



# **COM5940 NEW MEDIA BUSINESS MODEL & INNOVATION:**

## **LESSON 8 - INNOVATIVE APPLICATIONS OF ML - PART I**

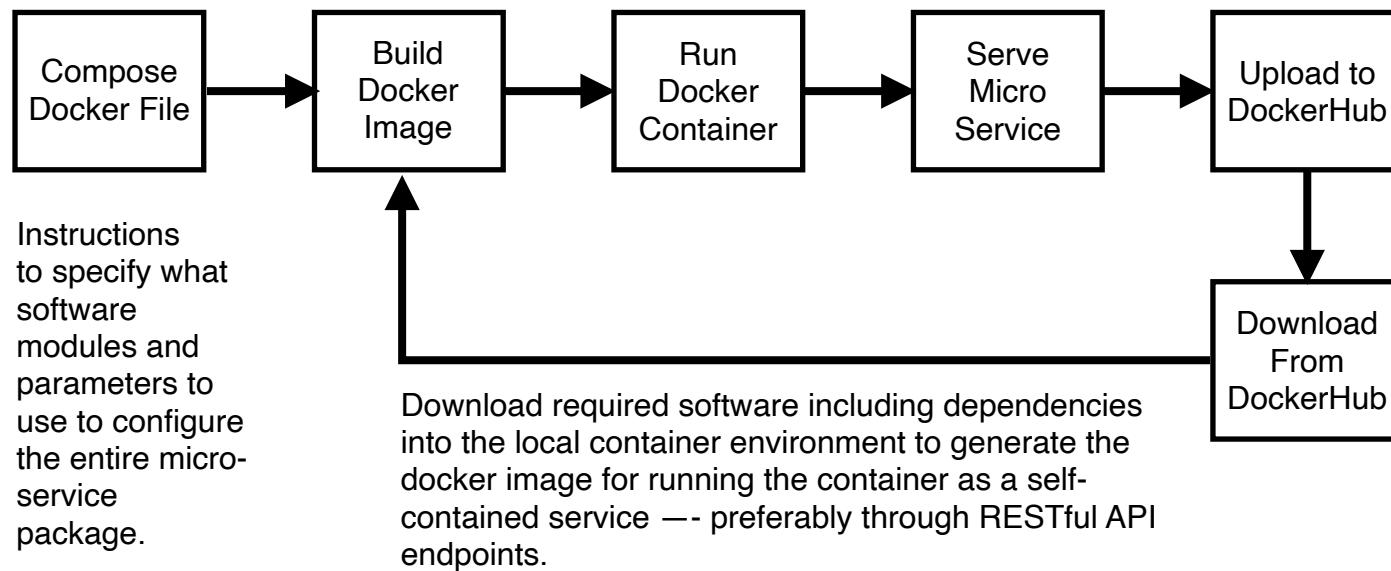
Bernard Suen  
Center for Entrepreneurship  
Chinese University of Hong Kong

**Today's agenda.**

1. Use of the **methodology map** for determining the appropriate approach to tackle a data problem.
2. Introduction to the **Teachable Machine** for getting started with supervised learning and deep learning.
3. Use of Teachable Machine trained models in **ML5.js/P5.js** for ML application and deployment.
4. **Data Science** approach to AI, Machine Learning, and Deep Learning using the **CRISP-DM** data cycle.
5. The machine learning **pipeline**.

# **Recap of Docker and WordPress Pods**

# How Docker works.



Instructions for creating an image for building single container.

Instructions for assembling multiple containers to deliver an application.

## Difference between Dockerfile and docker-compose

A **Dockerfile** is a text document that contains all the commands/Instruction a user could call on the command line to assemble an image.

For example

```
FROM centos:latest
LABEL maintainer="collabnix"
RUN yum update -y && \
    yum install -y httpd net-tools && \
    mkdir -p /run/httpd
EXPOSE 80
ENTRYPOINT apachectl "-DFOREGROUND"
```

Using **docker build** command we can build an image from a Dockerfile.

**Docker Compose** is a tool for defining and running multi-container Docker applications. With Compose, you use a YAML file to configure your application's services. Then, with a single command, you create and start all the services from your configuration. By default, docker-compose expects the name of the Compose file as **docker-compose.yml** or **docker-compose.yaml**. If the compose file have different name we can specify it with **-f** flag.

A docker-compose.yml looks like this:

```
version: '3'
services:
  web:
    build: .
    ports:
      - "5000:5000"
    volumes:
      - .:/code
      - logvolume01:/var/log
    links:
```

Use **Dockerfile** to build **each image** then use **compose** to **assemble the images**.

## Wordpress & Docker

This file will setup Wordpress, MySQL & PHPMyAdmin with a single command. Add the code below to a file called "docker-compose.yaml" and run the command

```
$ docker-compose up -d
# To Tear Down
$ docker-compose down --volumes

version: '3'

services:
  # Database
  db:
    image: mysql:5.7
    volumes:
      - db_data:/var/lib/mysql
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: password
      MYSQL_DATABASE: wordpress
      MYSQL_USER: wordpress
      MYSQL_PASSWORD: wordpress
    networks:
      - wpsite
  # phpmyadmin
  phpmyadmin:
    depends_on:
      - db
    image: phpmyadmin/phpmyadmin
    restart: always
    ports:
      - '8080:80'
    environment:
      PMA_HOST: db
      MYSQL_ROOT_PASSWORD: password
    networks:
      - wpsite
  # Wordpress
  wordpress:
    depends_on:
      - db
    image: wordpress:latest
    ports:
      - '8000:80'
    restart: always
    volumes: ['./:/var/www/html']
    environment:
      WORDPRESS_DB_HOST: db:3306
      WORDPRESS_DB_USER: wordpress
      WORDPRESS_DB_PASSWORD: wordpress
    networks:
      - wpsite
  networks:
    wpsite:
    volumes:
      db_data:
```

Here is a **docker-compose.yml** file for assembling multiple services in delivering a **WordPress** app.



Products Solutions Pricing Documentation Learn Partner Network AWS Marketplace Customer Enablement Events Explore More Q

[Sign In to the Console](#)

## Amazon Lightsail

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« Compute

# Amazon Lightsail

Build applications and websites fast with low-cost, pre-configured cloud resources

**3 months free**

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Create a website or application in just a few clicks. Automatically configure networking, access, and security environments.

Easily scale as you grow—or migrate your resources to the broader AWS ecosystem, such as Amazon EC2.

Leverage the security and reliability of the world's leading cloud platform.

Amazon Lightsail offers easy-to-use virtual private server (VPS) instances, containers, storage, databases, and more at a cost-effective monthly price.

## Use cases

### Launch simple web applications

Use pre-configured development

### Create custom websites

Build and personalize your blog

### Build small business applications

Launch line-of-business software

### Spin up test environments

Easy to create and delete



# AWS & Docker 圖解教學

Lightsail + Wordpress

# Create custom content type using Pods.



## Pods – Custom Content Types and Fields

[Activate](#)[More Details](#)

Pods is a framework for creating, managing, and deploying customized content types and fields.

By [Pods Framework Team](#)

★★★★★ (321)

100,000+ Active  
Installations

Last Updated: 1 week ago

✓ Compatible with your version of WordPress

Add New Pod [« Back to Manage](#)

1 Create or Extend

2 Configure

Pods are content types that you can customize and define fields for based on your needs. You can choose to create a Custom Post Type, Custom Taxonomy, or Custom Settings Pages for site-specific data. You can also extend existing content types like WP Objects such as Post Types, Taxonomies, Users, or Comments.

Not sure what content type you should use? Check out our [Content Type Comparison](#) to help you decide.

**Create New**

Create entirely new content types using Post Types, Taxonomies, or Custom Settings Pages.

**Extend Existing**

Extend any existing content type within WordPress, including Post Types (Posts, Pages, etc), Taxonomies (Categories, Tags, etc), Media, Users, or Comments.

11 0 + New Delete Cache

Howdy, master

Dashboard Posts Media Pages Comments Custom CSS & JS Exhibitions Appearance Plugins Users Tools Settings

Add New Pod [« Back to Manage](#)

**1 Create or Extend** ✓ **2 Configure**

Creating a new Content Type allows you to control exactly what that content type does, how it acts like, the fields it has, and the way you manage it.

Create a New Content Type

Content Type [?](#)

Singular Label [?](#)

Plural Label [?](#)

[Advanced +](#)

[Start Over](#) [Next Step](#)

Pods Admin

Edit Pods

**Add New**

Components

- Migrate Packages

- Pod Pages

- Pod Templates

- Roles & Capabilities

Settings

↳ Add-Ons

Help



W 11 0 + New Delete Cache

Dashboard Posts Media Pages Comments Custom CSS & JS Exhibitions Appearance Plugins Users Tools Settings

**Pods Admin**

Edit Pods Add New Components

- Migrate Packages
- Pod Pages
- Pod Templates
- Roles & Capabilities

Settings

↳ Add-Ons

Help

Add New Pod [« Back to Manage](#)

1 Create or Extend ✓ 2 Configure

Creating a new Content Type allows you to control exactly what that content type does, how it acts like, the fields it has, and the way you manage it.

