AI and Machine Learning in One Health

Predictive Modeling, Surveillance, and Real-Time Data Analysis

Elias W. BA
eliaswalyba@gmail.com

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

ONE HEALTH DATA ALLIANCE AFRICA

kaikai
ict4d and digital development

Key Takeaways

- Understand what AI is and, most importantly, what it is not
- Understand the state of art of AI and the best approaches
- Be able to train, evaluate, and export an AI model
- Identify applications of AI in One Health
- Get to know a few case studies and real world examples of applications of AI in One Health

What the heck is AI ?

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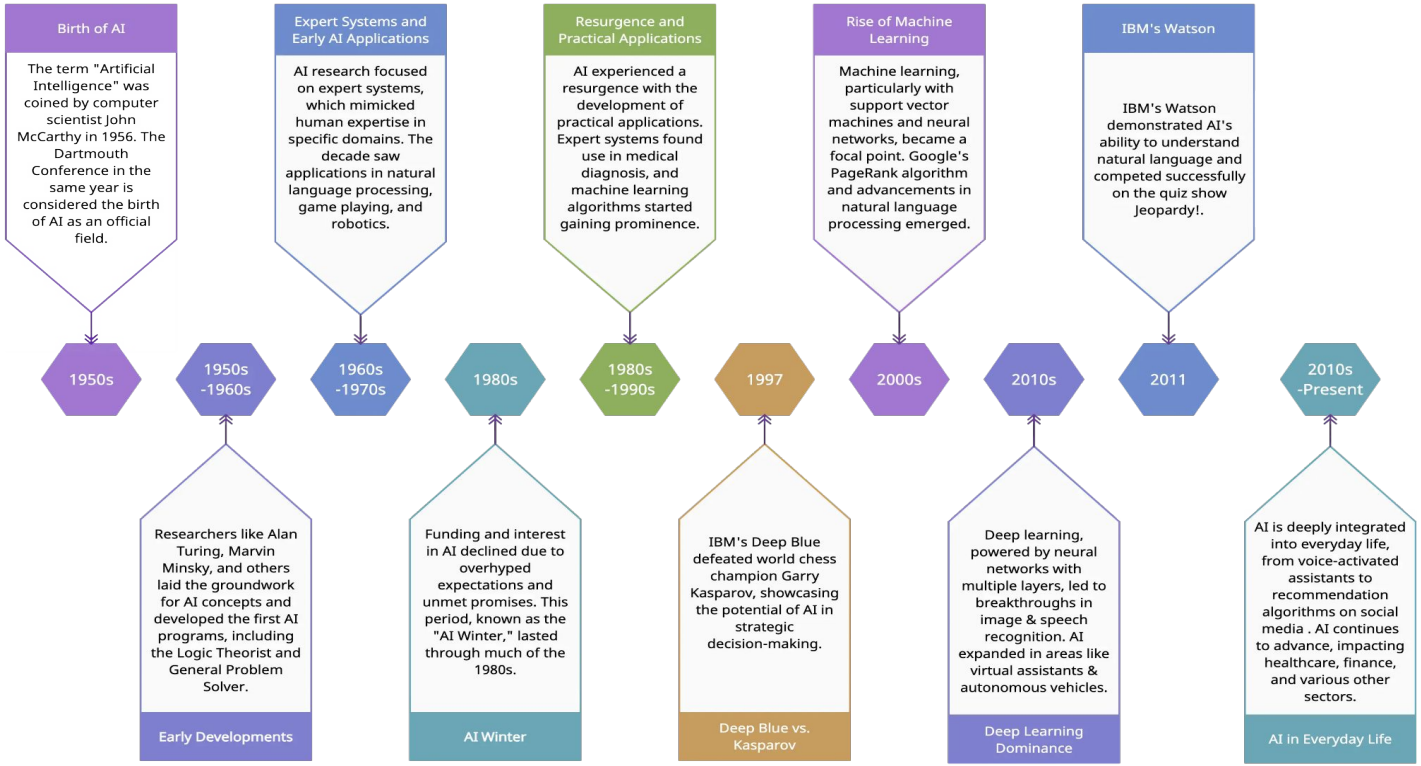
This is AI ! and guess what, it will take our job and kill us all

What the heck is AI ?



