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To file a program discrimination complaint, a complainant should complete a Form AD 3027, USDA Program Discrimination Complaint Form, which can be obtained online, from any USDA office, by calling (866) 632-9992, or by writing a letter addressed to USDA. The letter must contain the complainant's name, address, telephone number, and a written description of the alleged discriminatory action in sufficient detail to inform the Assistant Secretary for Civil Rights (ASCR) about the nature and date of an alleged civil rights violation. The completed AD-3027 form or letter must be submitted to USDA by:

mail:
U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410; or

fax:
(833) 256-1665 or (202) 690-7442;

email:
program.intake@usda.gov.

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La información del programa puede estar disponible en otros idiomas además del inglés. Las personas con discapacidades que requieran medios de comunicación alternativos para obtener información sobre el programa (por ejemplo, Braille, letra agrandada, grabación de audio y lenguaje de señas americano) deben comunicarse con la agencia estatal o local responsable que administra el programa o con el TARGET Center del USDA al (202) 720-2600 (voz y TTY) o comunicarse con el USDA a través del Servicio Federal de Transmisión de Información al (800) 877-8339.

Para presentar una queja por discriminación en el programa, el reclamante debe completar un formulario AD 3027, Formulario de queja por discriminación del programa del USDA, que se puede obtener en línea, en cualquier oficina del USDA, llamando al (866) 632-9992, o escribiendo una carta dirigida al USDA. La carta debe contener el nombre, la dirección y el número de teléfono del reclamante, y una descripción escrita de la supuesta acción discriminatoria con suficiente detalle para informar al Subsecretario de Derechos Civiles (ASCR, por sus siglas en inglés) sobre la naturaleza y la fecha de la presunta violación de los derechos civiles. La carta o el formulario AD-3027 completado debe enviarse al USDA por medio de:

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Washington, D.C. 20250-9410; o

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(833) 256-1665 o (202) 690-7442;

correo electrónico:
program.intake@usda.gov.

Esta institución ofrece igualdad de oportunidades.



The AI Crop Adviser

Advanced Crop Advisers Workshop | Jan 24, 2024 | Fargo, ND

Dr. Rob Proulx

Extension Agriculture Technology Systems Specialist



NDSU

EXTENSION





What is artificial intelligence?



Artificial intelligence (AI) refers to the field of computer science that focuses on creating intelligent machines that can perform tasks that typically require human intelligence. AI aims to develop computer systems capable of perceiving and understanding the environment, reasoning and making decisions, and learning from experience.



AI encompasses various subfields and approaches, including machine learning, natural language processing, computer vision, robotics, expert systems, and more. These techniques enable machines to analyze and interpret vast amounts of data, recognize patterns, solve problems, and adapt their behavior based on the information they receive.

Machine learning, a prominent branch of AI, involves training algorithms to learn from data and improve their performance over time without explicit programming. This approach has been instrumental in advancing AI applications such as speech recognition, image recognition, recommendation systems, and autonomous vehicles.



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How can the primary subfields of AI be categorized?



The primary subfields of AI can be categorized into the following:



1. **Machine Learning:** Machine learning focuses on developing algorithms and statistical models that enable computers to learn from data and make predictions or decisions without explicit programming. It includes techniques such as supervised learning, unsupervised learning, and reinforcement learning.
2. **Natural Language Processing (NLP):** NLP involves the interaction between computers and human language. It encompasses tasks such as speech recognition, language understanding, language generation, sentiment analysis, and machine translation. NLP enables machines to understand, interpret, and generate human language.
3. **Computer Vision:** Computer vision involves the analysis, processing, and understanding of visual data. It aims to enable machines to "see" and interpret images or videos, recognize objects, understand scenes, and perform tasks such as object detection, image classification, image segmentation, and facial recognition.

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Can you provide concrete examples of AI applications and relate them to their subfields?



Certainly! Here are some concrete examples of AI applications and their related subfields:



1. Machine Learning:

- **Spam Detection:** Machine learning algorithms can be trained to analyze email content and classify messages as spam or legitimate based on patterns and features in the data.
- **Recommendation Systems:** Machine learning techniques are used to analyze user preferences and behavior to provide personalized recommendations in various domains, such as movie recommendations on streaming platforms or product recommendations on e-commerce websites.

2. Natural Language Processing (NLP):

- **Voice Assistants:** NLP is employed in voice assistants like Siri, Google Assistant, and Alexa to understand spoken commands, answer questions, and perform tasks using natural language understanding and generation.
- **Sentiment Analysis:** NLP techniques are used to analyze social media posts, customer

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- What is “artificial intelligence (AI)?”
- The Gartner hype cycle
- AI crop adviser tools
 - green-on-green spot spraying
 - chatbot ag advisers
 - field analytics/crop intelligence

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Artificial Intelligence

Machine Learning

Natural Language
Processing (NLP)

Computer Vision

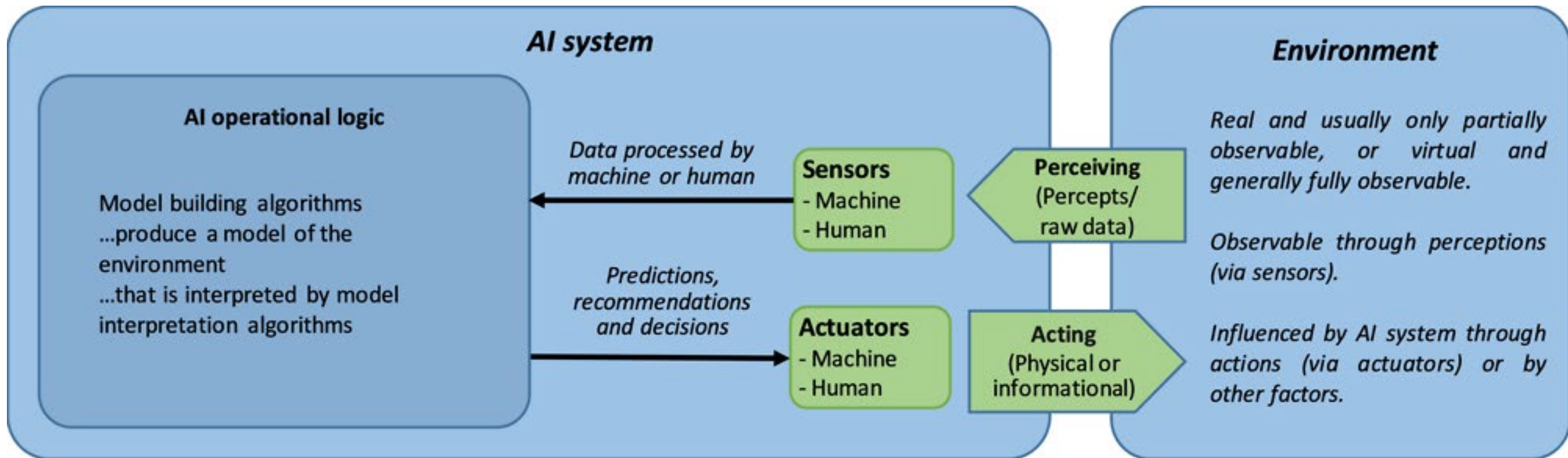
Robotics

Expert Systems

Planning and
Decision Making

Knowledge Representation and Reasoning

High-Level Conceptual View of AI System



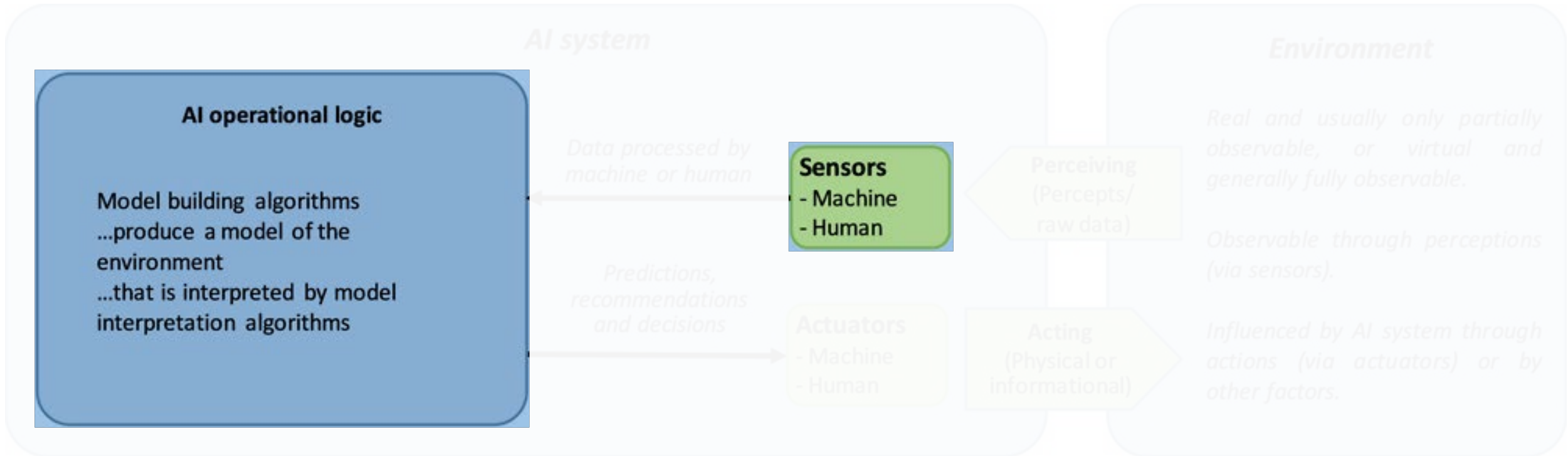
AI Operational Logic

AI operational logic

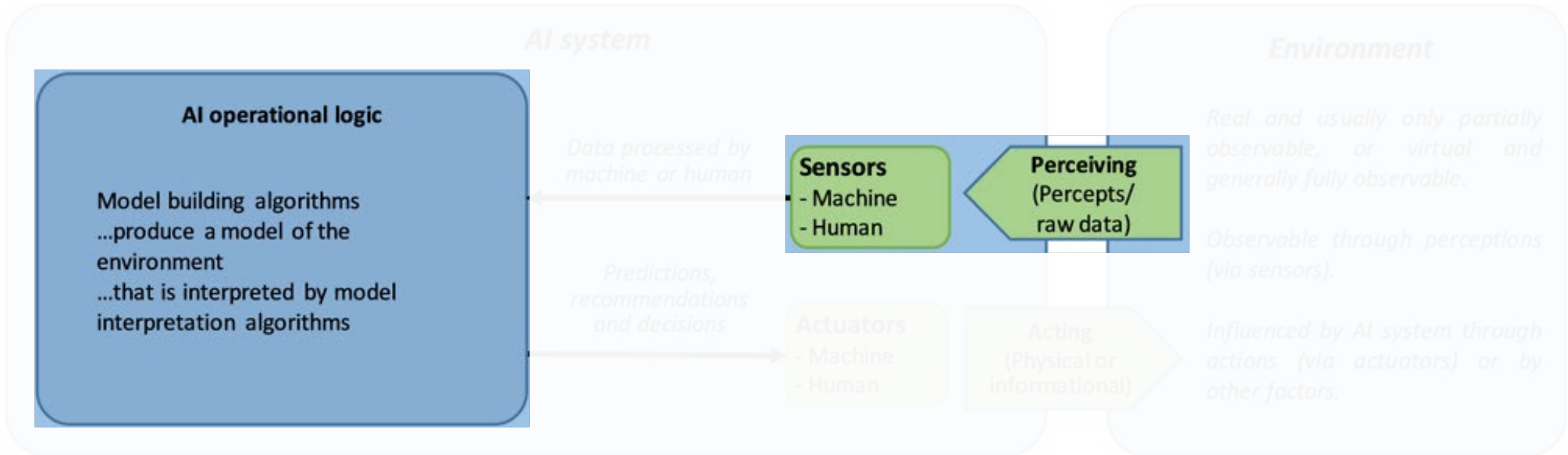
Model building algorithms
...produce a model of the
environment
...that is interpreted by model
interpretation algorithms

- algorithms are designed and developed by (imperfect, fallible) human beings
- algorithms are only as good as their training data

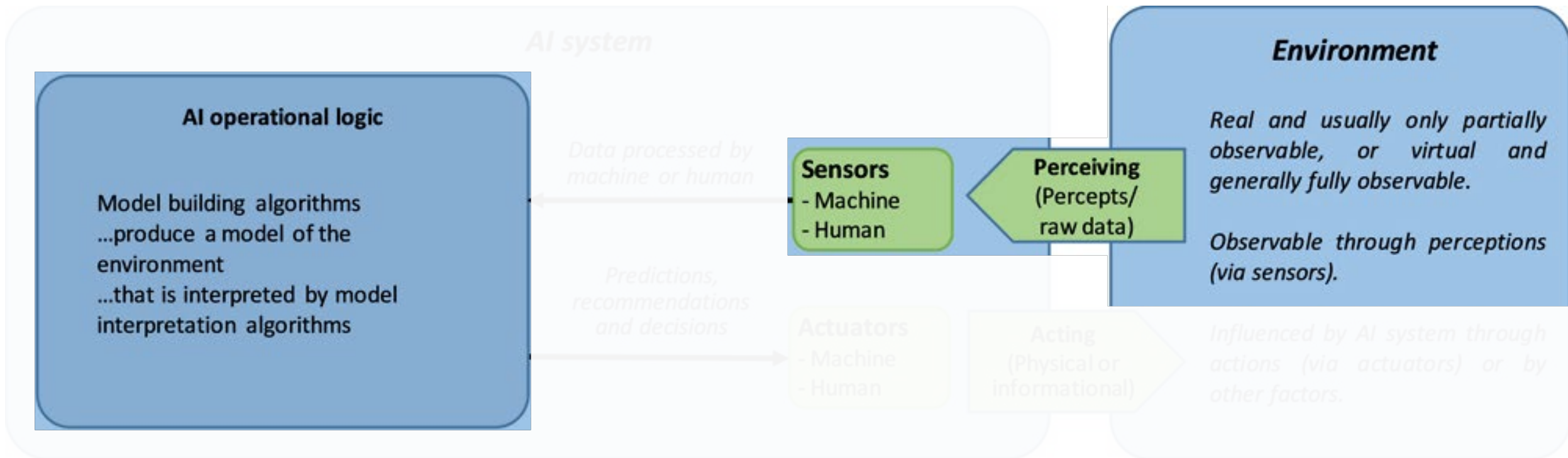
Sensors...



