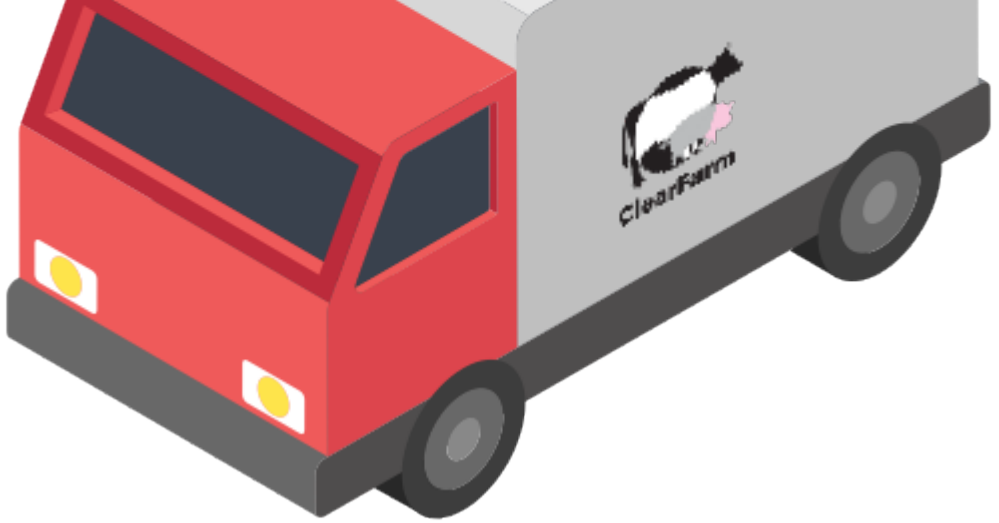

ClearFarm

Exploration of indicators measured by PLF sensors to monitor pig welfare during transportation

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29/08/2023

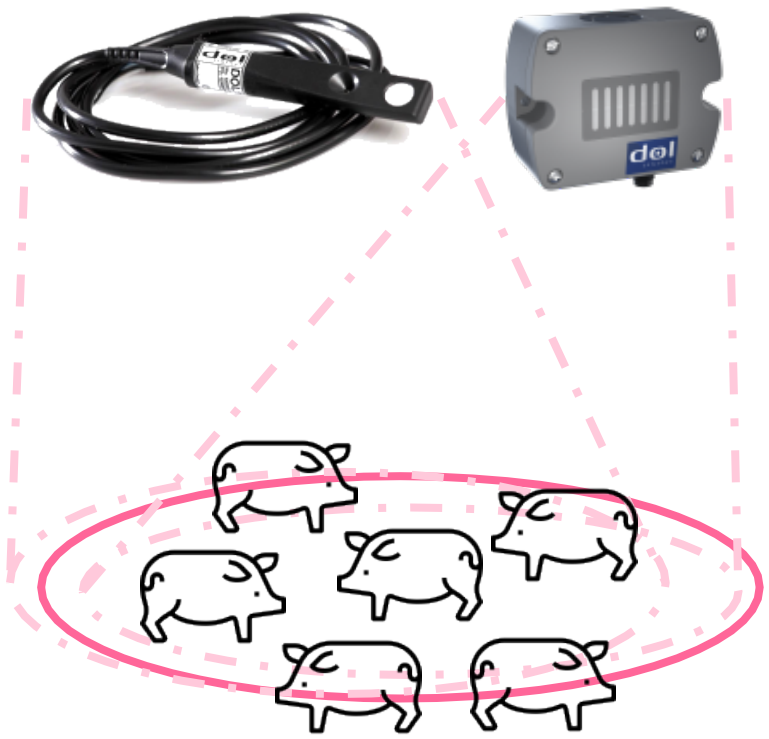
Project aim

HOME THE PROJECT PARTNERS CLEARFARM PLATFORM RESOURCES AND RESULTS JOIN US NEWS AND EVENTS

ClearFarm

www.clearfarm.eu

Introduction



ground truth (i.e., gold standard)

