

# An Introduction to Machine Learning

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- GDG VIT



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Tech Team,

- Google Developer Groups
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# What is *Intelligence*?

- The ability to learn and apply knowledge to future problems
- Capability of understanding, creating logic and problem solving.



# How do *you* learn?

We, humans, utilise our different senses to grasp information. The 5 sensory organs help us to gather *inputs* from our environment. These inputs are then passed to the brain for analysis or *learning*.

# Branches of Artificial Intelligence

- Computer Vision, Natural Language Processing, Speech Conversion
- Machine Learning, Deep Learning

# What is Machine Learning?

- Machine Learning, as defined by Arthur Samuel, is the field of computer science that gives computers the ability to *learn* without being *explicitly programmed*.
- The science of giving computers the ability to replicate human logic by applying knowledge gained from previous experiences.

# Features and Labels

- Features are the characteristics that constitute an object.
- Multiple features can be combined to form a *new* feature.
- Labels are *tags* on known data and are used to train models (not necessarily).



# The black box analogy



# Activity!

What do you think would be some appropriate features to distinguish between a boy and a girl?

# Classification of ML

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning
- Recommender Systems

# Supervised Learning

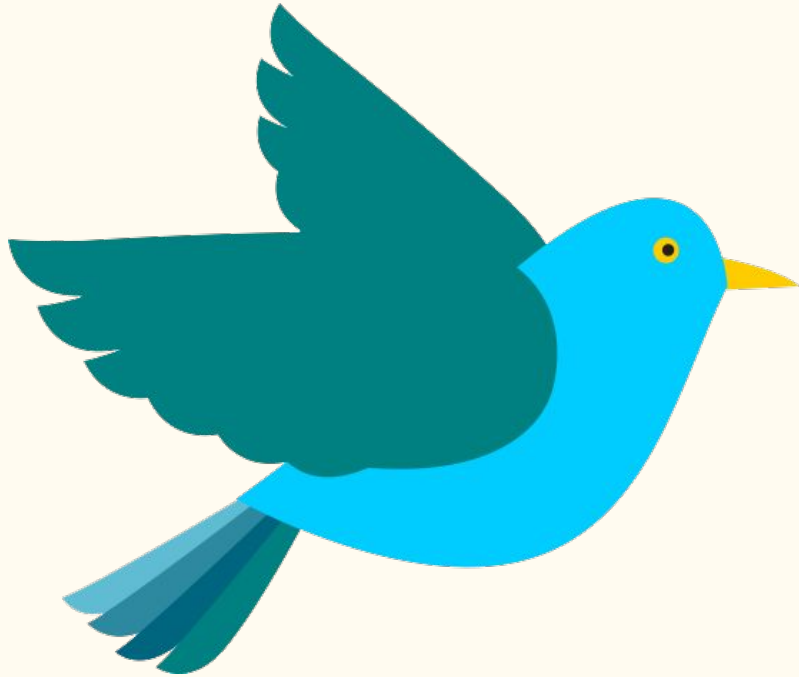
- Supervised Learning is used when one knows what the output should look like.

For example, given the weather data for the past ten years, predict future weather conditions.

# Activity!

The following would be some images with a label.