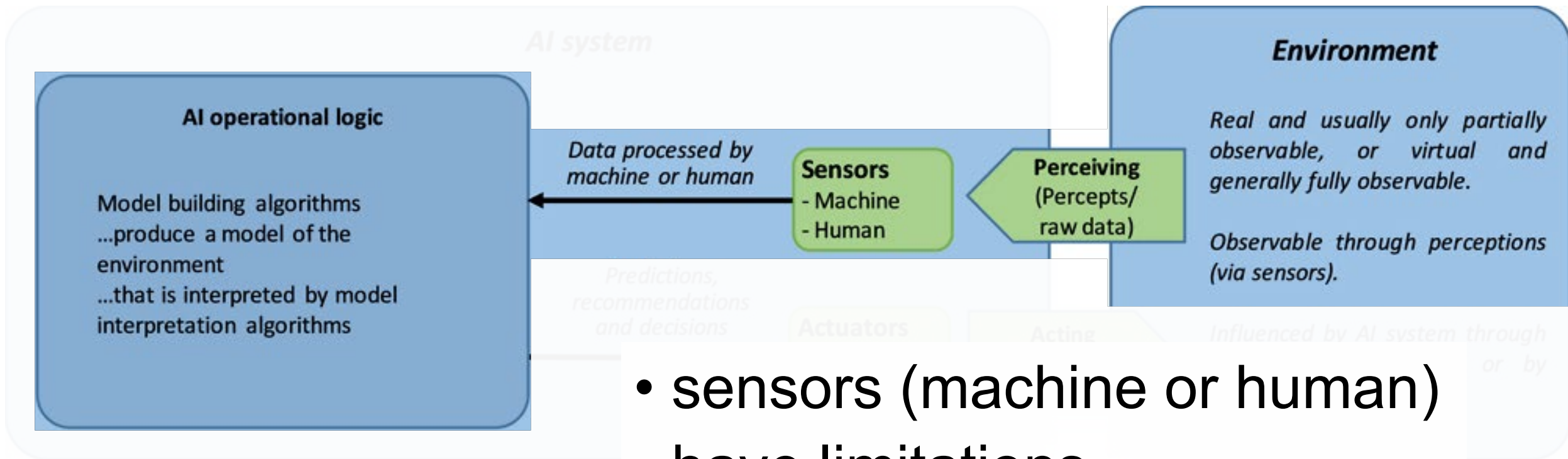
...perceiving



Environment

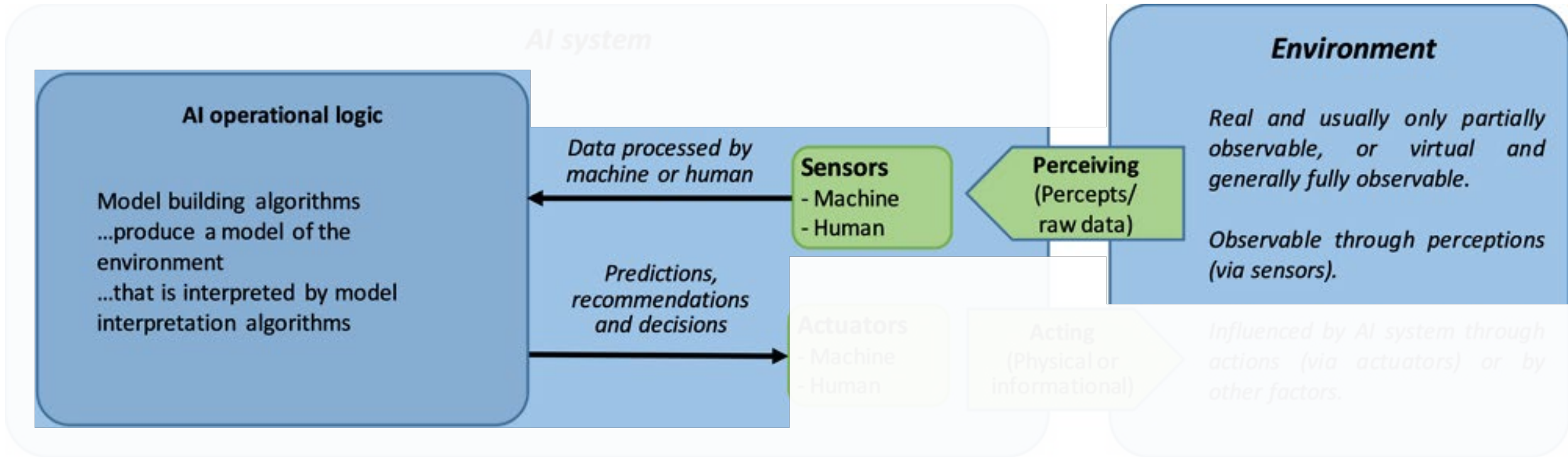


AI System Inputs

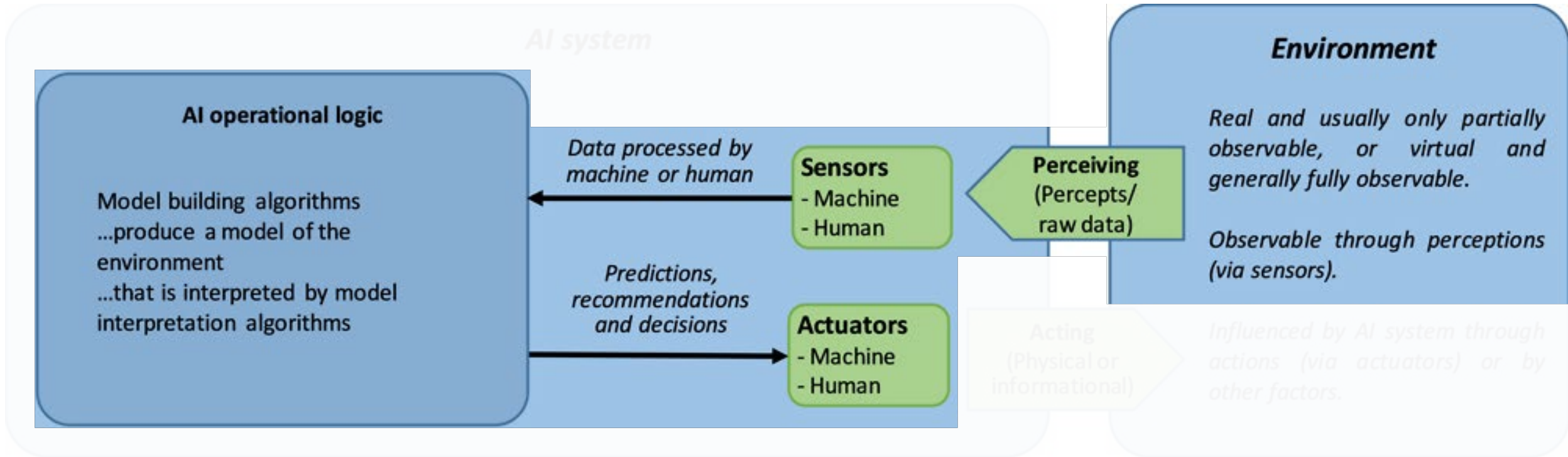


- sensors (machine or human) have limitations

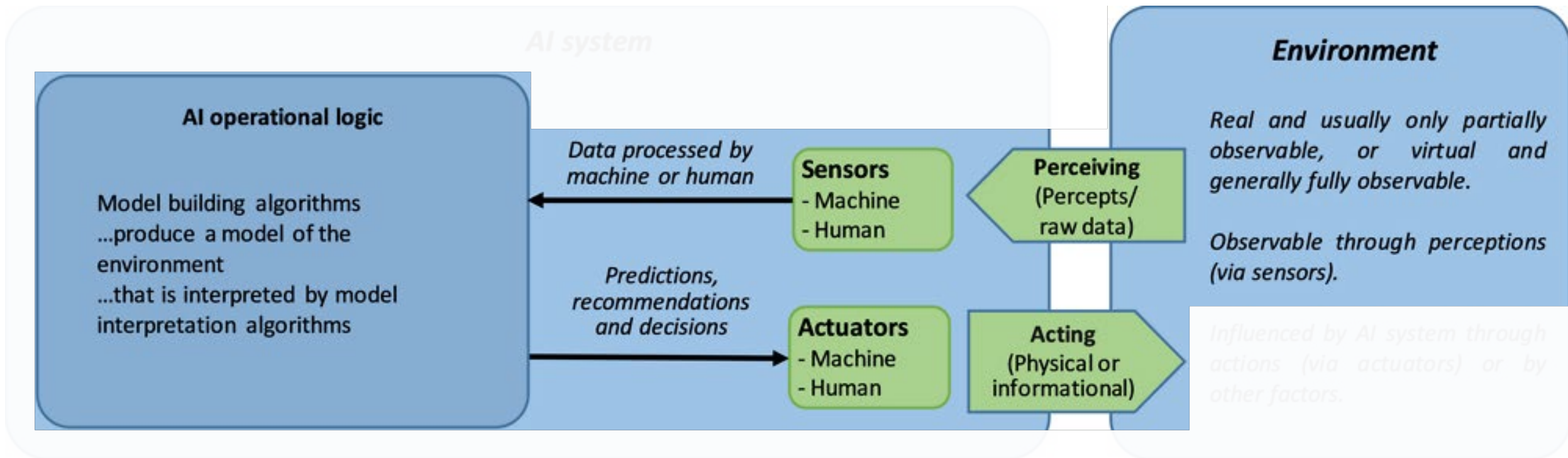
AI System Outputs



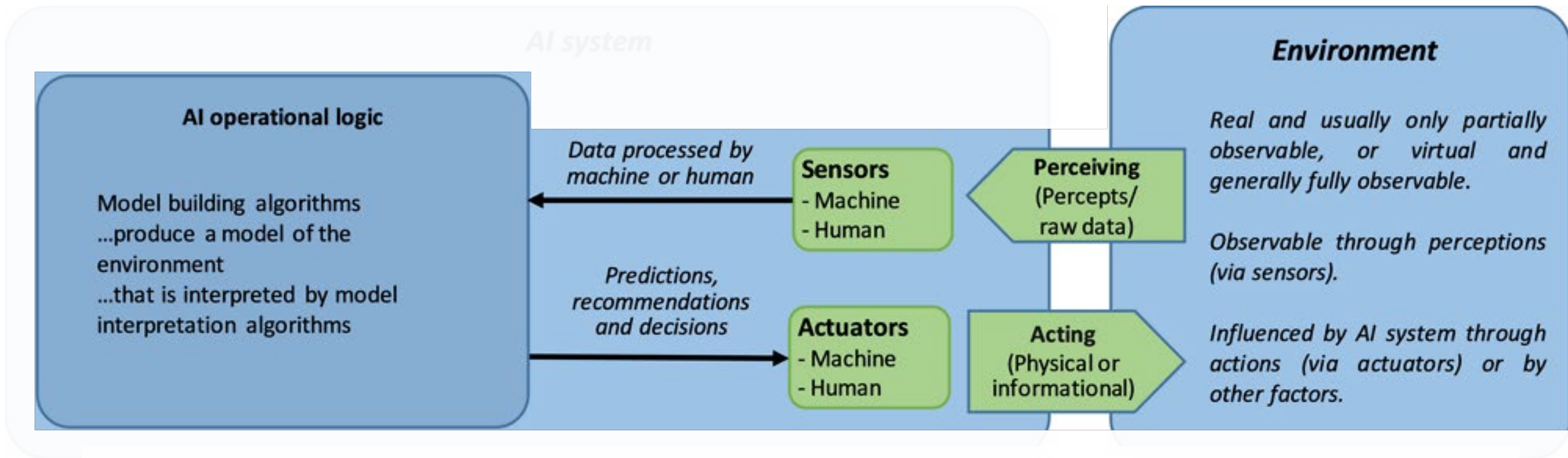
Actuators...



...acting

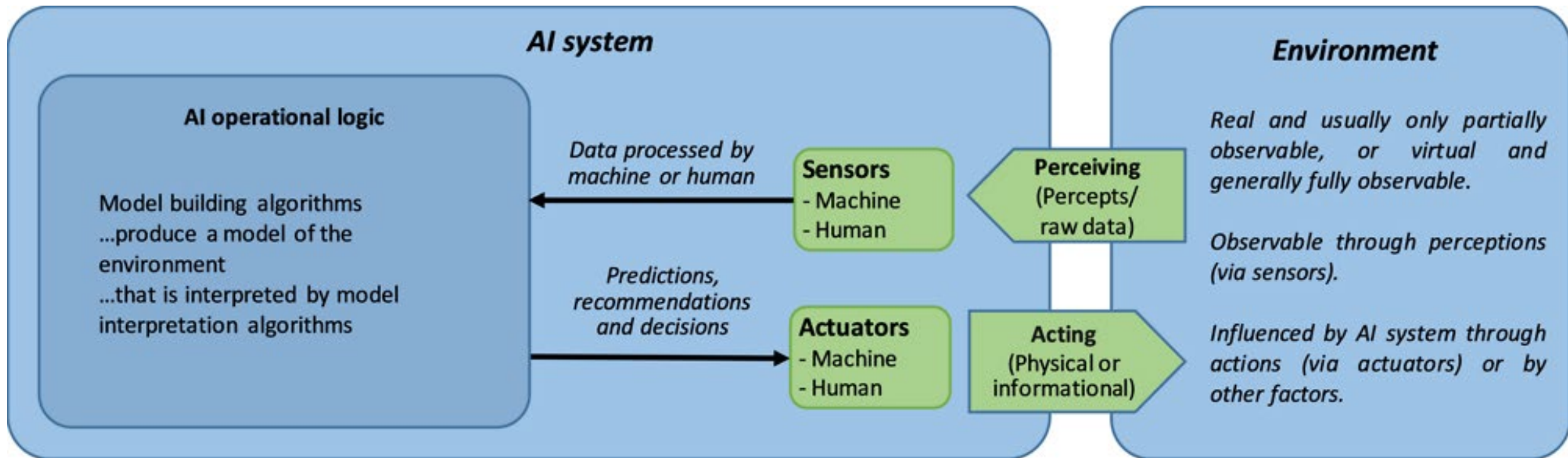


Environment



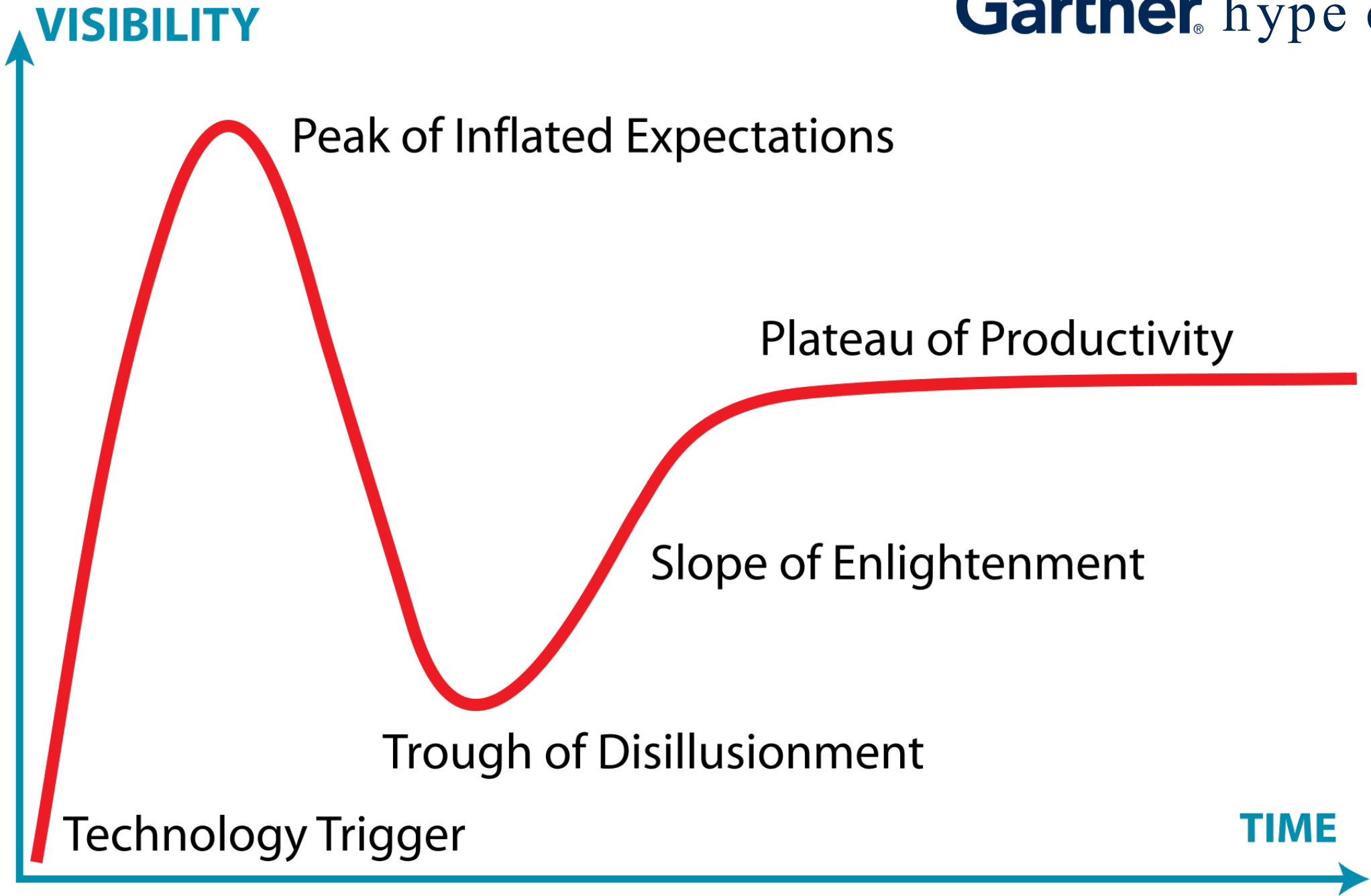
- human vs. machine actuators an important choice