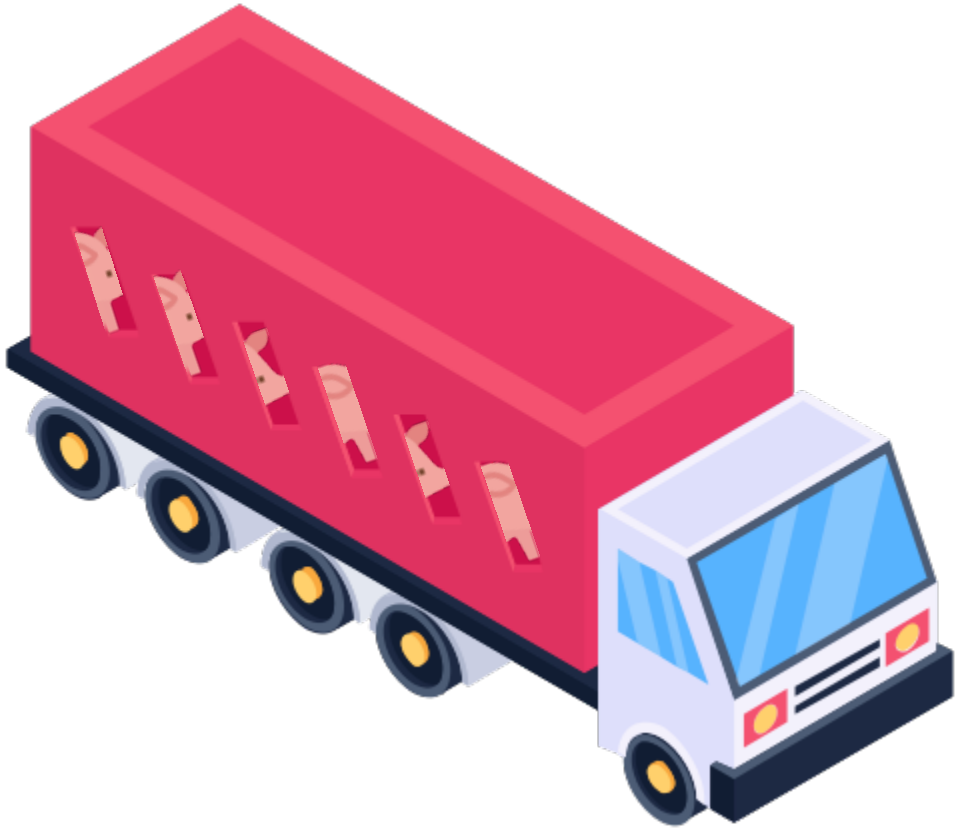
sensed truth

comparison

algorithm: automatic welfare assessment

Figure and flowchart adjusted from *Klausmann et al. (1999)*

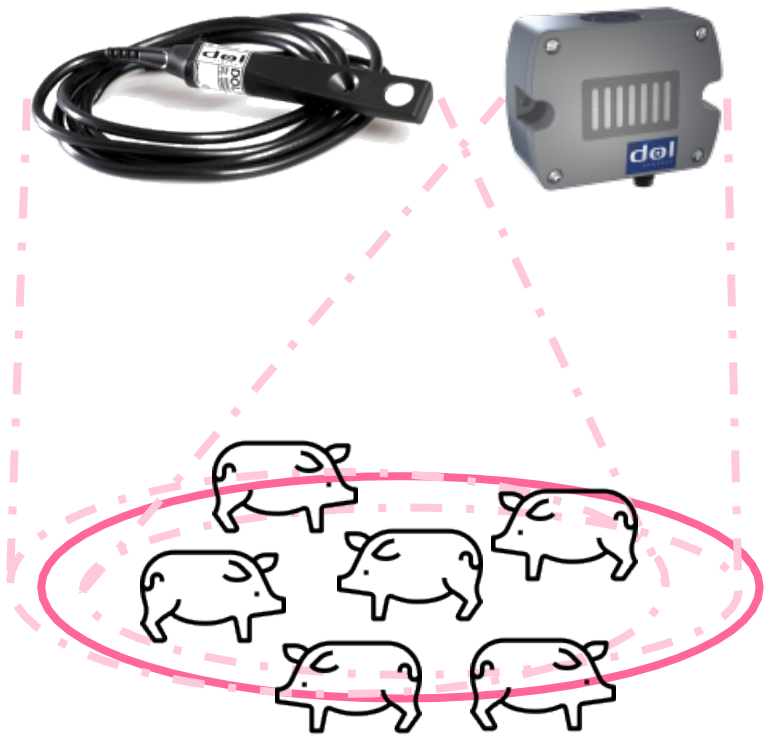
Introduction



- Most pigs are transported at least once in their lives.
- Average number of live pigs transported *intra-EU* per year (2017-2021): 34.9 million[1].
- Council Regulation (EC) No 1/2005 of 22 December 2004:
  - Ventilation
  - Temperature: between 5 and 30°C; with a +/- 5°C tolerance, depending on the outside temperature
  - Water and minimum space provision
  - Navigation system

[1] European Court of Auditors, (2023). *Transport of live animals in the EU : challenges and opportunities*, Publications Office of the European Union. https://data.europa.eu/doi/10.2865/211704.