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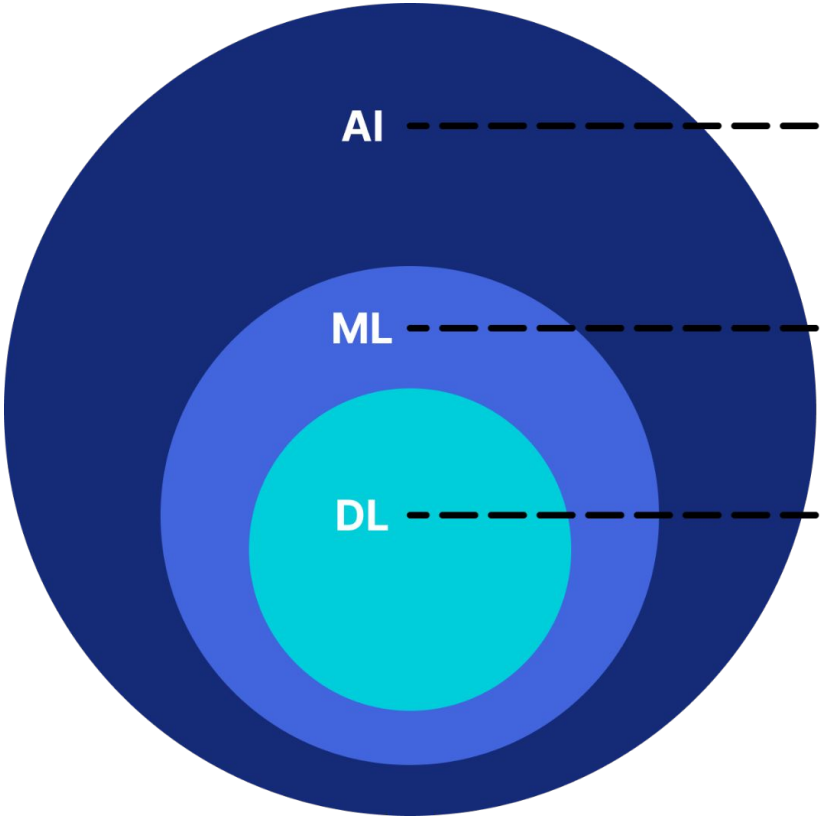

Artificial Intelligence
Engineering of making intelligent machines and programs.

Machine Learning
Ability to learn without being explicitly programmed.

Deep Learning
Learning based on deep neural networks.

What the heck is AI ?

- **AI (Artificial Intelligence)**: The ability of machines to perform tasks that typically require human intelligence, like understanding language, recognizing patterns, or making decisions.

- **Machine Learning (ML)**: A subset of AI where machines learn from data to improve performance over time, without explicit programming.

- **Deep Learning**: A further subset of ML, utilizing neural networks with many layers to analyze complex patterns, particularly in large datasets.