High-Level Conceptual View of AI System



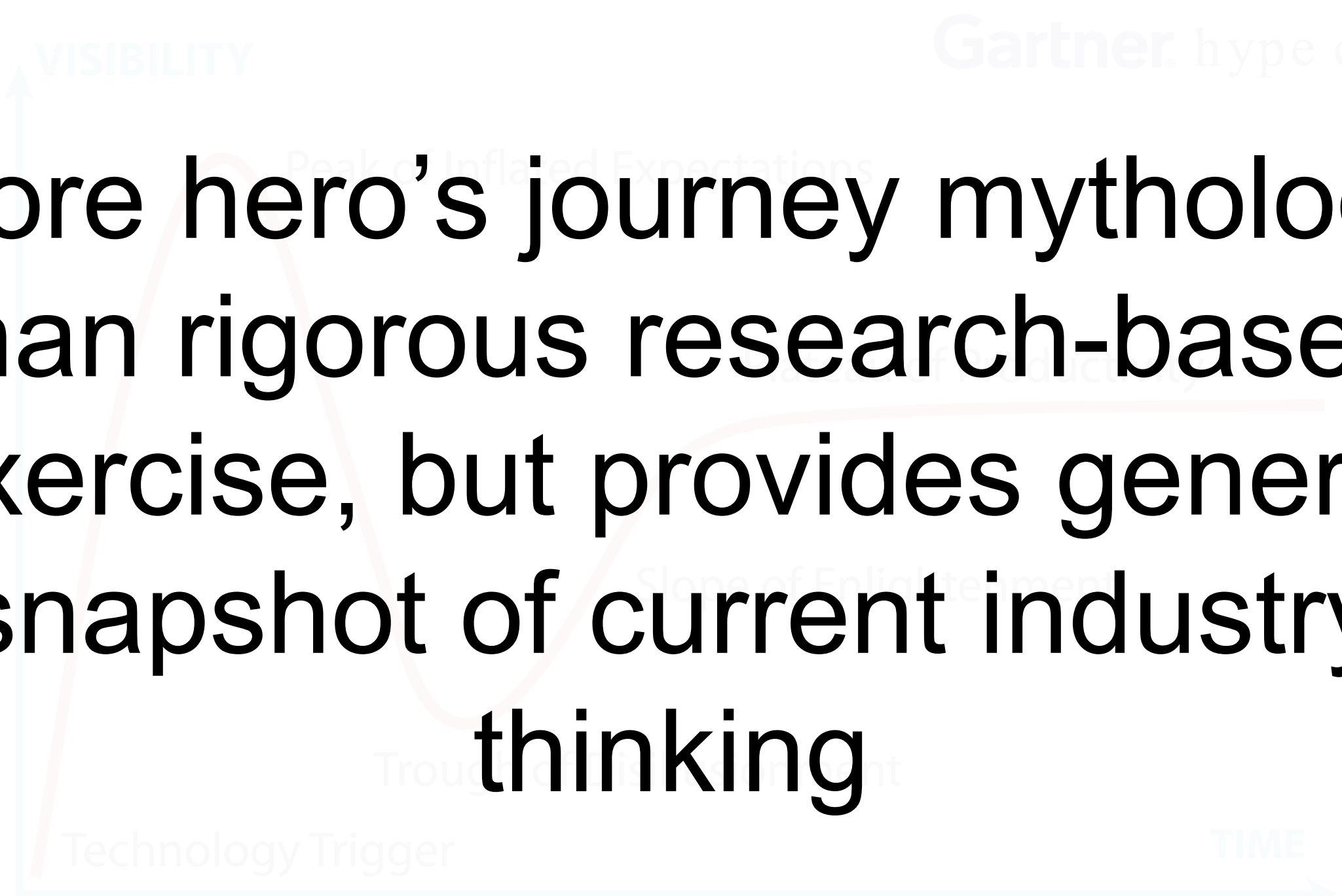
- What is “artificial intelligence (AI)?”
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Gartner® hype cycle

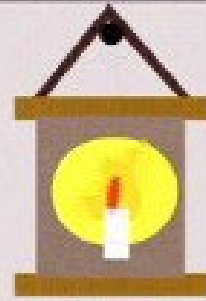


Source: [Wikipedia](#), [M. Mullany](#) (2016)

More hero's journey mythology than rigorous research-based exercise, but provides general snapshot of current industry thinking

The background features a faint Gartner Hype Cycle diagram. It consists of a light blue coordinate system with a vertical axis labeled 'VISIBILITY' and a horizontal axis labeled 'TIME'. A pink curve starts at the origin, rises to a peak, falls to a trough, and then rises again. Labels for the cycle stages are: 'Technology Trigger' at the start, 'Peak of Inflated Expectations' at the first peak, 'Trough of Disillusionment' at the first trough, 'Slope of Enlightenment' on the second rising slope, and 'Plateau of Productivity' at the second peak.

More hero's journey mythology
than rigorous research-based
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thinking



