AI explained

Iheb Brini

PhD student / CS engineer

12/11/2025

Plan

1. *Introduction*
2. *AI/ML*
3. *Applications*
4. *Responsible AI*
5. *Conclusion*

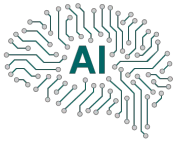
1. Introduction

PhD Topic:

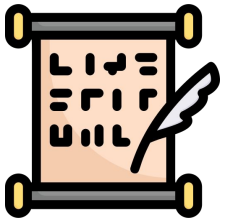
Explainable deep models for archival document image analysis.

(Explicabilité des modèles profonds pour l’analyse des images de documents)

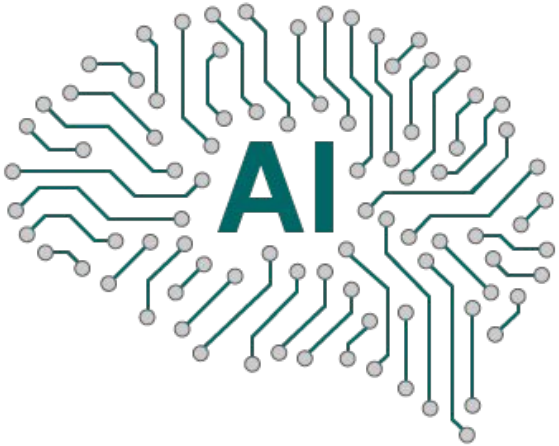
1. Introduction



Explainable deep models for archival document image analysis.



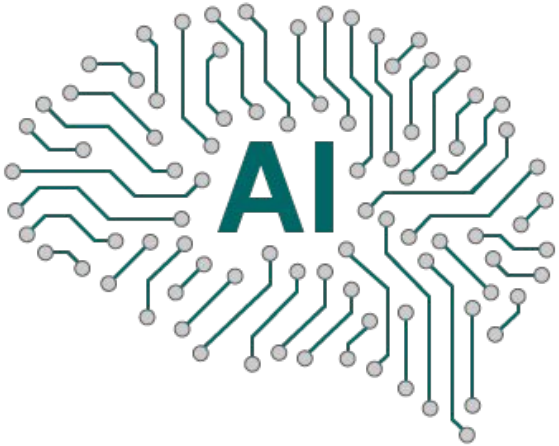
2. AI/ML



Computer systems capable of performing tasks that usually require **human intelligence**.

The aim is to simulate human-like intelligence in machines to enable them to **learn**, **reason** and **make decisions**.

2. AI/ML

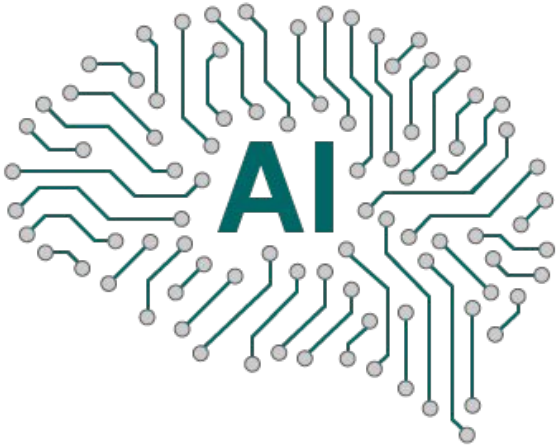


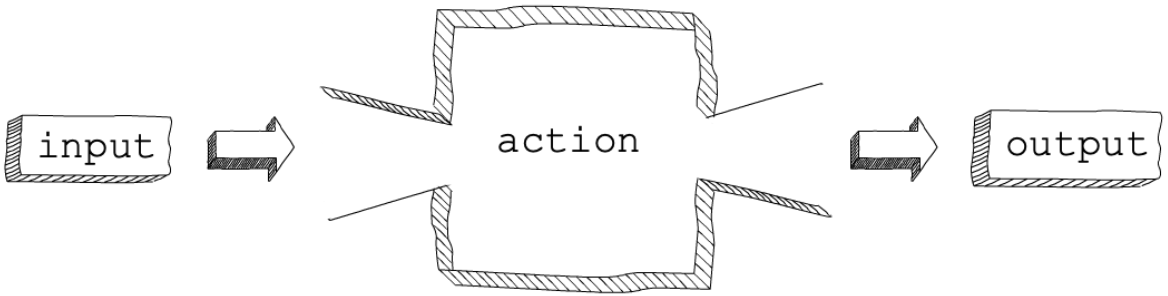
Computer systems capable of performing tasks that usually require **human intelligence**.

The aim is to simulate human-like intelligence in machines to enable them to **learn**, **reason** and **make decisions**.

" The ~~devil~~ math is in the details! "

