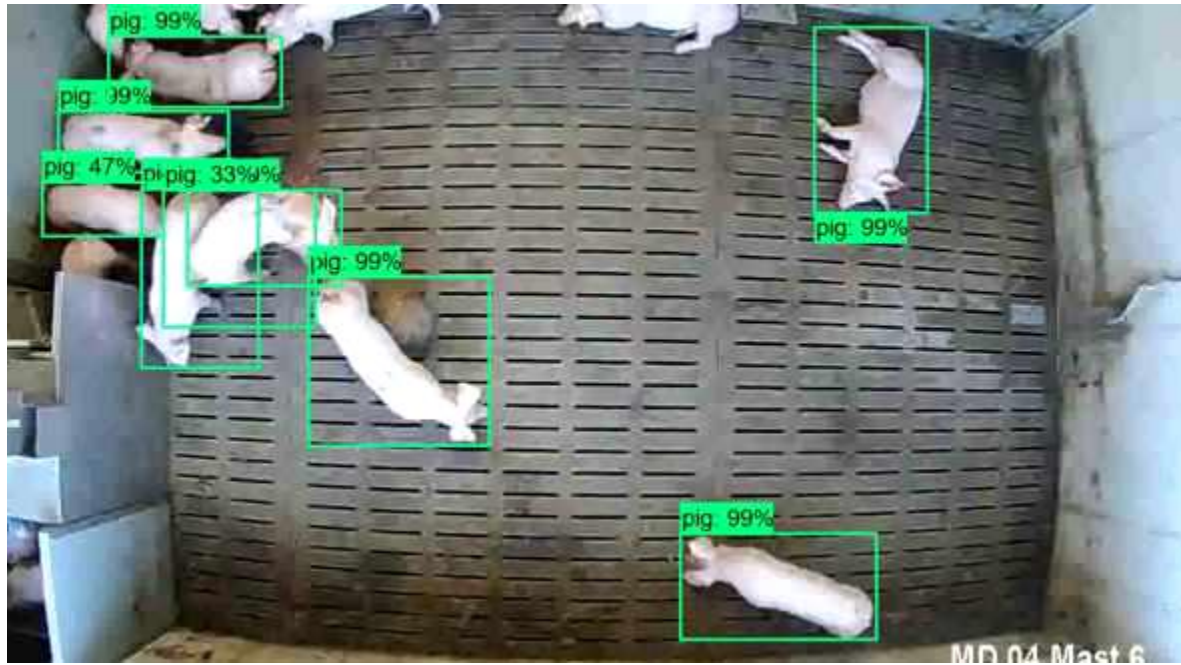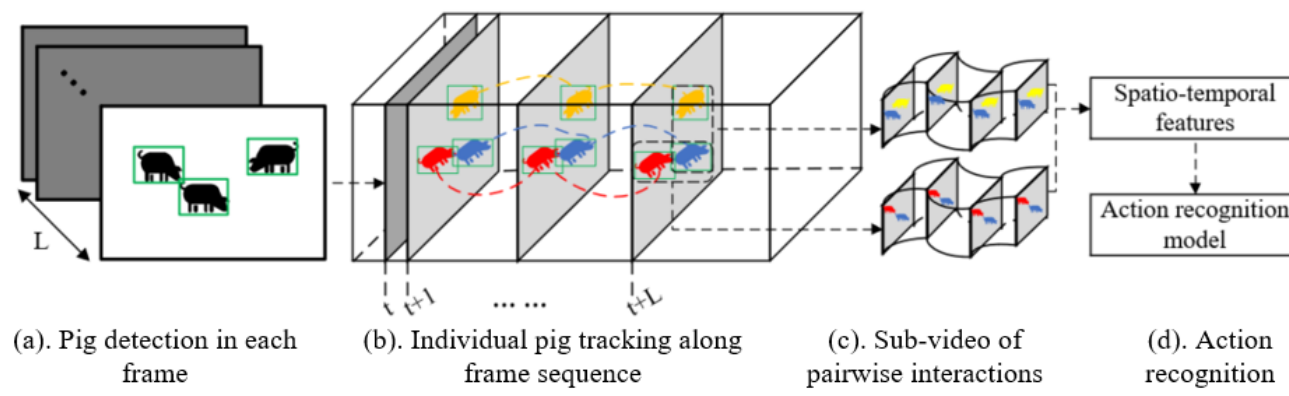WP1: Project coordination and management (KU Leuven)