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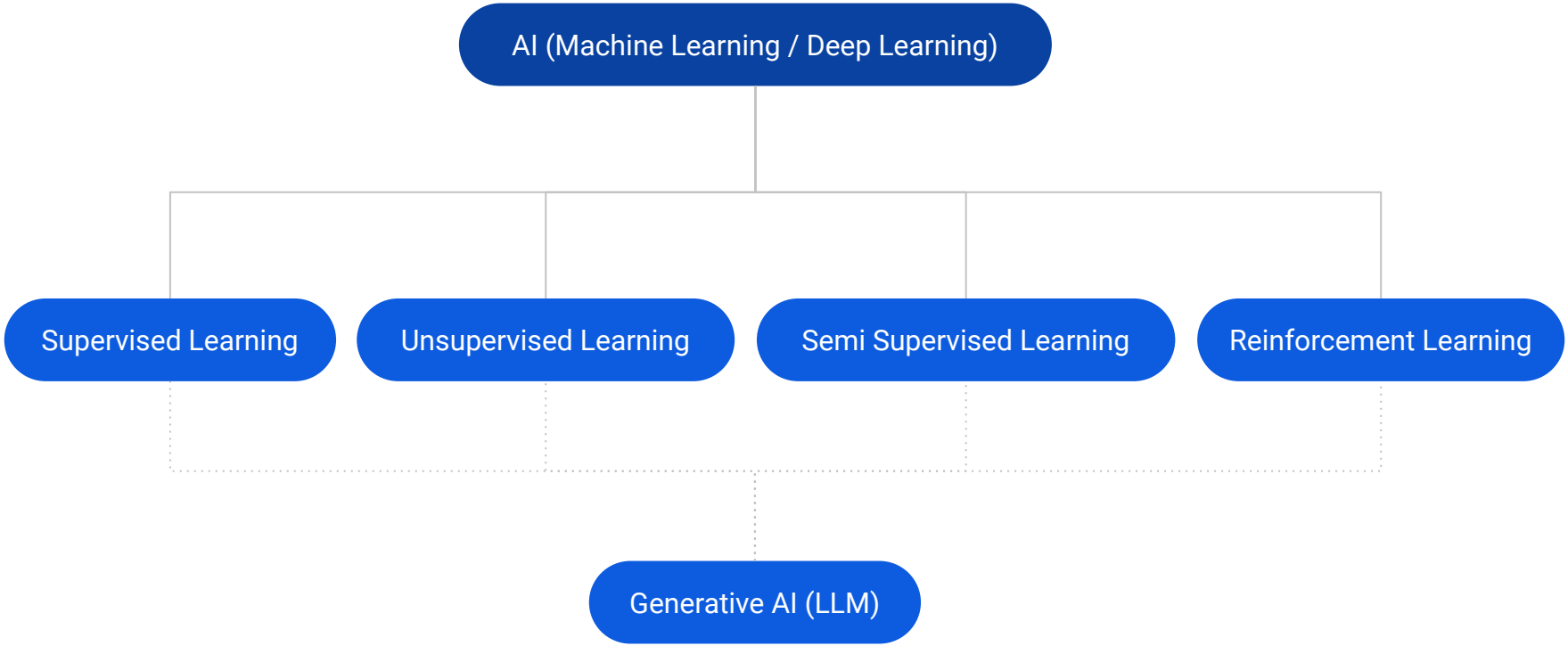