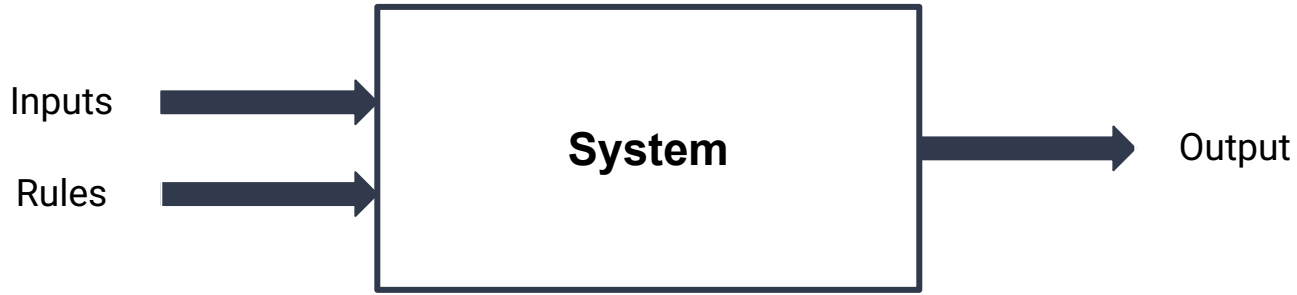
2. AI/ML



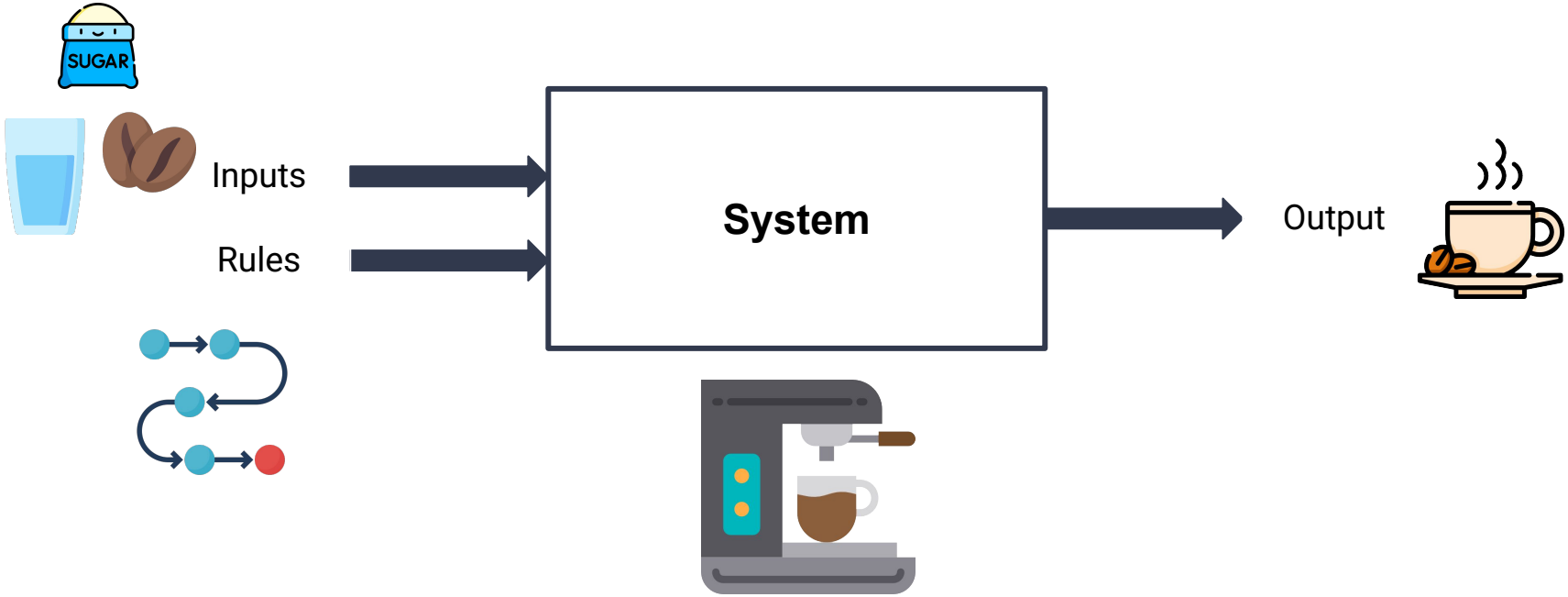


Model = Mathematical representation

Intelligent system



Intelligent system



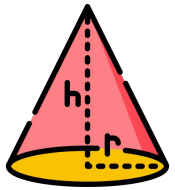
Intelligent system

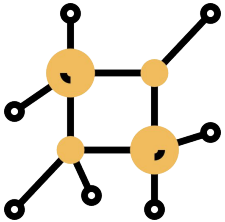
Inputs

Output

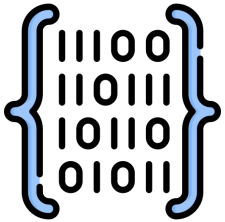
Label: Cat