WP2: Optimisation and integration of detection algorithms (KU Leuven)

WP3: Relationship between parameters and risk factors of tail biting (AU)

WP4: Demonstration of the developed decision support tool. <u>New focus: evaluate the emerging tail-biting behaviour: data being collected, intact vs docked, with vs without enrichment + standard management practices (Teagasc)</u>*

WP5: Multi-actor group on implementation of decision support tool (Teagasc, all)

WP6: Dissemination, communication and exploitation (KU Leuven, all)

(a). Pig detection in each frame

(b). Individual pig tracking along frame sequence

(c). Sub-video of pairwise interactions

(d). Action recognition

Spatio-temporal features

Action recognition model

Initial algorithm

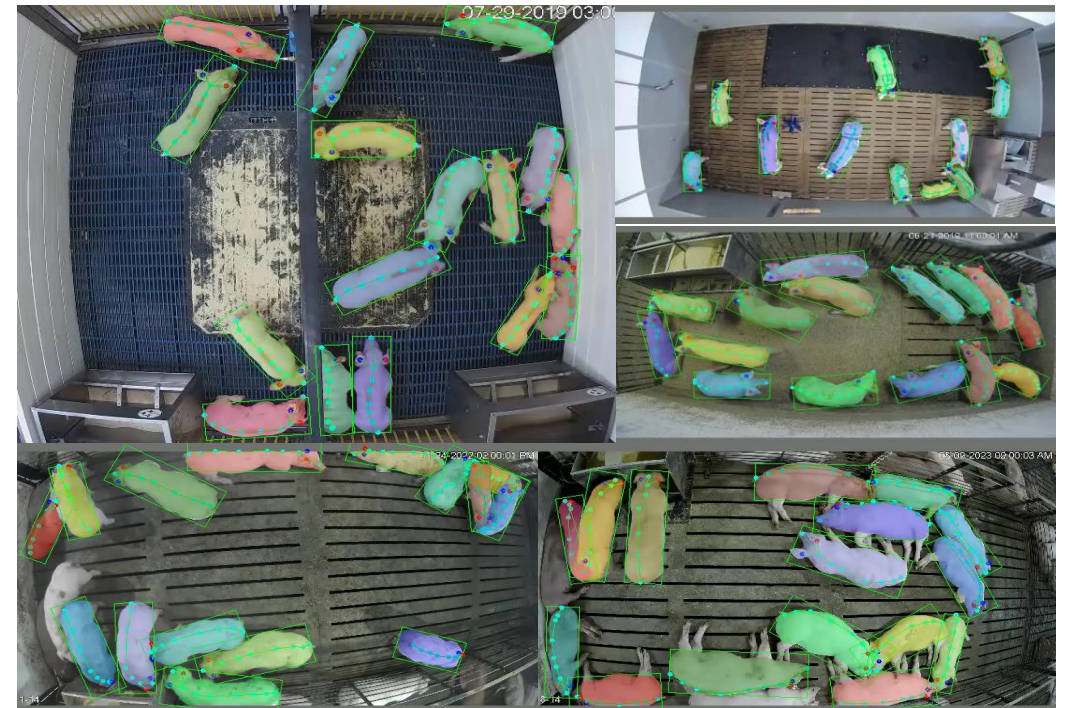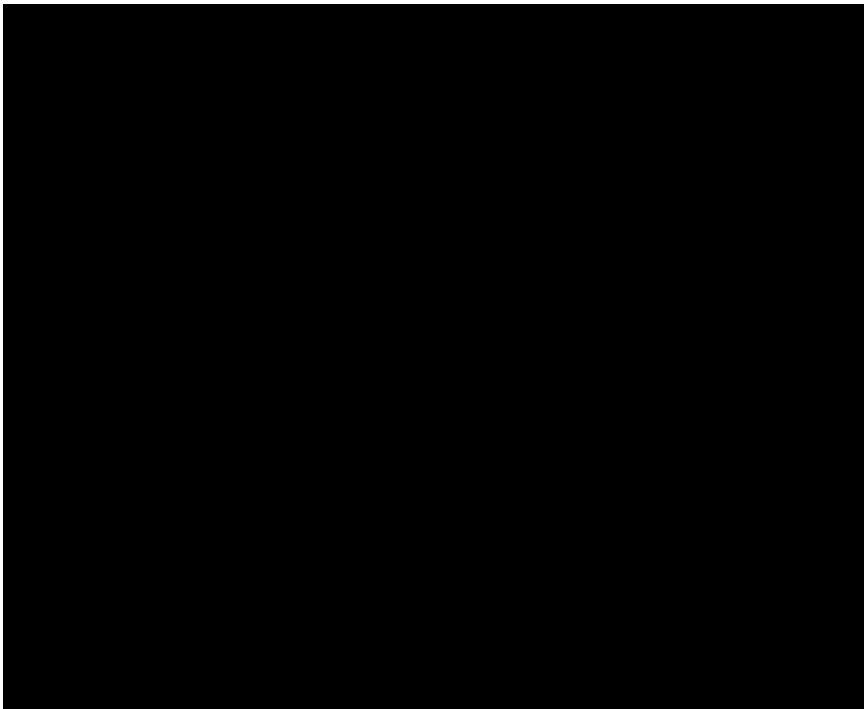New algorithm developed in TailbiteAdvice