Create a New Content Type

Content Type [?](#) Custom Post Type (like Posts or Pages) ▾

Singular Label [?](#) restaurant

Plural Label [?](#) restaurants

[Advanced +](#)

Start Over Next Step

The screenshot shows the 'Add New Pod' wizard in the Pods Admin section of the WordPress dashboard. The current step is 'Create or Extend'. The 'Content Type' dropdown is set to 'Custom Post Type (like Posts or Pages)'. The 'Singular Label' field contains 'restaurant' and the 'Plural Label' field contains 'restaurants', both highlighted with a red border. Below these fields is an 'Advanced +' link. At the bottom are 'Start Over' and 'Next Step' buttons.

11 0 + New Delete Cache Howdy, master

Dashboard Posts Media Pages Comments Custom CSS & JS Exhibitions restaurant Appearance Plugins Users Tools Settings Pods Admin

Edit Pod: **restaurant** Edit

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

No fields have been added yet

Add Field

Manage ([Back to Manage](#)) Delete Pod Save Pod

Edit Pods Add New Components - Migrate Packages - Pod Pages - Pod Templates - Roles & Capabilities Settings Help

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

New Field

Basic Additional Field Options Advanced REST API

Label chi\_title Name chi\_title Field Type Plain Text

Description

Field Type Plain Text

Options  Required

Cancel Save Field

Manage ( Back to Manage) Delete Pod Save Pod

Labels Admin UI Advanced Options Auto Template Options REST API

Add Field

Version 5.6

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

Label ⓘ	Name ⓘ	Field Type ⓘ
chi_title	chi_title	Plain Text
Label ⓘ	Name ⓘ	Field Type ⓘ

Add Field Manage (« Back to Manage) Delete Pod Save Pod

Howdy, master

Posts Media Pages Comments Custom CSS & JS Exhibitions restaurant Appearance Plugins Users Tools Settings

**Pods Admin**

Edit Pods

Add New Components

- Migrate Packages
- Pod Pages
- Pod Templates
- Roles & Capabilities

Settings

↳ Add-Ons

Help

Version 5.6

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

Label	Name	Field Type
chi_title	chi_title	Plain Text

New Field

Basic Additional Field Options Advanced REST API

Label pic1

Name

Description

Field Type

Options

Text

- Plain Text
- Website
- Phone
- E-mail
- Password

Paragraph

- Plain Paragraph Text
- WYSIWYG (Visual Editor)
- Code (Syntax Highlighting)

Date / Time

- Date / Time
- Date
- Time

Number

- Plain Number
- Currency

Relationships / Media

File / Image / Video

Embed

Relationship

Other

Yes / No

Color Picker

Manage (« Back to Manage) Delete Pod Save Pod

Version 5.6

Howdy, master

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

Label	Name	Field Type
chi_title	chi_title	Plain Text

New Field

Basic Additional Field Options Advanced REST API

Label pic1

Name pic1

Description

Field Type File / Image / Video

Options  Required

Cancel Save Field

Label Name Field Type Add Field

Manage ([Back to Manage](#))

Delete Pod Save Pod

Version 5.6

eonsite.io/wp-admin/admin.php?page=pods&action=edit&id=107&do=create#save-field

Success! Pod created successfully.

Manage Fields Labels Admin UI Advanced Options Auto Template Options REST API

Manage Fields Add Field

Manage ( Back to Manage) Delete Pod Save Pod

Label	Name	Field Type
chi_title	chi_title	Plain Text
pic1	pic1	File / Image / Video

Add Field

Pods Admin Edit Pods Add New Components - Migrate Packages - Pod Pages - Pod Templates - Roles & Capabilities Settings Help

11 0 + New Delete Cache

Howdy, master

Media

Pages

Comments

Custom CSS & JS

Exhibitions

restaurant

Appearance

Plugins

Users

Tools

Settings

**Pods Admin**

Edit Pods

Add New

Components

- Migrate Packages

- Pod Pages

- Pod Templates

- Roles & Capabilities

Settings

↳ Add-Ons

Help

Manage Fields

Labels

Admin UI

**Advanced Options**

Auto Template Options

REST API

Public

Publicly Queryable

Exclude from Search

User Capability

Additional User Capabilities

Enable Archive Page

Hierarchical

Rewrite

Custom Rewrite Slug

Rewrite with Front

Rewrite Feeds

Rewrite Pages

Query Var

Exportable

Default Status

Manage ([Back to Manage](#))

Delete Pod

Save Pod

The image shows a screenshot of the WordPress Pods Admin interface. The top navigation bar includes 'New' and 'Delete Cache' buttons, and a user 'Howdy, master'. On the left, a sidebar lists various site sections like Media, Pages, and Settings, with 'Pods Admin' highlighted in blue. Below this, a detailed list of pod settings is shown, each with a checkbox or dropdown menu. The 'Advanced Options' tab is currently active, indicated by a red border around its tab. The settings include: Public (checked), Publicly Queryable (checked), Exclude from Search (unchecked), User Capability (set to 'post'), Additional User Capabilities (checked), Enable Archive Page (checked), Hierarchical (unchecked), Rewrite (checked), Custom Rewrite Slug (empty input field), Rewrite with Front (checked), Rewrite Feeds (unchecked), Rewrite Pages (checked), Query Var (checked), Exportable (checked), and Default Status (set to 'Draft'). To the right, there's a 'Manage' button with a link to 'Back to Manage', a 'Delete Pod' button, and a 'Save Pod' button.

Howdy, master

11 0 + New Delete Cache  
Rewrite With Front

- Pod Templates  
- Roles & Capabilities  
Settings  
↳ Add-Ons  
Help

Manage ([« Back to Manage](#))

**Delete Pod** **Save Pod**

Rewrite Feeds

Rewrite Pages

Query Var

Exportable

Default Status

Supports

Title  
 Editor  
 Author  
 **Featured Image**  

Excerpt  
 Trackbacks  
 Custom Fields  
 Comments  
 Revisions  
 Page Attributes  
 Post Formats

Advanced Supports

Built-in Taxonomies

Categories (category) (category)  
 Link Categories (link\_category) (link\_category)  
 Tags (post\_tag) (post\_tag)



Howdy, master

New Delete Cache

Rewrite With Front

Rewrite Feeds

Rewrite Pages

Query Var

Exportable

Default Status Draft

Supports

Title

Editor

Author

Featured Image

Excerpt

Trackbacks

Custom Fields

Comments

Revisions

Page Attributes

Post Formats

Advanced Supports

Built-in Taxonomies

Categories (category) (category)

Link Categories (link\_category) (link\_category)

Tags (post\_tag) (post\_tag)

Manage ([« Back to Manage](#))

Delete Pod

Save Pod

Howdy, master

## Manage Components

**Category** All Field Types Tools Integration Migration Advanced

Name	Category	Description
Advanced Content Types	Advanced	A content type that exists outside of the WordPress post and postmeta table and uses custom tables instead. You most likely don't need these and we strongly recommend that you use Custom Post Types or Custom Taxonomies instead. FOR ADVANCED USERS ONLY. Version 2.3   by Pods Framework Team
Advanced Relationships	Advanced	Add advanced relationship objects for relating to including Database Tables, Multisite Networks, Multisite Sites, Themes, Page Templates, Sidebars, Post Type Objects, and Taxonomy Objects Version 2.3   by Pods Framework Team
Builder Integration	Integration	Integration with the Builder theme / child themes from iThemes; Adds new modules to the Layout engine Version 1.0   by Pods Framework Team
Helpers	Advanced	A holdover from Pods 1.x for backwards compatibility purposes, you most likely don't need these and we recommend you use our WP filters and actions instead. Version 2.3   by Pods Framework Team
Markdown Syntax	Field Types	Integration with Markdown ( <a href="http://michelf.com/projects/php-markdown/">http://michelf.com/projects/php-markdown/</a> ); Adds an option to enable Markdown syntax for Paragraph text fields. Version 1.0   by Pods Framework Team
Migrate: Import from the Custom Post Type UI plugin	Migration	Import Custom Post Types and Taxonomies from Custom Post Type UI ( <a href="http://webdevstudios.com/plugin/custom-post-type-ui/">http://webdevstudios.com/plugin/custom-post-type-ui/</a> ) Version 1.0   by Pods Framework Team
Migrate: Packages	Migration	Import/Export your Pods, Fields, and other settings from any Pods site; Includes an API to Import/Export Packages via PHP Version 2.0   by Pods Framework Team
Pages	Advanced	Creates advanced URL structures using wildcards in order to enable the front-end display of Pods Advanced Content Types. Not recommended for use with other content types. Version 2.3   by Pods Framework Team
Roles and Capabilities	Tools	Create and Manage WordPress User Roles and Capabilities; Uses the 'Members' plugin filters for additional plugin integrations; Portions of code based on the 'Members' plugin by Justin Tadlock Version 1.0   by Pods Framework Team
Table Storage	Advanced	Enable a custom database table for your custom fields on Post Types, Media, Taxonomies, Users, and Comments. Version 2.3   by Pods Framework Team
Templates	Advanced	An easy to use templating engine for Pods. Use {@field_name} magic tags to output values, within your HTML markup. Version 2.3   by Pods Framework Team
Translate Pods Admin	I18n	Allow UI of Pods and fields to be translated. Version 0.2   by Pods Framework Team
Name	Category	Description

12 components

Make sure these options are enabled.