Objective



ground truth:
→**Welfare Quality assessment**

sensed truth:
→**DOL sensors, GPS tracker**

comparison

algorithm:
automatic welfare assessment

Figure and flowchart adjusted from *Klausmann et al. (1999)*

M&M

Sensors

- **DOL 114**
  - Every 15 minutes:
  - Temperature (°C)
  - Humidity (%)

- **DOL 19**
  - Every 15 minutes:
  - CO_2 (ppm)

- **Movildata MD 321**
  - GPS tracker
  - Location, timestamp, and distance

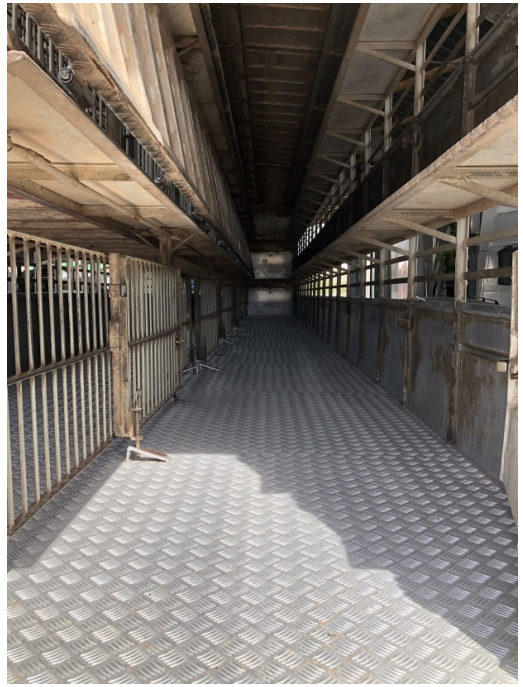
→ Journey distance (km)

→ Journey duration (min.)

→ Number of stops

M&M

Sensor installation



- 2.1 m x 13.2 m
- Sensor location: at 6.6 m measuring from the front
- Maximum capacity: 180 adult pigs (60 pigs/floor; ~1 nipple drinker/pig)

M&M

Experimental design

Study period

GPS: location, timestamp, and distance

DOL 114: temperature and humidity

DOL 19: CO_2

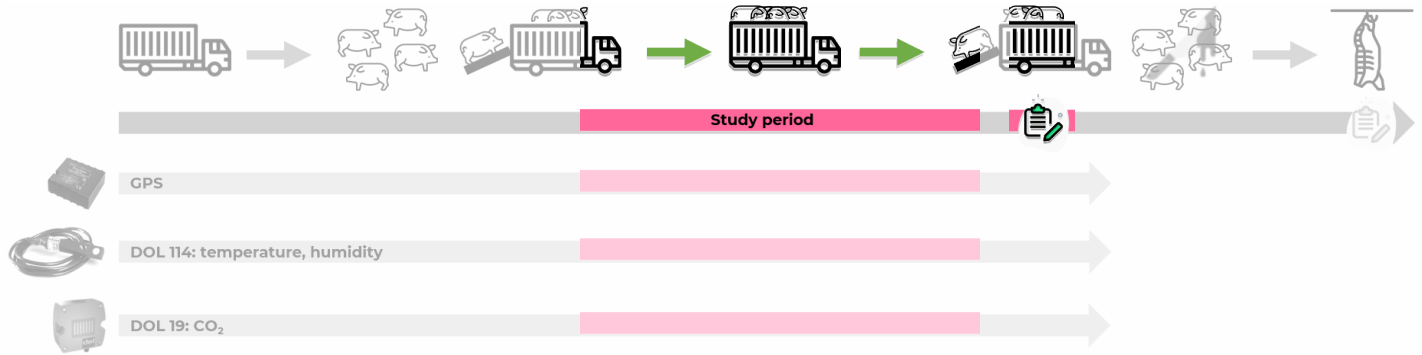
Modified Welfare Quality assessment:

