Automated chicken observation under varying light conditions using deep learning

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Why Lighting Matters in Poultry Farming?

- Affects welfare, behaviour, performance
- Traditional guidelines focused on:
  - Intensity (Lux) (minimum required intensity)
  - Light schedules (timing of light versus dark)
- However, lighting programmes in poultry houses still mainly based on **assumptions,** birds' preferences are largely unknown
- LED tech now enables:
  - Full spectrum control
  - Dynamic intensity and location-based lighting

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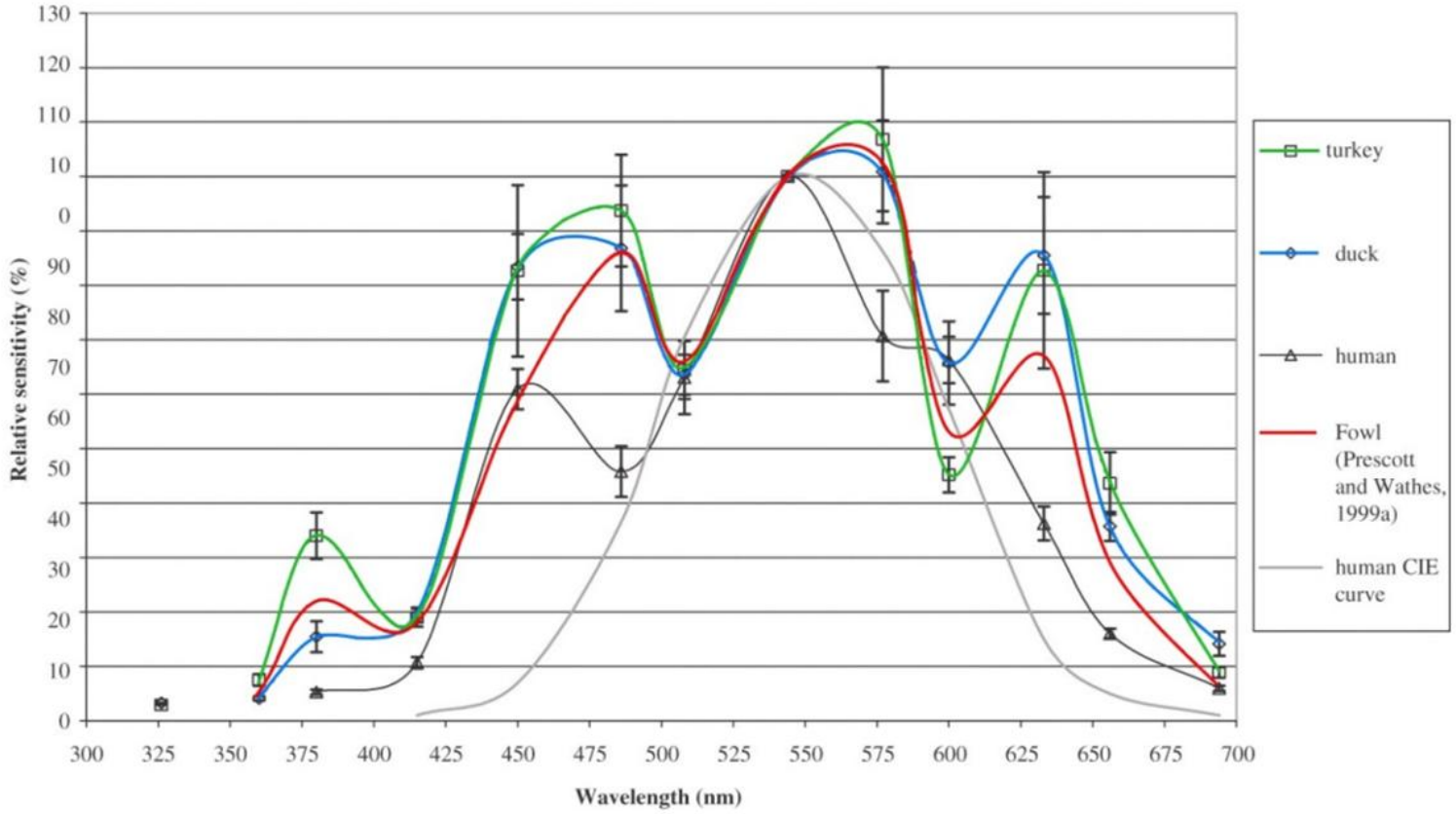
Why Lighting Matters in Poultry Farming?