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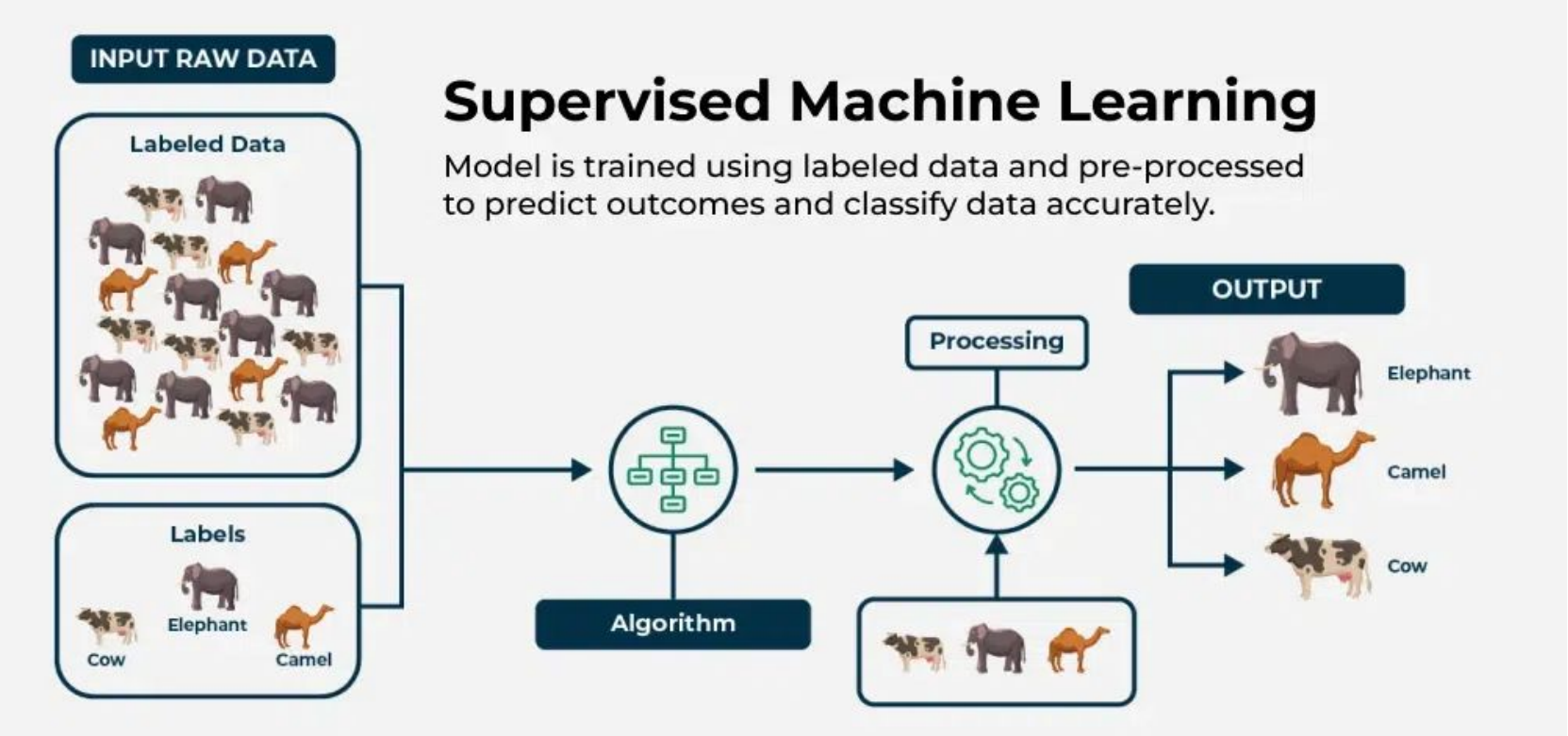

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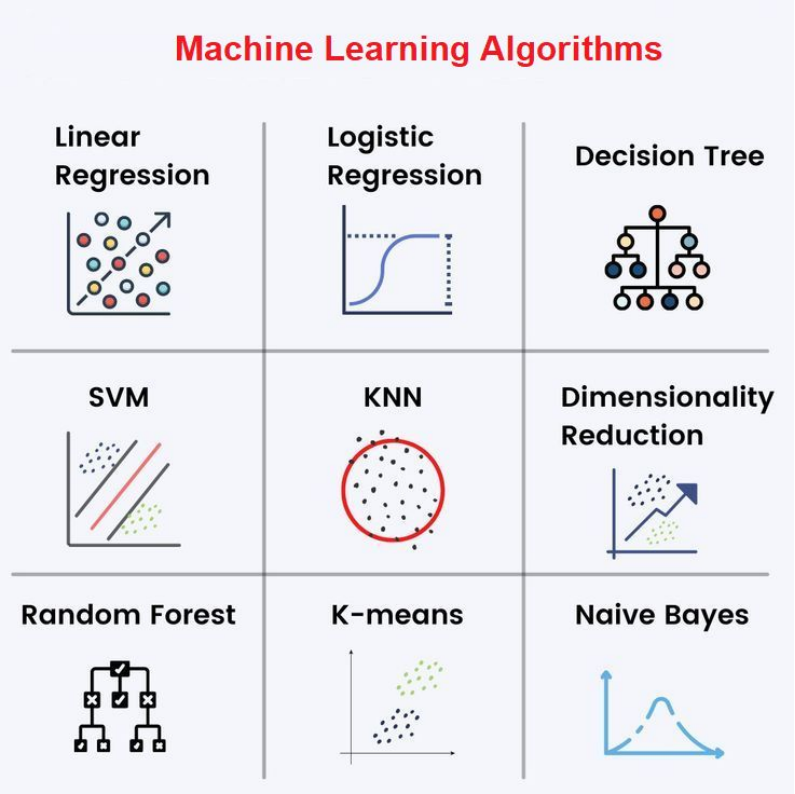