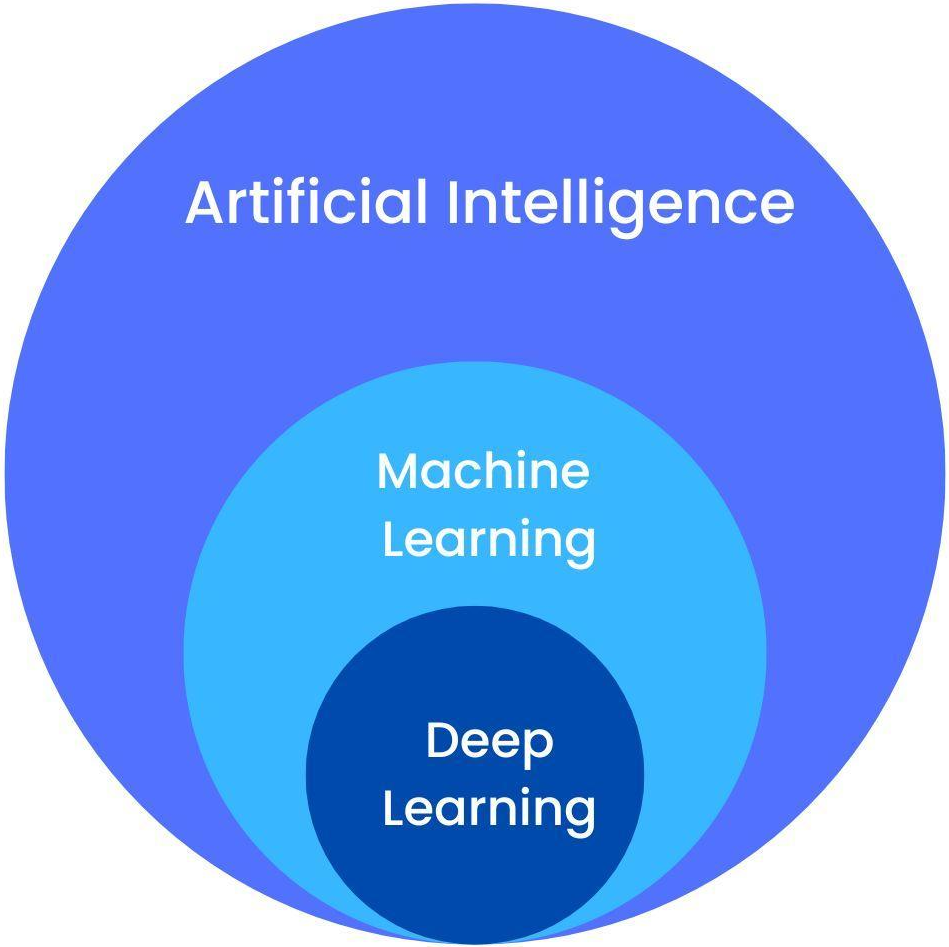
Intelligent system



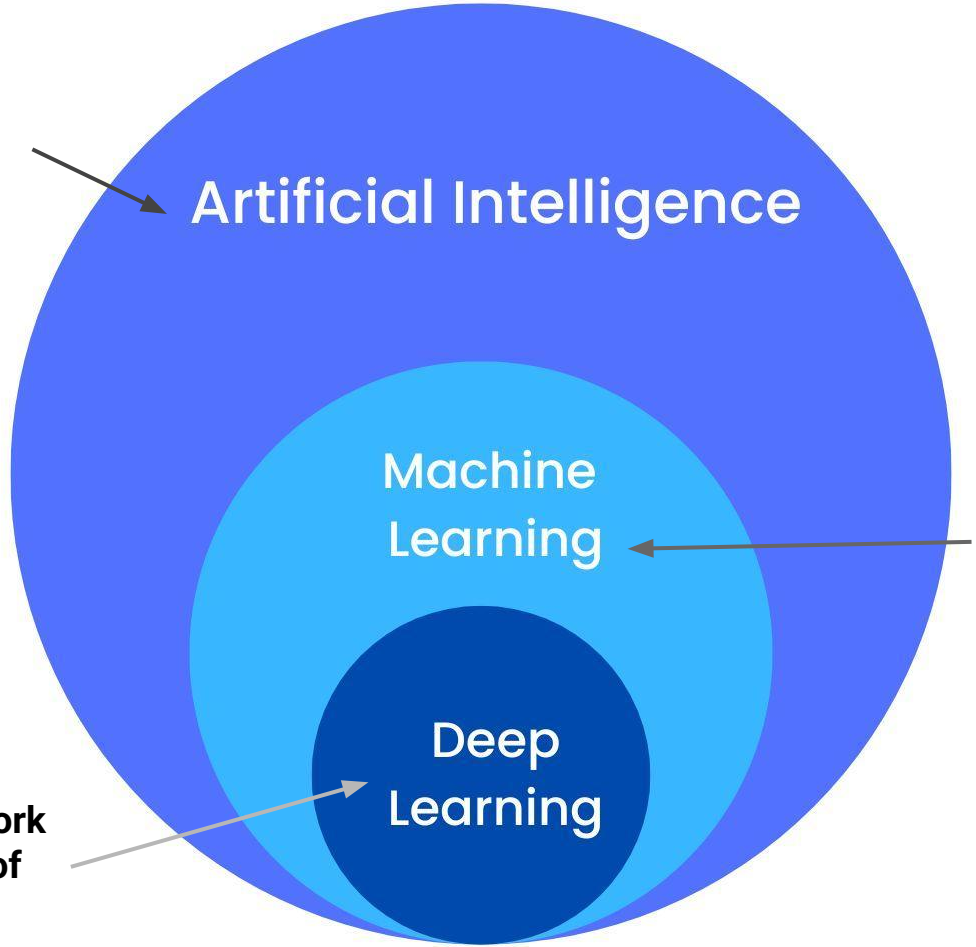


Rules




Artificial Intelligence
Machine Learning
Deep Learning

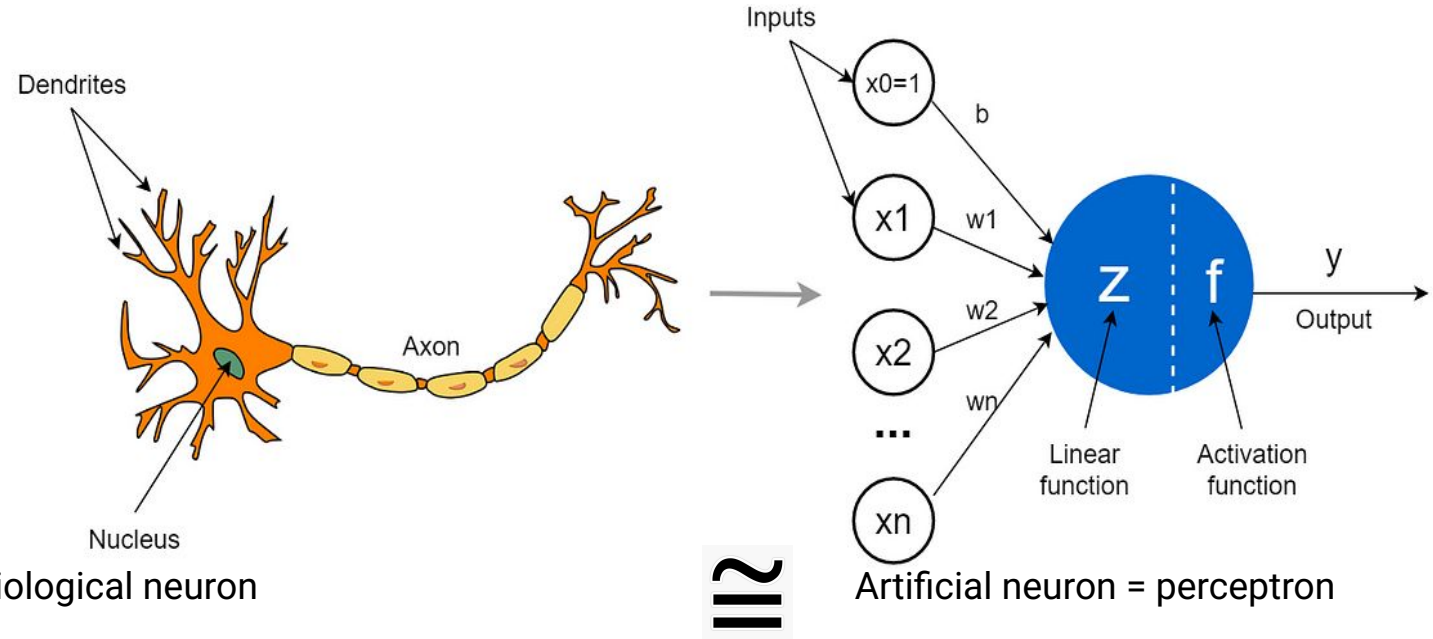
Intelligence + decision making



Ability to **learn** from **data**

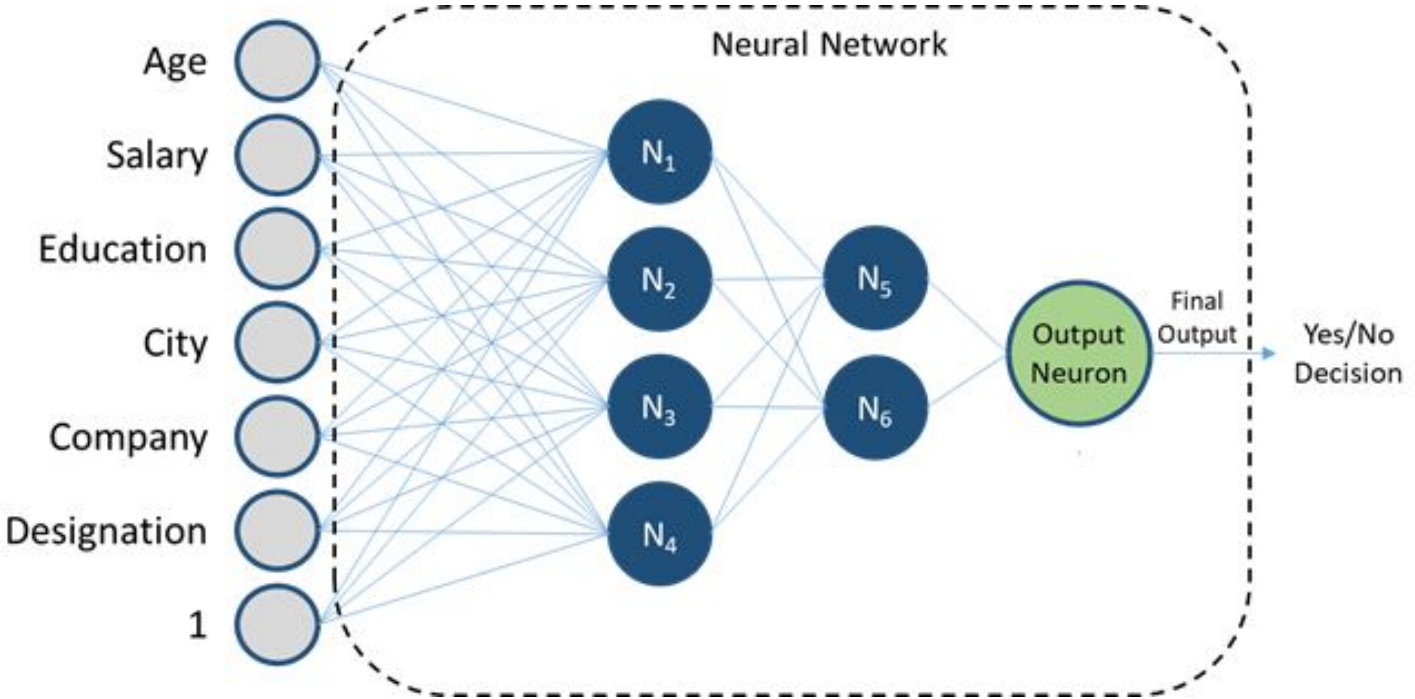
Based on Neural network + Large amount of data

