

How to Make Machines Learn

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ARTIFICIAL INTELLIGENCE (AI)

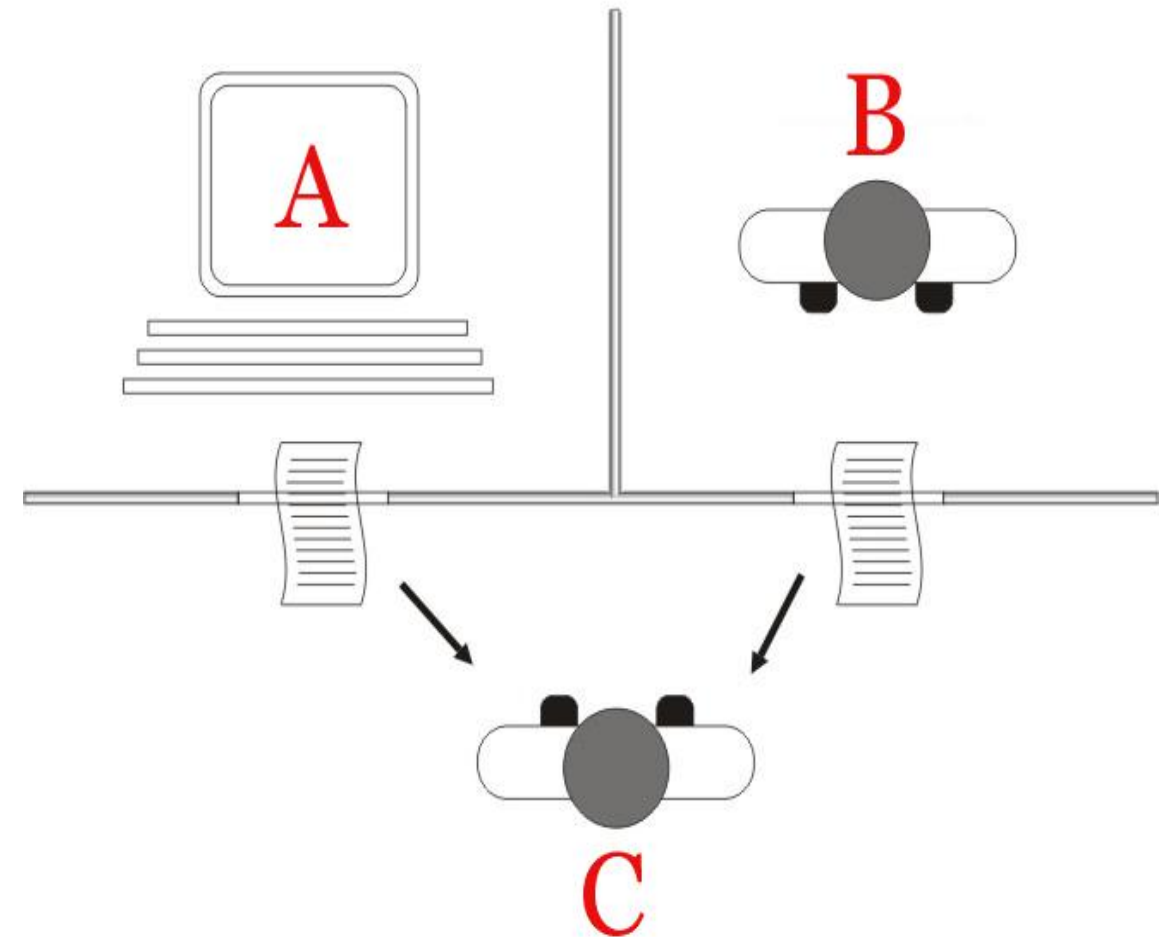
- Definition & History
- Turing Test
- Applications of AI
- Branches

ARTIFICIAL INTELLIGENCE - DEFINITION

- A way to make machines think and behave intelligently.
- Science of finding theories and methodologies that can help machines understand the world and accordingly react to situations in the same way that humans do.

ARTIFICIAL INTELLIGENCE - TURING TEST

The "standard interpretation" of the Turing Test, in which player C, the interrogator, is given the task of trying to determine which player – A or B – is a computer and which is a human. The interrogator is limited to using the responses to written questions to make the determination.



ARTIFICIAL INTELLIGENCE - Applications

- Computer Vision
- Natural Language Processing
- Speech Recognition
- Expert Systems
- Games
- Robotics

ARTIFICIAL INTELLIGENCE - Branches

- Machine learning and pattern recognition
- Logic-based AI
- Search
- Knowledge representation
- Planning
- Heuristics
- Genetic programming

MACHINE LEARNING

"To learn Machine Learning, be a learning machine"
(Hazem Khaled, 2017)

MACHINE LEARNING

- Definition
- Relationship with AI & Data Science
- Types
- Components
- Technical Examples
- Deep Learning
- 7 steps for Machine Learning
- How to Start?