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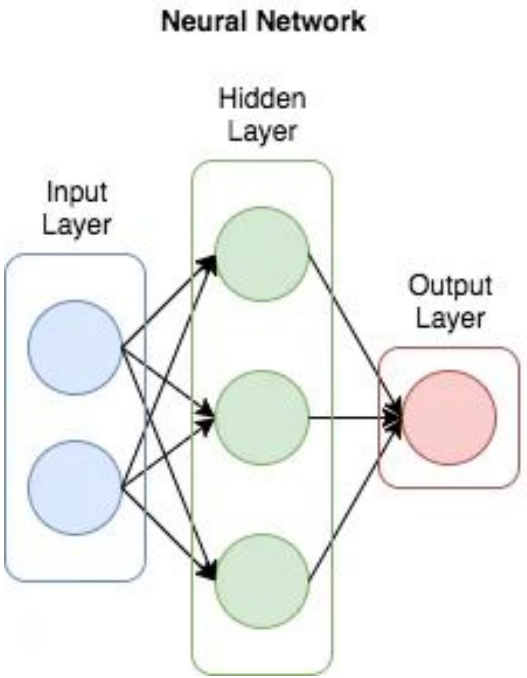

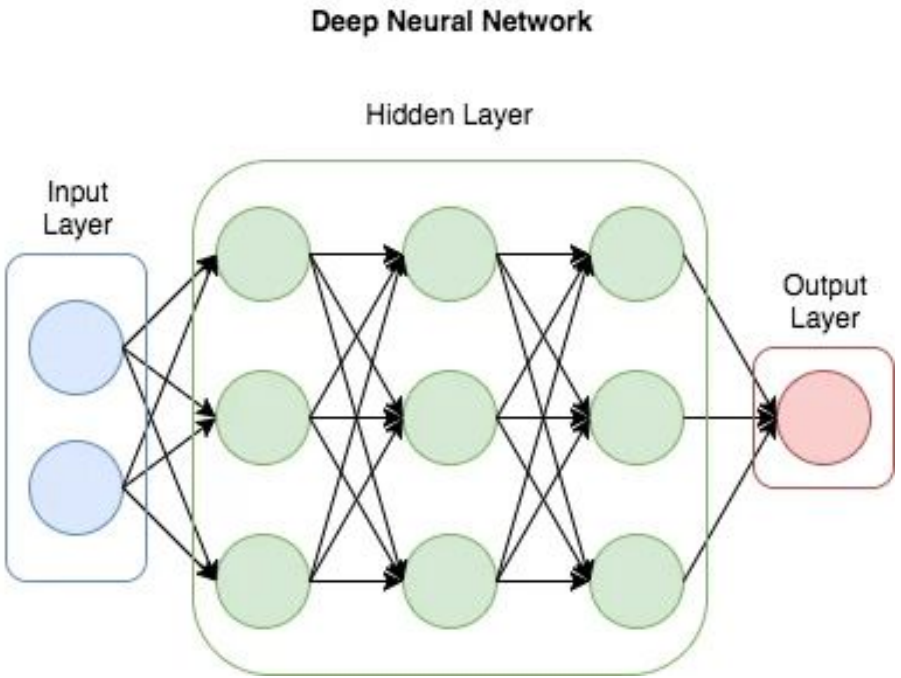

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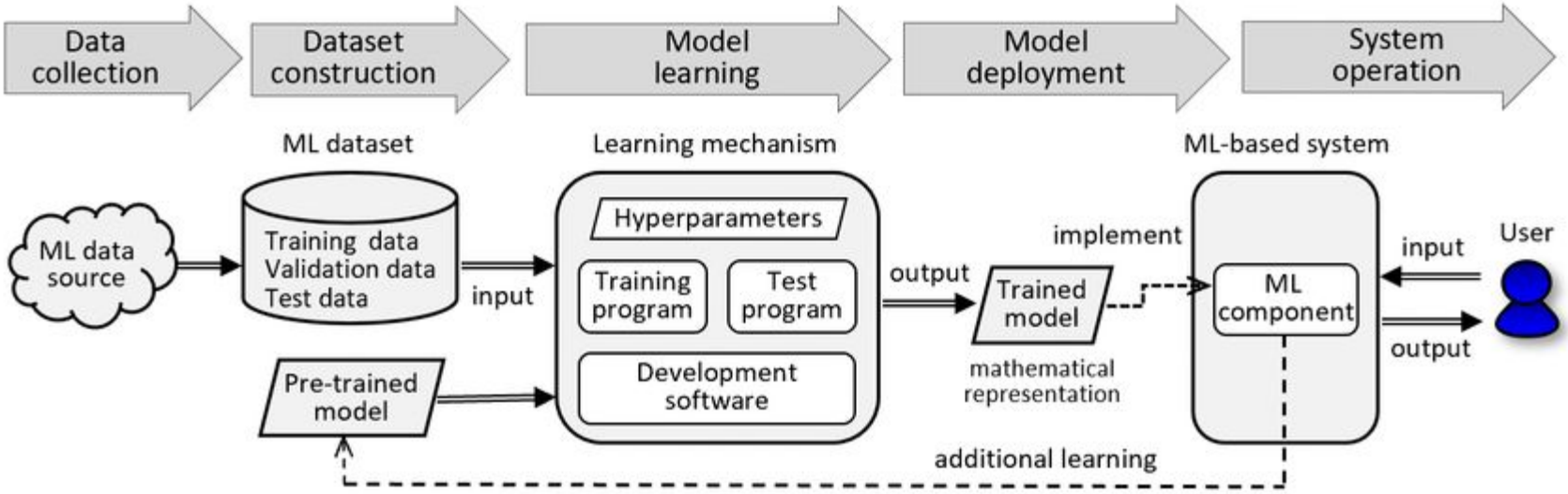
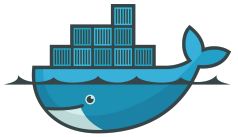