- **During unloading**
  - Good Housing: N° of falling pigs
  - Good Health: N° of lamed, sick, and dead pigs
  - Appropriate Behavior: N° of reluctant to move and turning back pigs
- **After slaughter**
  - Good Health: Wounds on body, pneumonia, pleurisy, pericarditis, and white spots in the liver

M&M

Statistical analysis

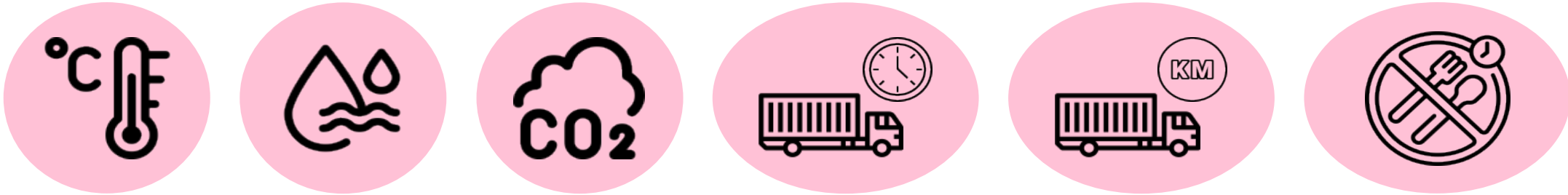
- RStudio
- Test 1: Correlation tests
- Test 2: Generalized linear models
  - Associations between sensor data (micro-climate conditions on truck) and Welfare Quality data (animal conditions and behavior during unloading)



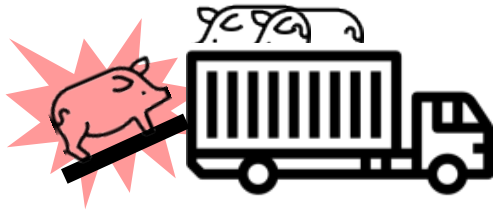
M&M

Statistical models

- **Explanatory variable** (mostly sensor data):

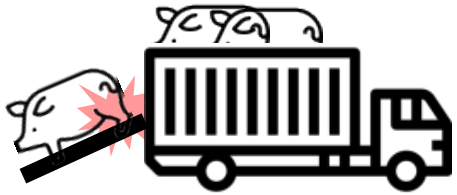


- **Response variable** (Welfare Quality data):



Turning back

Falling

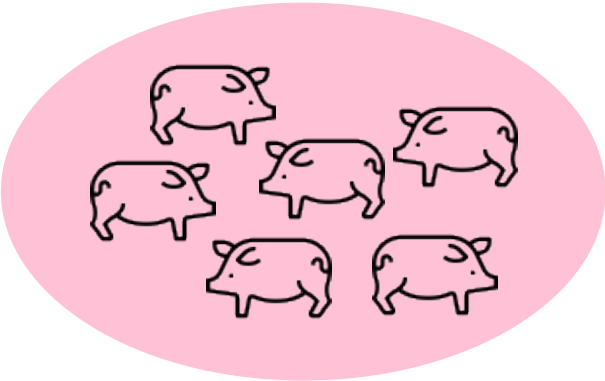


Lamed

(Descriptive) Results (1)

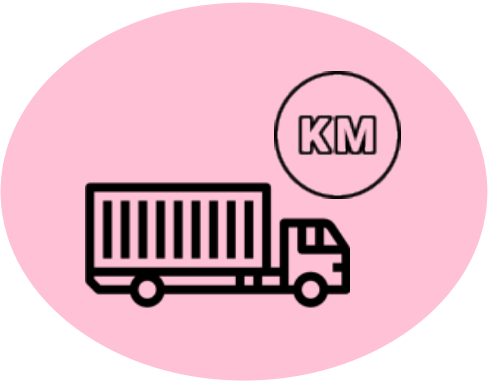
- 26 journeys (Oct 2022 - Feb 2023)

- On average, each journey:



