InsFeed
Sustainable food chain

Computer vision applications for insect rearing optimization

CVC Master's internship program

UAB, 2022

About InsFeed

Born in 2020 (Barcelona), InsFeed is committed to improving food chain sustainability from animal feed and soil fertilization with through industrial insect rearing.

Insects' potential as part of the solution

Automated intelligent industrial insect farming enables local responsible feed production with:

▸ Lower carbon footprint

▸ Minimal use of natural resources and relieving tension to natural habitats

▸ Sustainable, stable and reliable animal and vegetal nutrients.

InsFeed develops intelligent processes for insect rearing as an innovative and long-term sustainable alternative to current protein sources.
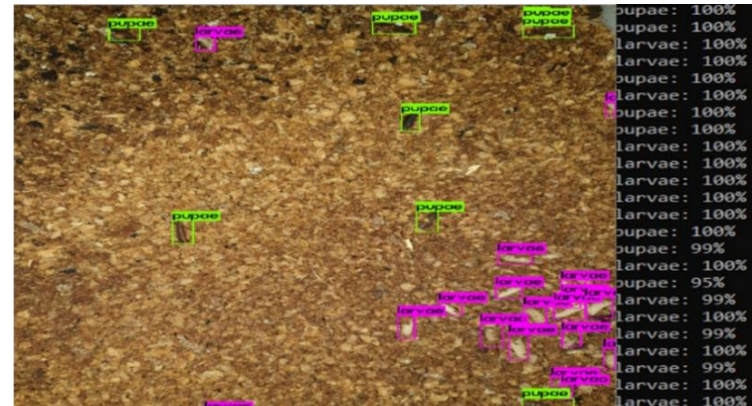
InsFeed

AI and CV applications in the industry

First insect industrial plant in Europe was installed in 2019.

Although insect farming viability highly relies on full process automation and careful disease control, computer vision techniques are hardly introduced into current full-scale projects. There is no evidence of CV being used in other processes other than rearing (nourish).
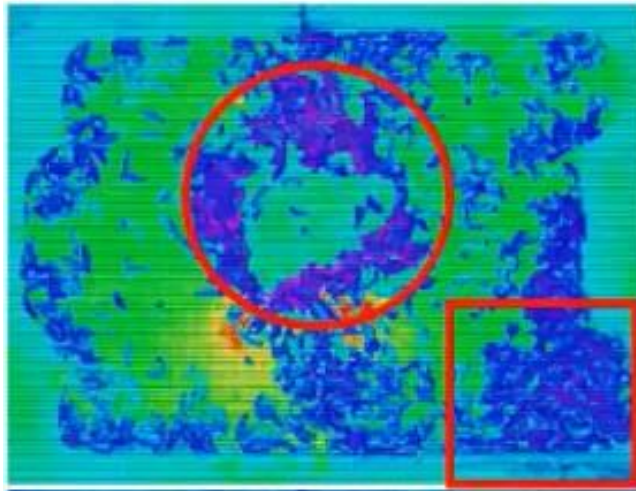
Entomo Ventures thermal vision in rearing process to detect an uneven distribution of larvae feed (2021).


InsFeed image recognition in rearing process to detect mature larval stages (2021).

InsFeed

AI at InsFeed

InsFeed aims to develop an end-to-end smart rearing digital twin.

Computer Vision to be integrated in critical steps of the process:

- Develop models that understand insect behavior, health and maturity during its larvae and fly stages.