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# **WordPress REST API and JWT Access**



## File Manager

file manager provides you ability to edit, delete, upload, download, copy and paste files and folders.

By [mndpsingh287](#)

Active

[More Details](#)

★★★★★ (1,221)      Last Updated: 4 weeks ago

1+ Million Active Installations      ✓ Compatible with your version of WordPress

[http://localhost/pods\\_test/wp-admin/plugin-install.php?tab=plugin-information&plugin=wp-file-manager&TB\\_iframe=true&width=600&height=550](http://localhost/pods_test/wp-admin/plugin-install.php?tab=plugin-information&plugin=wp-file-manager&TB_iframe=true&width=600&height=550)



## Database My Admin

Database manager, browser for (MySQL and MariaDB). Allows INSERT, SELECT, UPDATE, DELETE operations on database from Admin Dashboard.

By [securebit](#)

Active

[More Details](#)

★★★★★ (4)      Last Updated: 9 months ago

4,000+ Active Installations      Untested with your version of WordPress

[http://localhost/pods\\_test/wp-admin/plugin-install.php?tab=plugin-information&plugin=my-database-admin&TB\\_iframe=true&width=600&height=550](http://localhost/pods_test/wp-admin/plugin-install.php?tab=plugin-information&plugin=my-database-admin&TB_iframe=true&width=600&height=550)



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Pull requests Issues Marketplace Explore



anstak / wp-rest-user

Public

Watch 1

Fork 6

Star 5

<> Code

Pull requests 1

Actions

Projects

Wiki

Security

Insights

master ▾

1 branch

7 tags

Go to file

Add file ▾

Code ▾



anstak Fix error message for incorrect username

a170b2a on 12 Jul 2018 74 commits

	admin	Implementing Roles	4 years ago
	assets	Added README	4 years ago
	includes	Implementing Roles	4 years ago
	languages	Restructuring Plugin	4 years ago
	public	Fix error message for incorrect username	4 years ago
	LICENSE.txt	Restructuring Plugin	4 years ago
	deploy.md	Updated README	4 years ago
	index.php	Restructuring Plugin	4 years ago
	readme.txt	Update README	4 years ago
	uninstall.php	Restructuring Plugin	4 years ago
	wp-rest-user.php	1.3.2	4 years ago

## About

No description, website, or topics provided.

Readme

GPL-2.0 License

5 stars

1 watching

6 forks

## Releases

7 tags

## Packages

No packages published

<https://github.com/anstak/wp-rest-user>



Register Log In



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Openverse



Get WordPress

## Plugins

My Favorites Beta Testing Developers

Search plugins



### JWT Authentication for WP REST API V2



This plugin hasn't been tested with the latest 3 major releases of WordPress. It may no longer be maintained or supported and may have compatibility issues when used with more recent versions of WordPress.



### JWT Authentication for WP REST API

Download

By Enrique Chavez

Details

Reviews

Installation

Support

Development

#### Description

Version:

1.2.6

Extends the WP REST API using ISON Web Tokens Authentication as an

Last updated:

1 year ago

<https://wordpress.org/plugins/jwt-authentication-for-wp-rest-api/>

POST

http://localhost/wp\_demo/wp-json/wp/v2/users/register

Params

Send

Save

Authorization

Headers (1)

Body

Pre-request Script

Tests

Code

form-data     x-www-form-urlencoded     raw     binary    JSON (application/json) ▾

```
1 {  
2     "username": "johnnie",  
3     "email": "johnnie@cuhk.edu.hk",  
4     "password": "password"  
5 }
```

Body

Cookies

Headers (17)

Test Results

Status: 200 OK

Time: 674 ms

Pretty

Raw

Preview

Auto ▾



Save Response

```
1 {  
2     "code": 200,  
3     "id": 10,  
4     "message": "User 'johnnie' Registration was Successful"  
5 }
```

POST  https://dev-wp5940.pantheonsite.io/wp-json/jwt-auth/v1/token

Authorization Headers (1) **Body**  Pre-request Script Tests

form-data  x-www-form-urlencoded  raw  binary  JSON (application/json)

```
1 {  
2   "username": "johnnie",  
3   "email": "johnnie@cuhk.edu.hk",  
4   "password": "password"  
5 }
```

Body Cookies Headers (26) Test Results Status: 200 OK Time: 907 ms

Pretty Raw Preview Auto

```
1 {  
2   "token": "eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJpc3Mi0iJodHRwczovL2Rldi13cDU5NDaucGFudGhlb25zaXR1LmlvTiwiAWF0IjoxNjc4MDg3NDI3LCJuYm  
3   "user_email": "johnnie@cuhk.edu.hk",  
4   "user_nicename": "johnnie",  
5   "user_display_name": "johnnie"  
6 }
```

```
1 from flask import Flask, request, jsonify, make_response
2 import requests
3 import pandas as pd
4
5 # Value-params for user registration
6 #{{
7 #     "username": "johnnie",
8 #     "email": "johnnie@cuhk.edu.hk",
9 #     "password": "password"
10 #}
11
12 username = 'johnnie'
13 email = 'johnnie@cuhk.edu.hk'
14 password = 'password'
15
16 body = {
17     "username": username,
18     "email": email,
19     "password": password
20 }
21
22 url = 'http://localhost/wp_demo/wp-json/wp/v2/users/register'
23 r=requests.post(url, headers={"Content-Type": "application/json"}, json=body)
24 print("Status Code:",r.status_code)
25 r_list = r.json()
26 print(r_list)
```

```
Status Code: 200
{'code': 200, 'id': 13, 'message': "User 'johnnie' Registration was Successful"}
```

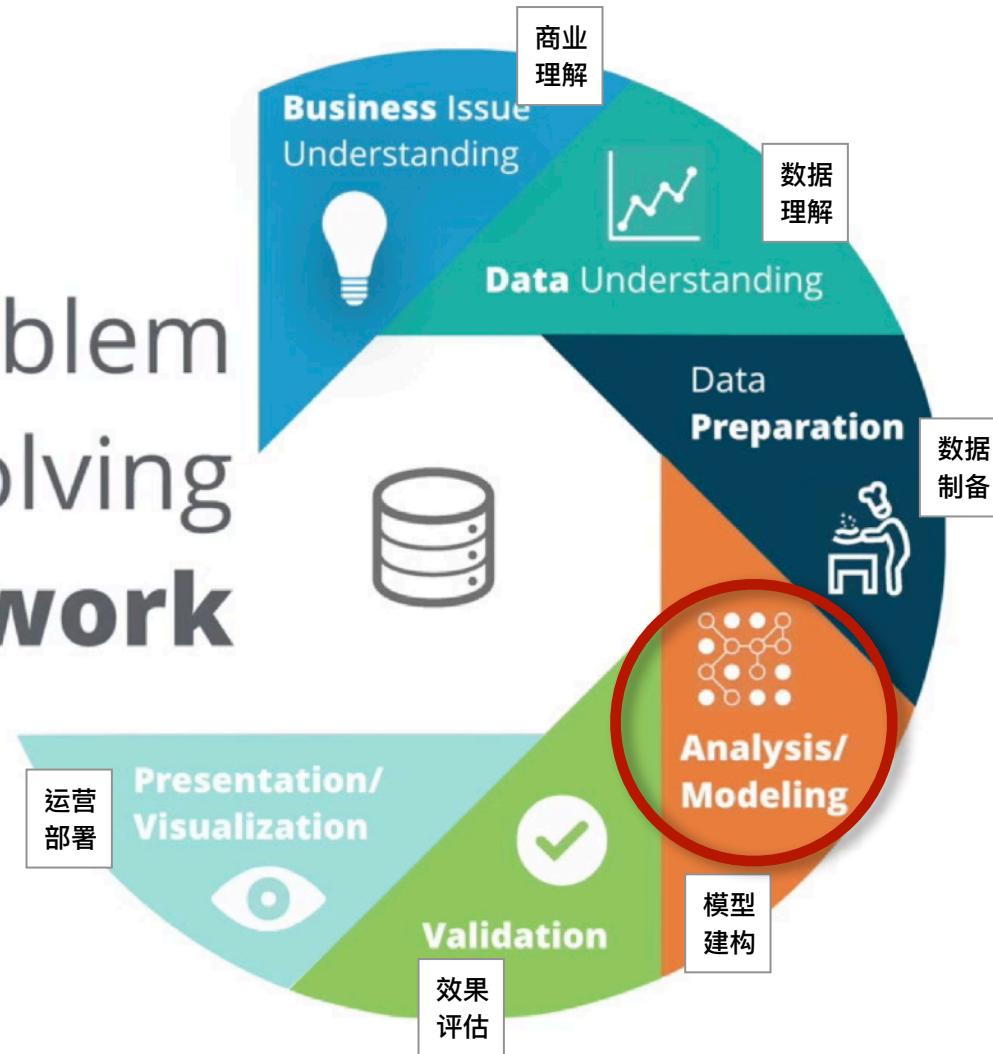
```
1 from flask import Flask, request, jsonify, make_response
2 import requests
3 import pandas as pd
4
5 # Value-paris for user registration
6 #{{
7 #     "username": "johnnie",
8 #     "email": "johnnie@cuhk.edu.hk",
9 #     "password": "password"
10 #}}
11
12 username = 'johnnie'
13 email = 'johnnie@cuhk.edu.hk'
14 password = 'password'
15
16 body = {
17     "username": username,
18     "email": email,
19     "password": password
20 }
21
22 url = 'http://localhost/wp_demo/wp-json/jwt-auth/v1/token'
23 r=requests.post(url, headers={"Content-Type": "application/json"}, json=body)
24
25 print("Status Code:",r.status_code)
26 r_list = r.json()
27 print(r_list)
```