MACHINE LEARNING - Definition

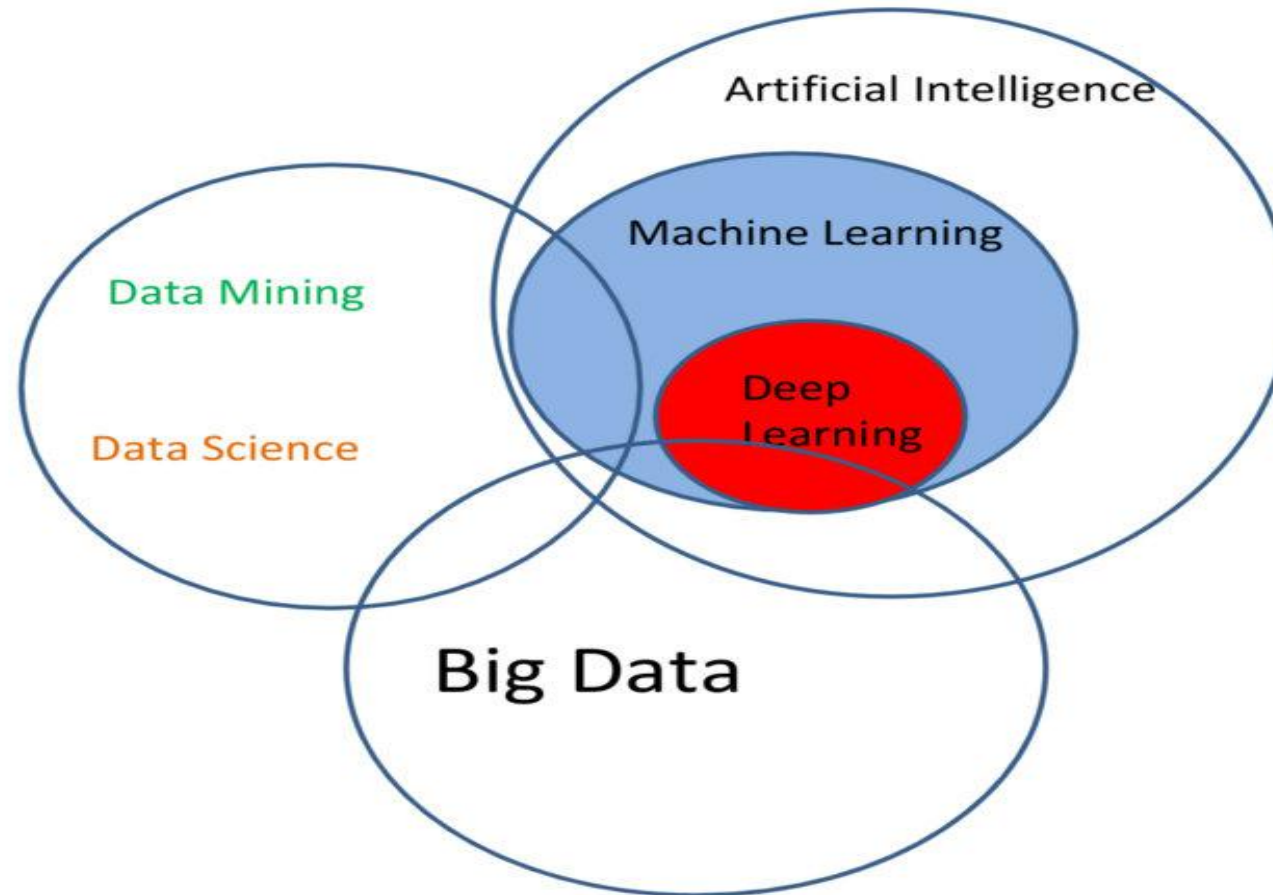
The field of computer science that gives computers the ability to learn without being explicitly programmed.

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T , as measured by P , improves with experience E ."

