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Discussion on AI in AgriFood

What is it and what can we do with it ?

Icos Capital

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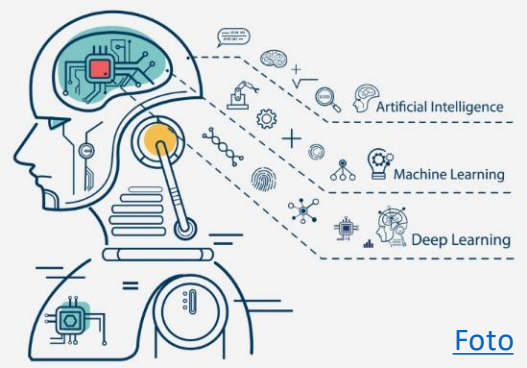
What is AI and what can we do with it in Agrifood?



Foto

1. What is the real difference between (new) AI systems (hype) vs other IT systems (BAU)?
2. How relevant is AI - ChatGPT, Watson, Machine learning, etc. to Agrifood?
3. What are the best practices we have seen so far? Case Study
4. What can be expected in future?

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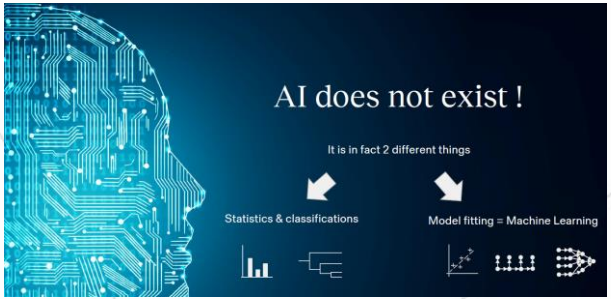
Does AI exist ?

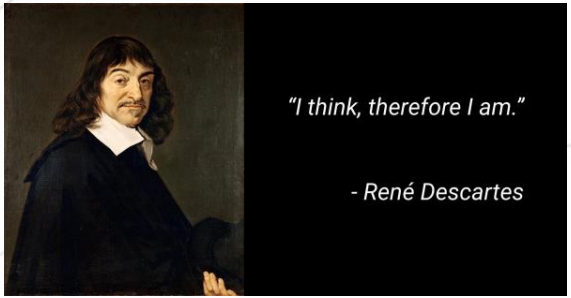


Cyrille Pauthenier, CEO, biotechnologies, Accelerating sustainability Summit, NY, Oct 2023 (hosted by Icos Capital)

Statistics & classification – Not enough data but enough to establish hypothesis

Machine learning with sufficient data for extrapolation for example, CHAT GPT hallucination and limitations

Definition of intelligent being



"Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind" IBM

AI, or Artificial Intelligence, refers to the development of computer systems that can perform tasks that typically require human intelligence.

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Practical understanding of the available tools:

Wikipedia:
„Artificial intelligence (AI) is the intelligence of machines or software, as opposed to the intelligence of humans or animals."

Model or rules based AI (Symbolic AI) --- Old methods
- reasoning or problem solving
- knowledge representation
- planning & decision making
- DOESNOT REQUIRE LOTS OF DATA

Machine learning AI (ML) -> this is LLM -> inductive logic
- natural language processing
- Big data obtained from sensors, systems, observation

Not yet AI
- Social intelligence recognize human activities, observations
- General intelligence to solve problems

AI (systems) ≠ Creative intelligence or human intelligence in <u>most</u> cases

LLM or large language models: Models that are trained with large sets of data to develop own "set of rules"

1) **Chat GPT** answers all kinds of questions but limited by *what it knows or what it can extrapolate (ML) and* ***sometimes hallucinates***

2) **DALL E2** – converts words in picture (gorilla on a mountain) *(ML)*

3) **Squirro AI** – Insight software provides answer to questions you ask from big data it has (ML) and connects (always needs backup evidence)

4) **Boston Dynamics** – Robots that dance, play ping pong, etc. (ML)

5) **Gamaya** – Determination of CO_2 captured in regenerative Ag for sugarcane (ML)