Status Code: 200

```
{'token': 'eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJpc3MiOiJodHRwOi8vbG9jYWxob3N0L3dwX2RlbW8iLCJpYXQiOjE2NzgwODk3NDgsIm5iZiI6MTY3ODA4OTc0OCwiZXhwIjoxNjc4Njk0NTQ4LCJkYXRhIjp7InVzzXIIOnsiaWQiOiIxMyJ9fX0.MPcbeN4zckHsCGANU4r1QCSW6zoqemNI0H1rQX4F6LM', 'user_email': 'johnnie@cuhk.edu.hk', 'user_nicename': 'johnnie', 'user_display_name': 'johnnie'}
```

# **Data Science Approach to AI, Machine Learning and Deep Learning.**

# Problem Solving Framework



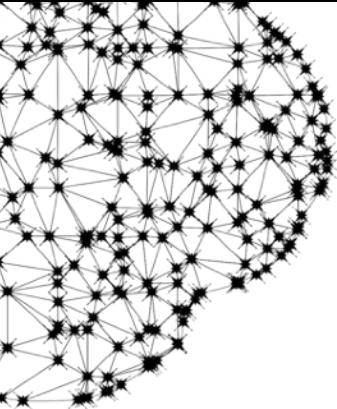
**Which analytics model to use? And why?**



# **The Methodology Map**

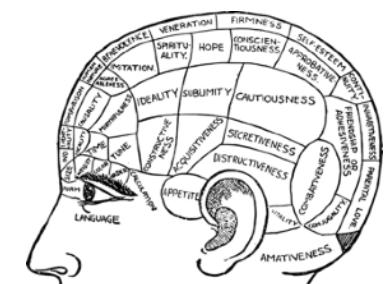
聚焦未来					聚焦过去和现在
Predict Outcome					Data Analysis
Data Rich			Data Poor	Geospatial	
Numeric		Classification		A/B Test	Segmentation
Continuous	Count	Binary	Non Binary	<ul style="list-style-type: none"> <li>Inferential Statistics (t-test, Chi square, etc.)</li> </ul>	Aggregation
<ul style="list-style-type: none"> <li>Linear Regression,</li> <li>Multiple Regression</li> </ul>	<ul style="list-style-type: none"> <li>Count Regression</li> </ul>	<ul style="list-style-type: none"> <li>Logistic Regression</li> <li>Decision Tree</li> </ul>	<ul style="list-style-type: none"> <li>Random Forest</li> <li>K-Nearest Neighbour</li> </ul>		Descriptive
<b>Popular tools:</b> Scikit-learn, Tensorflow, PyTorch, Keras, ML5.js, Brain.js, Knime, Orange, BigQuery ML etc.				e.g. SPSS, Jamovi	e.g. SQL, SPSS, Jamovi

Source: Udacity Model Selection Methodology Map



# Deep Learning for Everyone

## (Neural Network Model)



[About](#)   [FAQ](#)   [Get Started](#)

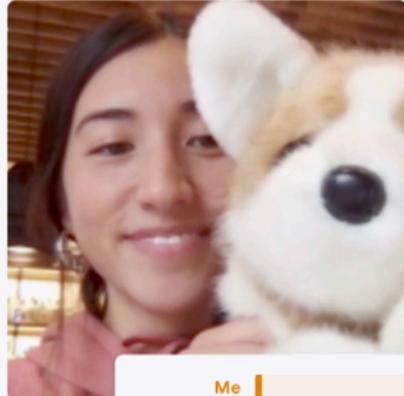
# Teachable Machine

**Train a computer to recognize your own images, sounds, & poses.**

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

[Get Started](#)

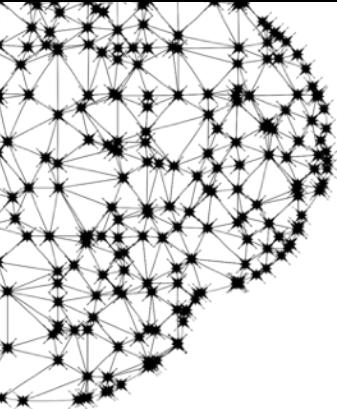
TensorFlow.js   p5.js   Coral   Node.js   GPU



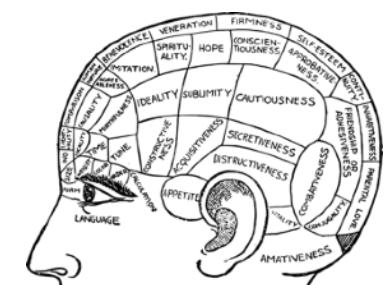
Me 100%

Me + Dog <3 98%

Source: <https://teachablemachine.withgoogle.com/train>



# How does the machine perform its “**magic**”?





### Output

Too  
Early



Ripe



Too Late



No  
Banana



# **Introduction to**

# **ML5.js**

Tracks &gt; A Beginner's Guide to Machine Learning in JavaScript

# A BEGINNER'S GUIDE TO MACHINE LEARNING IN JAVASCRIPT

Welcome to "A Beginner's Guide to Machine Learning in JavaScript"! In this series, I'll teach the concepts behind machine learning using the ml5.js library.

**Main track**

10 chapters, 23 videos

**Languages**p5.js, ml5.js, [Show more](#)**Topics**machine learning (ML), ml5.js, [Show more](#)

## A Beginner's Guide to Machine Learning with ml5.js

**Languages** p5.js, ml5.js, [Show more](#)**Topics** machine learning (ML), ml5.js, [Show more](#)

TRACK STOPS	TIMESTAMPS
<b>INTRODUCTION</b>	
<input checked="" type="radio"/> A Beginner's Guide to Machine Learning with ml5.js	
<b>CLASSIFICATION</b>	
<input type="radio"/> ml5.js: Image Classification with MobileNet	
<input type="radio"/> ml5.js: Webcam Image Classification	
<input type="radio"/> Object Detection with COCO-SSD	

Source: <https://thecodingtrain.com/tracks/ml5js-beginners-guide>



# Friendly Machine Learning for the Web

A neighborly approach to creating and exploring artificial intelligence in the browser.

Source: <https://learn.ml5js.org/#/>



Type to search

ml5

## Welcome

[Getting Started](#)[FAQ](#)

## Tutorials

[Introduction to ml5.js](#)[Running a local web server](#)[Promises and Callbacks in ml5](#)

## Reference

[Overview](#)

## Helpers

[NeuralNetwork](#)[FeatureExtractor](#)[KNNClassifier](#)[kmeans](#)

## Image

[ImageClassifier](#)[- Description](#)[- Quickstart](#)

# ImageClassifier



Label: robin, American robin, *Turdus migratorius*  
Confidence: 0.99

## Description

You can use neural networks to recognize the content of images. `ml5.imageClassifier()` is a method to create an object that classifies an image using a pre-trained model.

It should be noted that the pre-trained model provided by the example below was trained on a database of approximately 15 million images (ImageNet). The ml5 library accesses this model from the cloud. What the algorithm labels an image is entirely dependent on that training data -- what is included, excluded, and how those images are labeled (or mislabeled).

**Train your own image classification model with Teachable Machine:** If you'd like to train your own custom image classification model, try [Google's Teachable Machine](#).

## Quickstart

Source: <https://learn.ml5js.org/#/reference/image-classifier>



14,197,122 images, 21841 synsets indexed

[Home](#) [Download](#) [Challenges](#) [About](#)

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**ImageNet** is an image database organized according to the **WordNet** hierarchy (currently only the nouns), in which each node of the hierarchy is depicted by hundreds and thousands of images. The project has been **instrumental** in advancing computer vision and deep learning research. The data is available for free to researchers for non-commercial use.