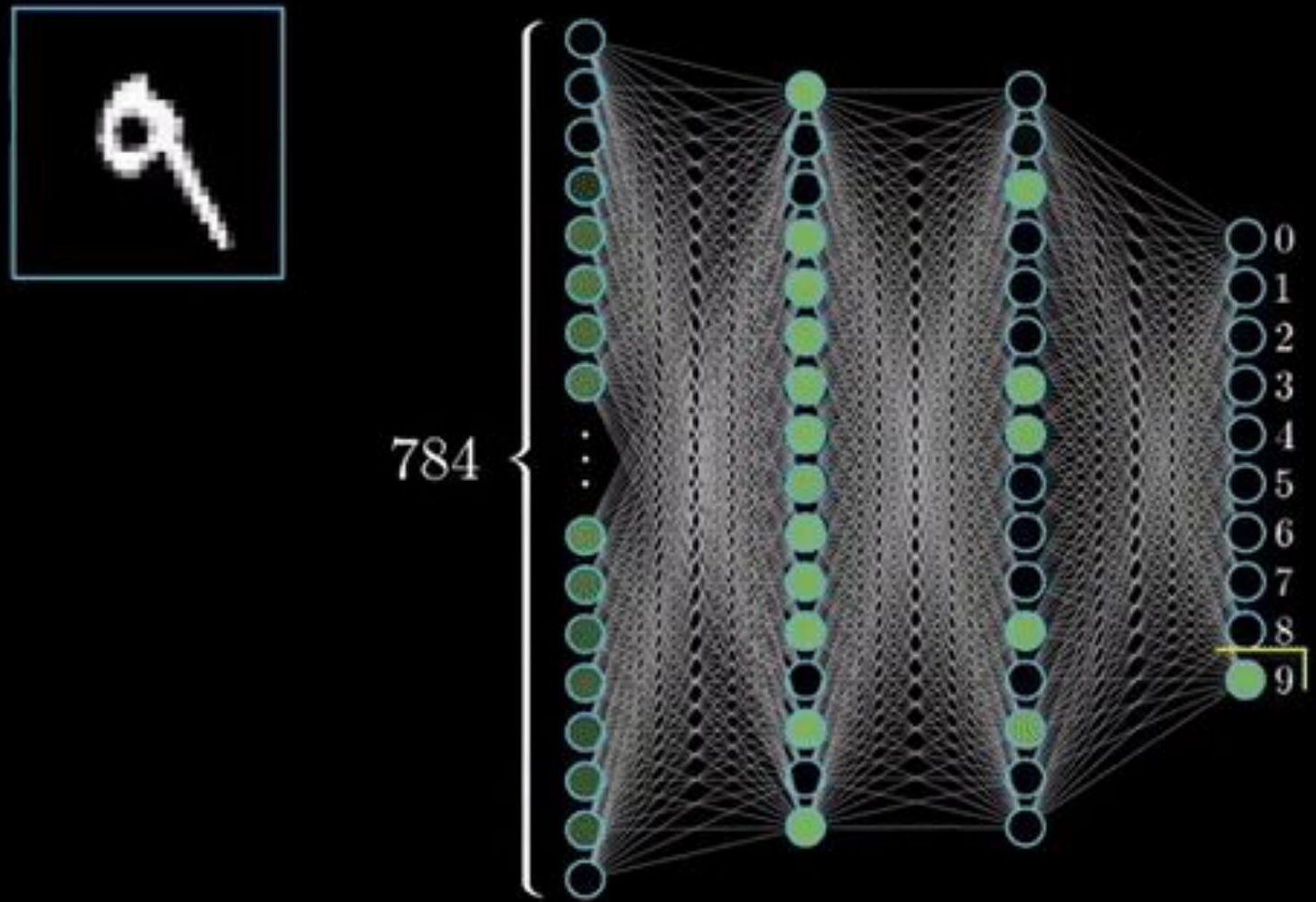
2. AI/ML: Neural network



biological neuron ≈ Artificial neuron = perceptron

2. AI/ML: Neural network



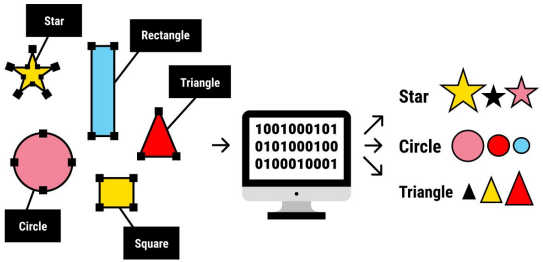

784
0
1
2
3
4
5
6
7
8
9

How does a ML model learning anyway ?