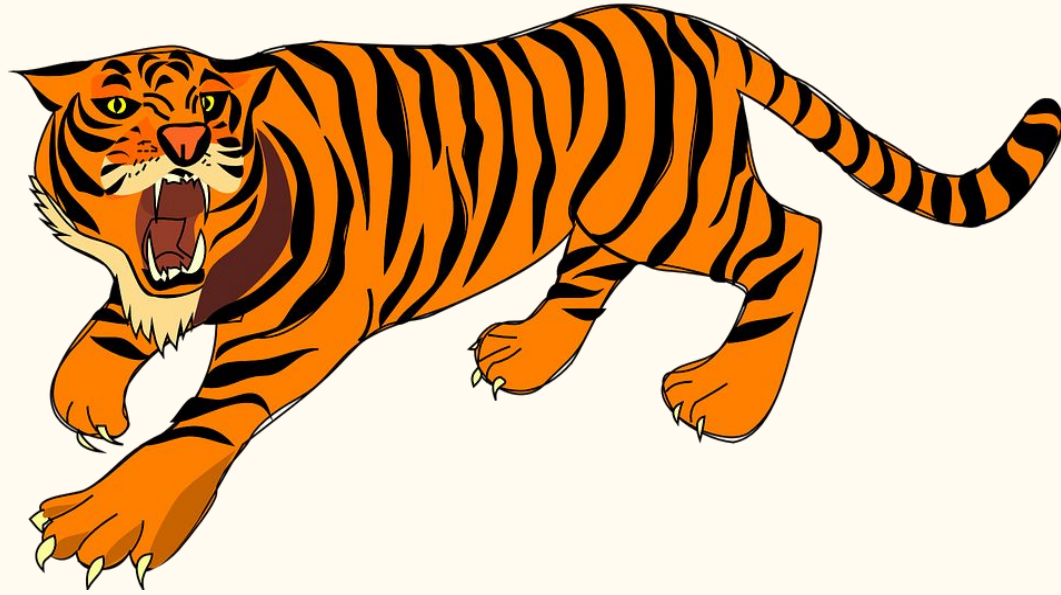
Lets see if you can do some ML in your head? :P