**Mar 11 2021. ImageNet website update.**

© 2020 Stanford Vision Lab, Stanford University, Princeton University [imagenet.help.desk@gmail.com](mailto:imagenet.help.desk@gmail.com) Copyright infringement

Source: <https://www.image-net.org/index.php>



## DEMO

- Tutorials
- Model and Data Provenance
- Acknowledgements
- Source Code

## Sound

[SoundClassification](#)[PitchDetection](#)

## Text

[CharRNN](#)[Sentiment](#)[Word2Vec](#)

## Utils

[utils](#)

## Contributing

[Contributor Notes](#)[Maintenance Notes](#)[Style Guide](#)[Reference guidelines](#)[Development guidelines](#)

## Design guidelines



## Description

Real-time object detection system using either [YOLO](#) or [CocoSsd](#) model.

## Quickstart

```
const video = document.getElementById('video');

// Create a ObjectDetector method
const objectDetector = ml5.objectDetector('cocossd', {}, modelLoaded);

// When the model is loaded
function modelLoaded() {
```

Source: <https://learn.ml5js.org/#/reference/object-detector>

## News

- We are pleased to announce the [LVIS 2021 Challenge and Workshop](#) to be held at ICCV.
- Please note that there will not be a COCO 2021 Challenge, instead, we encourage people to participate in the LVIS 2021 Challenge.
- We have partnered with the team behind the open-source tool [FiftyOne](#) to make it easier to download, visualize, and evaluate COCO
- [FiftyOne](#) is an open-source tool facilitating visualization and access to COCO data resources and serves as an evaluation tool for model analysis on COCO.

## What is COCO?



COCO is a large-scale object detection, segmentation, and captioning dataset. COCO has several features:

- ✓ Object segmentation
- ✓ Recognition in context
- ✓ Superpixel stuff segmentation
- ✓ 330K images (>200K labeled)
- ✓ 1.5 million object instances
- ✓ 80 object categories
- ✓ 91 stuff categories
- ✓ 5 captions per image
- ✓ 250,000 people with keypoints

## Collaborators

Tsung-Yi Lin Google Brain

Genevieve Patterson MSR, Trash TV

Matteo R. Ronchi Caltech

Yin Cui Google

Michael Maire TTI-Chicago

Serge Belongie Cornell Tech

Lubomir Bourdev WaveOne, Inc.

Ross Girshick FAIR

James Hays Georgia Tech

Pietro Perona Caltech

Deva Ramanan CMU

Larry Zitnick FAIR

Piotr Dollár FAIR

## Sponsors



CVDF



Microsoft

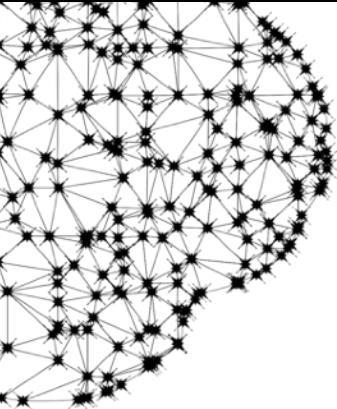


facebook

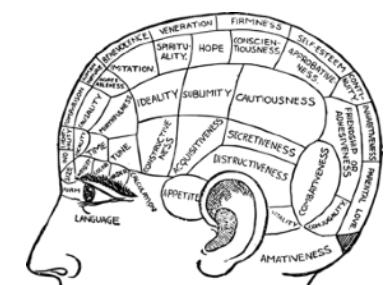


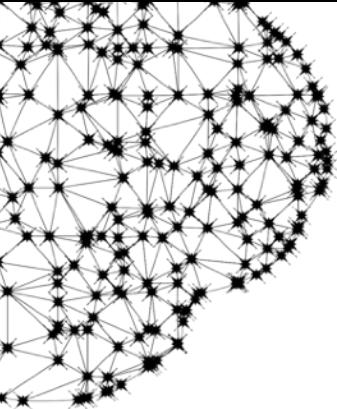
Mighty Ai

Source: <https://cocodataset.org/#home>

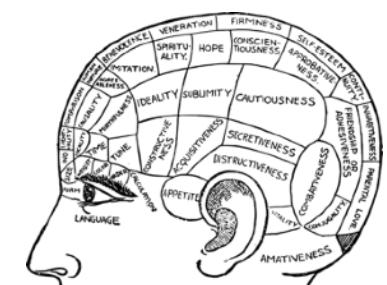


To work with in data science and machine learning, **data** is the **key**.

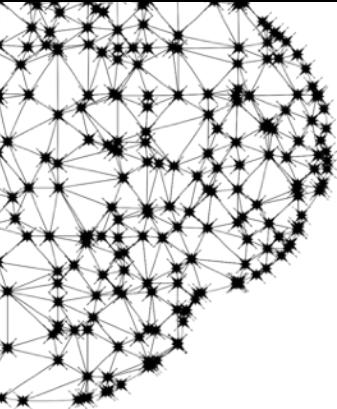




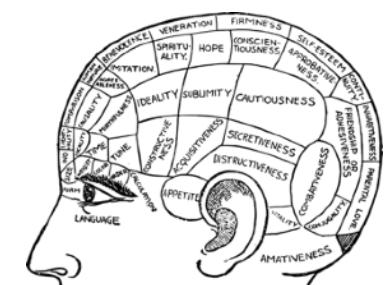
**Yes, data is important. But **what** kind of data?**



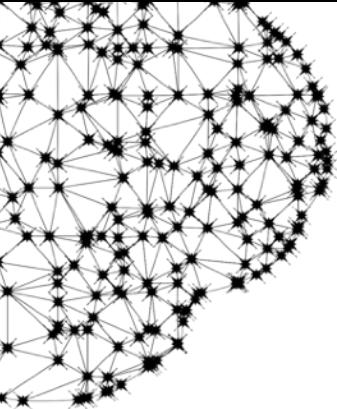




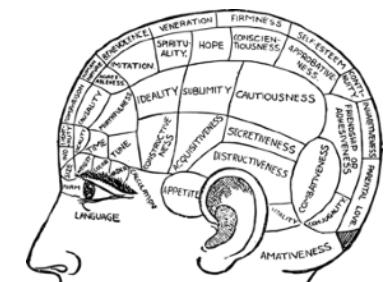
**How to **avoid** bias? How should the data  
be **collected**? These are important issues  
for us to think about beyond the hype!**