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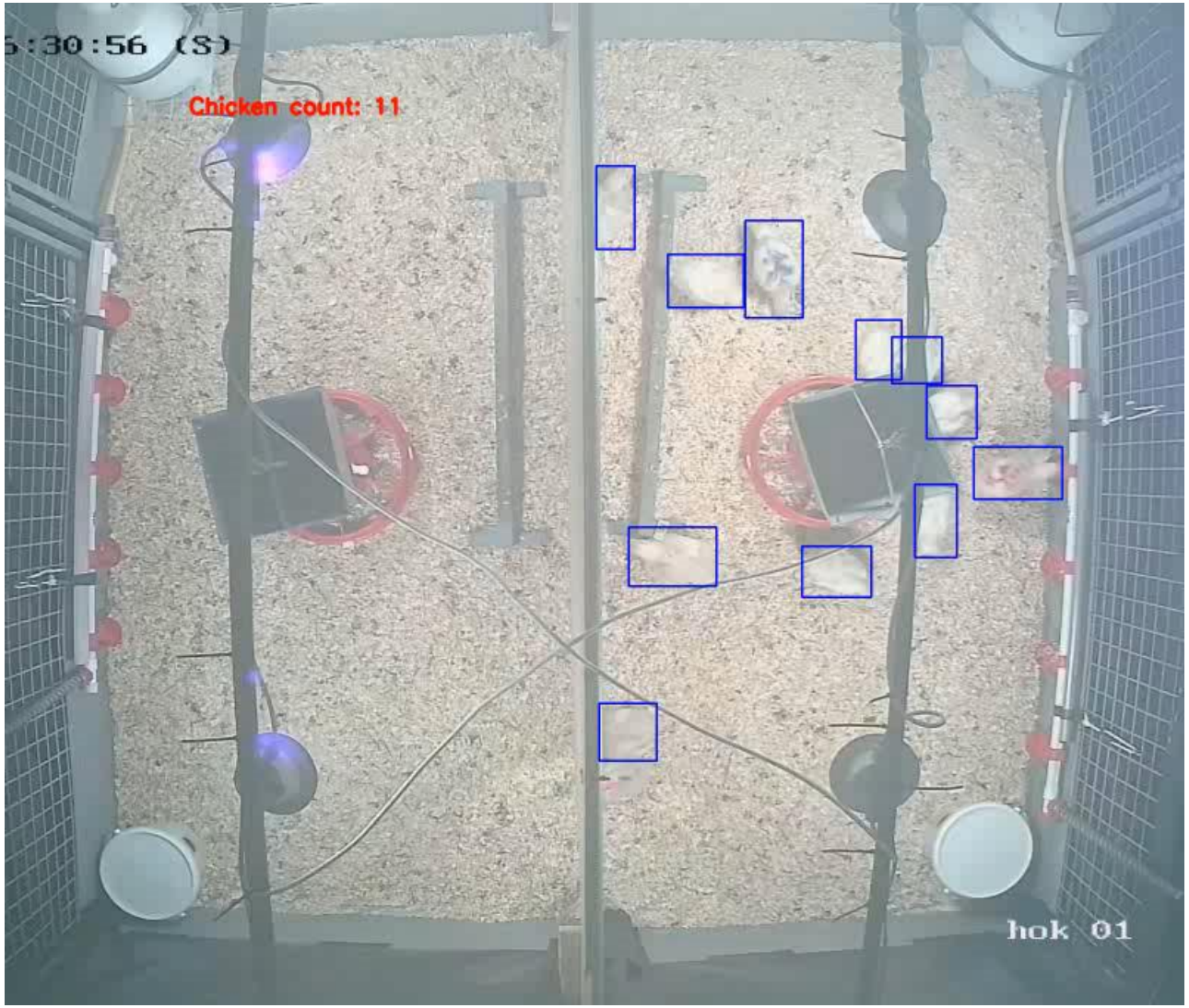
Project goal

- Understand chickens' preferences for:
  - UV light
  - Light intensity
  - Spectrum
- Use automated deep learning to track behaviour and preferences

  Manual observation is:
  - Time-consuming
  - Not scalable
- Design welfare-friendly lighting programs.