WP2: Actions

- Tailored each component for pig monitoring system
  - → *Performs well in dense scenario*
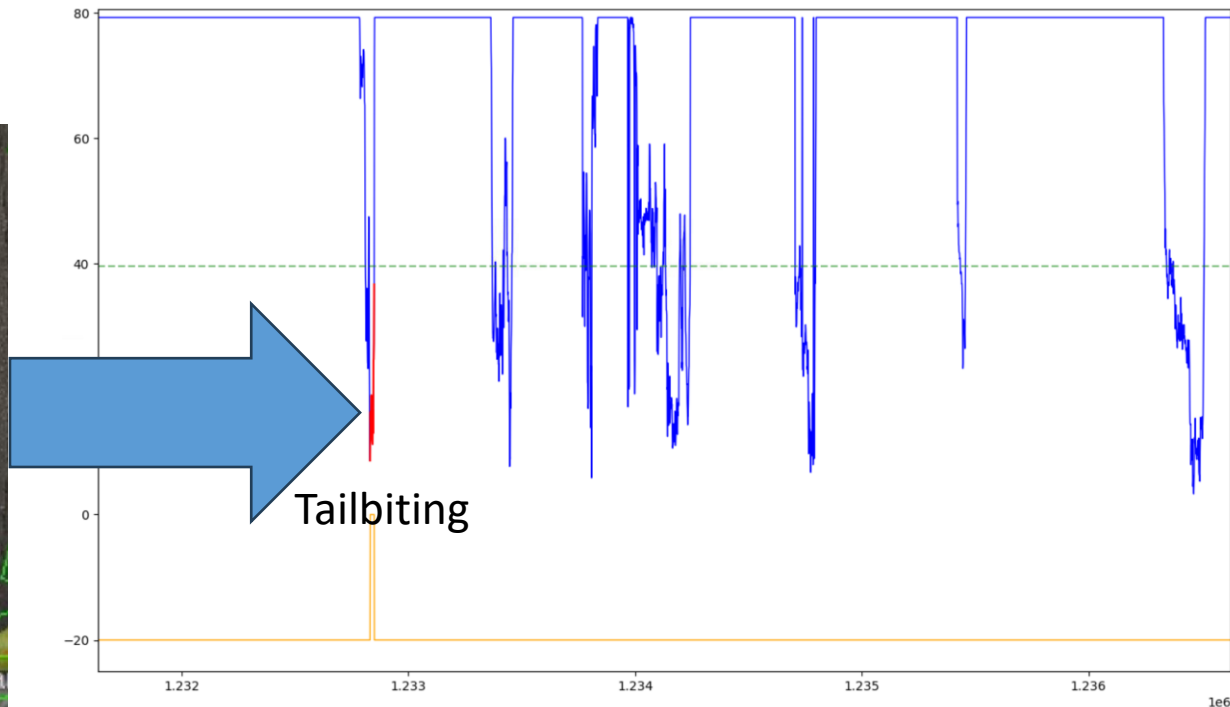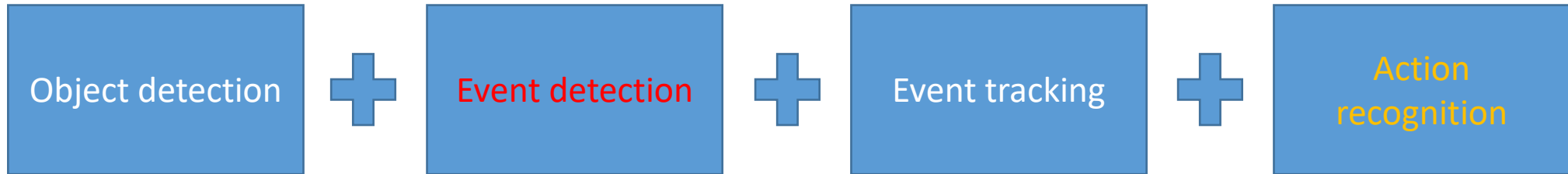 - → *Faster inferencing for large-scale analysis*
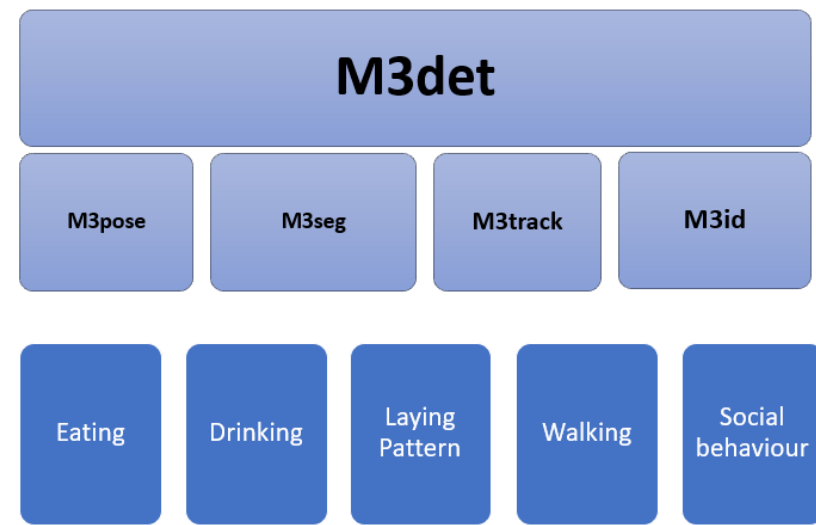
WP2 Challenges:

