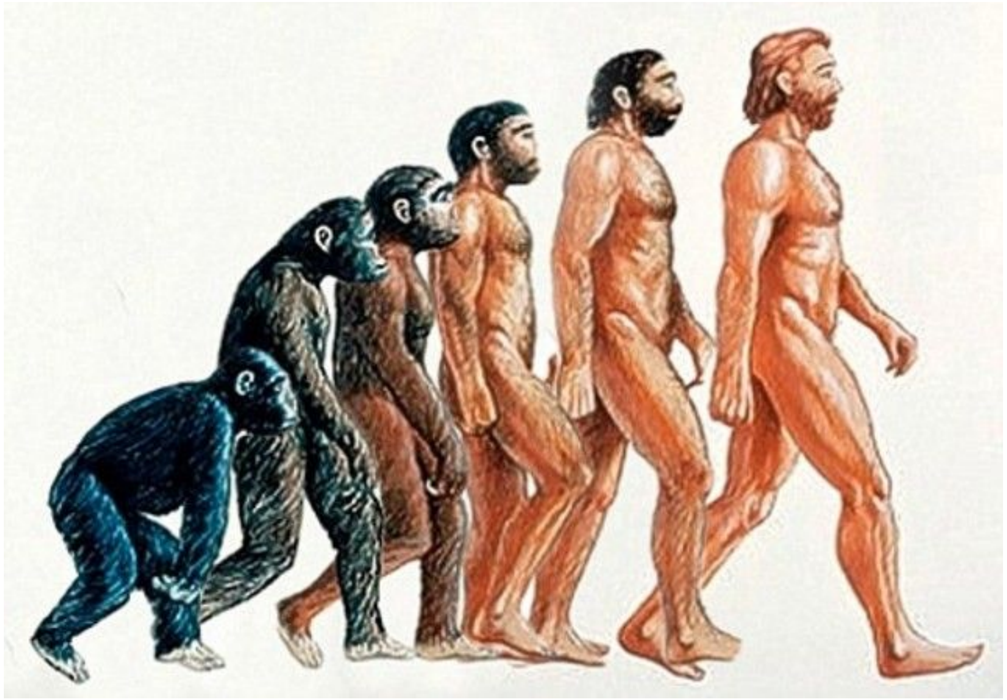
Google Developer Student Clubs

Introduction to AI / ML

The first steps in the universal field of AI

By GDSC ML Department

Why AI? (1)



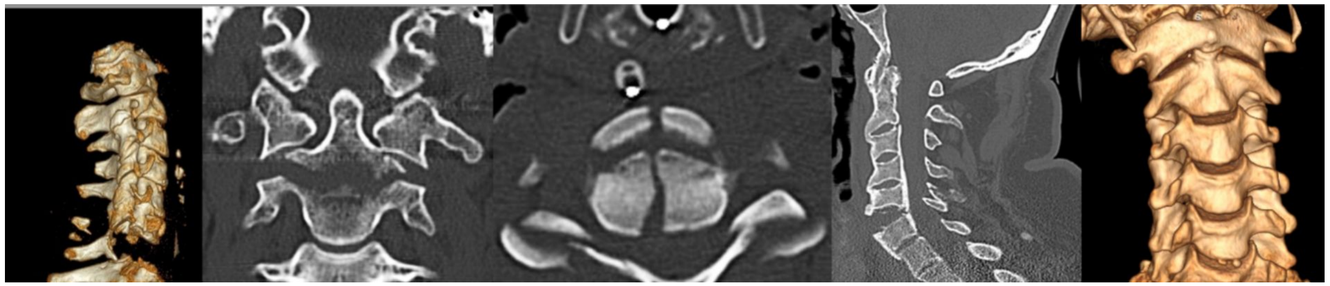
The evolution of homosapiens

Definition from Encyclopedia Britannica | Britannica

Homo sapiens, (Latin: “wise man”) the species to which all modern human beings belong.

We value our **intelligence**.