PHASE 1

PHASE 2

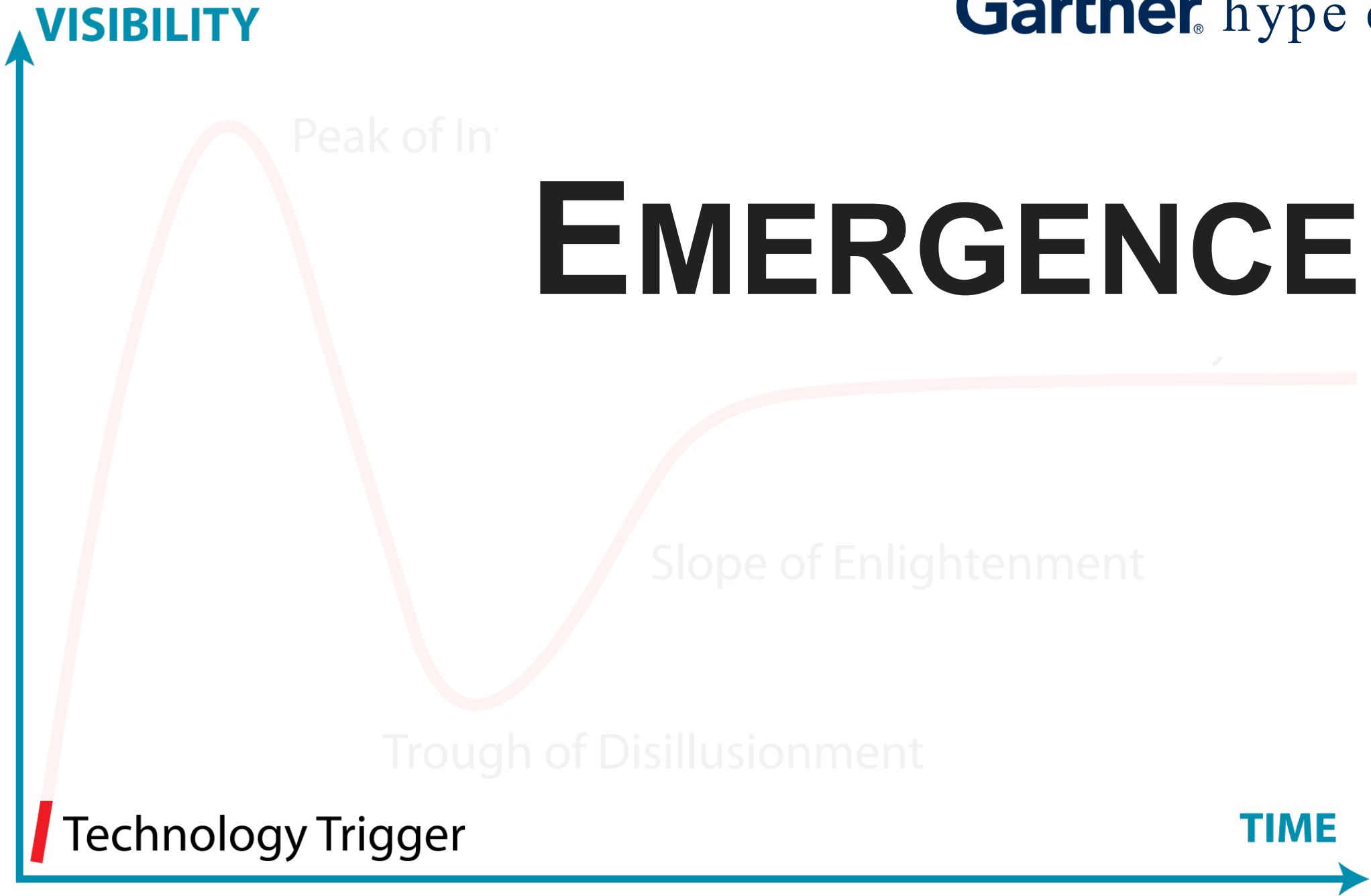
PHASE 3

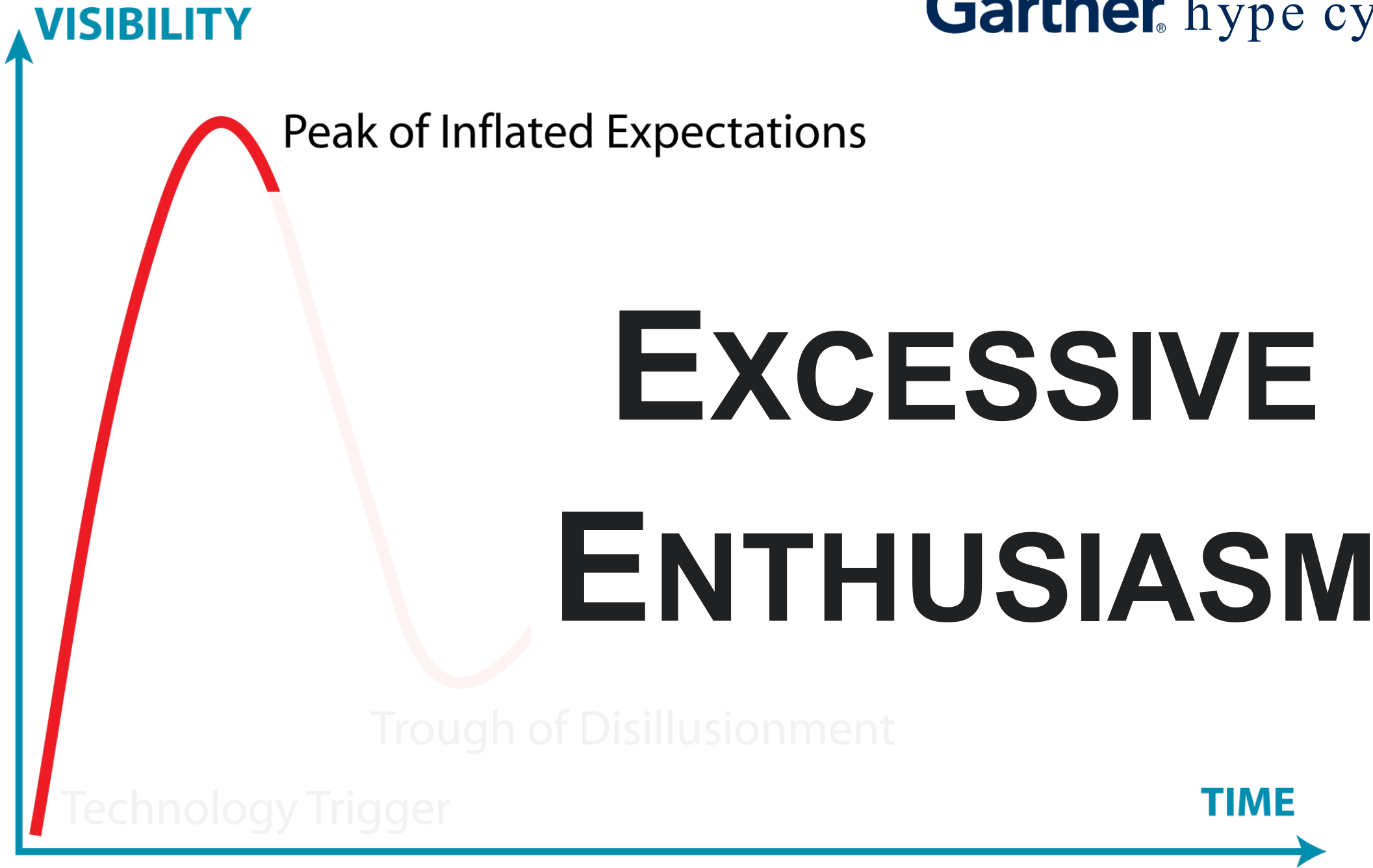
**ARTIFICIAL
INTELLIGENCE**



Profit

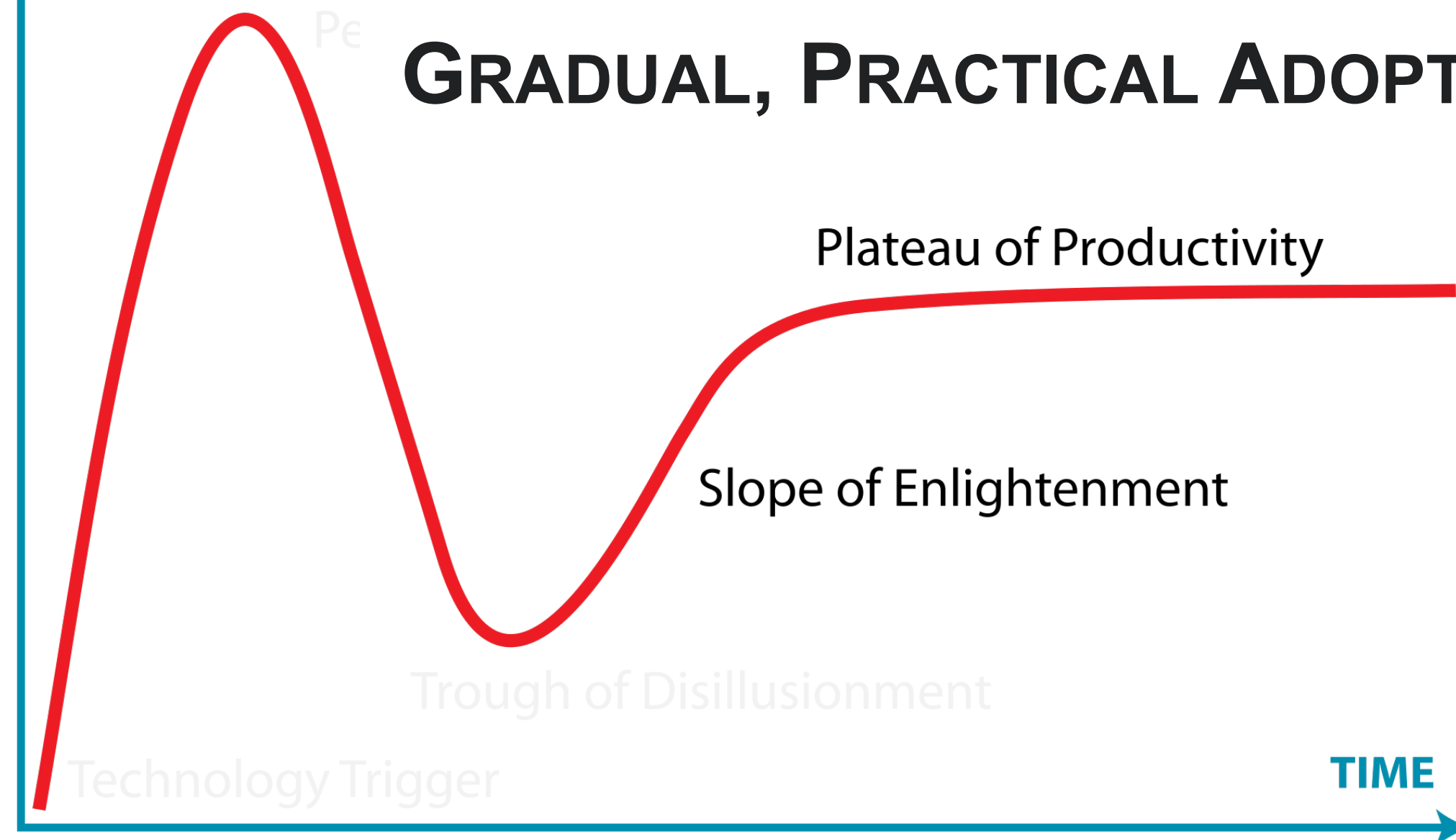








VISIBILITY



GRADUAL, PRACTICAL ADOPTION

Plateau of Productivity

Slope of Enlightenment

Trough of Disillusionment

Technology Trigger

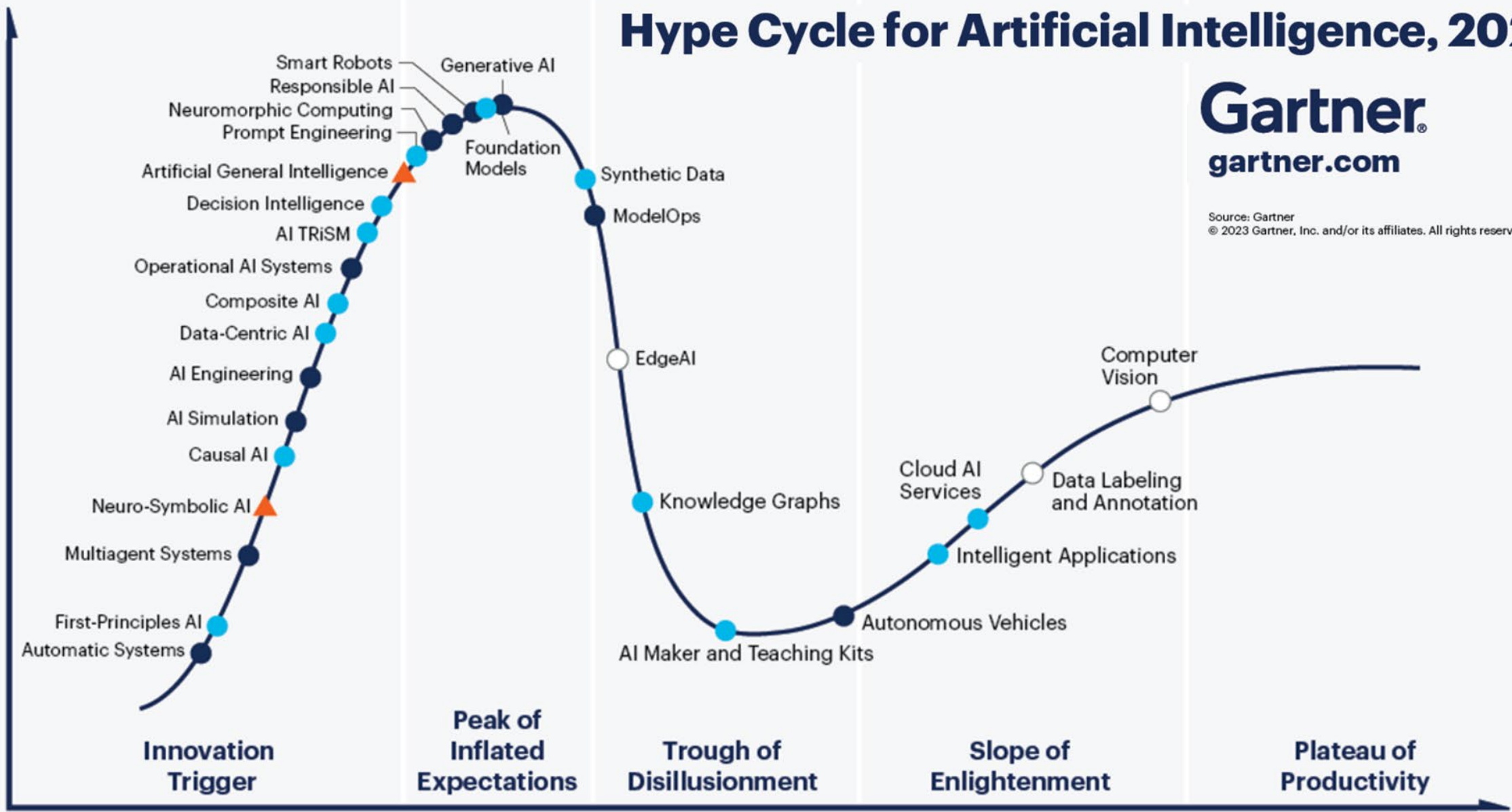
TIME

Hype Cycle for Artificial Intelligence, 2023

Gartner
gartner.com

Source: Gartner
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Expectations



Plateau will be reached:

○ less than 2 years

● 2 to 5 years

● 5 to 10 years

▲ more than 10 years

⊗ obsolete before plateau

As of July 2023

Time

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GoG Spot Spraying

Computer vision: Computer vision involves the analysis, processing, and understanding of **visual data**. It aims to enable machines to "**see**" and **interpret images** or videos, recognize objects, understand scenes, and perform tasks such as **object detection, image classification, image segmentation, and facial recognition**.