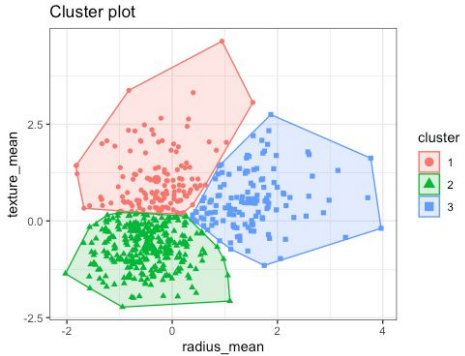
2. AI/ML

Types of learning

Supervised learning



unsupervised learning

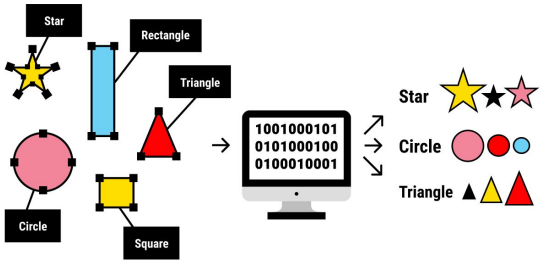


Reinforcement learning

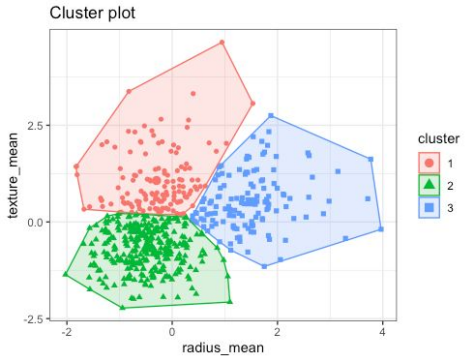
2. AI/ML

Types of learning

Supervised learning

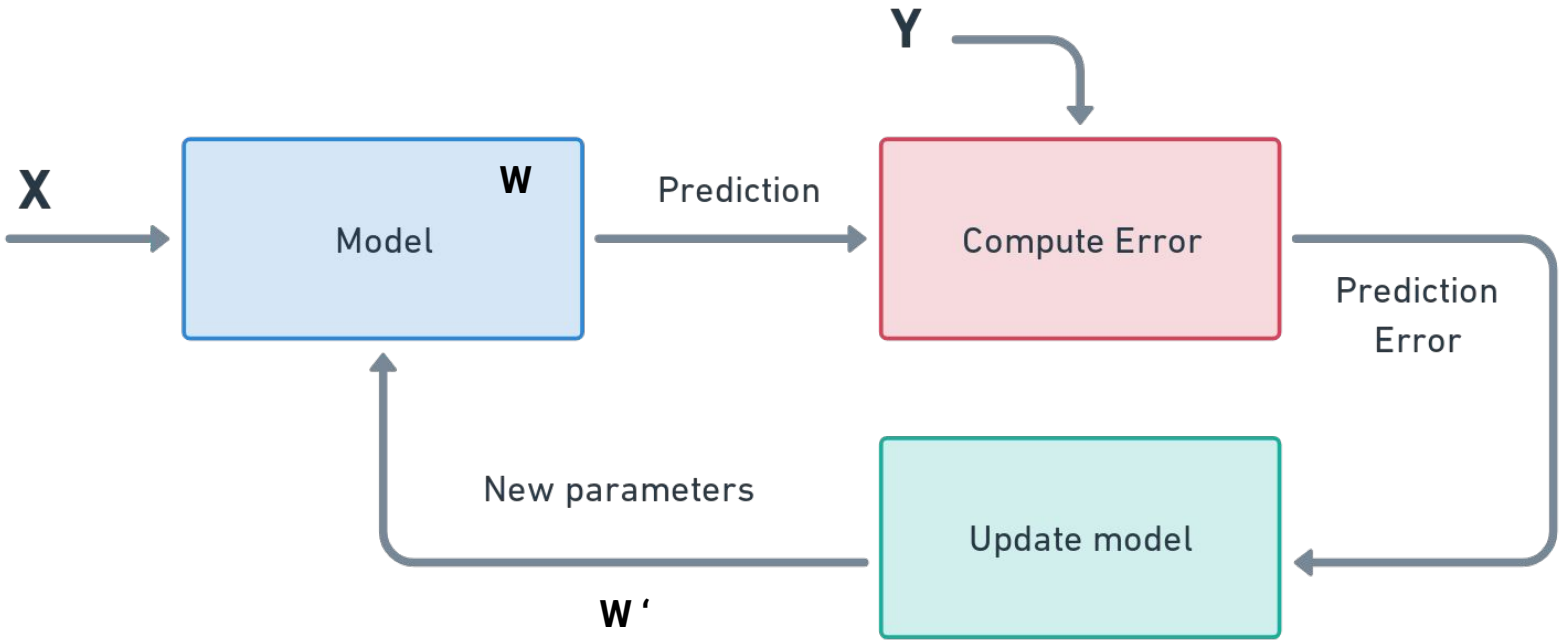


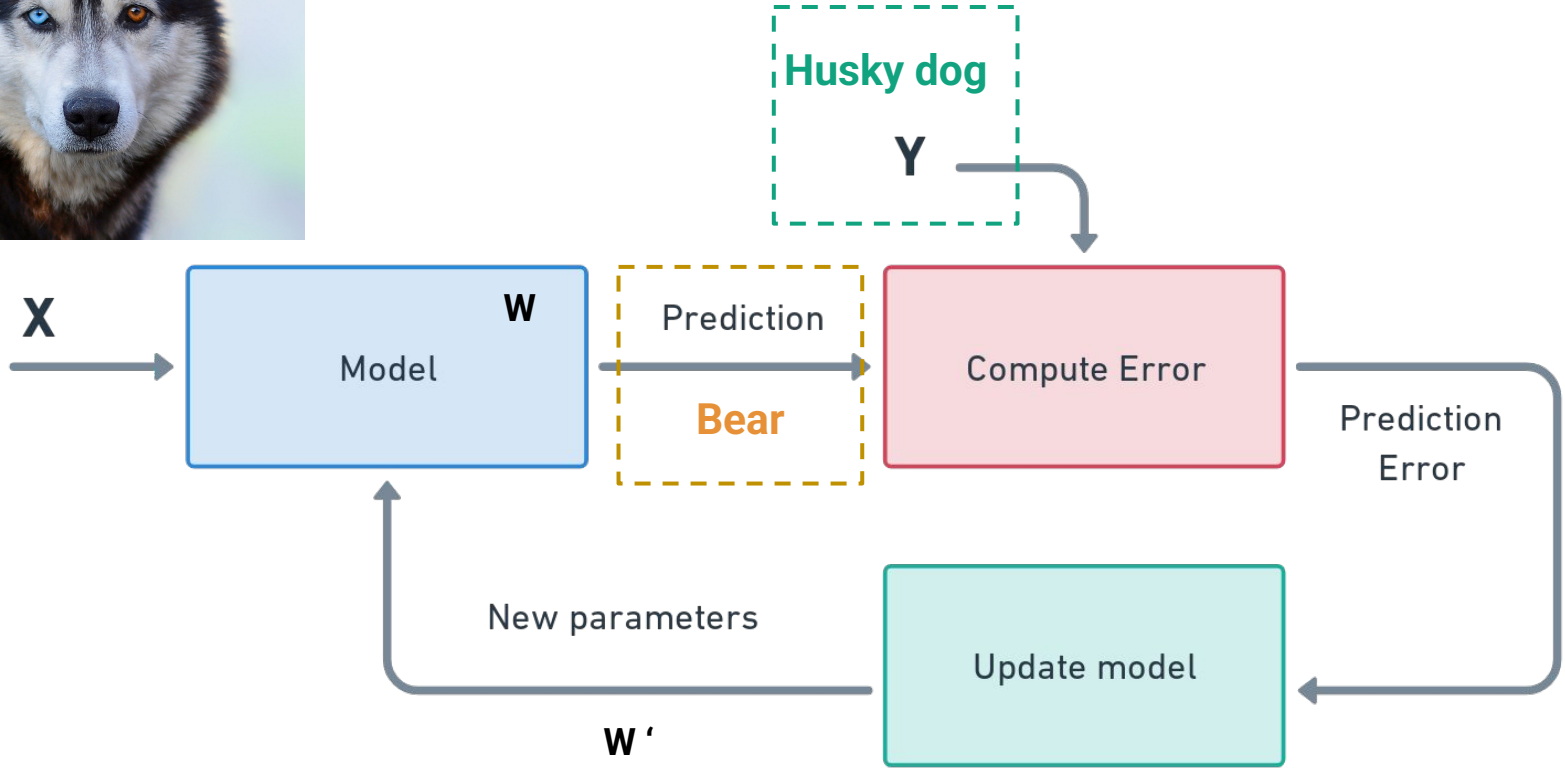
unsupervised learning



Reinforcement learning

Model Training pipeline (Supervised learning)



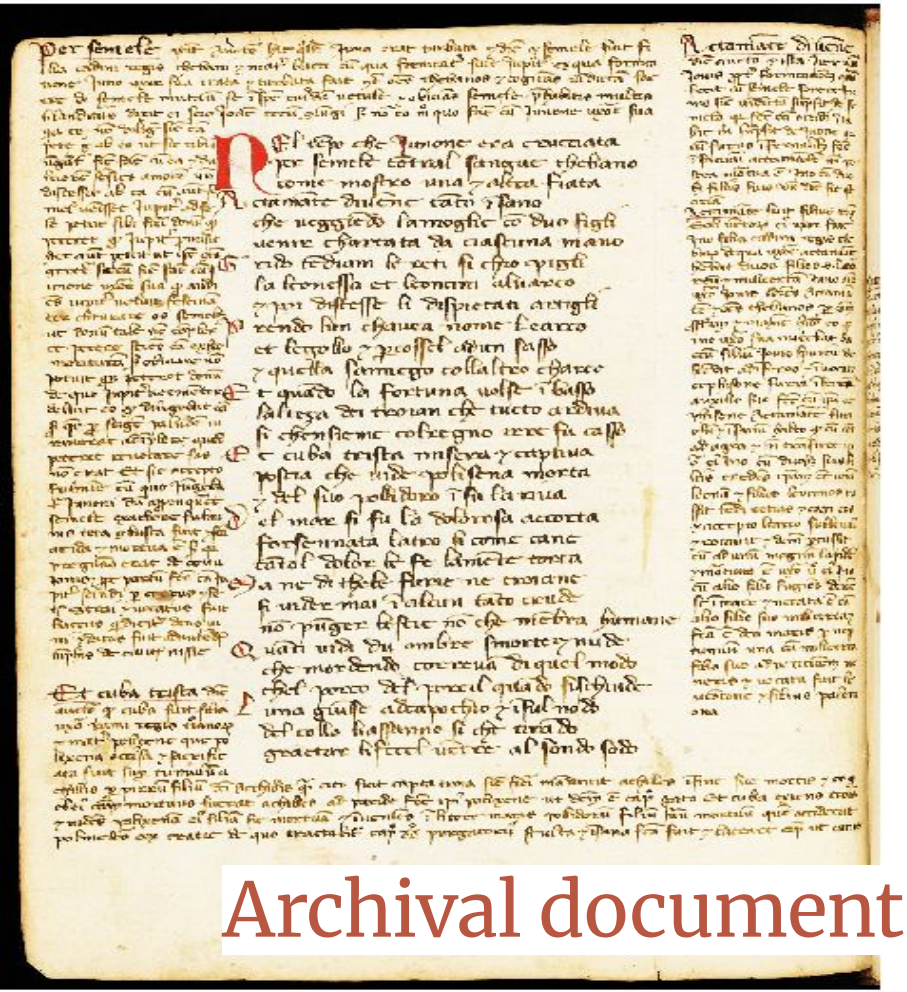

Husky dog
Y
X
Model
W
Prediction
Bear
Compute Error
Prediction
Error
New parameters
W '
Update model