Why AI? (2)



RSNA 2022 Cervical Spine Fracture Detection | Kaggle

Jason Allen's A.I.-generated work, "Théâtre D'opéra Spatial," took first place in the digital category at the Colorado State Fair.

Stockfish: the highest rated chess engine

Google Developer Student Clubs

The history of AI

The **Turing Test** by Alan Turing

Artificial Intelligence used by John McCarthy in a conference.

General Problem Solver by Allen Newell and Herbert Simon

Self-Driving car (STANLEY) wins DARPA

1950 1952 1956 1959 1961 1997 2005 2011

The Samuel Checkers-playing Program

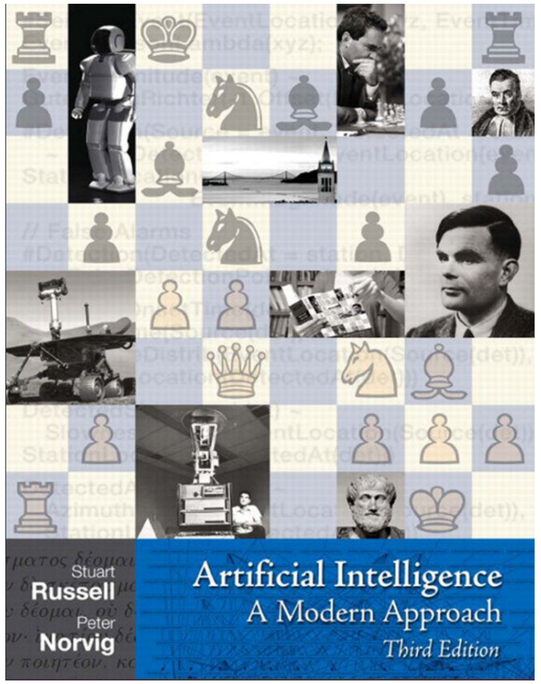
Arthur Samuel used the term **Machine Learning**

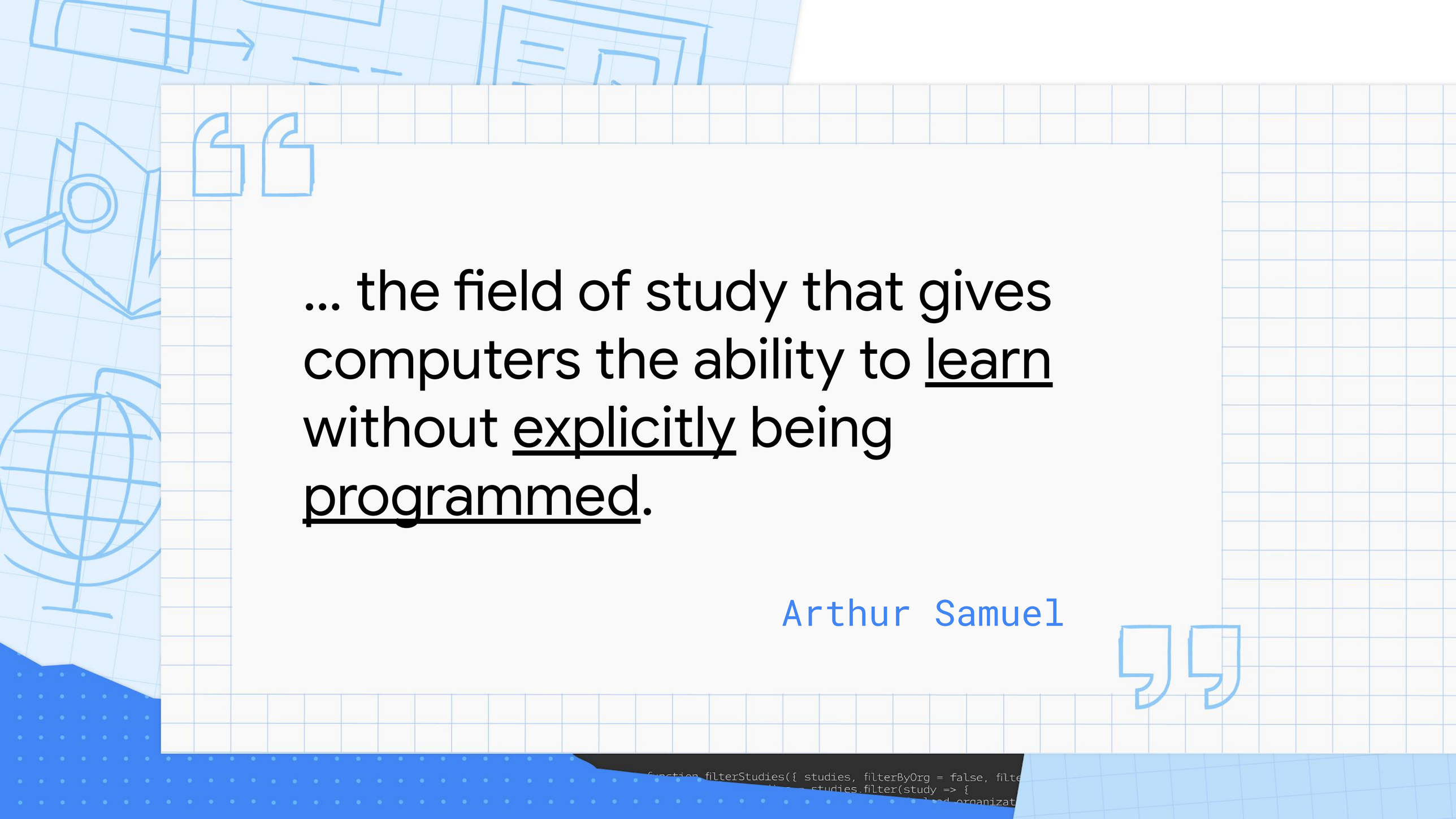
IBM's Deep Blue beats the world champion in chess.