spray found cluster

corn spray found cluster

corn spray found cluster

Broad le. l: 0, p: 0.31

corn spray found cluster

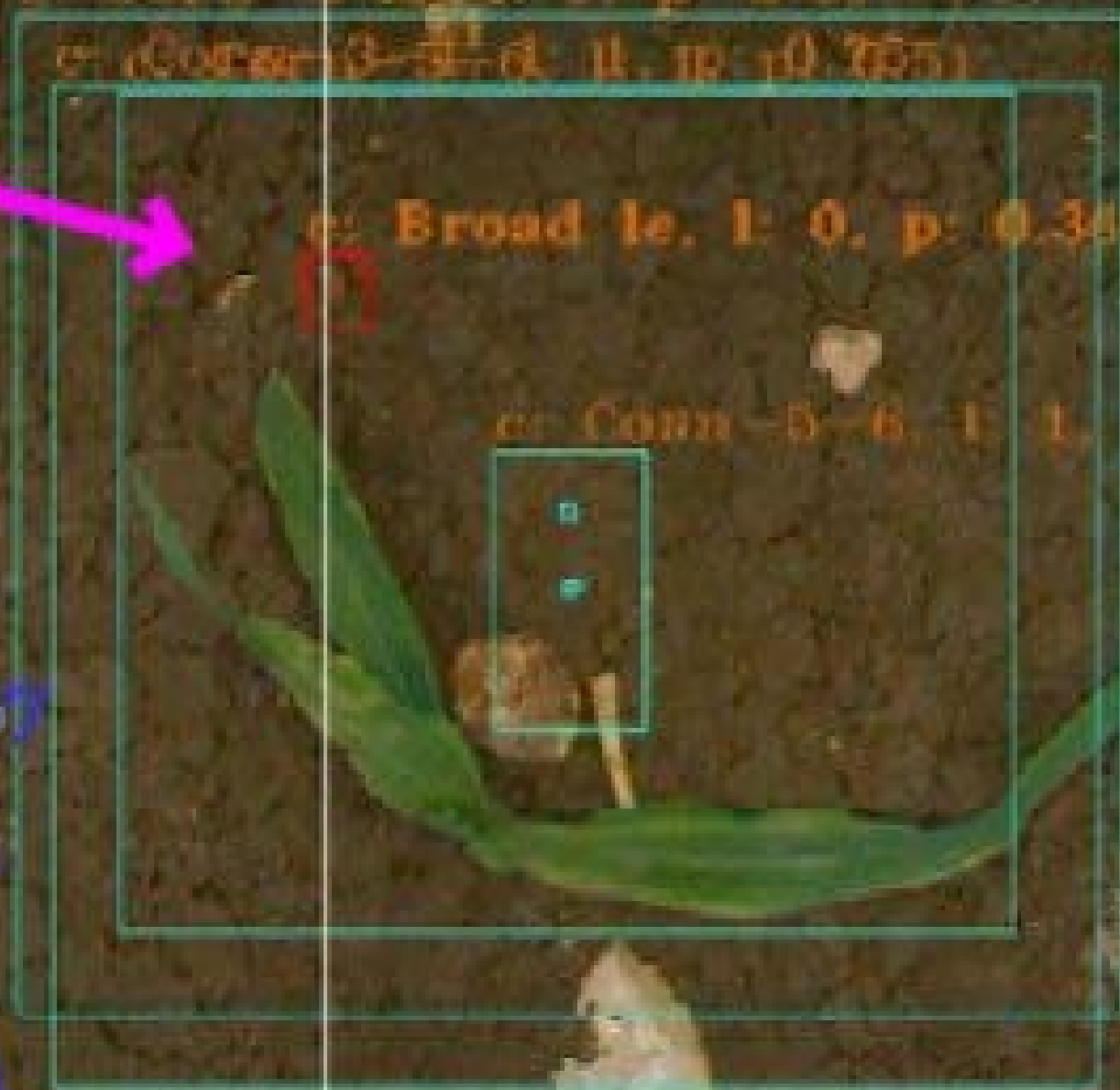
camera fps = 13.0

success fps = 0.31

detect fps = 0.31

picture id = 30704

Spraying l: 1, 0,

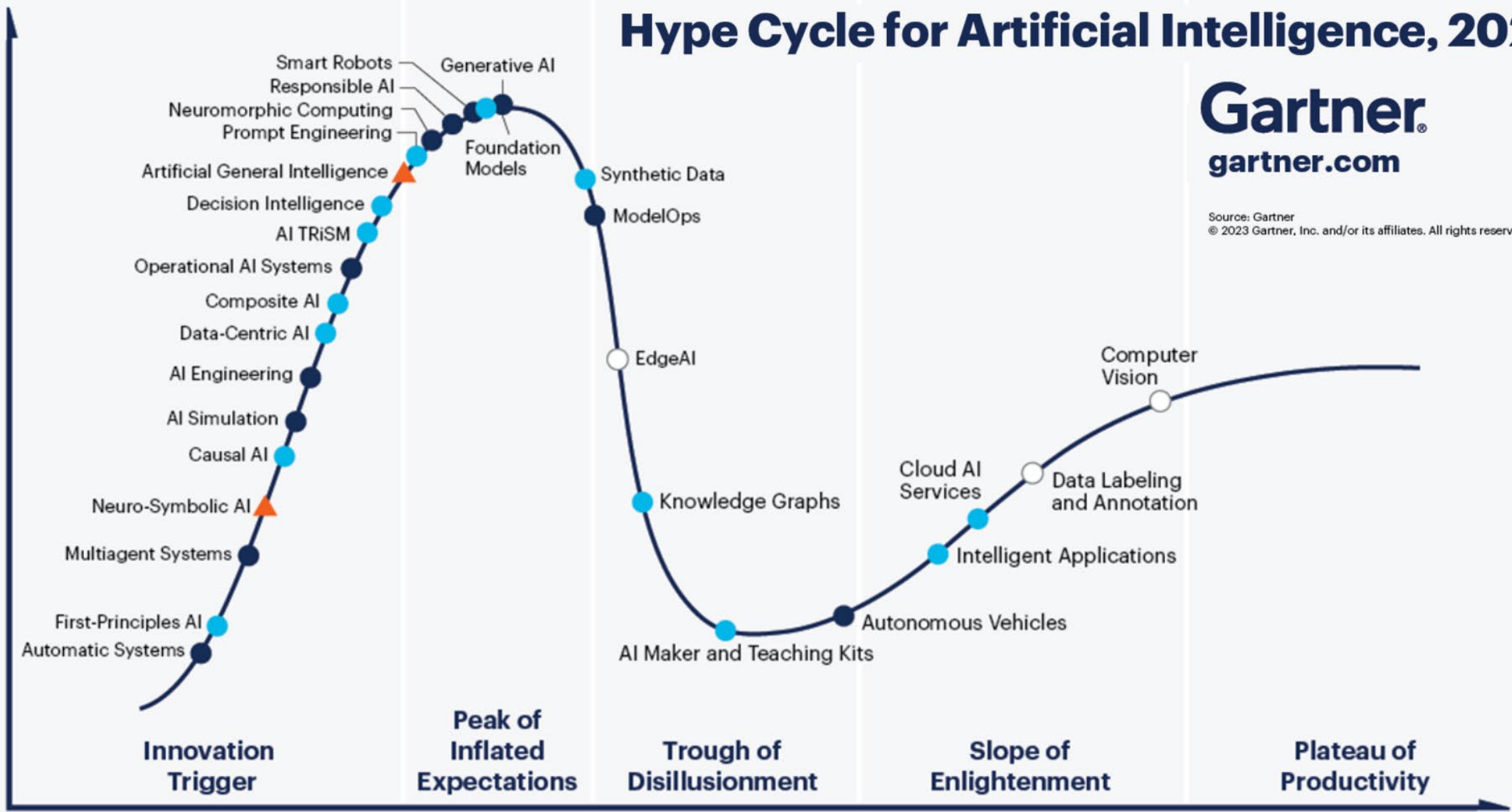


Hype Cycle for Artificial Intelligence, 2023

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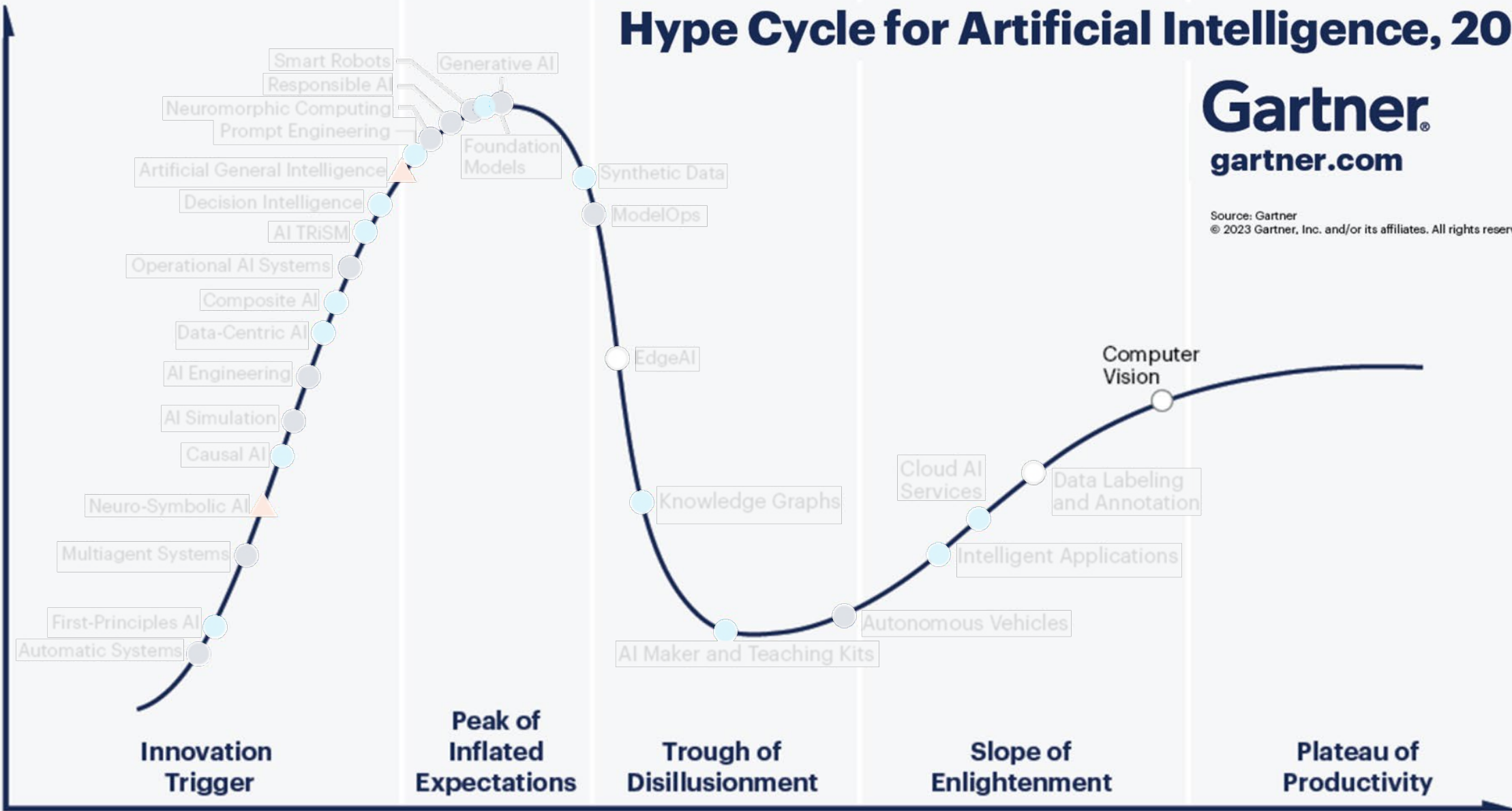
Time

Hype Cycle for Artificial Intelligence, 2023

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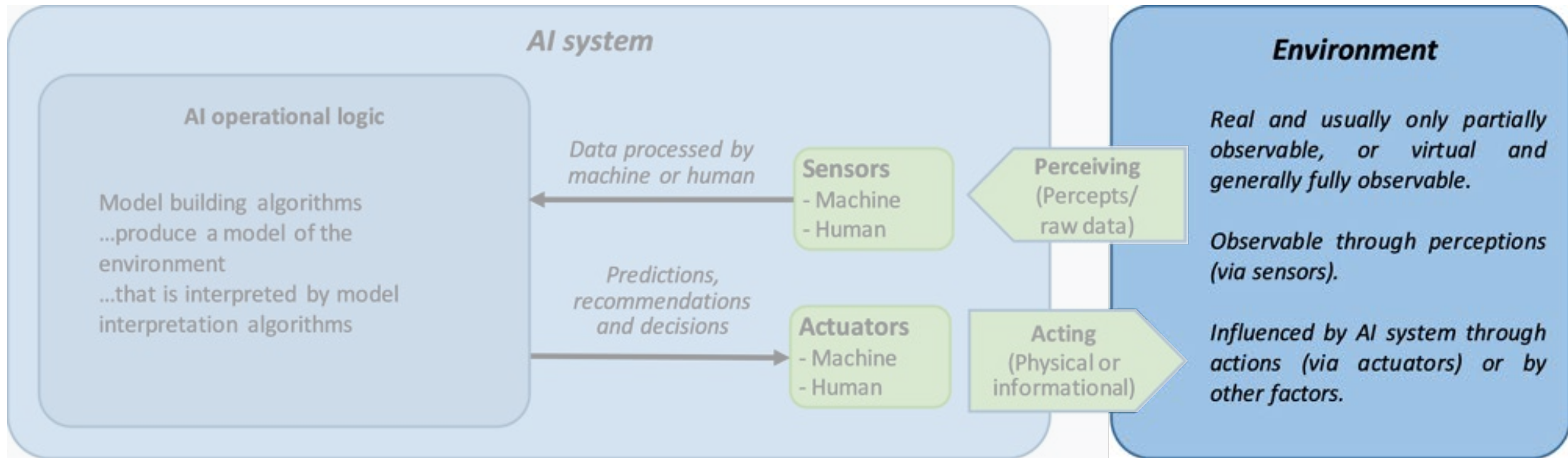
JOHN DEERE

SEE & SPRAY ULTIMATE



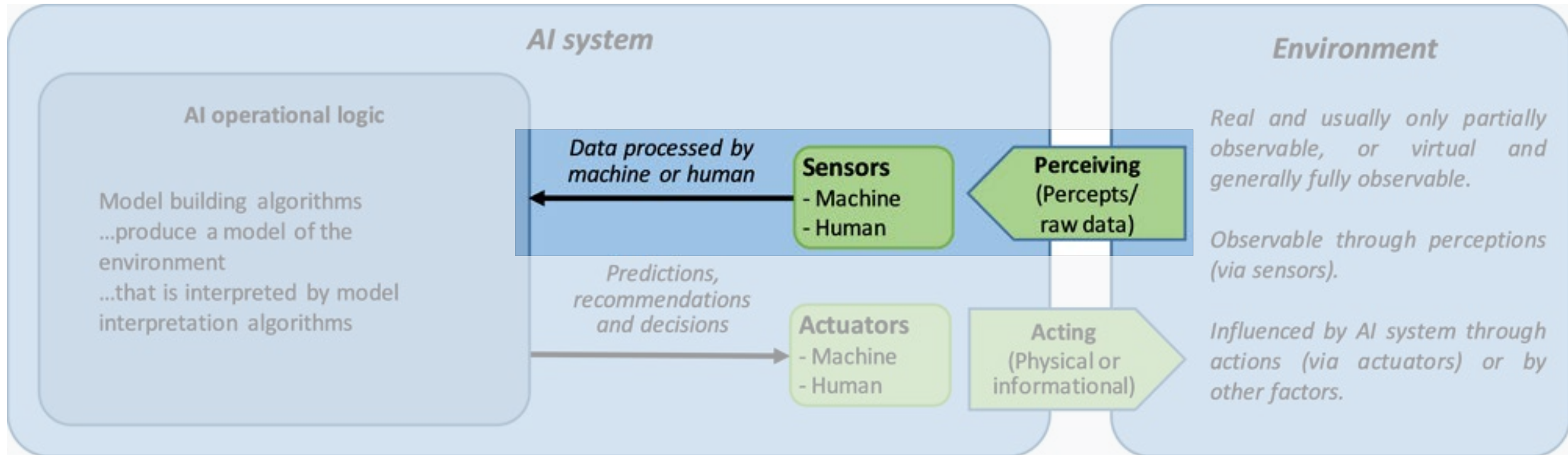


Environment





Input Sensors

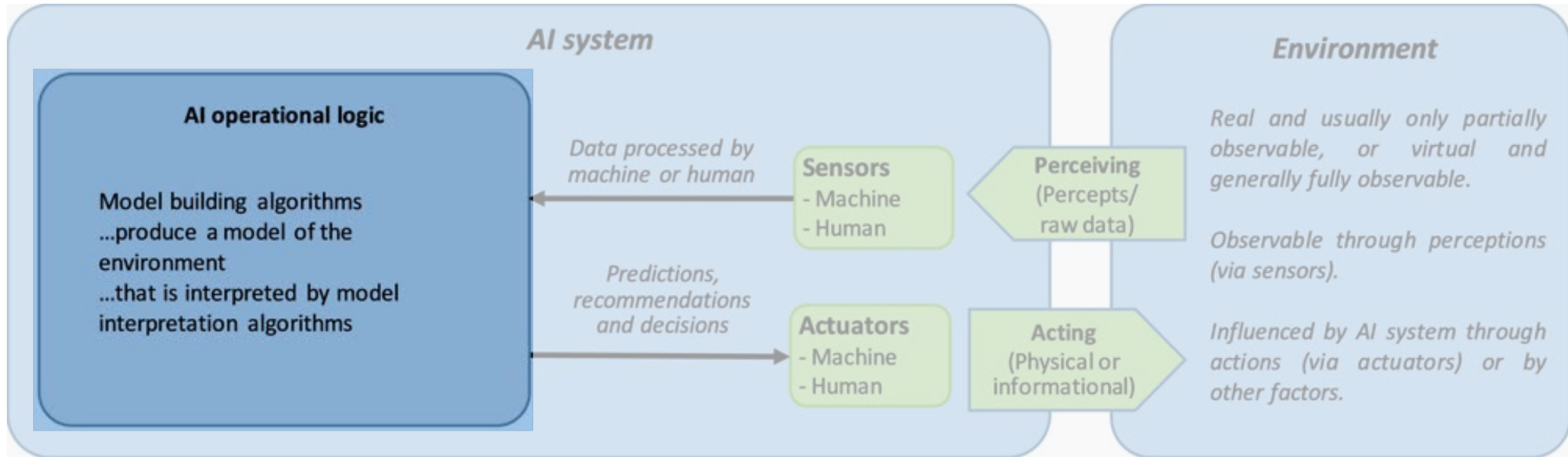




Cameras

36 cameras mounted across the boom scan more than 2,100 square feet (195 m²) at once.

AI Operational Logic

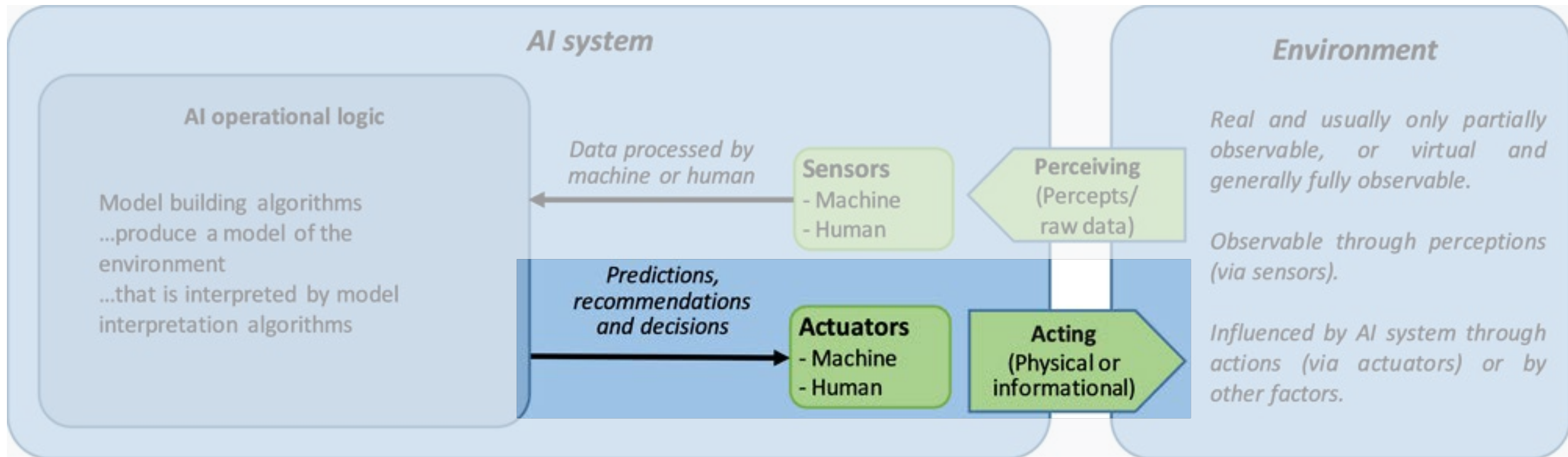




Vision Processing Unit

Multiple processors across the boom use camera vision technology and machine learning to detect weeds from plants, and activate sprayer nozzles all within 200 milliseconds.

Actuators



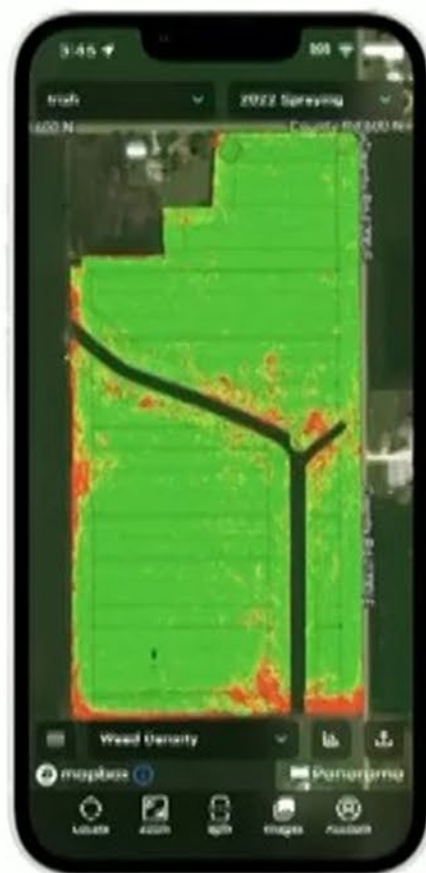


ExactApply™ Nozzle Control System

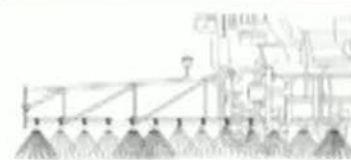
Individual nozzle control with ExactApply offers precise droplet sizing for a consistent targeted spray that also reduces over-application and off-target drift.

Symphony Targeted Spraying

Last Year



Next Year

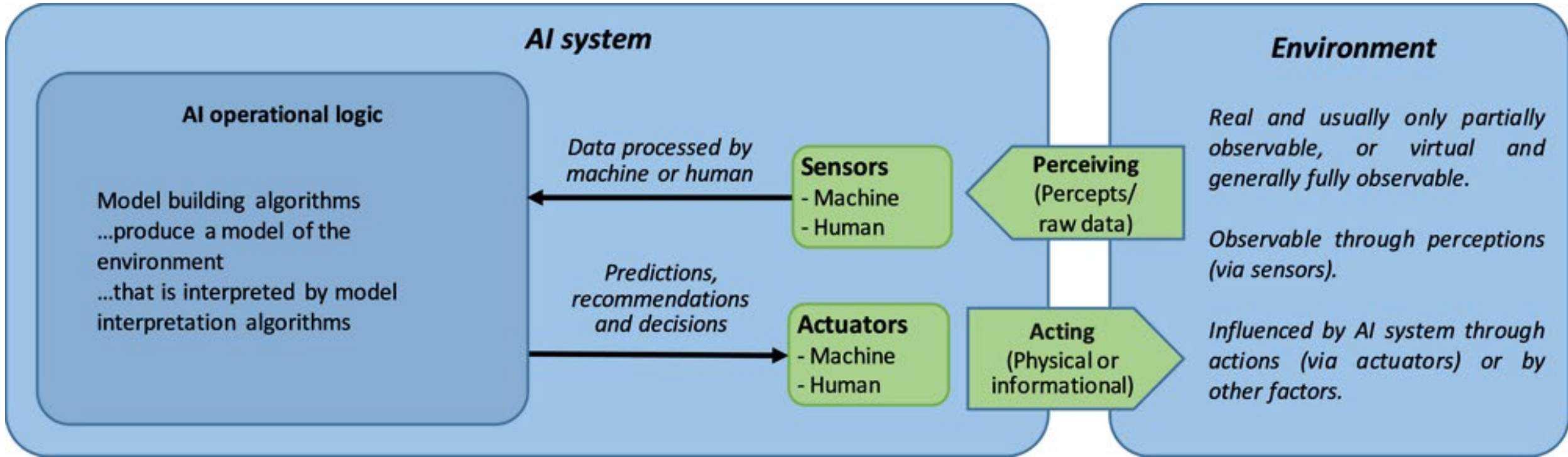


Residual - Prescription

+



Contact - Autorate



- What is “artificial intelligence (AI)?”
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- **AI crop adviser tools**
 - green-on-green spot spraying
 - **chatbot ag advisers**
 - field analytics/crop intelligence

Chatbot Ag Advisers

Generative AI: Generative AI refers to a class of artificial intelligence models and algorithms that have the ability to **generate new, original content**. Unlike traditional AI systems that are designed for specific tasks or classifications, generative models aim to **create data that is similar to, but not exactly the same as, the data they were trained on**.