AI Development tools




elixir
julia
Mojo
pandas
matplotlib
jupyter


git

docker


PyTorch

TensorFlow



Streamlit

FastAPI

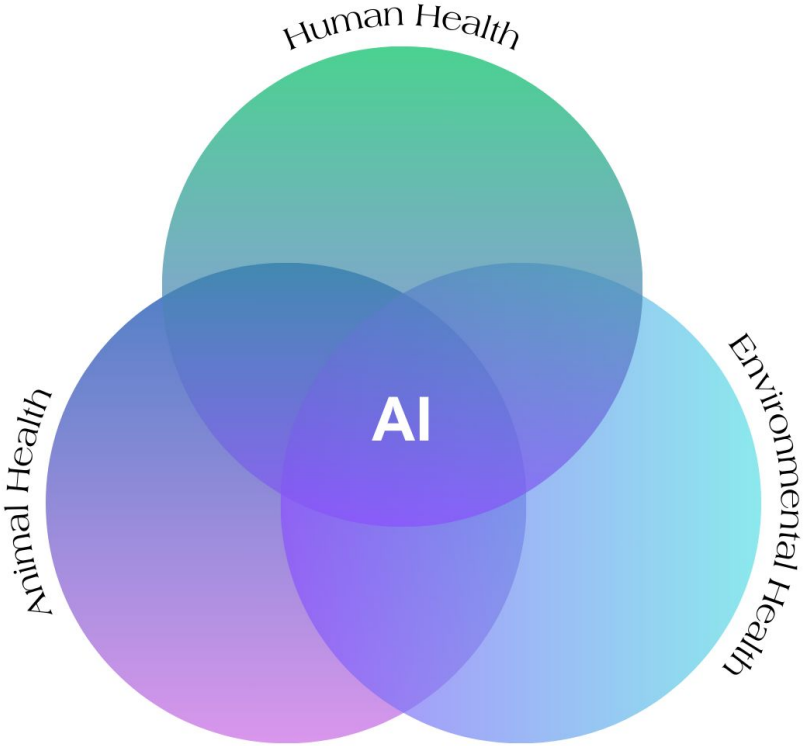
Conclusion

AI technologies, especially ML and deep learning, enable us to draw insights from complex, multi-source data and help make proactive decisions in One Health scenarios, such as anticipating disease outbreaks or understanding environmental health risks.

Let’s build our First AI Model

AI In One Health

How relevant is AI to One Health ?



One Health challenges, like zoonotic diseases, require an understanding of interactions across humans, animals, and the environment.

AI solutions can bridge these sectors by integrating data and generating insights that wouldn't be visible when analyzed separately.