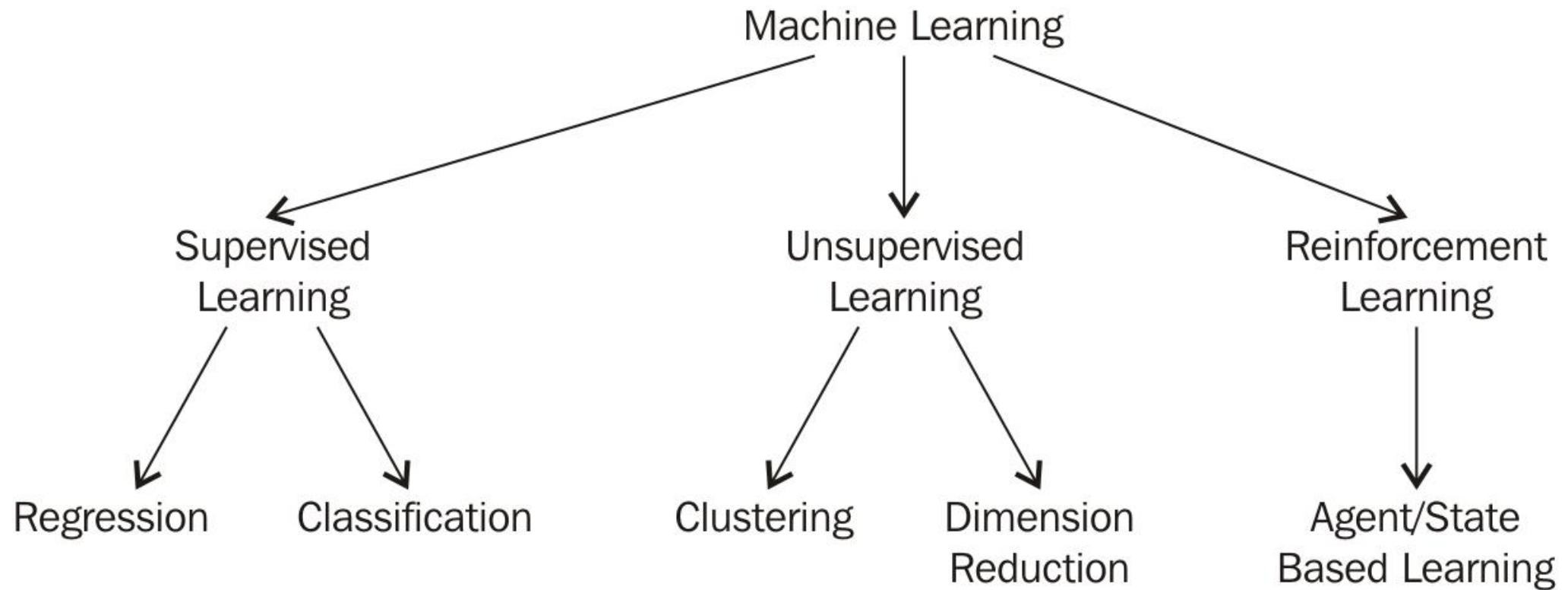
(Tom M. Mitchell)

MACHINE LEARNING

Relationship with AI & Data Science



MACHINE LEARNING - Types



MACHINE LEARNING - Types

- *Supervised learning* algorithm takes a known set of input data and known responses to the data (output) and trains a model to generate reasonable predictions for the response to new data.

Pros:

- It can make future predictions
- It can quantify relationships between predictors and response variables
- It can show us how variables affect each other and how much

Cons:

- It requires labeled data (which can be difficult to get)

MACHINE LEARNING - Types

- *Unsupervised learning* finds hidden patterns or intrinsic structures in data.

Pros:

- It can find groups of data points that behave similarly that a human would never have noted
- It can be a preprocessing step for supervised learning
- It can use unlabeled data, which is much easier to find

Cons:

- It has zero predictive power
- It can be hard to determine if we are on the right track
- It relies much more on human interpretation

MACHINE LEARNING - Types

- *Reinforcement learning* algorithms get to choose an action in an environment and then are rewarded (positively or negatively) for choosing this action.

Pros:

- Very complicated rewards systems create very complicated AI systems
- It can learn in almost any environment, including our own Earth.

Cons:

- The agent is erratic at first and makes many terrible choices before realizing that these choices have negative rewards
- It can take a while before the agent avoids decisions altogether
- The agent might play it safe and only choose one action and be "too afraid" to try anything else for fear of being punished

MACHINE LEARNING - Components

Machine learning systems are made up of three major parts, which are:

- **Model:** the system that makes predictions or identifications.
- **Parameters:** the signals or factors used by the model to form its decisions.
- **Learner:** the system that adjusts the parameters — and in turn the model — by looking at differences in predictions versus actual outcome.