Chatbot Ag Advisers

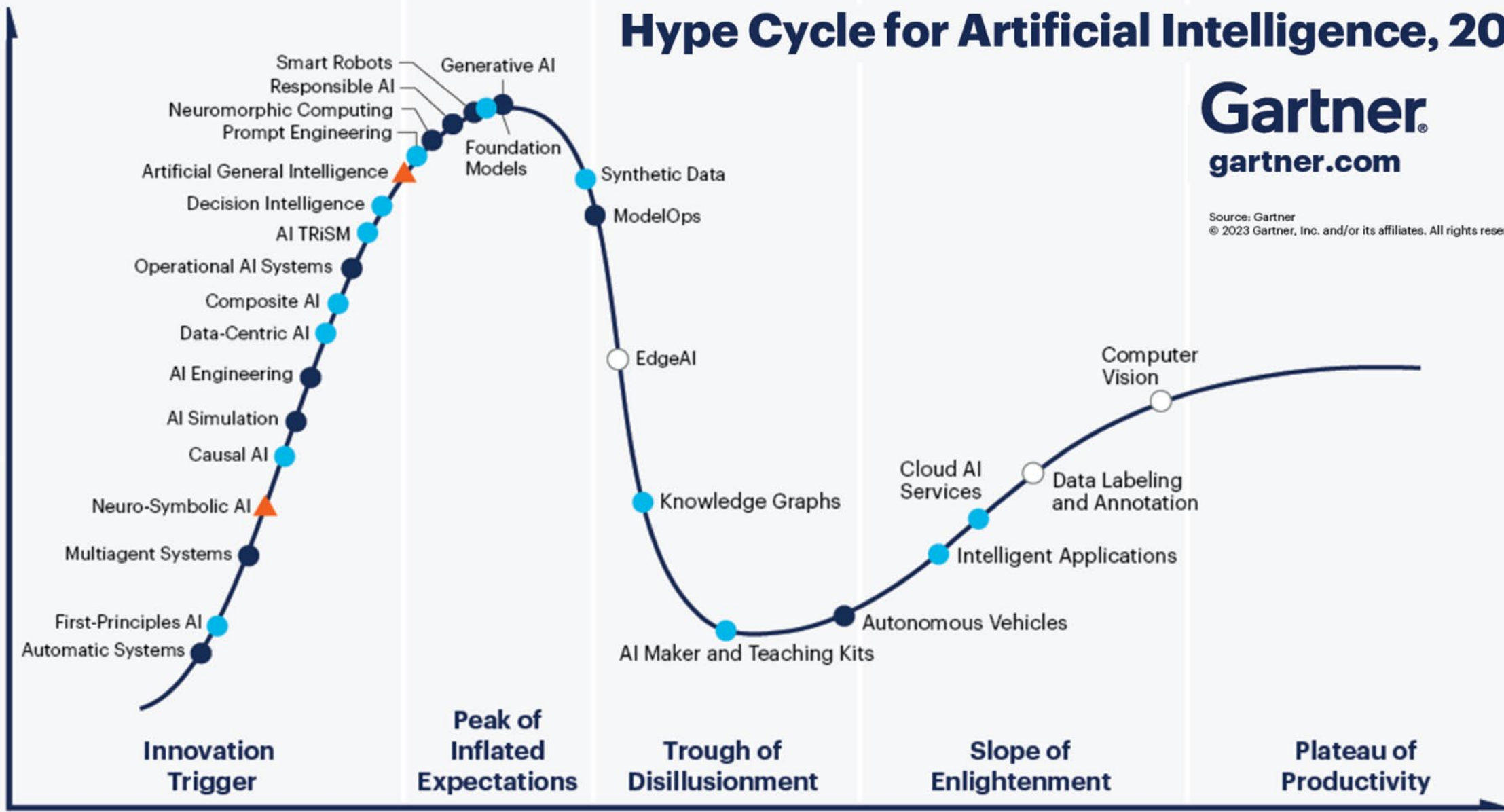
Generative AI is applied in various domains, including **Text Generation**. Models like OpenAI's GPT (Generative Pre-trained Transformer) can generate coherent and contextually relevant text. This is often used in natural language generation tasks, chatbots, and even creative writing.

Hype Cycle for Artificial Intelligence, 2023

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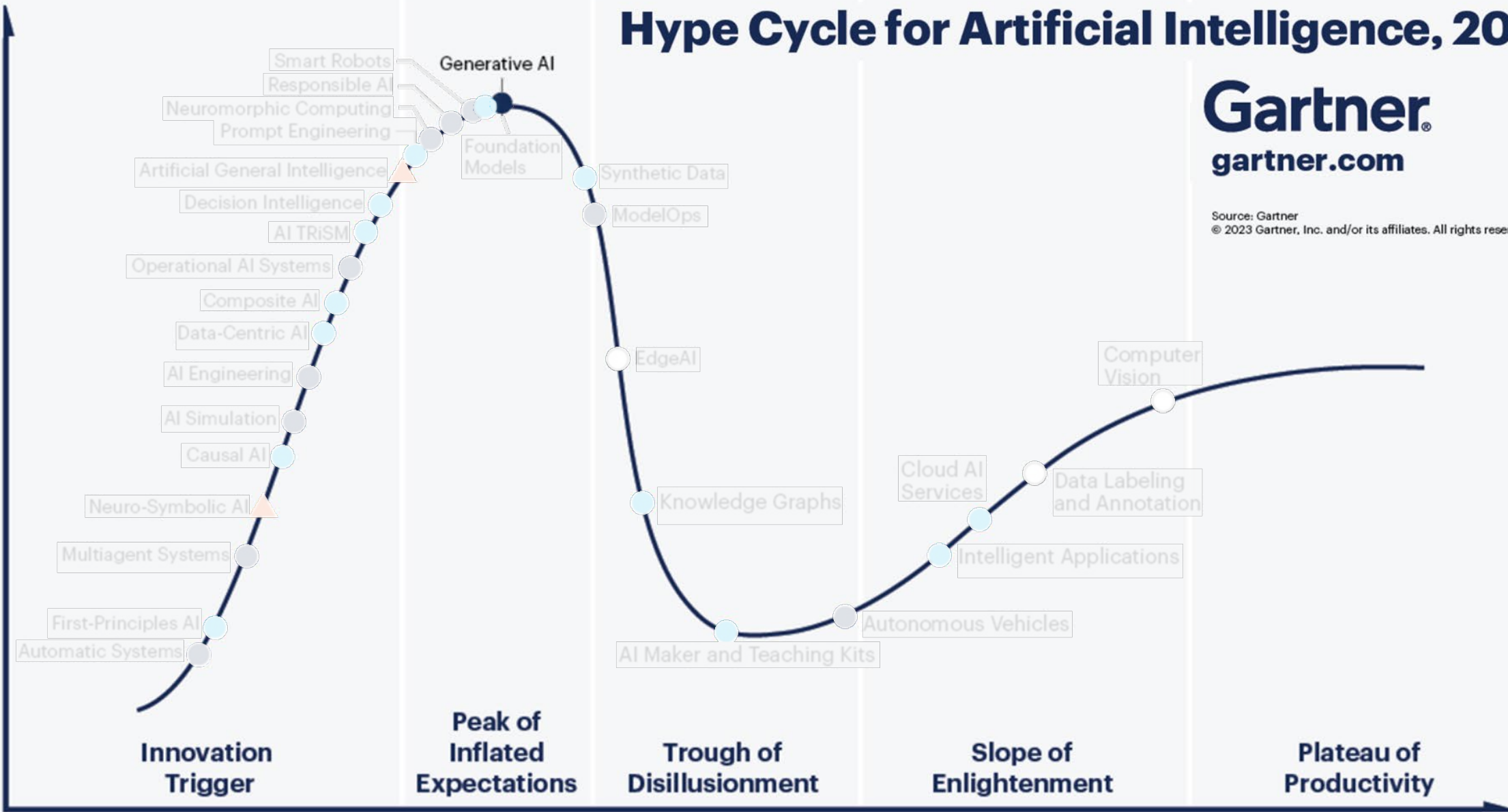
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Time

FEATURED

Ask Norm: Farmer's Business Network launches ag-tailored chatbot

Melisa Goss Apr 18, 2023



Norm **BETA**

AI AG ADVISOR

Ask Norm a question or have a conversation about a topic of your choice. [FAQ](#)



Press Release

July 6, 2023

Calgary, Alberta

FOR IMMEDIATE RELEASE



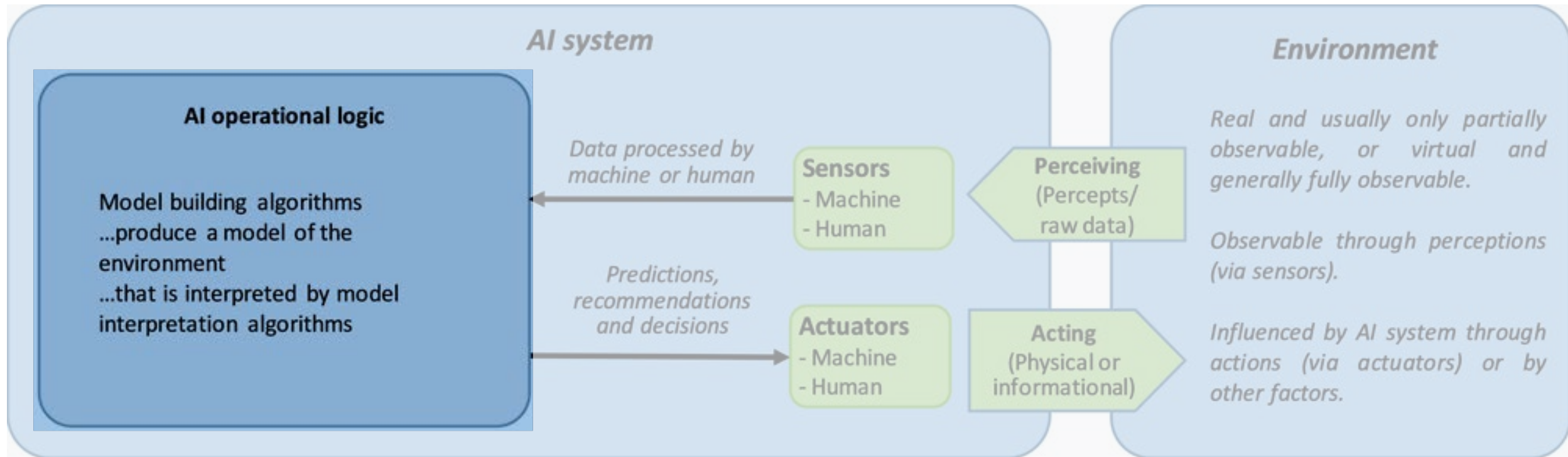
AGvisorPRO Partners with Young's Equipment to Launch the First Large Language Model for Equipment Dealers

AGvisorPRO Inc. is excited to announce an expanded partnership with Young's Equipment, a leading farm equipment dealership who will be leveraging its visorPRO™ AI-powered technology with the aim of enhancing customer technical service and support.

“The challenge for equipment dealerships is the sheer volume of questions and technical support required in a compressed season. Hundreds of requests arrive each day during seeding, spraying and harvest. Considering the scarcity and expense of onboarding skilled talent, often these recurring questions tie up even more valuable technical resources” says Patrick Walther, Co-Founder of AGvisorPRO™.

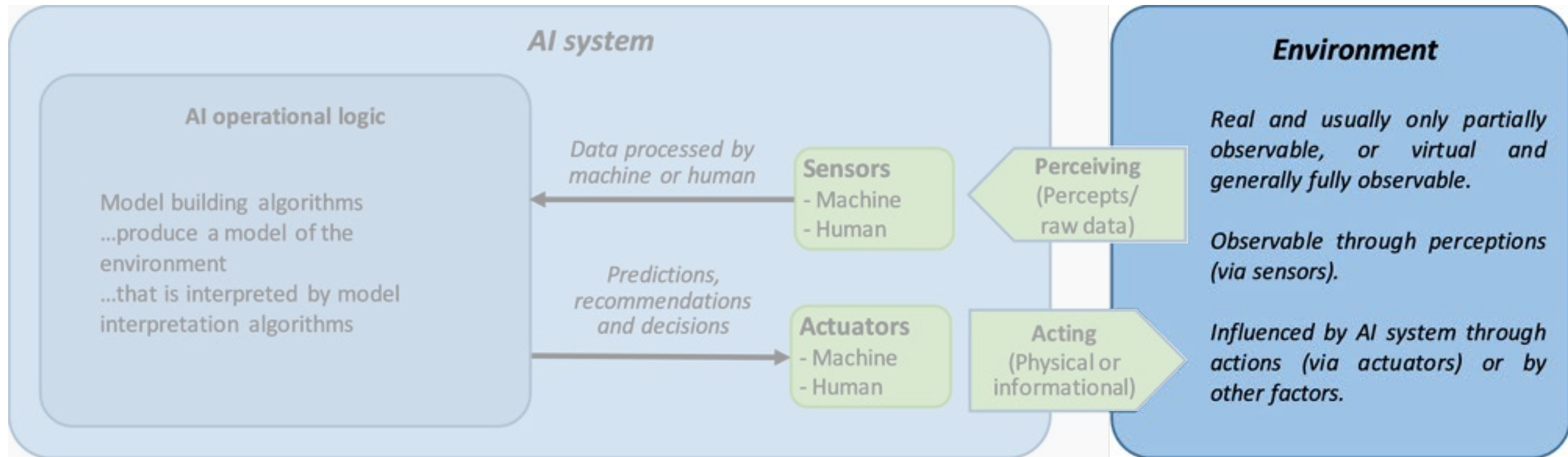
“Our team recognized this constraint and behind the scenes, has been working on a scalable solution leveraging the

