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## **WAIT4: un projet collaboratif sur l'évaluation en dynamique du bien-être des animaux d'élevage - de la captation de la donnée à la découverte de motifs significants et de seuils d'alertes spécifiques**

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➤ **WAIT4: un projet collaboratif sur l'évaluation en dynamique du bien-être des animaux d'élevage – de la captation de la donnée à la découverte de motifs signifiants et de seuils d'alertes spécifiques**

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**WAIT4: Welfare: Artificial Intelligence and new Technologies for Tracking key indicator Traits in animals facing challenges of the agroecological Transition**



Flagship project in the PEPR Agroecology and ICT (oct 2022 – oct 2027)



**Agroecological (AE) transition of livestock systems**

**Positive effects ?**

(more freedoms, socialization, self-medication,...)



Dynamic phenotype

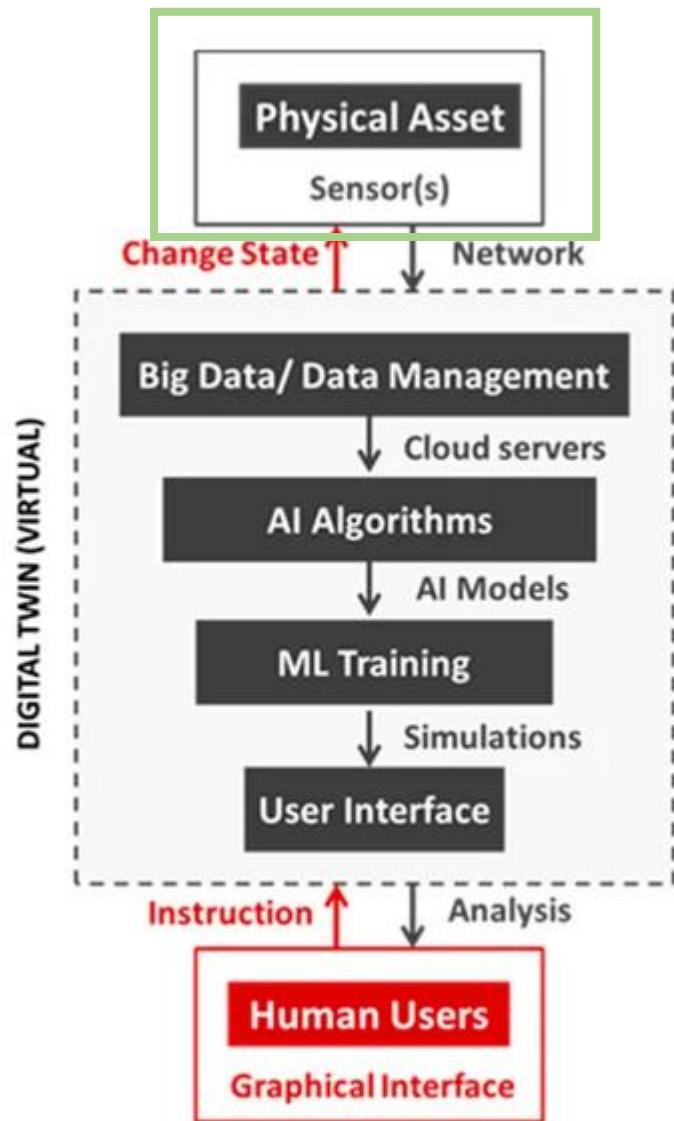
**Negative effects ?**

(climate hazards, heat stress, feeds, pathogens,...)