- Make fundamental CV tasks perform well in dense scenario (Done)
- Interactive behaviour recognition in group-housed condition (Doing)
- Large-scale data annotation to verify the developed algorithms (Doing)

WP3: Experiment on risk factors

Aim: Identification of responsible risk factor of tail biting from behaviour change

Induced (1 week)   Monitored

Lack of enrichment   Health
Limited access to feed   Climate
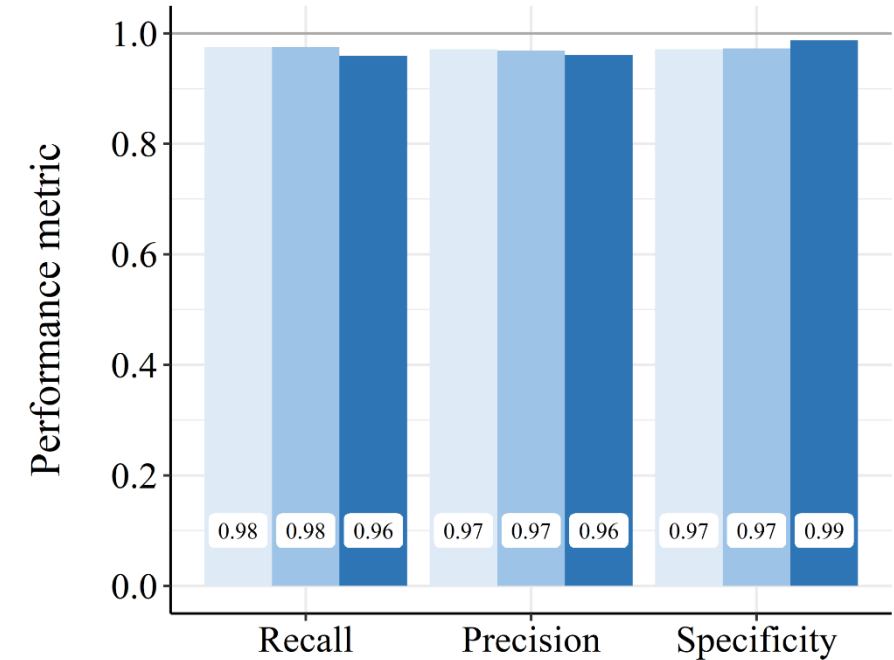Limited access to water   Pen cleanliness

Large scale data on feeding and drinking behaviour
- 16 pens of finisher pigs - 9 weeks study period
- Each pen experienced all three induced risk factors
- Observed every 10 second, all days

Investigate changes in feeding and drinking behaviour in relation to the risk factors

Feeding & Drinking behaviour metrics

WP5: Multi-actor group on implementation of decision support tool (Teagasc, all)

- Workshop in November 2021

Pig producers
PVPs
Department of Agriculture veterinary inspectors
Teagasc pig specialist advisors
National and international researchers

1. What Information should PLF technology provide you with?

Predict tail biting outbreaks	Send an alarm
Suggestions to prevent tail biting	No need to enter the unit for behaviour observations

Additional information (temperature, light, ventilation, etc.)