Experiments Setup

- **Experiment 1:** UV vs. no-UV in broilers
- The pen is divided into two compartments
  UV light & non UV light
- Birds can move freely between the compartments through a gate.
- Two breeds were used, fast (Ross) and slow (Hubbard) growing
- Some area of interests were defined to observe preferences



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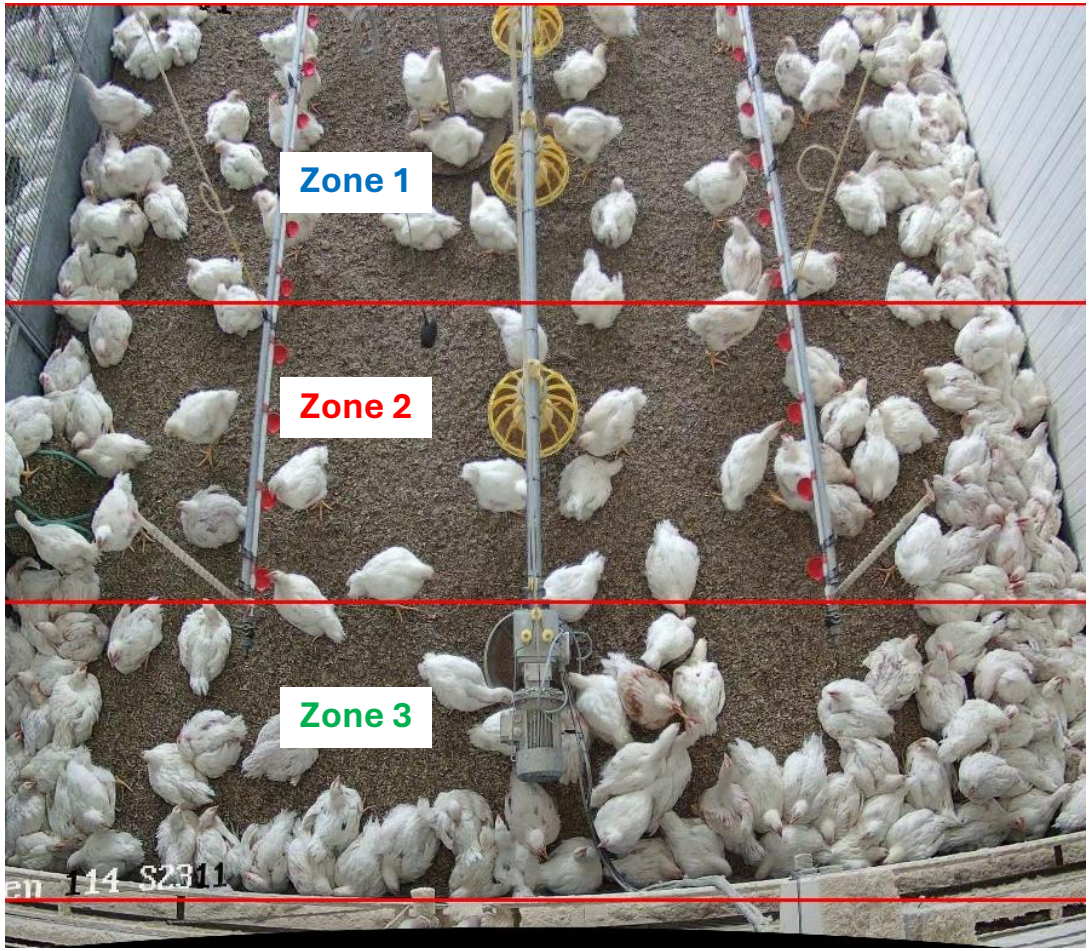
Experiments Setup