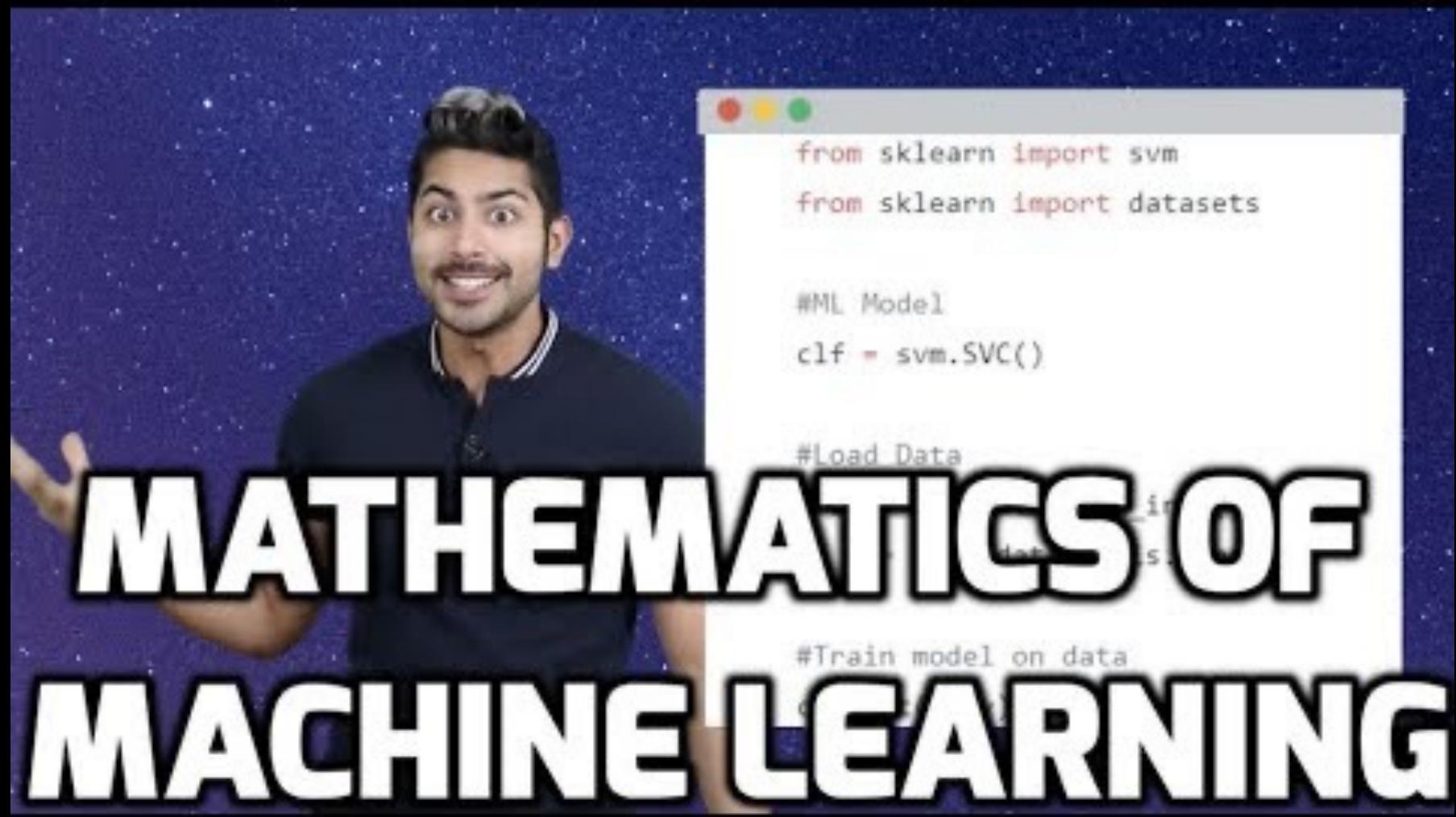


**Using `JavaScript` in WordPress  
to empower your applications.**



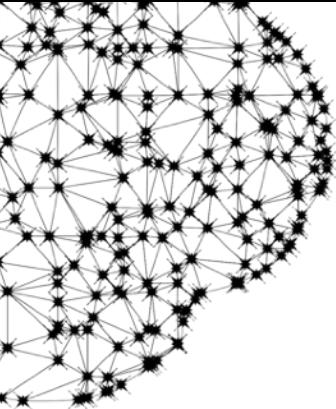
# **Mathematical Foundation of Machine Learning**



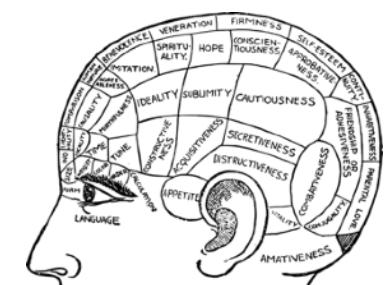


Source: <https://www.youtube.com/watch?v=8onB7rPG4Pk&t=1s>

**Does that mean you need to know all those maths to implement codes in Python to perform the machine learning functions (e.g. Least Square - linear shaped or Sigmoid function - S shaped line fitting)?**



# Well, how does the machine learn in the first place?



# Gradient descent



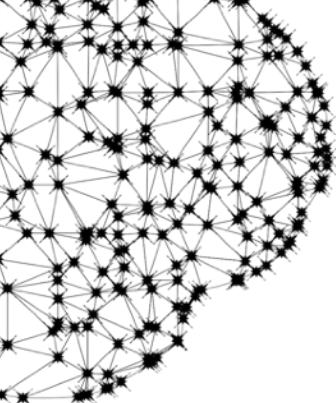
Mount Errorest



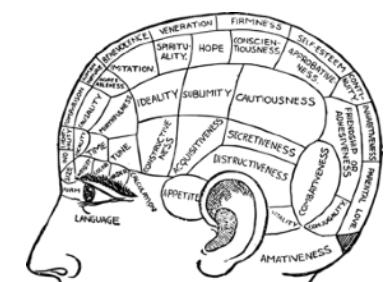
<https://www.youtube.com/watch?v=IpGxLWOIZy4>

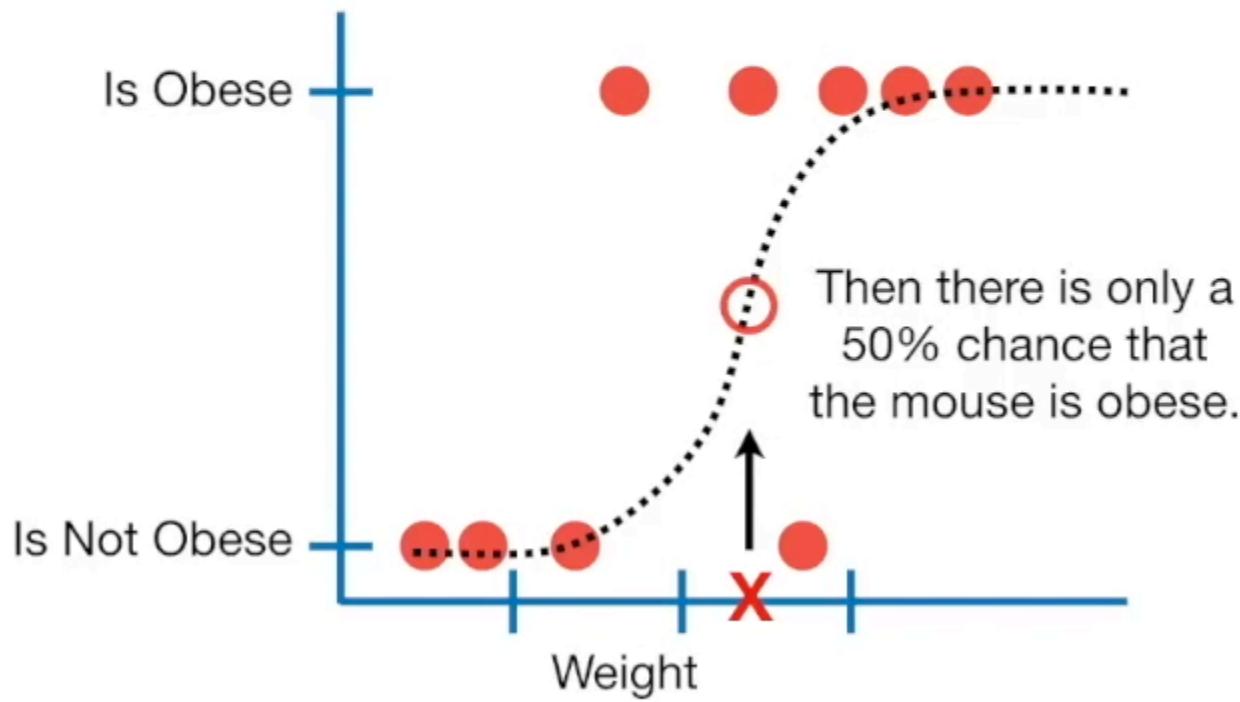
聚焦未来				聚焦过去和现在	
Predict Outcome				Data Analysis	
Data Rich		Data Poor		Geospatial	
Numeric		Classification		A/B Test	Segmentation
Continuous	Count	Binary	Non Binary	<ul style="list-style-type: none"> <li>Inferential Statistics (t-test, Chi square, etc.)</li> </ul>	Aggregation
<ul style="list-style-type: none"> <li>Linear Regression,</li> <li>Multiple Regression</li> </ul>	<ul style="list-style-type: none"> <li>Count Regression</li> </ul>	<ul style="list-style-type: none"> <li>Logistic Regression</li> <li>Decision Tree</li> </ul>	<ul style="list-style-type: none"> <li>Random Forest</li> <li>K-Nearest Neighbour</li> </ul>		Descriptive
<b>Popular tools:</b> Scikit-learn, Tensorflow, PyTorch, Keras, ML5.js, Brain.js, Knime, Orange, BigQuery ML etc.				e.g. SPSS, Jamovi	e.g. SQL, SPSS, Jamovi

Source: Udacity Model Selection Methodology Map



# From Linear Regression to Logistic Regression





**How is Machine Learning related to  
Predictive Analytics and Deep Learning?  
What are their relationships to Data Science?**