A neural network wins over humans in traffic sign recognition.

What is AI?

Thinking Humanly	**Thinking Rationally**
"The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense." (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	"The study of mental faculties through the use of computational models." (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act." (Winston, 1992)
Acting Humanly	**Acting Rationally**
"The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)	"Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998) "AI . . . is concerned with intelligent behavior in artifacts." (Nilsson, 1998)





... the field of study that gives computers the ability to learn without explicitly being programmed.

Arthur Samuel

What is learning?

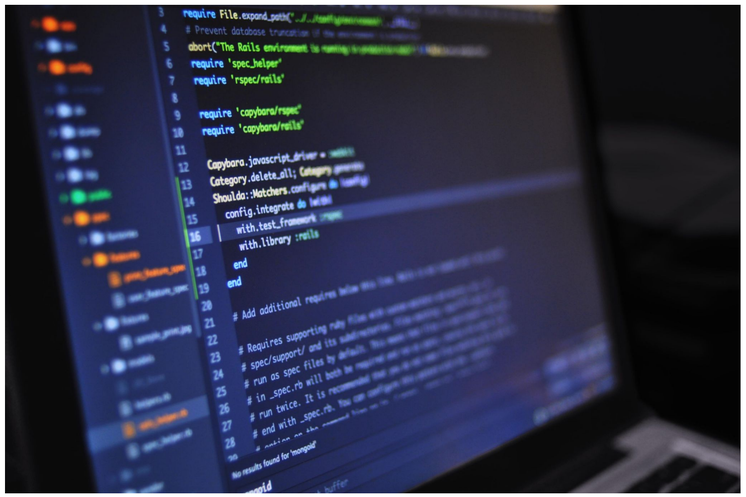
Definition from [Oxford Languages and Google - English | Oxford Languages (oup.com)]

Learning is the acquisition of knowledge or skills through study, experience, or being taught.

Experience = Data

Google Developer Student Clubs

What is a program?