- **Experiment 2:** Gradient light in broilers
  20–200 lux
  - The pen is divided into 3 equal zones



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Experiments Setup

- **Experiment 2:** Gradient light in broilers
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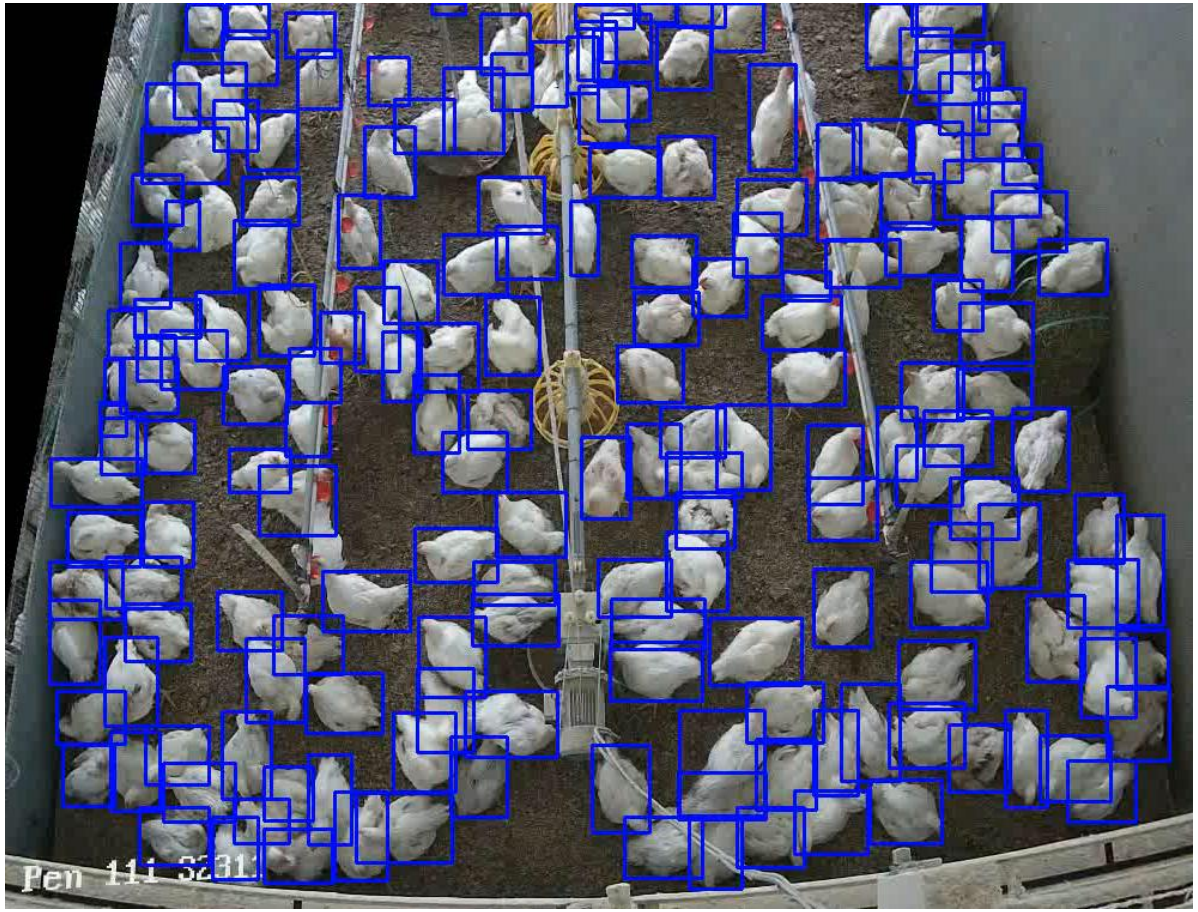
  - The pen is divided into 3 equal zones
  - Measuring activity level in each zone