173 ± 12.5
pigs

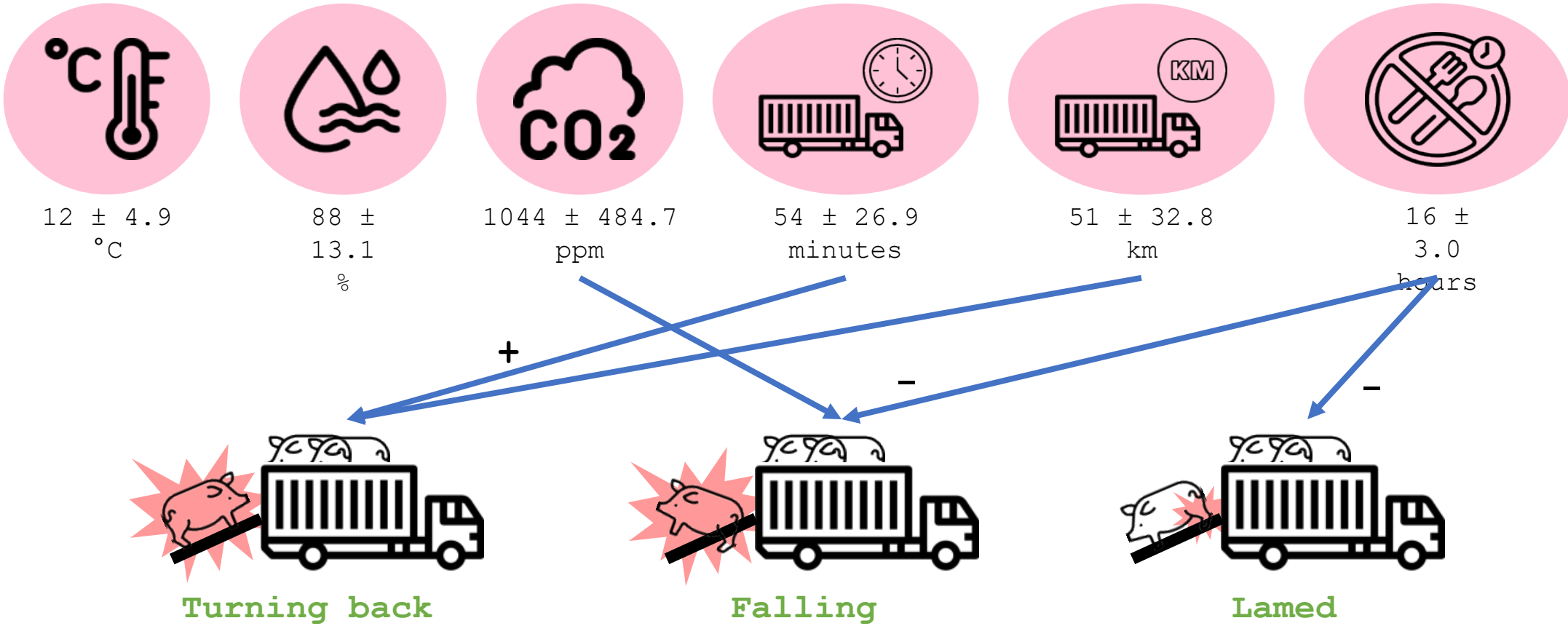
54 ± 26.9
minutes



51 ± 32.8
km

16 ± 3.0
hours

Preliminary results (2)

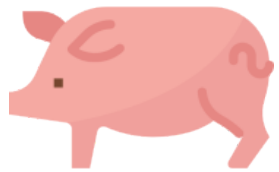


Discussion and Conclusion

- Journey distance ↑
  - Temperature ↑, humidity ↑
  - N° of turning back pigs ↑
- Journey duration ↑
  - N° of turning back pigs ↑

Fear
(Dalmau et al., 2009)

- Fasting hours ↓
  - N° of falling pigs ↑ (Driessen et al., 2020)
  - N° of lamed pigs ↑ (?)
- CO_2 ↓
  - N° of falling pigs ↑



Future steps

- To collect more data until October 2023
  - ~100 trips in total covering the whole year
- To refine the stats models and include Welfare Quality assessment records on carcass into data analysis
- To incorporate sensor data into the ClearFarm platform algorithm during transportation
- To develop more sensor technology (European Court of Auditors, 2023):
  - Monitor ABMs and their association with animal welfare and meat quality (example on lambs: Ogun et al., 2022)
  - Optimize route planning and thus reduce journey

Thank you!

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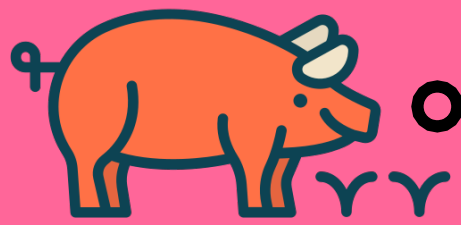

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