## (Supervised Learning)

### Predictive Analytics

预测分析/机器学习/深度学习

- Linear Regression
- Decision Tree
- Forest Model
- Boosted Model

- Count Regression
- Logistic Regression
- Decision Tree

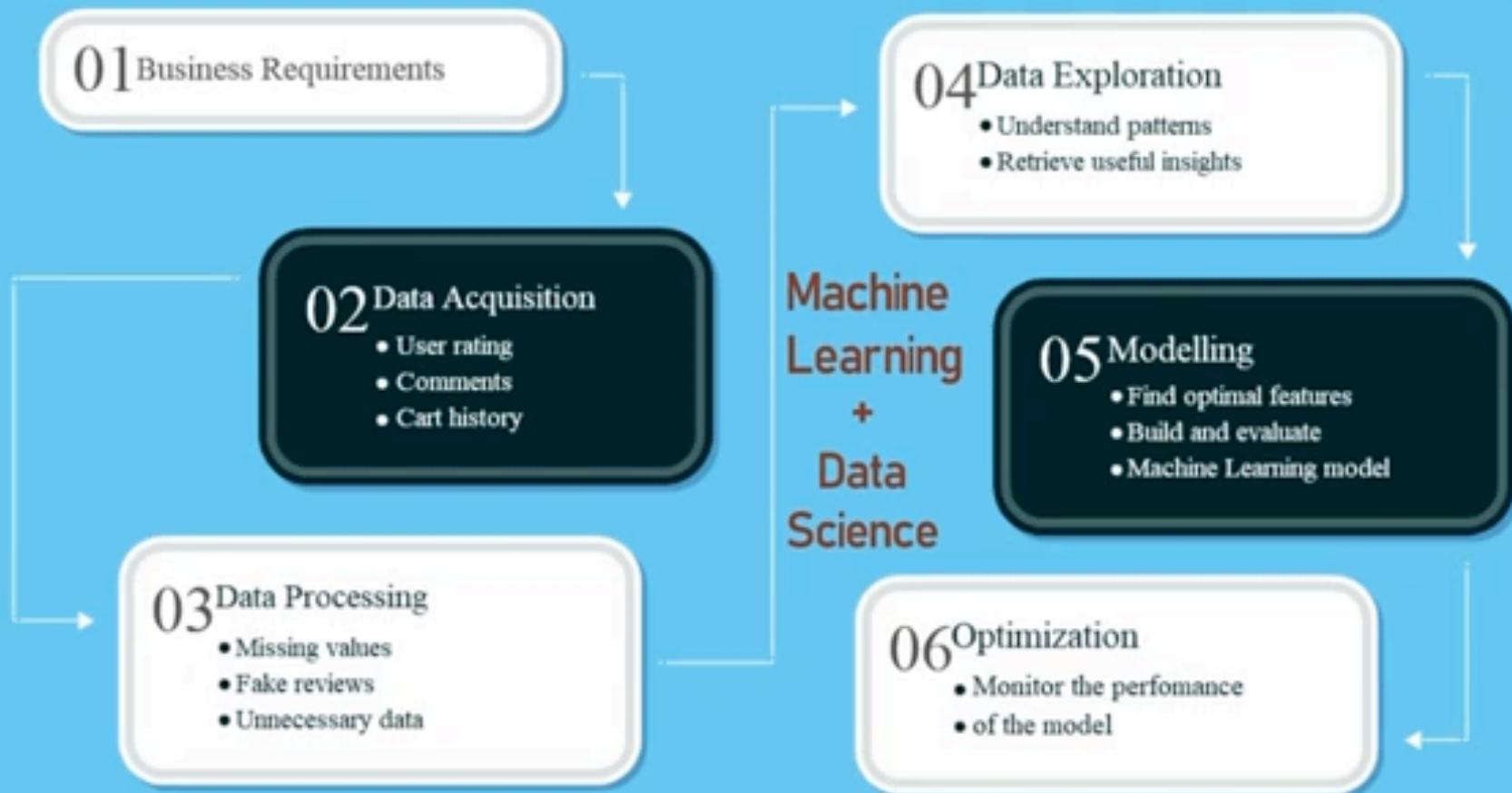
- Forest Model
- Booted Model

## (Unsupervised Learning)

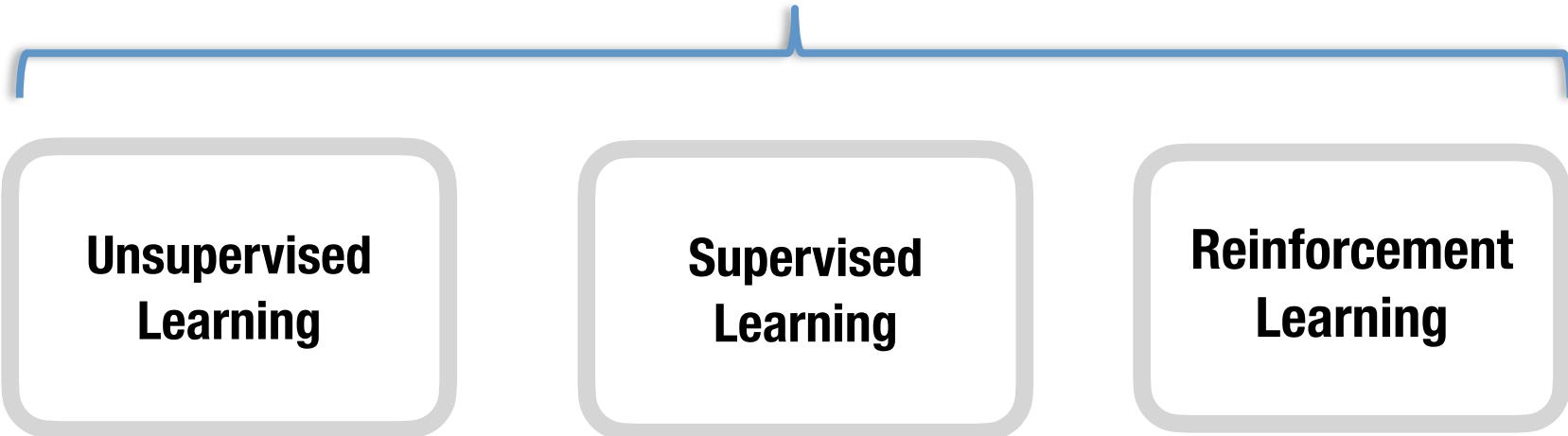
Inferential Statistics & Hypothesis Testing  
推论统计与假设检验

Explorative Data Analysis & Descriptive Statistics  
探索性数据分析与描述性统计

Source: Udacity Model Selection Methodology Map



# **Machine Learning**



```
graph TD; A[Machine Learning] --> B[Unsupervised Learning]; A --> C[Supervised Learning]; A --> D[Reinforcement Learning]
```

**Unsupervised Learning**

**Supervised Learning**

**Reinforcement Learning**

**“Machine Learning is a sub-field of Artificial Intelligence used in programming the computers to learn on its own from data fed to it. The data can be labelled, unlabelled and environmentally triggered through reinforced interactions.”**

## **Supervised Learning**

- Used for prediction of categorical and numerical outcome.
- Data has to be labelled and separated into training set and testing set before model building.
- Apply different algorithms and evaluate which one has best fit.

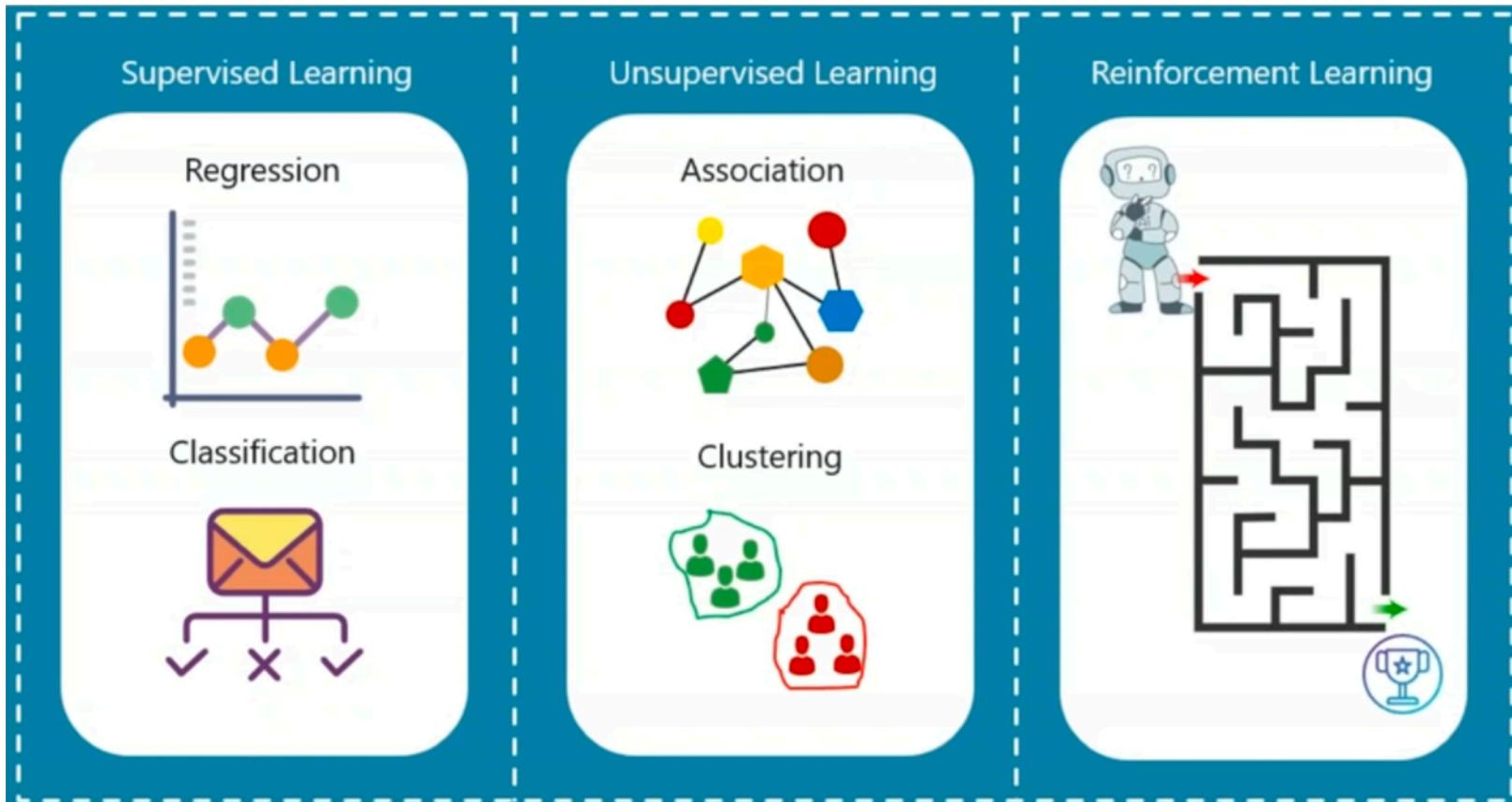
## **Unsupervised Learning**

- Used in the exploratory stage of data preparation to find out patterns (clusters).
- Data is not labelled.
- Used in performing dimension reduction to help extract the essential features for preparing datasets used in model building.