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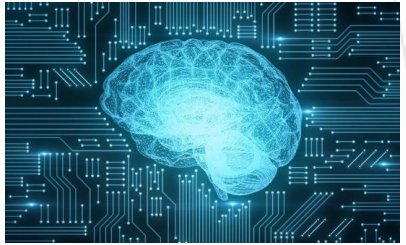
Case Study I
INGREDIENTS



COMPANY:

ABOLiS BIO-SYNTHESIS ARCHITECTS

MOA FOODTECH

EV BIOTECH

GINKGO BIOWORKS

Applications in: Food enzymes engineering, microbial metabolic engineering, food safety and, in general, food microbiology

Leverage rules in science, metabolic pathways and results from existing experiments to identify new molecules BUT
- **not enough data** to fit the model and - not enough data for machine learning
- extensive use of **statistics**
- **rules** based
- **extrapolation is difficult** (A small protein of 200 amino-acid: $20^{20} = 10^{26}$ combinations)

Some applications for repetitive analysis, data insight are still possible

What they do ?	What type of AI ?
Database searches, metabolic pathways, model focused	Symbolic AI Statistics, modeling Limited data and plenty of rules (science)

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Case Study II
ROBOTICS

COMPANY:

ecorobotix

FIXPOSITION

AgriRobot
enabling safe autonomy

dilepix

Agricultural robots are revolutionizing the world of farming in unprecedented ways. These versatile machines can operate in a diverse range of environments, from the cozy confines of indoor greenhouses to expansive outdoor fields, adapting seamlessly to various crop types. The increasing adoption of robotics in agriculture is a testament to the transformative power of technology in addressing pressing global challenges.

- **Trained with big data** (Is this weed -> take out weed-> move another 10 cm)
- **Generate AI not advisable** (don't want robots to extrapolate by generating data)

What they do ?	What type of AI ?
Database searches, metabolic pathways, model focused	ML is required to train systems Object recognition is important here

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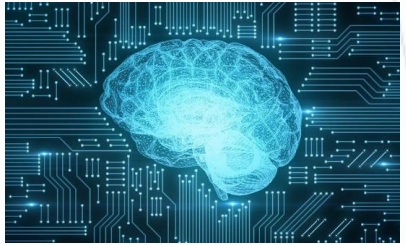
Case Study III
PREDICTIVE ANALYTICS



COMPANY:

GAMAYA

UKKO AGRO

ceres

prospera
A valmont COMPANY

Predictive analytics, is machine learning based rules (co-relate two sets of data to come up with conclusions identified)
- **requires large sets** of data
- Easy questions -> straight forward data
- **Difficult questions -> much more data** -> e.g; hyperspectral data to identify nematodes
- training time

Use case:
Get the system to find patters between drone (high resolution) and satellite data, predict CO2 in soil or harvest time, etc.

What they do ?	What type of AI ?
Mainly leveraging know data to find patterns	Machine learning

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What we can expect from AI (system) ?

1. It will not create, invent, observe or be our “artificial intelligence”

2. Stronger analysis, better insights, better products
   1. **Symbolic AI** – Statistics, modelling and rules for new products
   2. **ML approach** - Big data driven insights and analysis leading to better decisions, models and product development

3. More user-friendly formats like ChatGPT allows for broader adoption of AI **but** Generative AI is subject to hallucination and errors if used widely

Predictive analytics

Ingredients

Predictive analytics

Robotics

Predictive analytics

Predictive analytics

Robotics

Predictive analytics

Ingredients

Predictive analytics

Predictive analytics

Source: SDG

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AI take aways:

- **Agriculture:** Predictive analytics is well developed field with solutions available to save cost, optimize yield, avoid diseases, etc.
- **Research:** Automate / Model or use Machine Learning if you have plenty of data to solve problems
- **Entrepreneur:** Opportunities are big from symbolic AI and in some instances from Machine Learning
- **Investor:** AI cannot create but facilitate, optimize; Machine Learning; Deep learning not applicable everywhere

Thank you !

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