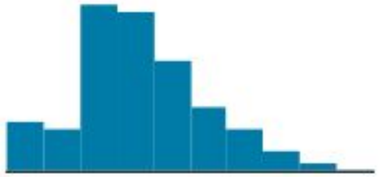


Definition from Webopedia: IT & Computer Dictionary, Study Guides & Reviews

A program is a set of instructions that a computer uses to perform a specific function.

Set of instructions = rules, conditions..

Google Developer Student Clubs

PassengerId	Survived	Pclass	Name	Sex	Age
 1 891	 0 1	 1 3	**891** unique values	male 65% female 35%	 0.42 80
1	0	3	Braund, Mr. Owen Harris	male	22
2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38
3	1	3	Heikkinen, Miss. Laina	female	26
4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35
5	0	3	Allen, Mr. William Henry	male	35
6	0	3	Moran, Mr. James	male	
7	0	1	McCarthy, Mr. Timothy J	male	54
8	0	3	Palsson, Master. Gosta Leonard	male	2
9	1	3	Johnson, Mrs. Oscar	female	27

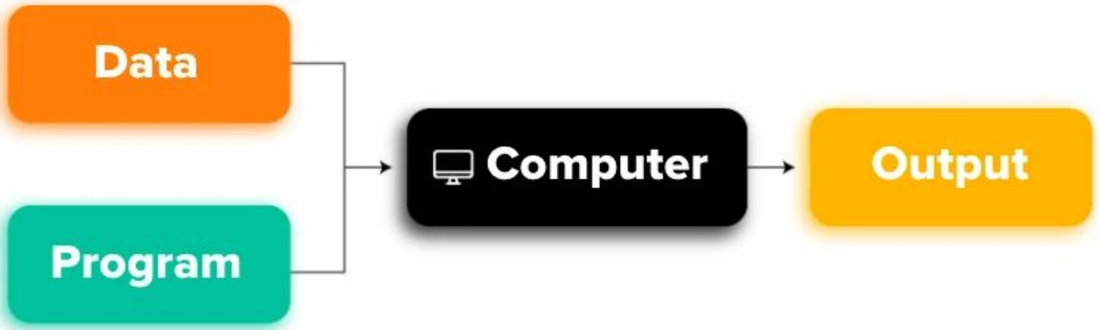
Traditional Programming Approach

```
if passenger_class == 1:
    if passenger_sex == 'female':
        print('Passenger survives.')
    elif passenger_age < 15:
        print('Passenger survives.')
    else:
        print('Passenger does not survive.')
elif passenger_class == 2:
    if passenger_sex == 'female' and passenger_age < 15:
        print('Passenger survives.')
    else:
        print('Passenger does not survive')
else:
    print('Passenger does not survive.')
```

Machine Learning Based Approach

```
1 model = ml_algorithm.learn(X, y)
2 prediction = model.predict(new_X)
3 print(prediction)
4
```