AI Operational Logic



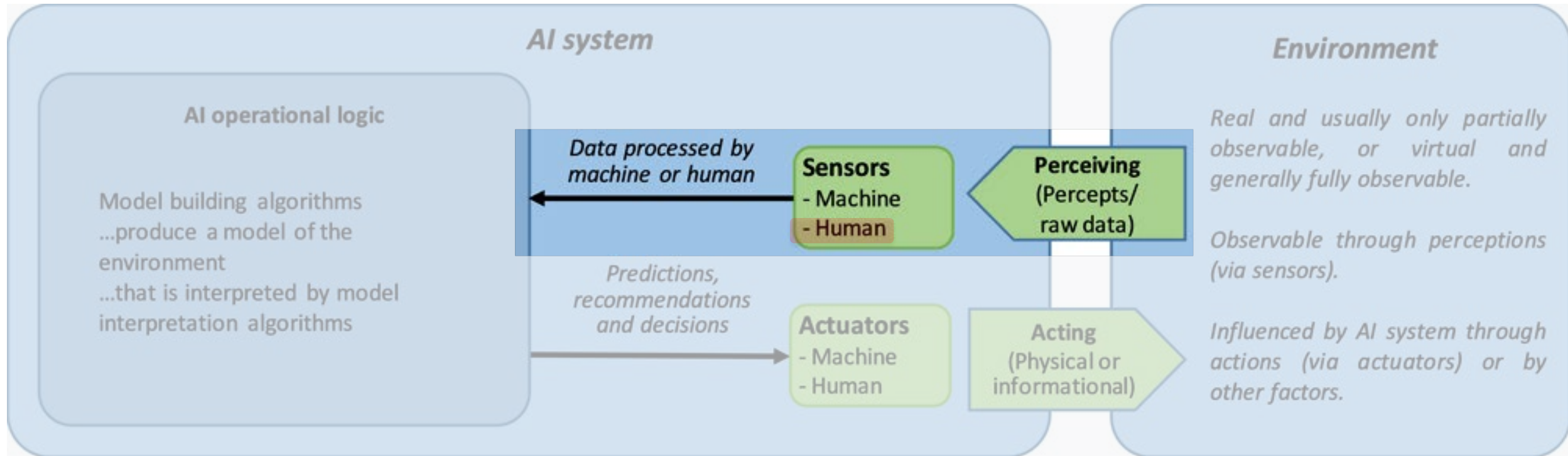
The inner workings (“guts”) of the chatbot

Environment



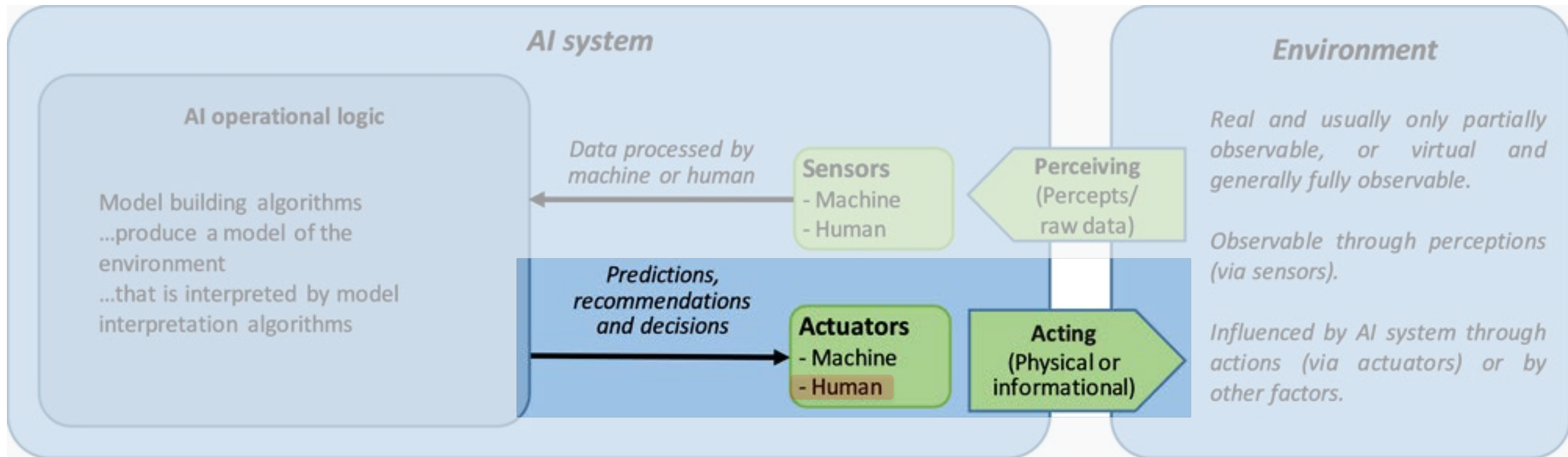
A body of knowledge relevant to a crop adviser

Sensors



Human beings with relevant questions

Chatbot Advisers



Human beings who act upon the chatbot responses



NormSM **BETA**
AI AG ADVISOR

- make it public
- post a disclaimer

Q: What are the limitations of Norm?

A: While Norm is designed to provide helpful agricultural information, it is not a replacement for consulting with a trained agronomist. Norm's knowledge is based on general agricultural principles and may not always account for specific regional, environmental, or farm-specific factors. Additionally, it is an AI-based tool and not a human expert, so there may be occasional inaccuracies or misunderstandings. **Always verify the information provided and consult with an expert when making critical decisions.**

VISORPRO™

- equipment dealerships as customers
- service and technical manuals
- human in the loop

How visorPRO™ Works



Upload Your Data

Upload your manual files in **visorVAULT™** to protect them and make them available for visorPRO™ to process.



Ask a Question

Ask a question about an equipment technical specification or procedure.



Get the Answer

visorPRO™ generates an incredible answer based on the manuals/support data and provides references



Reply to Your Client

You reply to the customer with a great answer in just minutes.

VISORPRO™

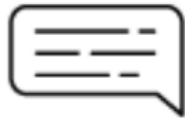
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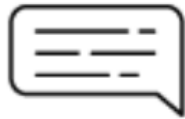
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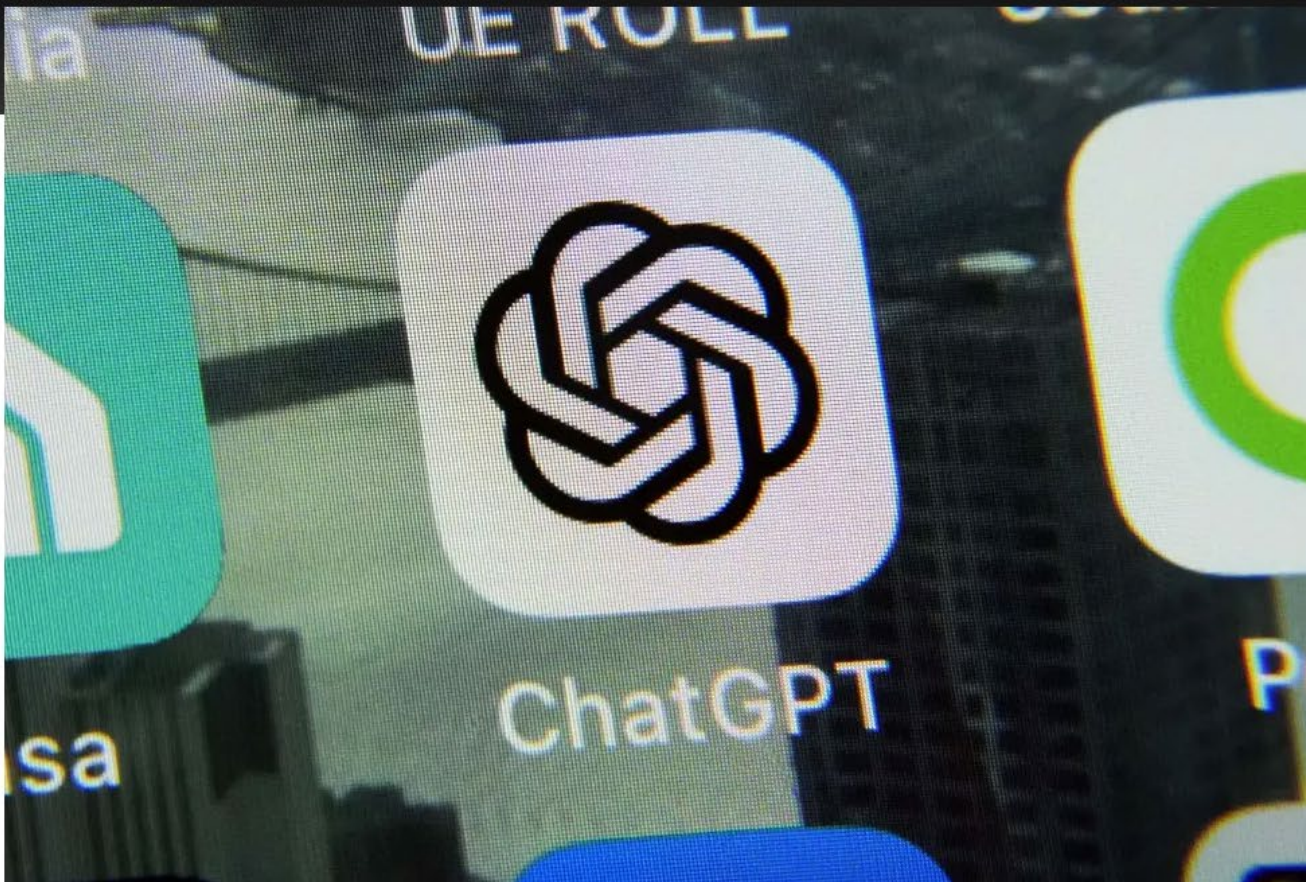
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You reply to the customer with a great answer in just minutes.

Lawyers blame ChatGPT for tricking them into citing bogus case law



FILE - The ChatGPT app is displayed on an iPhone in New York, May 18, 2023. A judge is deciding whether to sanction two lawyers who blamed ChatGPT for tricking them into including fictitious legal research in a court filing. The lawyers apologized at a hearing Thursday, June 8, 2023, in Manhattan federal court for their roles in written submissions that seemed to leave Judge P. Kevin Castel both baffled and disturbed at what happened. (AP Photo/Richard Drew, File)

BY LARRY NEUMEISTER

Published 10:25 PM CDT, June 8, 2023

Share 

ChatGPT-4 Training Dataset



1 petabyte
(1,000 terabytes)

LOC Digital Collection (as of 2022)

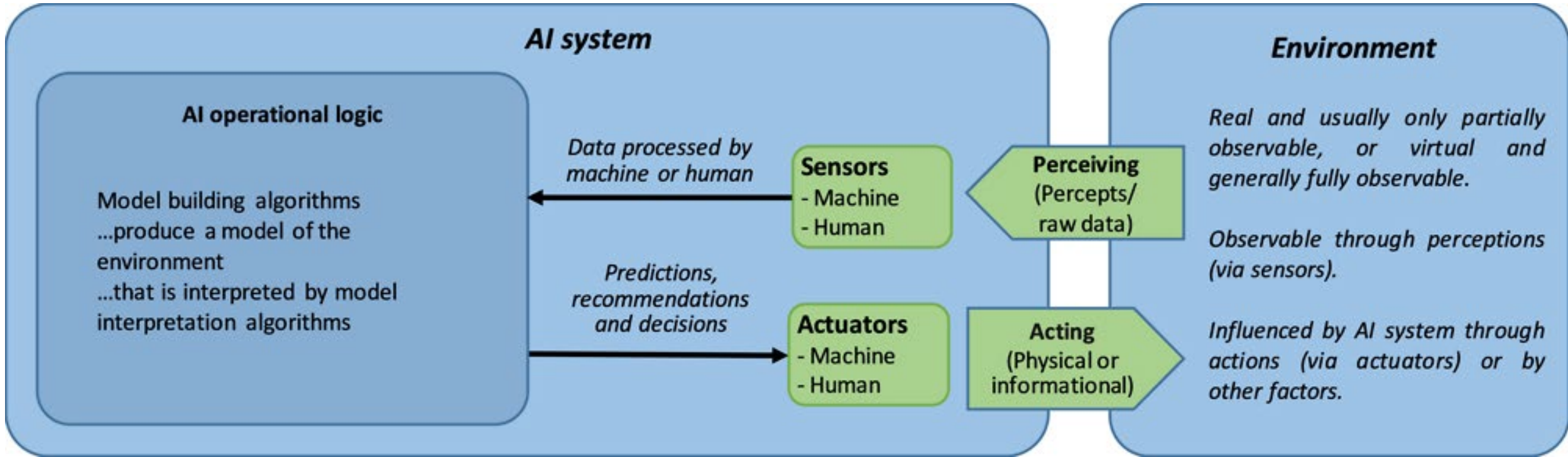


21 petabytes

The Internet (as of 2020)



64,000,000 petabytes
(64 zettabytes)



- What is “artificial intelligence (AI)?”
- The Gartner hype cycle
- **AI crop adviser tools**
 - green-on-green spot spraying
 - chatbot ag advisers
 - **field analytics/crop intelligence**





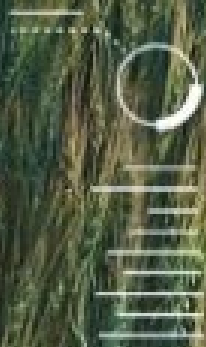
24°/18°

Precipitation 5%

1016 hPa

Soil temperature

50°



pH 5.0



Moisture

60%



Decision Intelligence

Decision Intelligence: Decision Intelligence (DI) refers to a multidisciplinary approach that leverages various technologies, including artificial intelligence (AI), to **enhance decision-making processes**. The goal of decision intelligence is to **improve the quality of decisions** by integrating **data-driven insights, analytics, and computational models** into the decision-making workflow.

AI Simulation

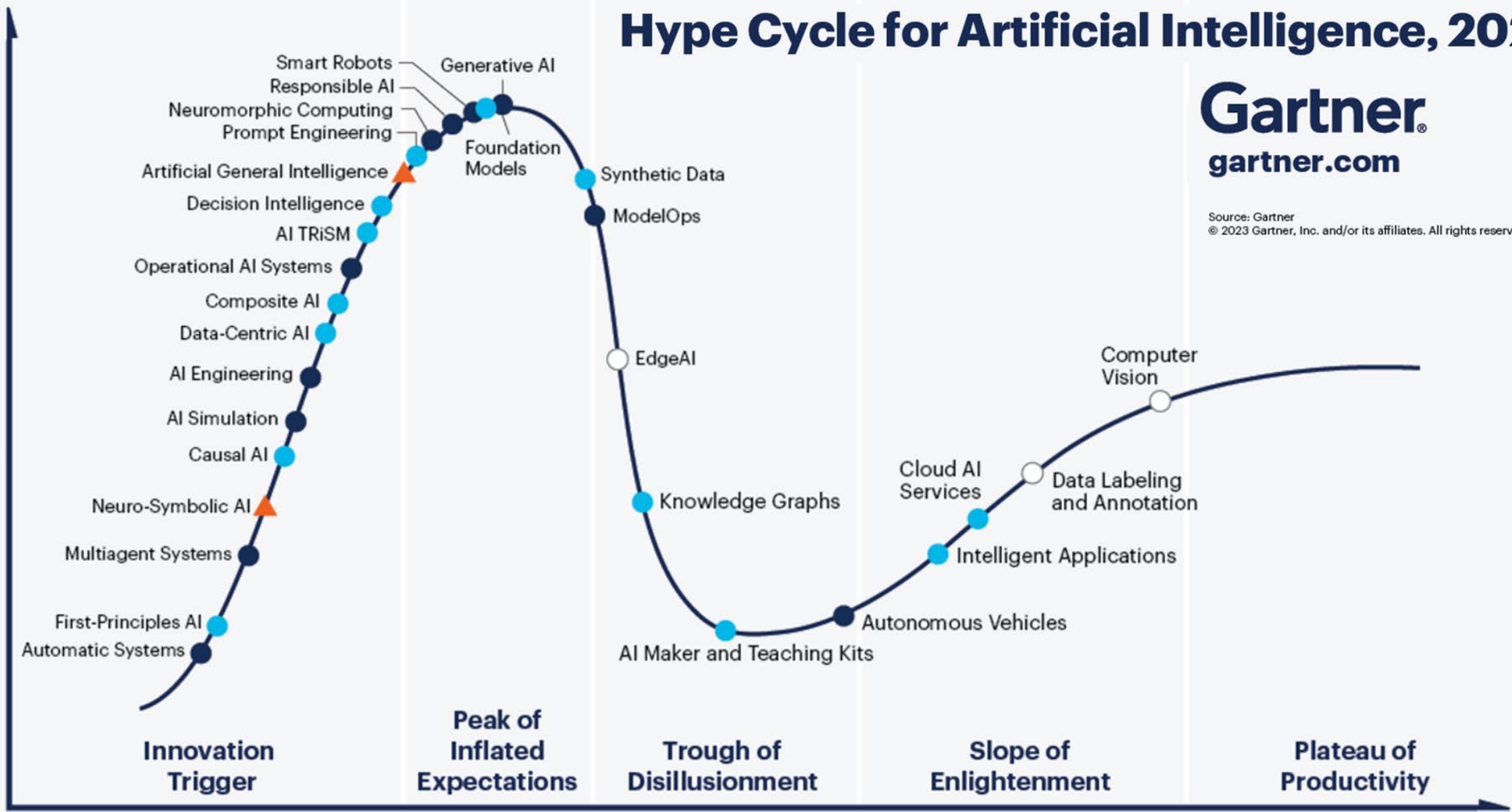
AI simulation: AI simulation refers to the use of artificial intelligence (AI) techniques in the **creation and execution of simulations**. Simulations are **models or representations of real-world systems, processes, or environments**. By incorporating AI, these simulations can become more dynamic, adaptive, and capable of **mimicking complex behaviors, interactions, and decision-making processes** observed in the real world.