MACHINE LEARNING - Components

"Gradient descent" or "Gradient learning"

It means that the system makes those little adjustments over and over, until it gets things right

MACHINE LEARNING - Example

- **Regression Problems**
House Price Prediction
- **Classification Problems**
Cat Image Classifier

MACHINE LEARNING IN PRACTICE

7 steps of Machine Learning:

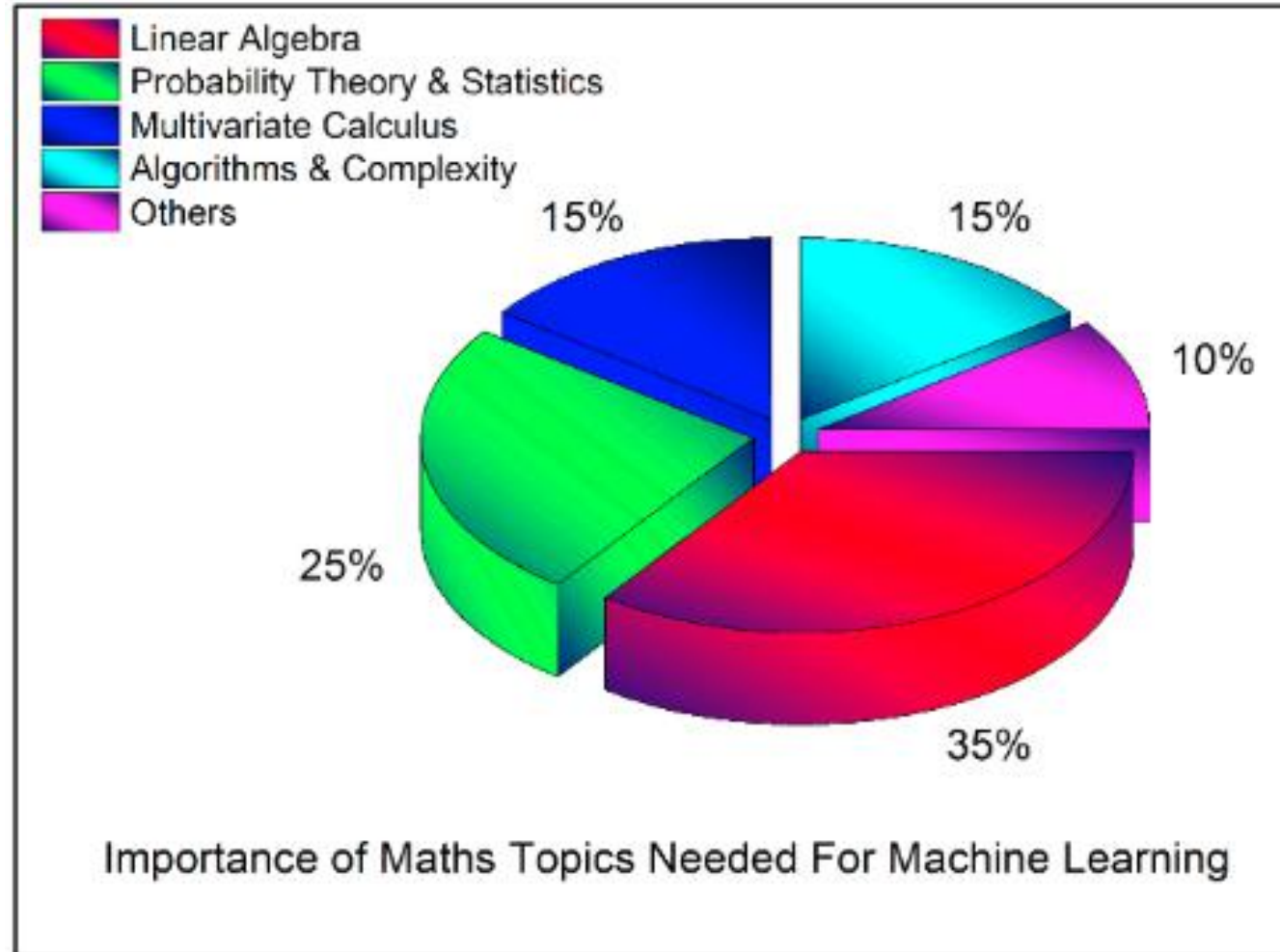
1. Gathering data
2. Preparing data
3. Choosing a model
4. Training
5. Evaluation
6. Hyperparameter tuning
7. Prediction

MACHINE LEARNING - Maths

Why Worry About The Maths?

1. Selecting the right algorithm which includes giving considerations to accuracy, training time, model complexity, number of parameters and number of features.
2. Choosing parameter settings and validation strategies.
3. Identifying underfitting and overfitting by understanding the Bias-Variance tradeoff.
4. Estimating the right confidence interval and uncertainty.

MACHINE LEARNING - Maths



MACHINE LEARNING

How to Start?

MACHINE LEARNING

AI/ML Community

Arabic Content



**THANK
YOU**