TRADITIONAL PROGRAMMING



MACHINE LEARNING

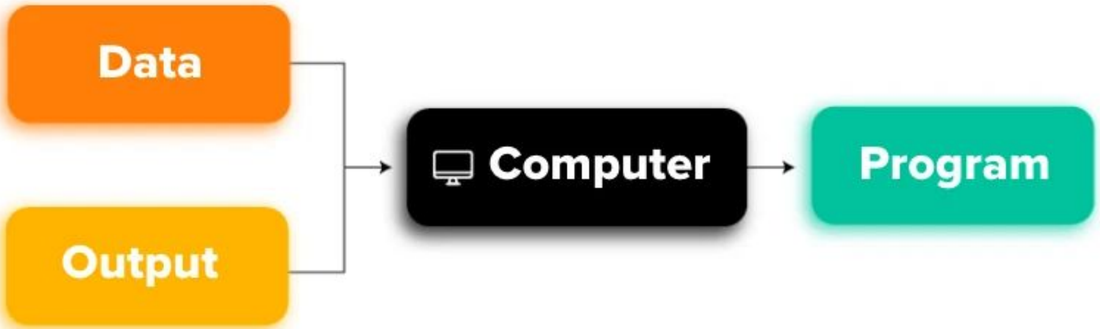
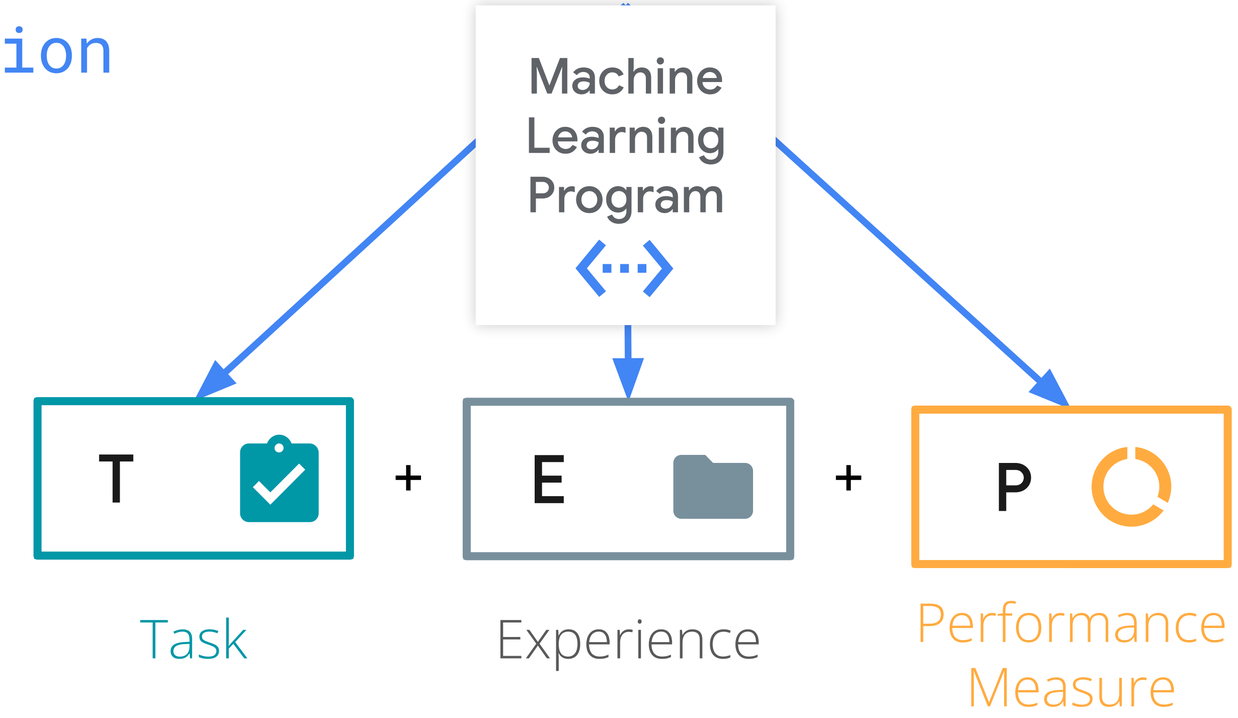


Image source: [Machine Learning vs Traditional Programming - Avenga]

What is Machine Learning?

Tom Mitchell's modern definition of machine learning

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**.



Machine Learning Examples (1):

A chess learning problem:

- Task T: playing chess.
- Performance measure P: percent of games won against an opponent.
- Experience E: playing practice games against itself.

Covid diagnosis problem:

- Task T: predict if a patient has covid.
- Performance measure P: f1-score.
- Experience E: labeled patients data containing test results.

Machine Learning Examples (2):

House Price Prediction:

- Task T: predict the price of a house based on its features (surface, location..).
- Performance measure P: MSE (Mean Squared Error).
- Experience E: labeled houses data.

Cat vs. Dog Image Classification:

- Task T: predict if the image is a cat's image or a dog's image.
- Performance measure P: accuracy.
- Experience E: labeled images of cats and dogs.