How relevant is AI to One Health ?

- **Predictive Modeling**: AI can predict disease spread by analyzing animal migration, human population density, and environmental factors.
- **Surveillance Systems**: Real-time monitoring of animal and human health data to detect early signs of disease outbreaks.
- **Environmental Data Integration**: AI can assess environmental data (like air quality or water contamination) to anticipate health impacts on nearby human and animal populations.

How relevant is AI to One Health ?

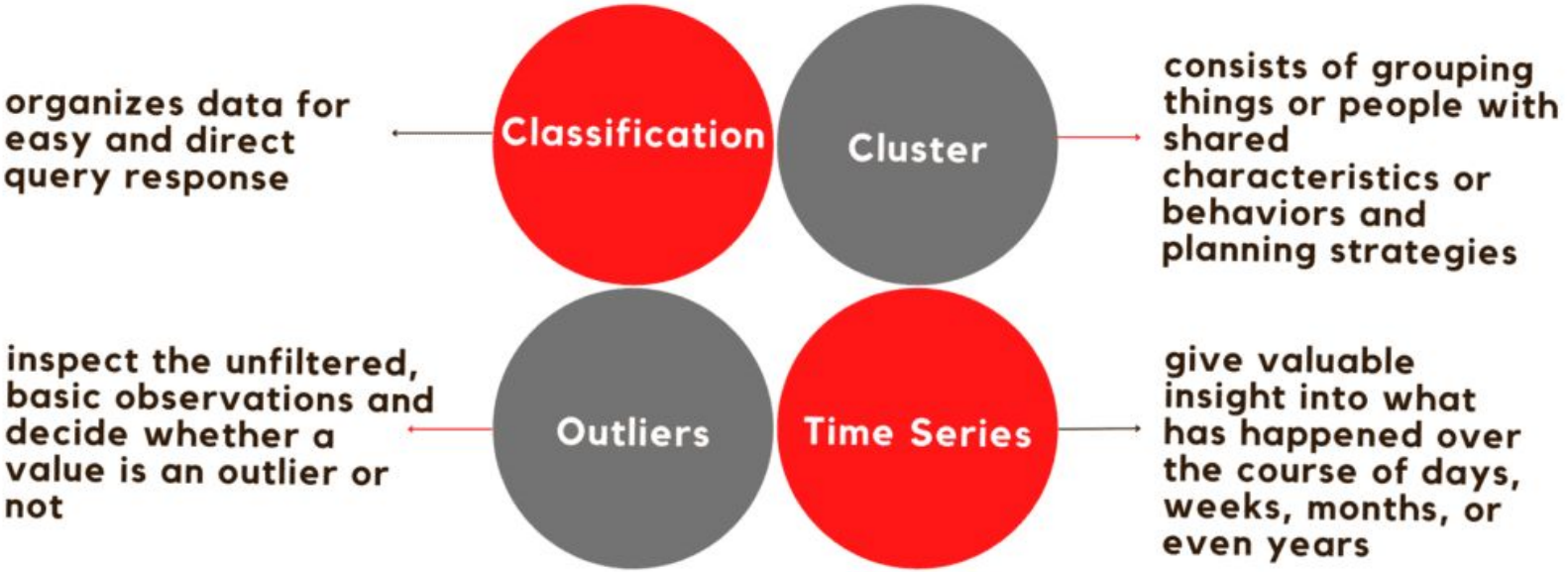
AI is crucial in One Health as it enables comprehensive, data-driven decisions that consider the interconnectedness of our health systems. By integrating data across sectors, we can improve health outcomes and respond to challenges more effectively.