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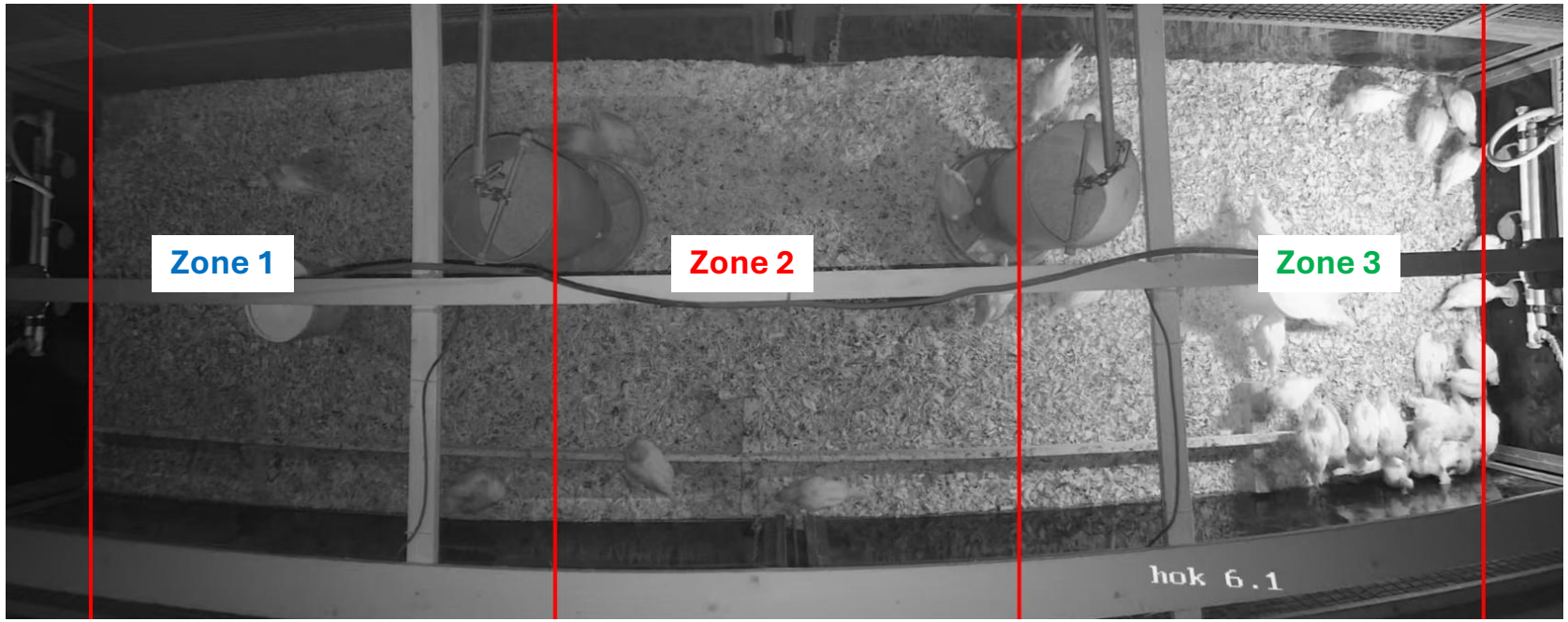
Experiments Setup

- **Experiment 3:** Gradient light in layers
  20–100 lux
  - The pen is divided into 3 equal zones