WP5: Multi-actor group on implementation of decision support tool (Teagasc, all)

2. What barriers are there to the implementation of PLF technologies?
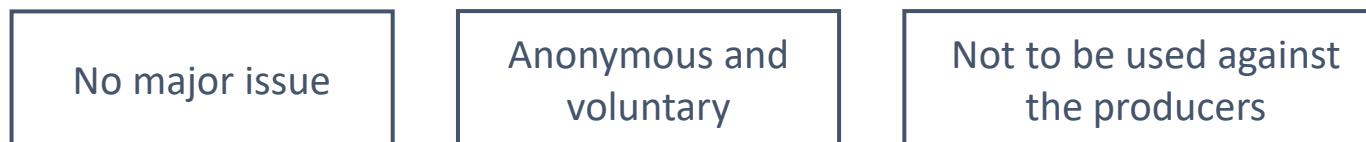
Cost of cameras and maintenance	Durability of the system material	Broadband availability
Ethics in recording the staff?	Reliability of the algorithms for different farms	Lack of knowledge of the system
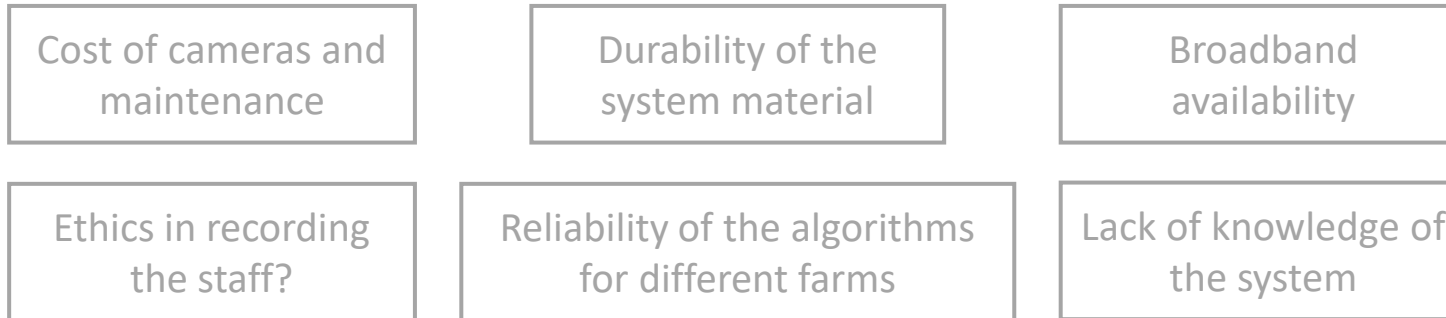
3. How can data sharing issues be dealt with and what actors should be involved?

No major issue	Anonymous and voluntary	Not to be used against the producers

WP5: Multi-actor group on implementation of decision support tool (Teagasc, all)

- Ethical approval obtained that covers all partners
- Workshops will be organized with a variety of stakeholders from the pig production
  - Three national workshops to focus on SWOT analysis of the tool: protocol to deliver
    - Workshop in Ireland: aim for same day as the IPHS conference in April 2024.

- One global workshop in Summer 2024 where results will be disseminated

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Expected results and potential impact

ICT-tool development for pig behaviour monitoring

- <u>Development</u>: Location/Trajectory/Identify/Posture/eating/drinking/Interactive behaviours for individual animal
- <u>Applications</u>: Identification of responsible risk factor of tail biting from behaviour change
- <u>Extra applications</u>: Digital phenotype

Connections:

- Three company in pig supply chain has contacted
- New scientific collaborations (Italy/Greece/Spain/Denmark)

Potential impact:

- Minimise tail biting in fattening pigs
- Pig digital phenotype for pig breeding

Next steps

- Algorithm verification on large-scale data cross different pens

- ICT tool integration for stakeholders

LET'S KEEP IN TOUCH!

Please feel always free to reach out to us.

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Thank you for your attention!