- Edge computing to act proactively in the process based on the immediate and heterogenous needs of the colony, as well as adapt to market demands.
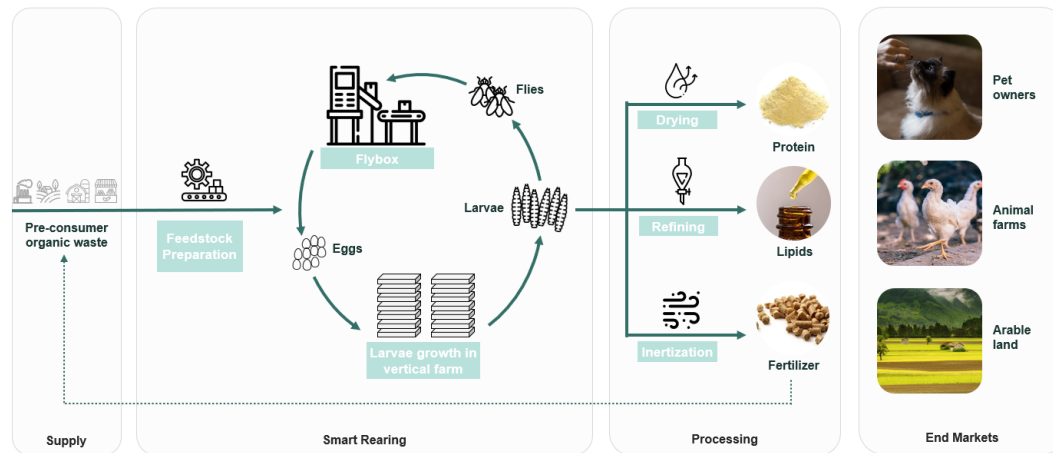
Operations process
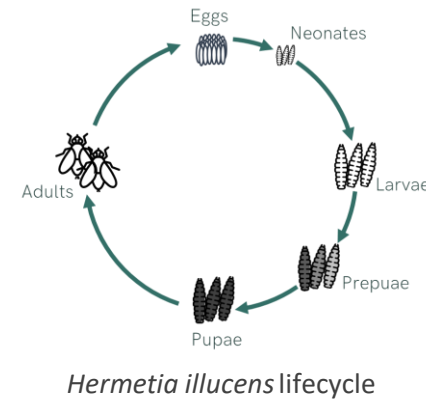
Hermetia illucens lifecycle

Main Challenges

- Disease detection and classification
- Predict insect maturity and age
- Understand feeding patterns to allow even growth of the colony
- Identify dead larvae
- Assess feeding rate / undigested food availability
- Determine colony status with small visible samples
- Detect predators/intruders
- Predict flies' gender
- Understand movement patterns
- High fps fly tracking
- Forecast optimal processing and reproduction stages per box
- Classify adults by gender
- Track mating couples
- Track egg laying and estimate quantity

Project workflow

o Evaluate and solve an actual automation business challenge end to end with the aim of computer vision.

o Define algorithm parameters to be tracked through CV.

o From defined hardware, acquire the necessary data & labeling to train a state-of-the-art object detection algorithm for larvae and fly identification (and eventually, tracking). To further analyze the behavior of the insects, complement with a state-of-the-art tracking algorithm in order to generate statistical information with respect to the insect patterns and lifetime behavior in the current process conditions.

o From the obtained information, iterate an algorithm capable of solving the current challenge, in order to enable future automation for previously manual procedures.

| **Problem Definition** | → | **Parameter Design** | → | **Data Capture/ Labelling** | → | **Object Detection/ Tracking** | → | **Problem Solving** |

Master's project options

The student can select one of the below challenges:

1. In the rearing (growing) phase, the maturity, age and size of the larvae enclosed in each rearing unit (container) is unknown due to uneven feeding patterns and different hatching periods. Goal is to determine the previous parameters for a random harvesting unit through CV and statistical analysis of the visible surface.

2. In the rearing (growing) phase, each rearing unit (container) can contain different elements such as larvae (alive/dead), substrate (larvae food), frass and skins. Goal is to be able to classify visible elements present in the surface, as well as detect unexpected elements such as predators.

3. In the fly reproduction phase, it is critical to have an optimal density of adult flies (male & female) to efficiently ensure cycle continuity (infinite number of future generations for harvesting). Goal is to be able to determine real time fly density as well as calculate the emergence rate to correctly assess the process automation.

Company supervisor

Oriol Valls

Higher industrial engineer at IQS and Executive MBA at ESADE. With more than 7 years as R&D director at the automotive sector, Oriol has extensive experience in the development of industrial products and processes and knowledge about intellectual property protection solutions. CPO at InsFeed and Responsible for Artificial Intelligence deployment and R&D projects.

Internship approach

- Our pilot plant is located at UAB university (Granges i Camps Experimentals).

- Hybrid approach: hands on work at the plant is expected to understand the challenges and capture needed data, while remote work is also allowed to complete the development.

- It is expected that the intern is self disciplined, with organizational skills and initiative to lead the project development.

- InsFeed is always open to new ideas that the intern might want to try or implement during the stablished contract.

Oportunities at InsFeed

InsFeed is building the **AI – R&D team** that will pilot the tests and develop solutions to be embedded in the neural spine of the company.

As part of a growing company with several projects on the pipeline, the AI – R&D team will champion game-changing applications with direct impact on daily operations and that will resolve major ground-breaking solutions for this revolutionary industry.

✉ rrhh@insfeed.com

🌐 www.insfeed.com

in /insfeed