Hype Cycle for Artificial Intelligence, 2023

Gartner
gartner.com

Source: Gartner
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Expectations



Plateau will be reached:

○ less than 2 years

● 2 to 5 years

● 5 to 10 years

▲ more than 10 years

⊗ obsolete before plateau

As of July 2023

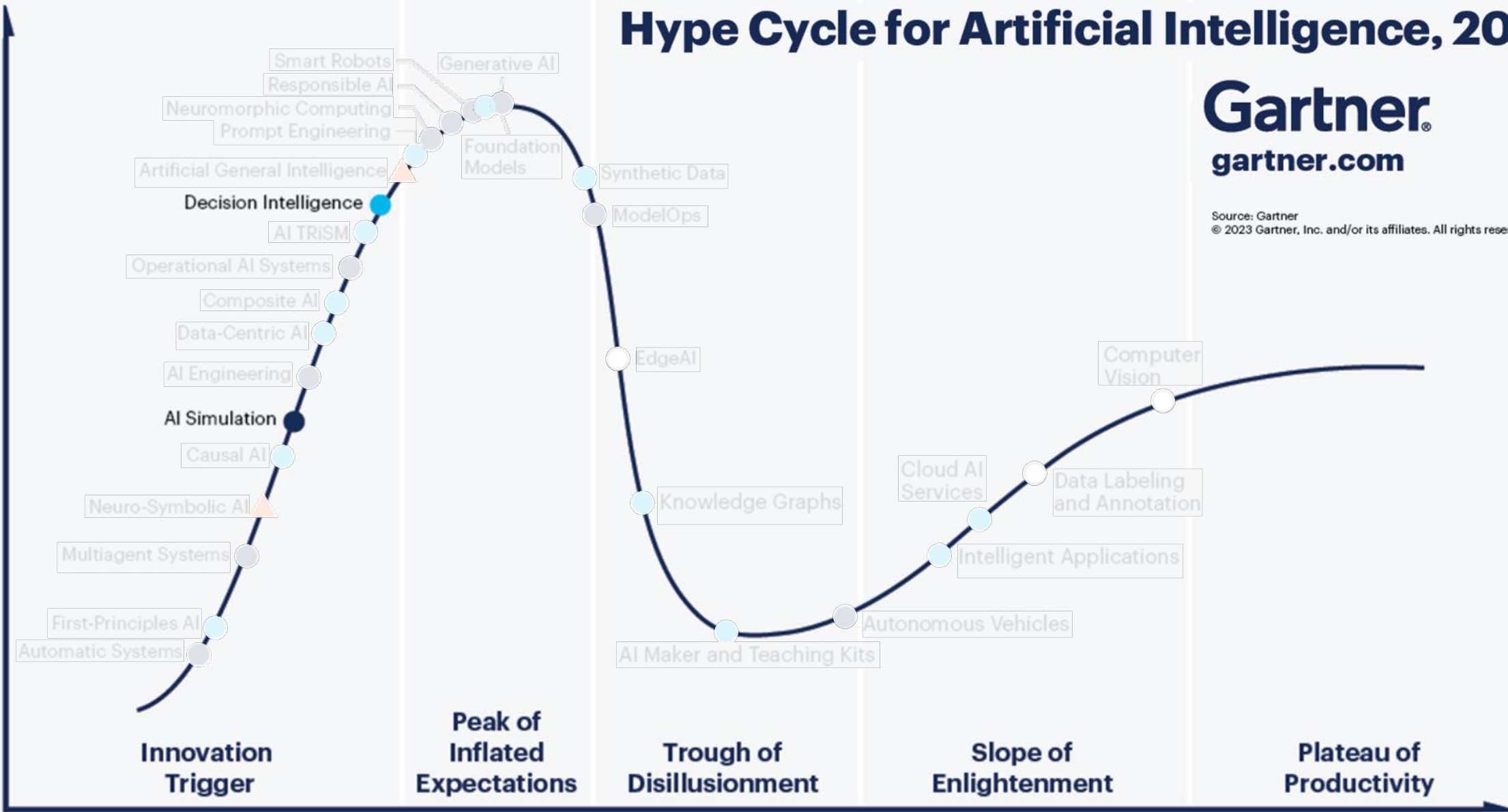
Time

Hype Cycle for Artificial Intelligence, 2023

Gartner
gartner.com

Source: Gartner
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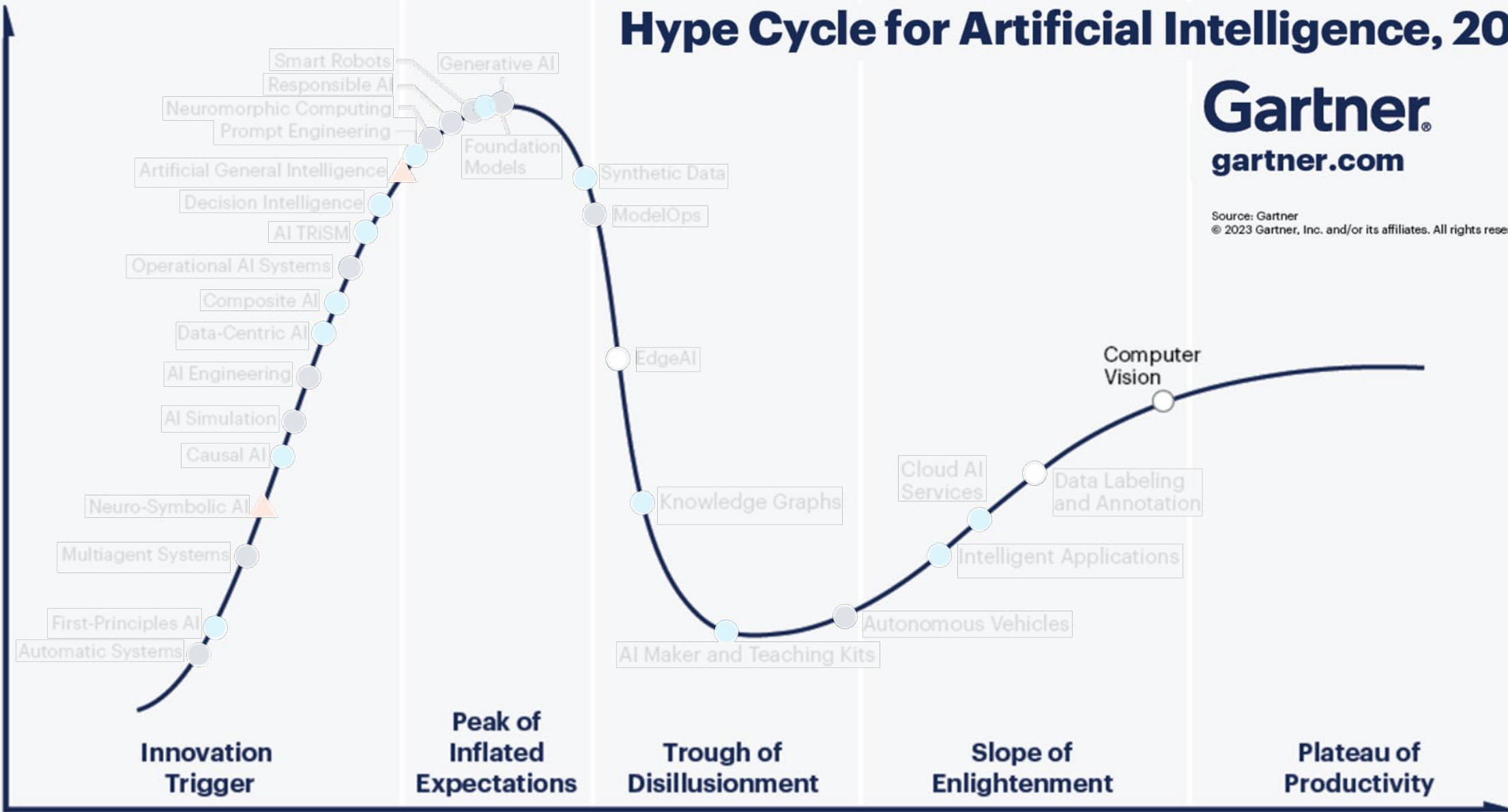
Time

Hype Cycle for Artificial Intelligence, 2023

Gartner
gartner.com

Source: Gartner
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As of July 2023

Time

The most powerful field analytics software for precision agriculture

We help agricultural and forestry professionals and companies to gain a competitive advantage with highly precise field data.

Our precision agriculture software is based on human expertise, backed by scientific research, and augmented with artificial intelligence.

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Free demo - no credit card required



Hello, welcome to [redacted]



Crop intelligence at scale

We're 100% focused on helping advisors demonstrate value for growers and build better relationships through full-service, leaf-level insights.

FOR ADVISORS



Cover more acres

Scout from anywhere and prioritize the farms that require the most attention.

Act decisively with more speed

Get timely insights to accelerate decision-making and validate recommendations.

Unlock more opportunities

Show growers how to maximize yield to improve planning and boost their bottom line.

[SOLUTIONS](#) [HOW IT WORKS](#) [SUCCESS](#) [RESOURCES](#) [ABOUT US](#)[GET A DEMO](#)

Practical innovation born from a proud farming legacy

██████████ is leading the **AI-powered crop intelligence revolution**, combining high-end tech with expert agronomy.

[SEE OUR INSIGHTS](#)

Year-round coverage

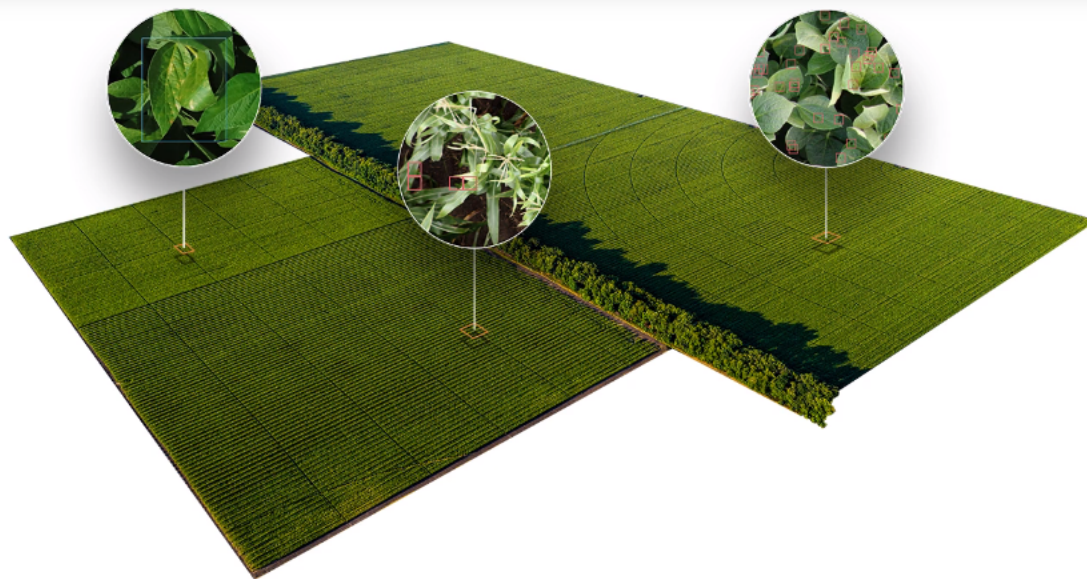
Full service before, during, and after the season, backed by unmatched technology and deep ag expertise.

Leaf-level ground truth

Submillimeter image resolution of every acre, collected by drones and delivered right to your fingertips—wherever you are.

Largest crop imagery dataset

Deep AI and machine learning, trained by 200M+ data points and continuously optimized by our team of experts.



CROP

THREAT

REGION

Disease

**Insect
Damage**

**Nutrient
Deficiency**

**Stand
Count**

Weeds



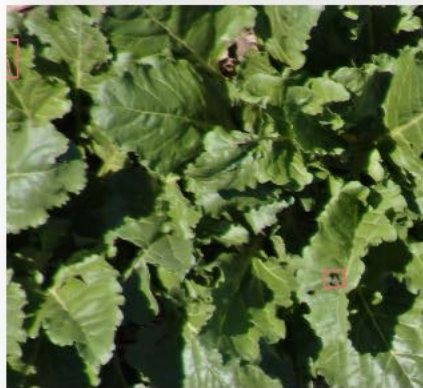
Early Sugar Beet Weeds
Scottsbluff, NE



Stand Count
Scottsbluff, NE



Stand Count
Morrill, NE



Grasshopper and Chewing Damage
Scottsbluff, NE



Grasshopper Damage
Morrill, NE



Cercospora leaf spot (CLS)
Nebraska

Supported ANALYSES



STAND COUNT



VRS STAND
COUNT



PLANT COUNT
AND SIZE



CANOPY COVER



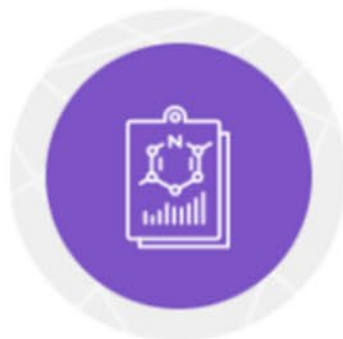
PLANT STRESS



WEED
DETECTION



WATERLOGGING
DETECTION



PLANT VIGOR



Vendors



**AI FIELD ANALYTICS
AND CROP INTELLIGENCE**

Users



that gives me a
pile of maps to look at

1. Construct your own high-level understandings of AI systems
2. Most AI is not ready for widespread practical adoption
3. Your greatest value = addressing the tough problems

Thank you!

- Greg Endres (co-chair) | NDSU Extension | Carrington, ND
- Angie Peltier (co-chair) | Univ. of Minnesota Extension | Crookston, MN
- Jerry Arneson | Bell Bank | Moorhead, MN
- Jodi Boe | GK Technology | Halstad, MN
- Darren Dunham | Control Crop Consulting | Maxbass, ND
- Dave Franzen | NDSU | Fargo, ND
- Chris Johnson | Control Crop Consulting | Horace, ND
- Tom Jones | Wyndmere, ND
- Lindsey Lysne | Liberty Ag | Minnewauken, ND
- Linda Schuster | NDSU | Carrington, ND

Thank you!

Access my public presentations here



[linktr.ee/
robproulx](https://linktr.ee/robproulx)