**ACEROUS**

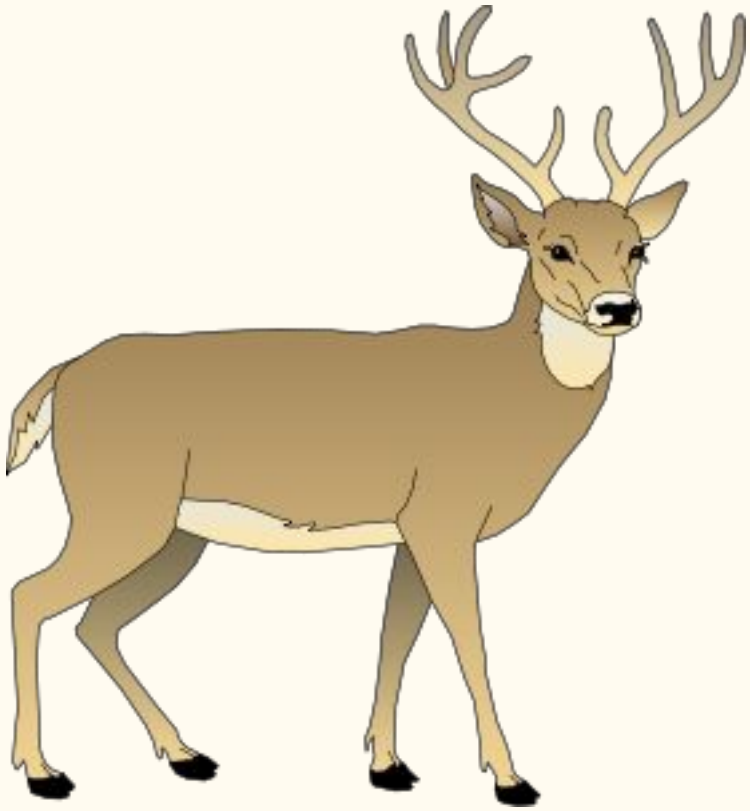


**NON-ACEROUS**

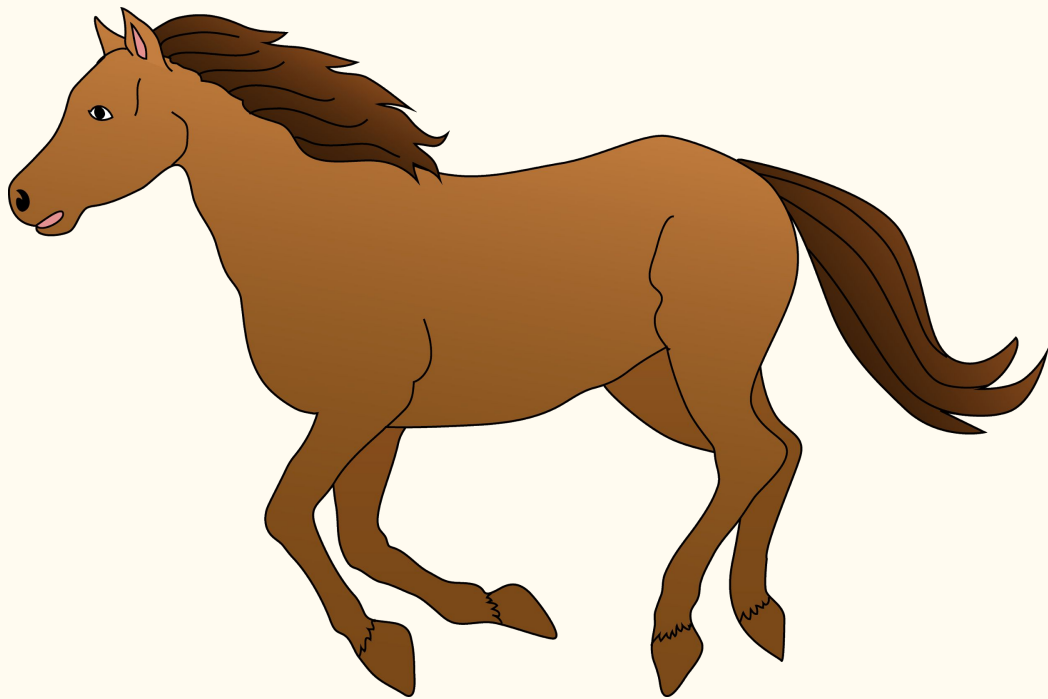


**ACEROUS**





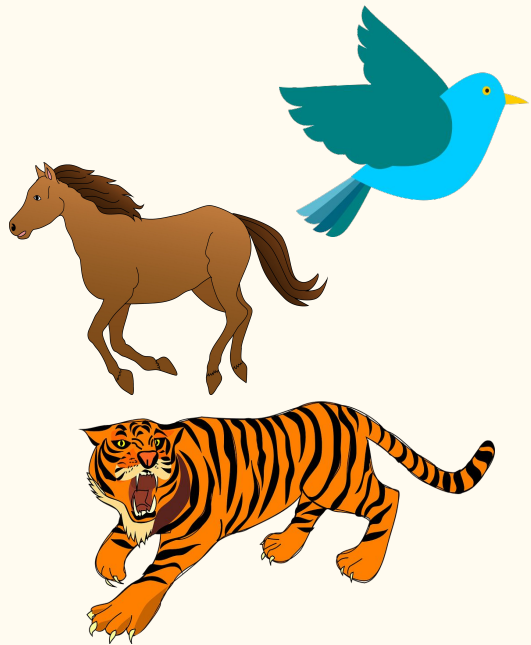
**NON-ACEROUS**



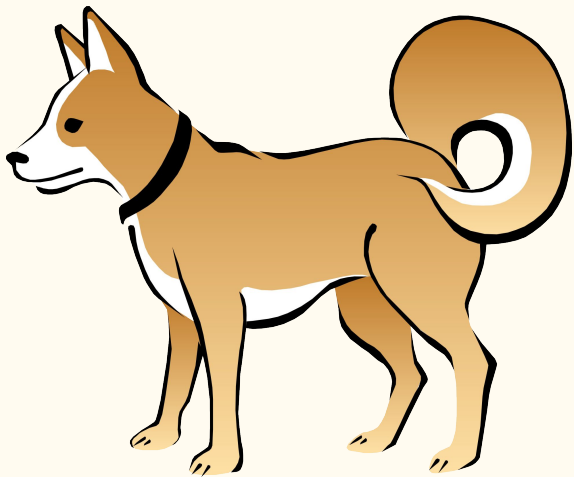
**ACEROUS**



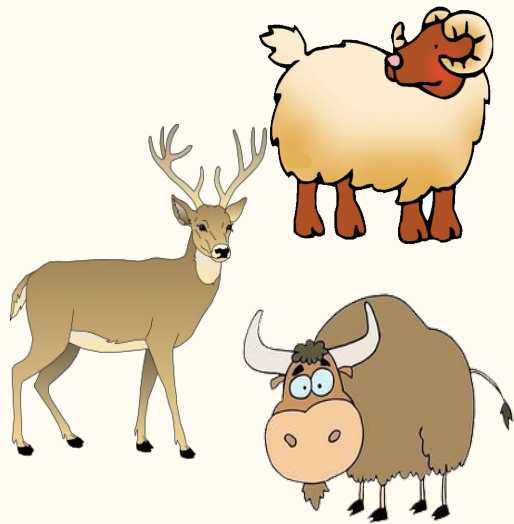
**NON-ACEROUS**



**ACEROUS**



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**NON-ACEROUS**

# Unsupervised Learning

- Unsupervised Learning is used when the outputs are not known.
- Clustering is a common example of unsupervised learning.

For example, unsupervised learning is commonly used in network security to detect anomalous behaviour.

# Reinforcement Learning

- Reinforcement Learning utilises a *learning by doing* strategy.
- So the outputs are not known before running the ML Algorithm.

For example, a computer learning to play tic-tac-toe can decide if the moves it played were good or bad only after the game has ended either resulting in a win or loss.

# Recommender Systems

- Recommender systems are an application of machine learning.
- Netflix, Amazon, Facebook, etc. use recommender systems.

# Exact Solution vs. Heuristic Solution

- In the world of computers, you can either have an exact solution or a heuristic one.
- An exact solution will be, as the name suggests, ***exact***.