Voice-to-text transcription

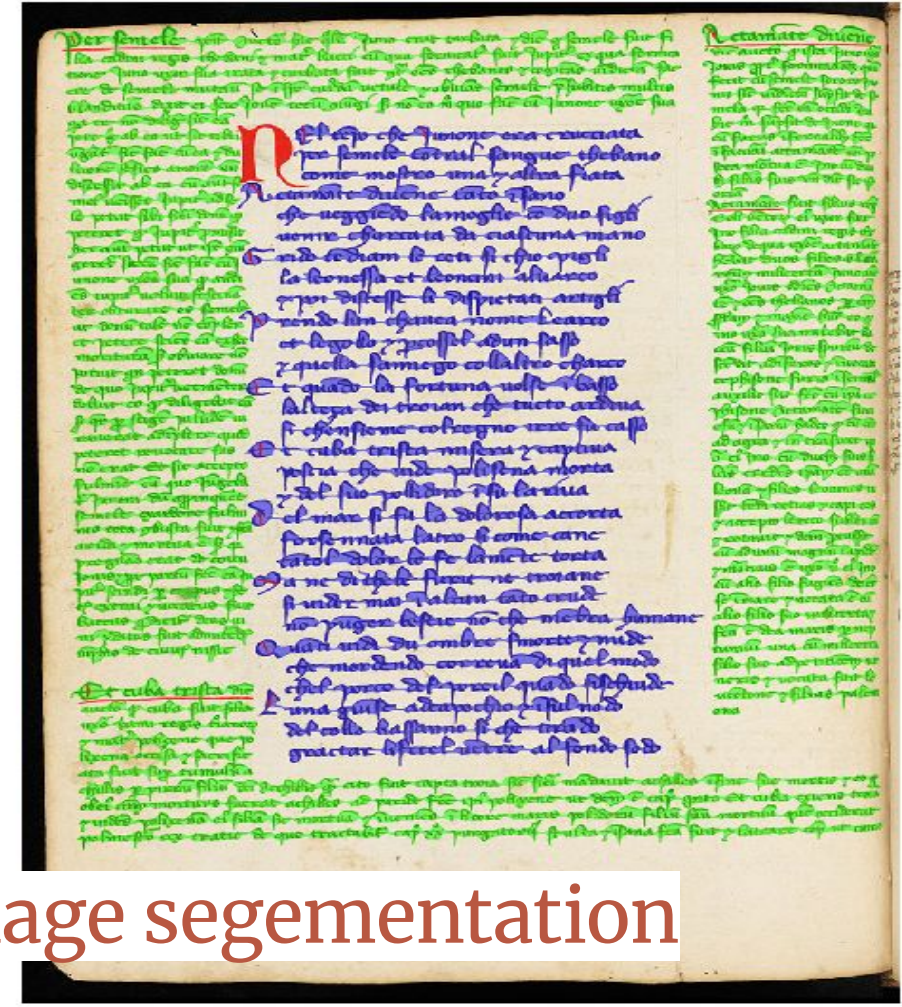
Recommendation system

Image restoration

Image segmentation



(a) Original image.

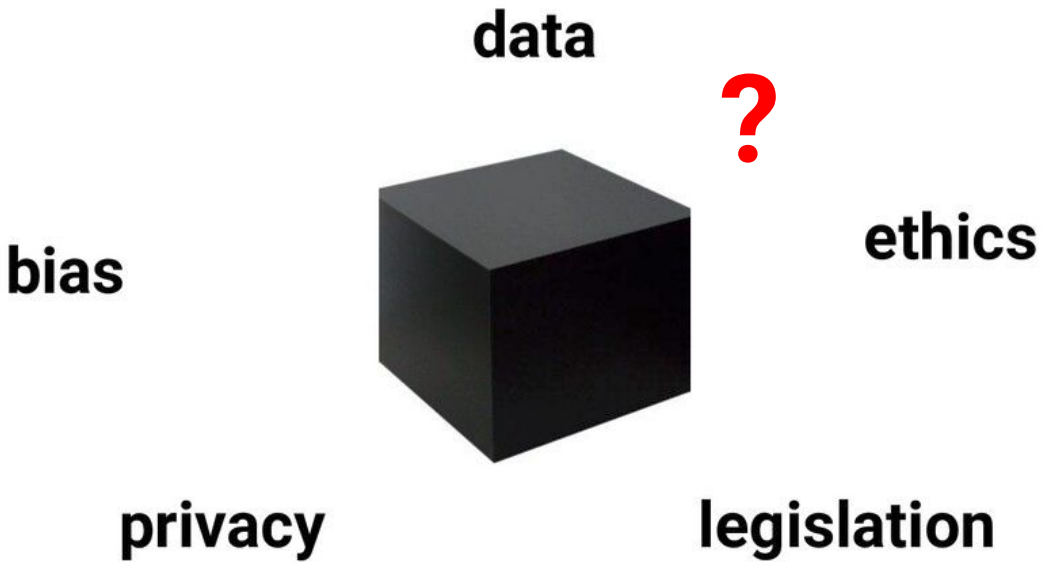


(b) Segmentation result.