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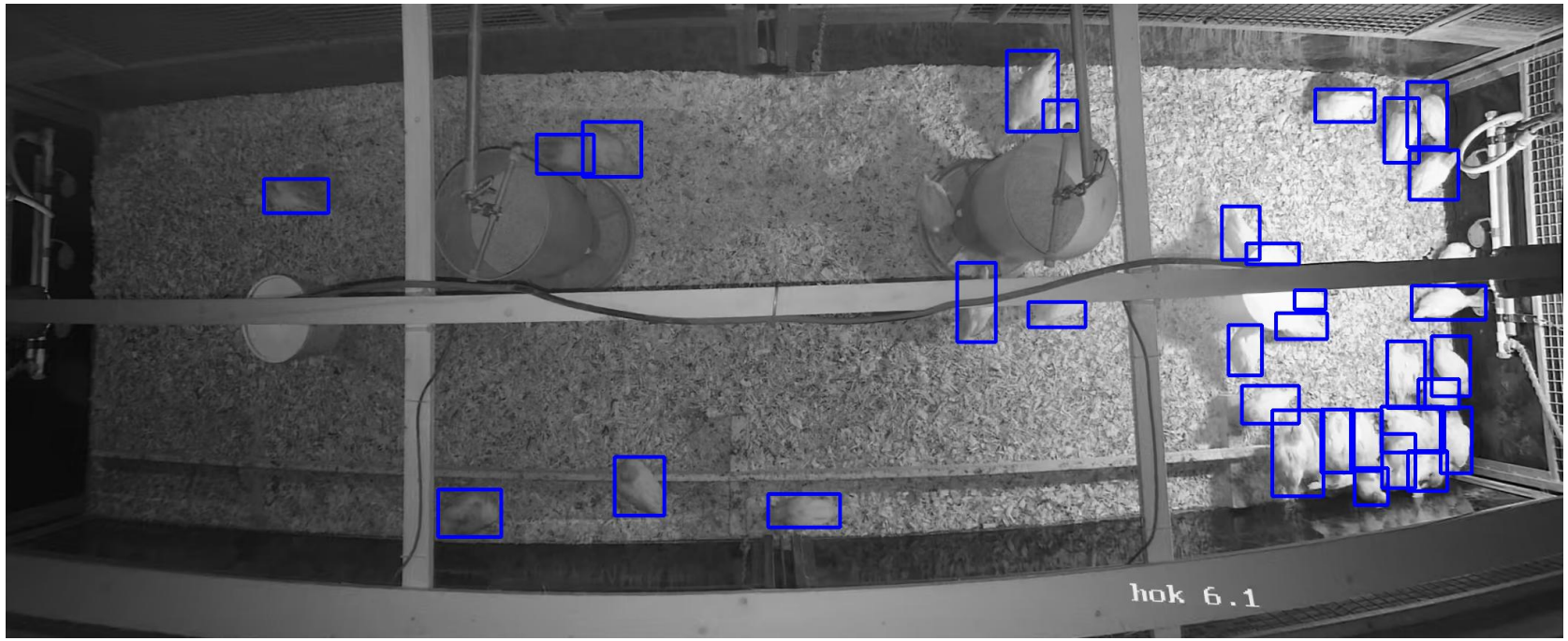