- A heuristic solution is when the computer tries to find the ***closest*** solution which satisfies our immediate goals.



# Linear Regression

- Continuous Predictive Function
- $y = Mx + C$ , or here,  $y = \mathbf{W}x + \mathbf{B}$
- $W = \text{weight(s)}$ ,  $B = \text{Bias}$

# Can you guess the function?

Consider the following data:

<b>X</b>	1	2	3	4	5	6	7	8	9	10
<b>Y</b>	2	4	6	8	10	12	14	16	18	20

Then,  $F(x) = y = ?$

# Can you guess the function?

Consider the following data:

<b>X</b>	1	2	3	4	5	6	7	8	9	10
<b>Y</b>	2	4	6	8	10	12	14	16	18	20

Then,  $F(x) = y = 2x$

# Can you guess the function?

Consider the following data:

<b>X</b>	3	6	9	12	15	18	21	24	27	30
<b>Y</b>	7	13	19	25	31	37	43	49	55	61

Then,  $F(x) = y = ?$

# Can you guess the function?

Consider the following data:

<b>X</b>	3	6	9	12	15	18	21	24	27	30
<b>Y</b>	7	13	19	25	31	37	43	49	55	61

Then,  $F(x) = y = 2x + 1$

# Can you guess the function?

Consider the following data:

<b>X</b>	2	4	5	6.5	9	12	13	13.5	15	17
<b>Y</b>	3	6	7.5	9.75	13.5	18	19.5	20.25	22.5	25.5

Then,  $F(x) = y = ?$

# Can you guess the function?

Consider the following data:

<b>X</b>	2	4	5	6.5	9	12	13	13.5	15	17
<b>Y</b>	3	6	7.5	9.75	13.5	18	19.5	20.25	22.5	25.5

Then,  $F(x) = y = 1.5x$

# Some Math Stuff.. :(

- Things you'll need: Covariance, Variance and Mean
- Know these? You're (kinda) done!



I'm gonna write some stuff on the  
board now..

Thank you! :)