What is Predictive Modeling?

Predictive modeling uses statistical and machine learning techniques to analyze historical data and make predictions about future outcomes.

- Helps anticipate disease outbreaks before they happen, enabling early response.
- Supports tracking zoonotic diseases that jump between animals and humans (e.g., avian flu, rabies).
- Can inform public health decisions by analyzing risk factors, such as population density, animal migration patterns, and environmental conditions.

What is Predictive Modeling ?



Use Cases of Predictive Modeling in One Health

Use Case 1: Predicting Zoonotic Disease Spread

Example: Predicting avian flu spread by analyzing bird migration, temperature, and human population density.

Impact: Enables early intervention, targeted vaccination, and informed public health advisories.

Use Case 2: Seasonal Disease Forecasting

Example: Predicting malaria outbreaks by using environmental factors like rainfall and humidity.

Impact: Optimizes resource allocation, such as mosquito net distribution, and health education campaigns.

What is Predictive Modeling?

Predictive modeling provides crucial foresight for health crises, allowing for proactive measures that can mitigate the impact on human, animal, and environmental health.

Predictive modeling in One Health offers actionable insights that can save lives by anticipating and mitigating health risks across species.

AI-Powered Real-Time Surveillance

AI-driven surveillance uses automated data collection and analysis to monitor health data across sectors continuously.

Real-time data processing allows for immediate detection of anomalies, such as disease outbreaks or environmental hazards.

AI models can trigger alerts based on patterns, helping authorities respond faster and prevent spread.

AI-Based Early Warning System

Description: An AI model monitoring both human and animal health records to detect disease symptoms (e.g., respiratory symptoms in livestock and humans).

Impact: Anomalies detected in real-time can alert health agencies, allowing for immediate containment measures.

AI-Powered Real-Time Surveillance

AI-driven surveillance enables a swift response to emerging health threats, preventing disease spread and enhancing public safety.

Real-Time Data Integration with AI

Real-time data integration is the process of gathering, analyzing, and visualizing data from various sources continuously.

Comprehensive Analysis: Enables health officials to view human, animal, and environmental health data together, which helps identify correlations and predict risks more accurately.

Enhanced Decision-Making: Real-time insights allow for more accurate and timely health interventions, optimizing resource allocation.

Use Case Example: AI for Integrated Health Insights

Description: A dashboard integrating data on air quality, animal infections, and human respiratory symptoms to provide health insights.

Impact: Real-time analysis allows health officials to anticipate and respond to environmental impacts on health proactively.

Real-Time Data Integration with AI

AI-driven real-time data integration helps create a holistic view of health risks, leading to well-rounded and proactive health interventions in One Health.

Thanks !

“AI won’t kill us, nor will it replace us. People who know how to use AI, will do.”

kaikai
ict4d and digital development

mail@kaikai.dev

Dakar, Senegal

www.kaikai.dev