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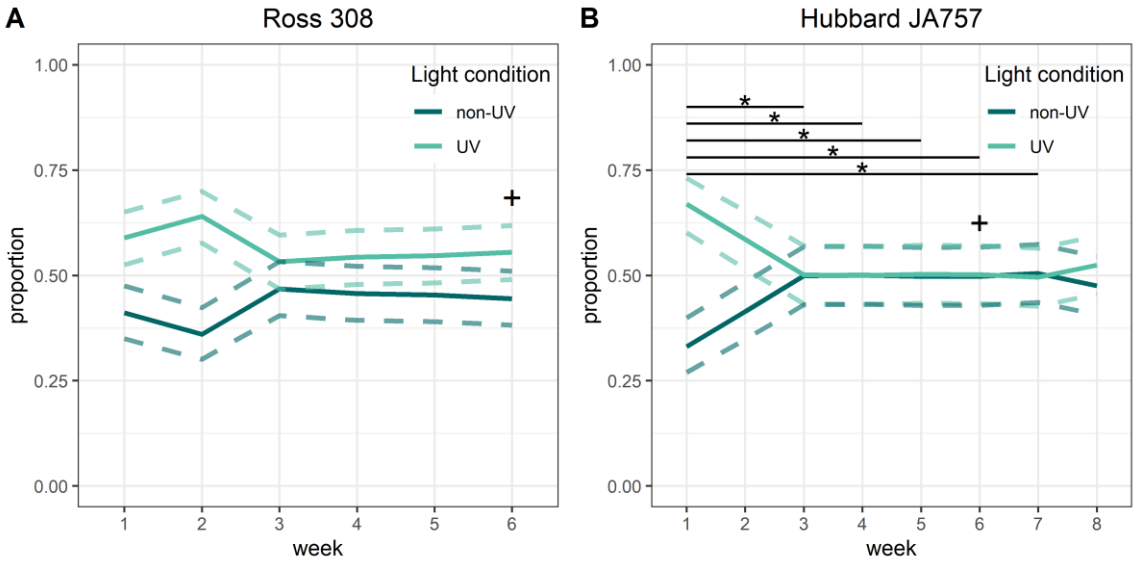
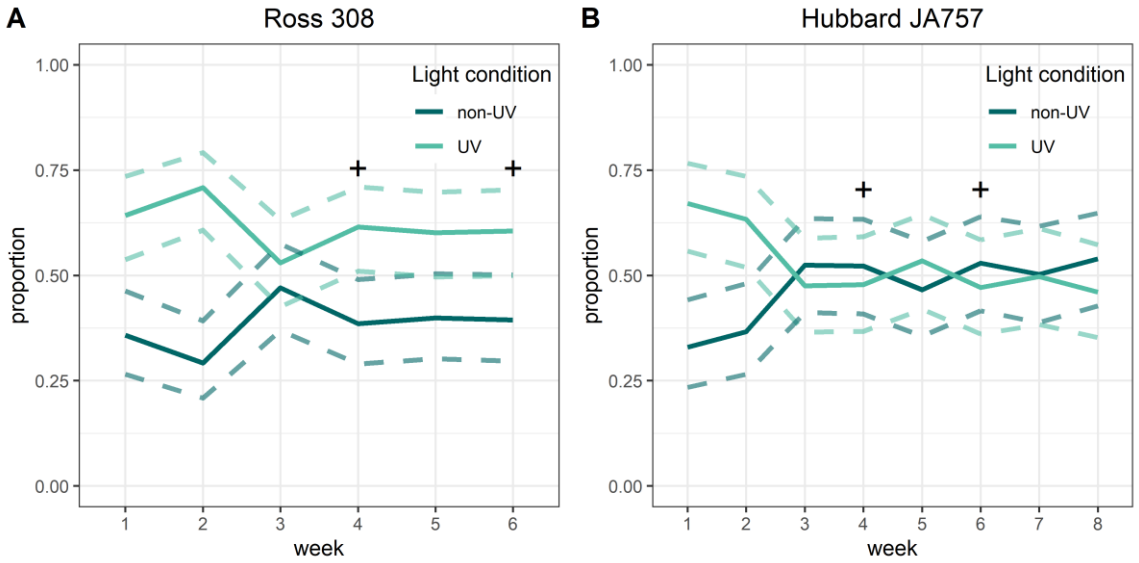
Deep learning model

- Model: **YOLOv8**
- Purpose: Detect chicken during the period of turning light on
- What it does:
    - Observing chicken location every 5 minutes during the light was turned on
    - Detects distribution patterns of chicken under various lighting conditions
- Model performance: 96.2% AP

Results



Relative estimated proportions of birds present in the different light treatment compartments over time, across the full day (05.00-23.00 h)



Estimated proportions of birds present in the feeder area in the different light treatment compartments over time, across the full day (05.00-23.00 h).

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Van der Sluis, M., van der Eijk, J.A.J., Bekhit, R., te Beest, D.E., Gunnink, H., Melis, S. & de Jong, I.C., 2025. Ultraviolet light provisioning: preferences from the broilers' viewpoint. [Manuscript submitted for publication].

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Outcome & Impact

- **Deep learning model advantages**
  - Replace manual observation
  - Enable continuous, high-resolution monitoring
  - A step toward **precision livestock farming**
  - Opens the door for broader behaviour detection as indicators of welfare

- **Understanding chicken preference**
  - Reveals real preferences for UV, intensity, and spectrum
  - Support evidence-based light programs
  - Improves chicken welfare by promoting natural behaviour
  - Applicable in real-world commercial poultry systems

Functilight partners

Functional light provision for broiler and layer pullets to promote welfare, health and performance (LWV20.133)

Aviagen

Hubbard
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BREEDING FOR YOU SINCE 1921

Norsk Kylling

LOHMANN
LOHMANN BREEDERS

once by signify

AVI NED

Big Dutchman

Ministerie van Landbouw, Natuur en Voedselkwaliteit

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Thank you!

Question?