Archival document image segementation

Text generation

4. Responsible AI

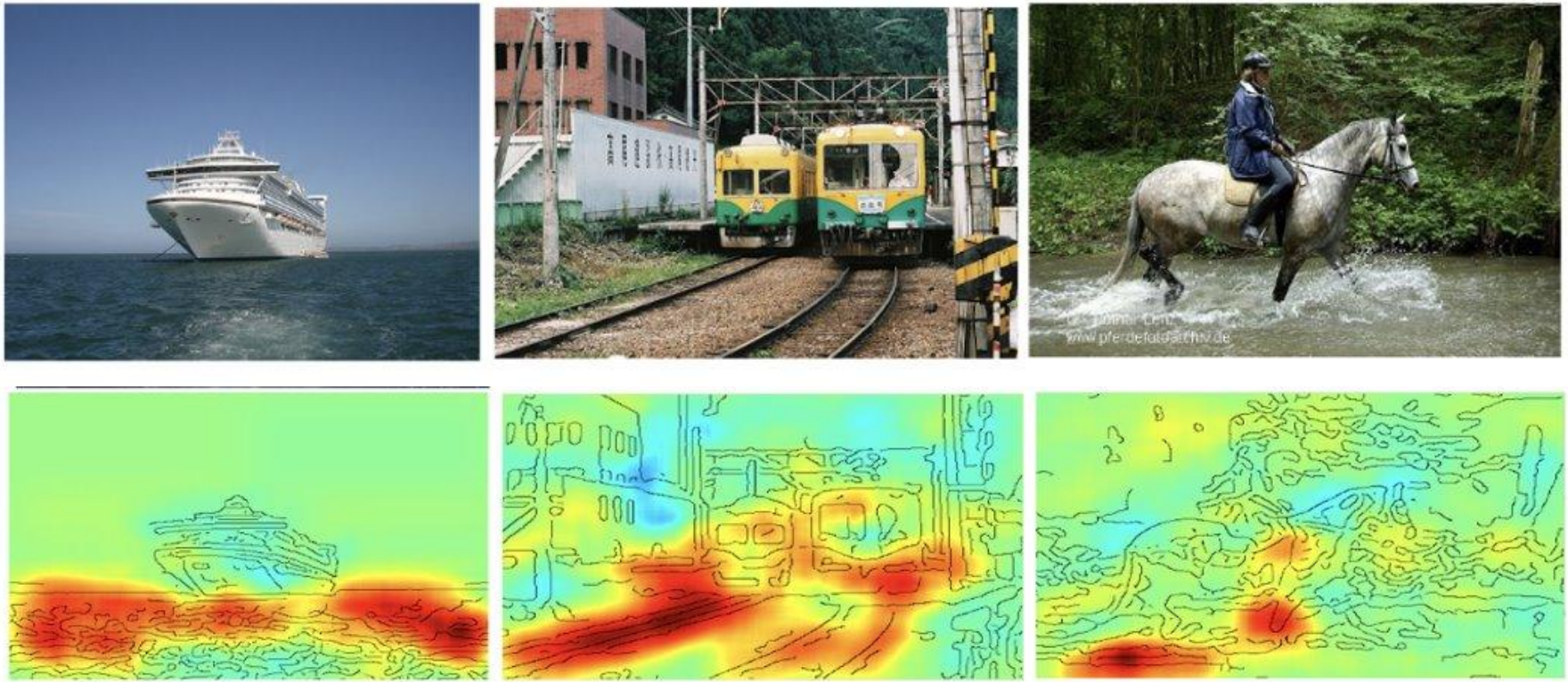


AI and trust

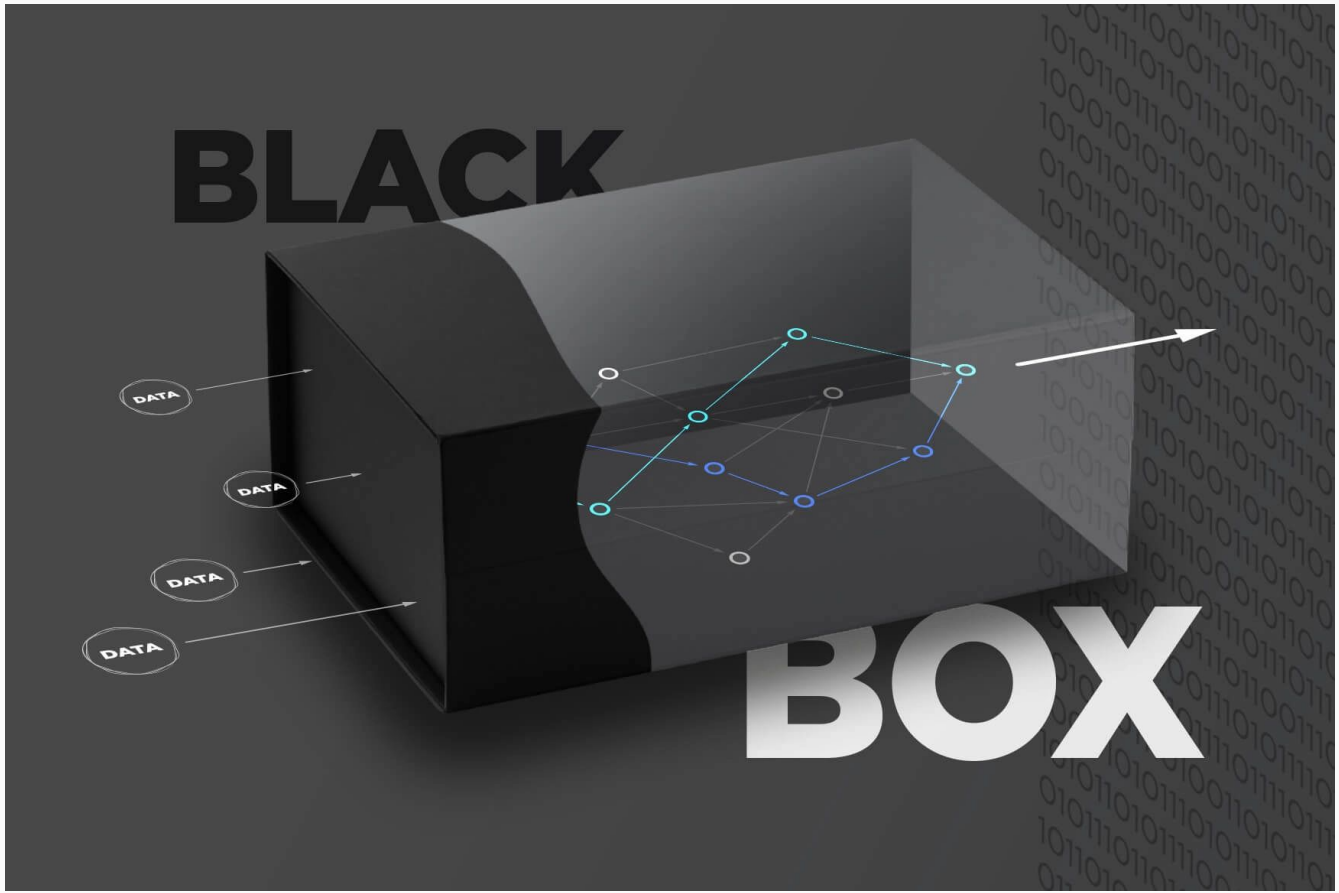
Leading method (Fisher-Vector / SVM Model) of PASCAL VOC challenge