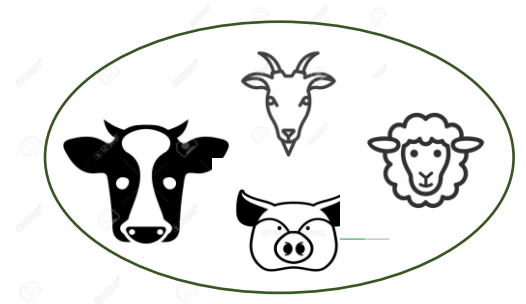
**Global warming**

**Objectives of the WAIT4 project:**

- ☑ Real-time analysis of AW indicators under different environments (indoor, outdoor, grazing, loose, organic farming) and climates (continental, harsh, tropical), in response to AE practices
- ☑ Defining early alerts for deteriorated AW and evaluation of improved welfare



1. Testing/developing tools to send and receive continuously-transmitted data



**Mental state**  
(How the animal perceives the environment)

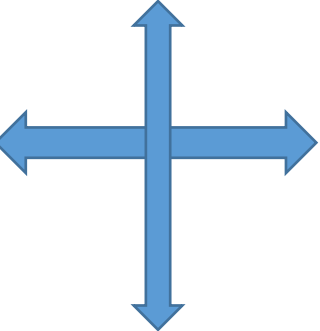
Positive/negative emotions  
 ⇒ Sounds/calls (audio)  
 ⇒ Cameras

**Physiology**

Homeostasis  
 Stressors  
 ⇒ Thermal probes  
 ⇒ Chemical sensors  
 ⇒ Fluids (milk)

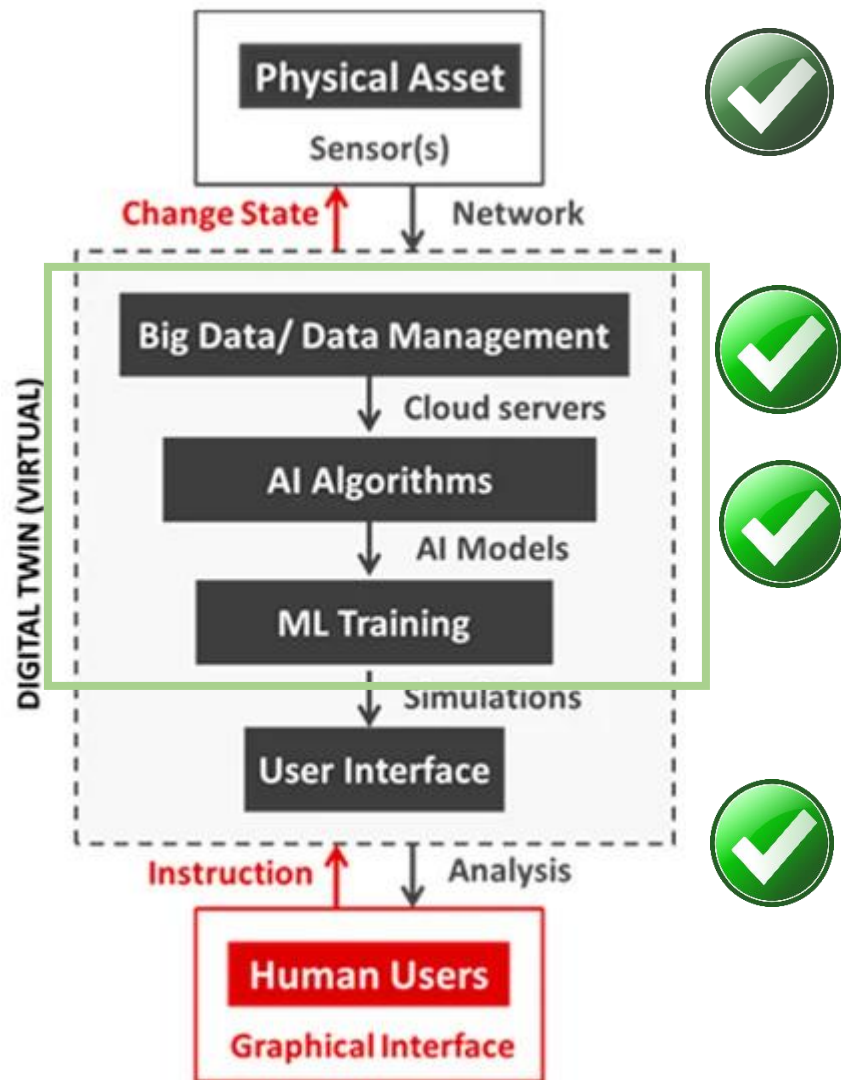
**Behavior**

Positions  
 Activities  
 Relations  
 ⇒ Accelerometers, GPS  
 ⇒ Thermal imaging  
 ⇒ Videos



**Animal choices**

⇒ Automates (drinking, feeding)  
 ⇒ Social interactions  
 ⇒ Shadow sensors



2. Store, process and extract information

3. Using algorithms to suggest recommendations

**Coupling massive heterogeneous information** (symbolic + numerical data; different times)

- ⇒ **Holistic view**
- ⇒ **Deviations from baseline**

**AI to identify new patterns**

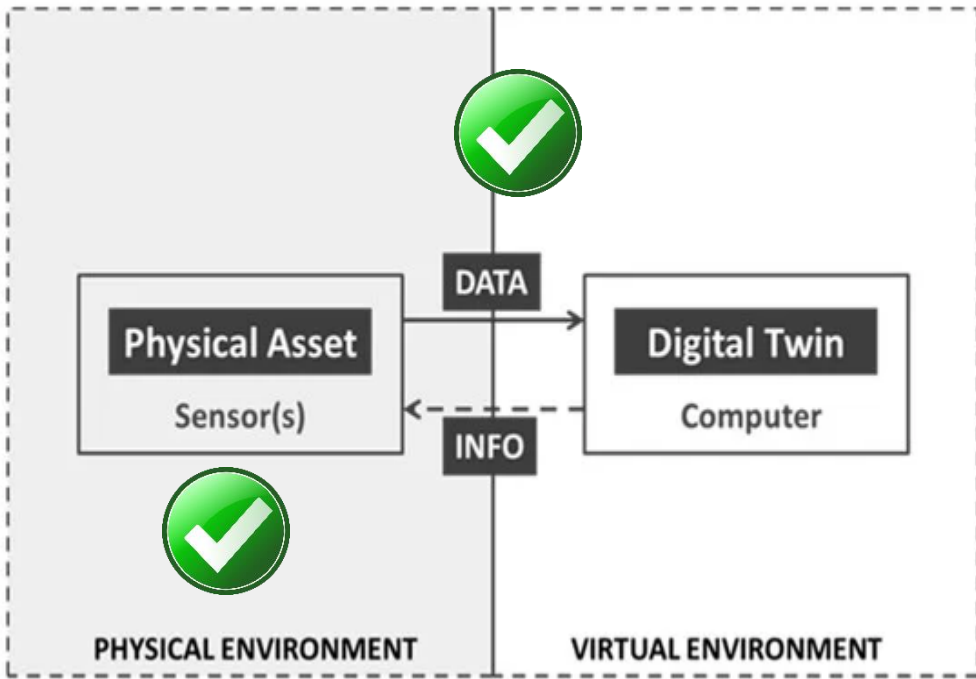
- ⇒ **Iceberg signals of AW**
- ⇒ **Thresholds : warning signals**
- ⇒ **Predictive responses**

- Time series
- Machine Learning and Deep Learning
- Graph modeling
- Interactive model mining
- Pattern mining

Model selection techniques

Hybrid models

WAIT4 is an exploratory project using stored data (and not data transmitted in real-time) to develop and train the algorithms



The retro-action loop in real time is not in the immediate ambition of the WAIT4 project, which primarily addresses:

- ☑ What are the relevant frequencies to assess AW traits ?  
=> More frugal sensors can be then developed
- ☑ What are the relative importance between AW traits ?  
=> Accentuate the phenotyping efforts on some traits
- ☑ Give messages to stakeholders that are objectified by scientific bases to recommend AE practices  
=> Define thresholds for animal resistance
- ☑ Encourage the change of paradigm in AW  
=> From obligation of means to obligation of results\*

✘ 4. Interactive digital user interface to apply the learning to improve the performance of the physical asset is not available in real-time

- \*1. Algorithms will analyze the data and define alerts (for health and welfare)
- \*2. Feedback will be obtained to anticipate the responses of the animals when facing challenges (heat stress, water or feed restriction, improved AE practices ..)  
=> Part of a digital twin ...