AI and trust

Leading method (Fisher-Vector / SVM Model) of PASCAL VOC challenge

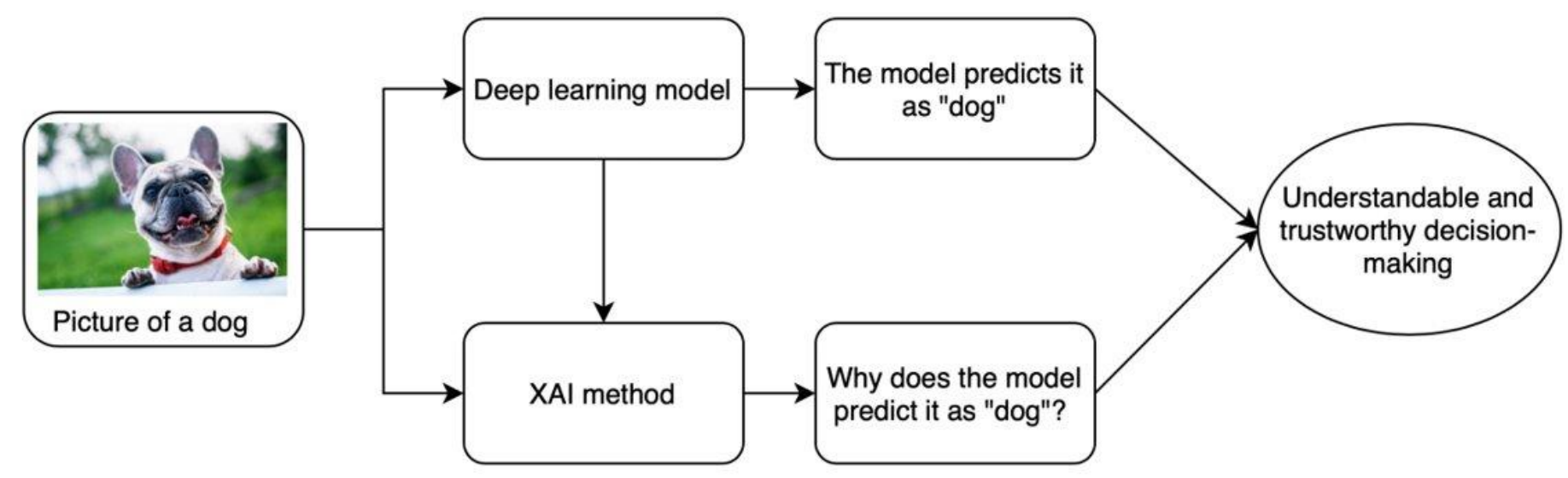


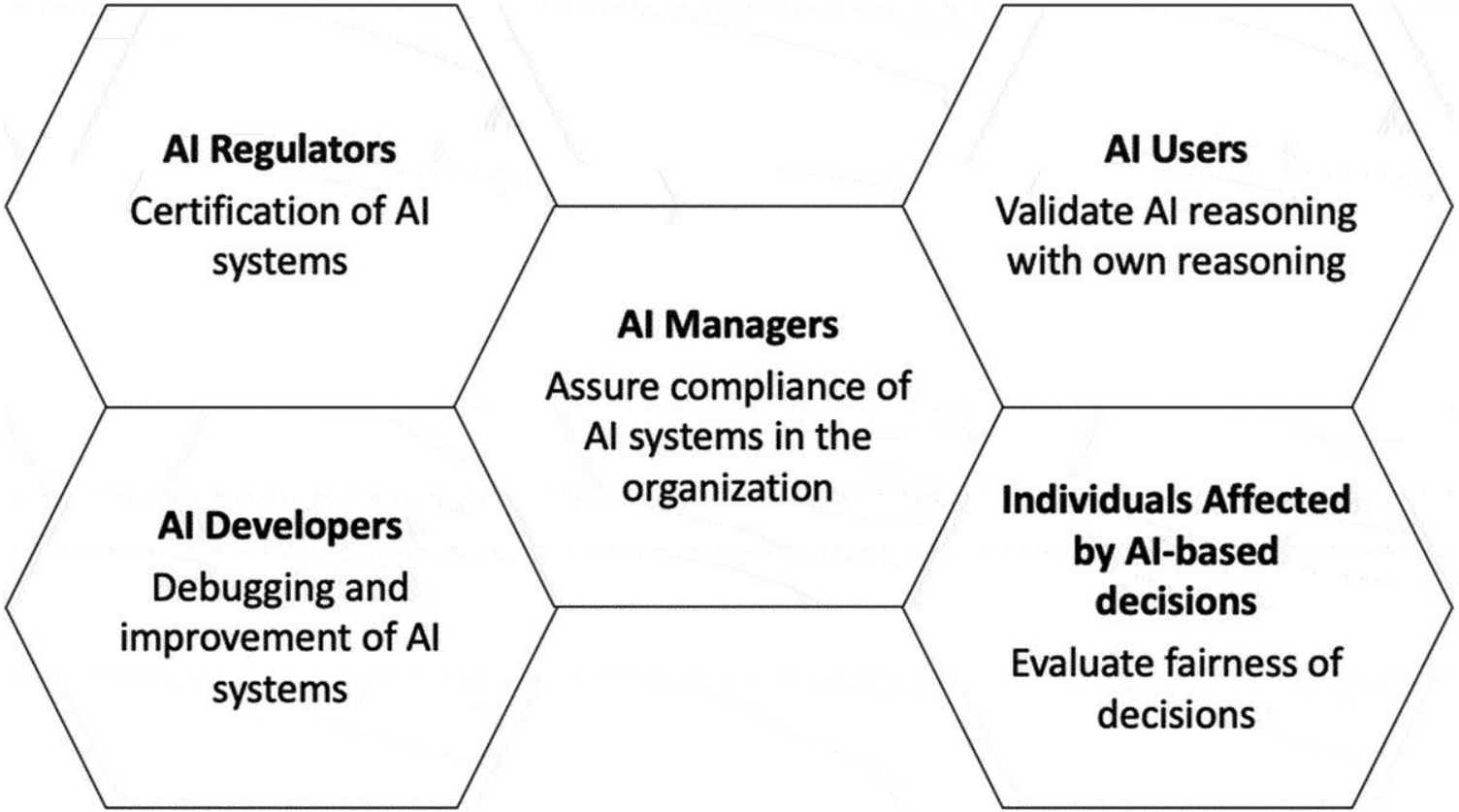
AI and trust



- Transparency
- Trust
- ….

Need for AI regulation : XAI



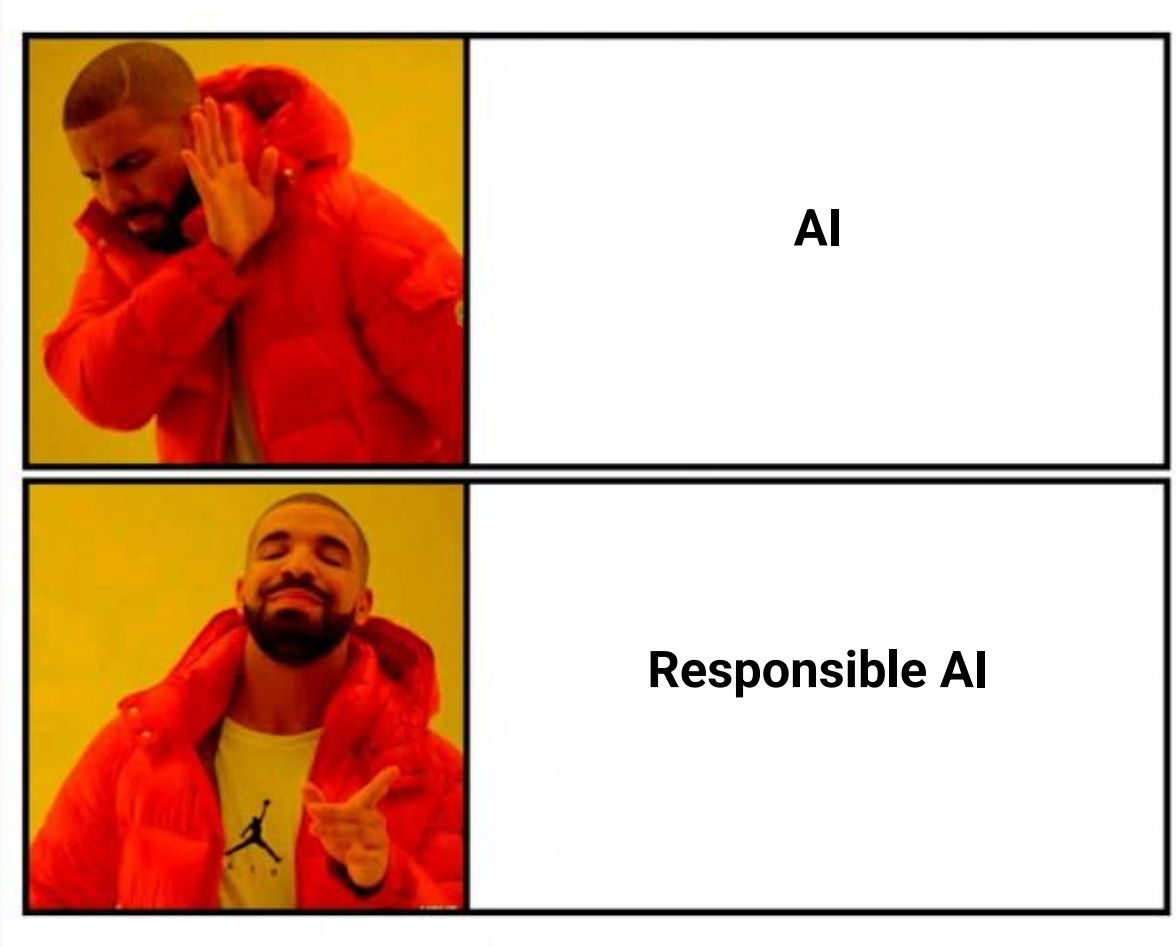

AI Regulators
Certification of AI systems
AI Users
Validate AI reasoning with own reasoning
AI Managers
Assure compliance of AI systems in the organization
AI Developers
Debugging and improvement of AI systems
Individuals Affected by AI-based decisions
Evaluate fairness of decisions

5. Conclusion

- ML system learns from data
- **ML** = **Optimization problem** (Math) + **Computer program**
- Complex System = black box
- XAI is must not a trend

Recommendations

1. Dive into deep learning : https://d2l.ai/
2. Interpretable machine learning book: https://christophm.github.io/interpretable-ml-book/


AI
Responsible AI