## **Reinforcement Learning**

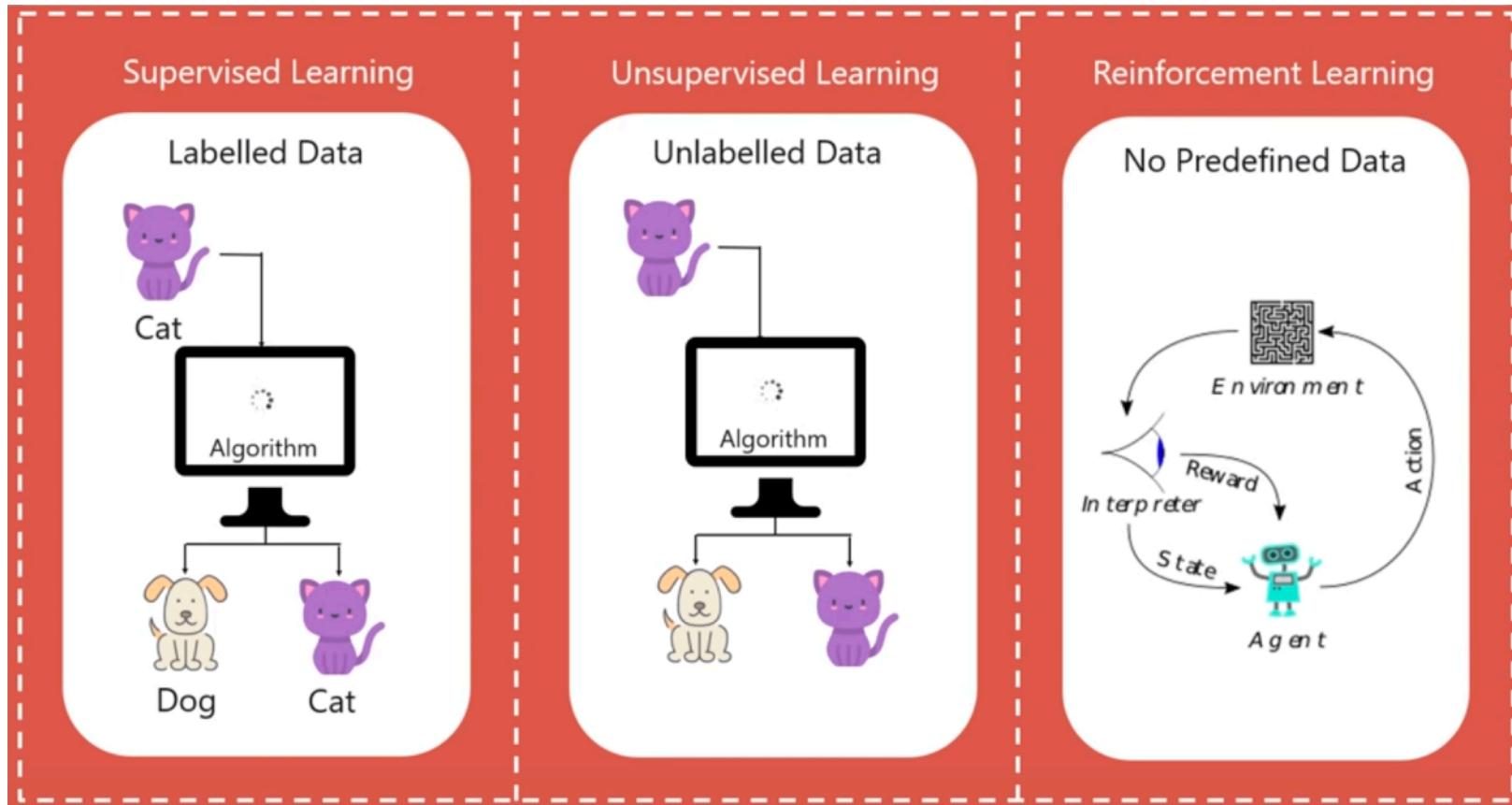
- The ML program is turned into a software agent, navigating through a problem space to reach a goal by trial and error.
- Throughout the course of interaction with the environment, feedbacks will be given to steer the agent toward the goal.

## Type of Problems



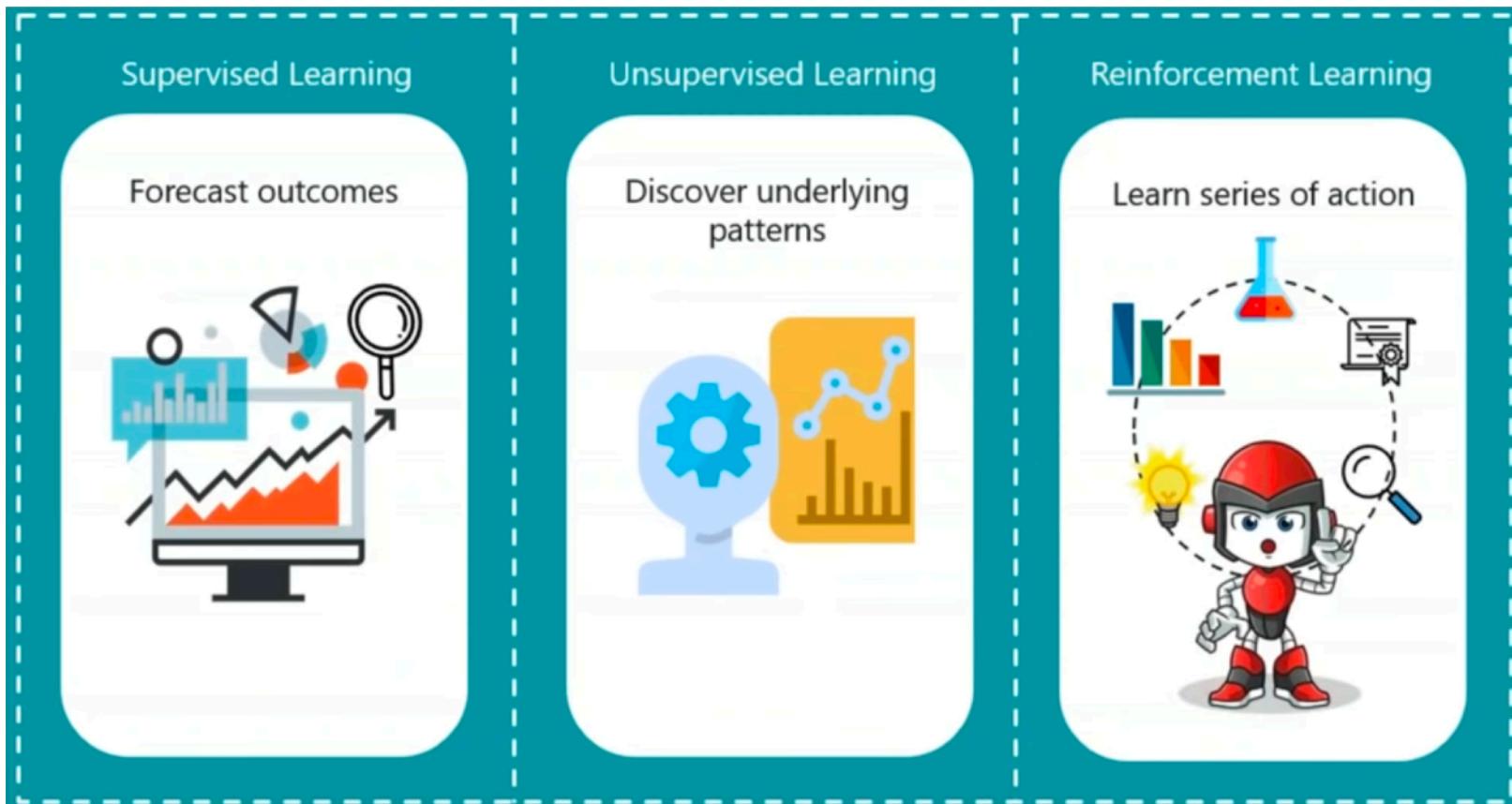
Source: Edureka!

## Type of Data



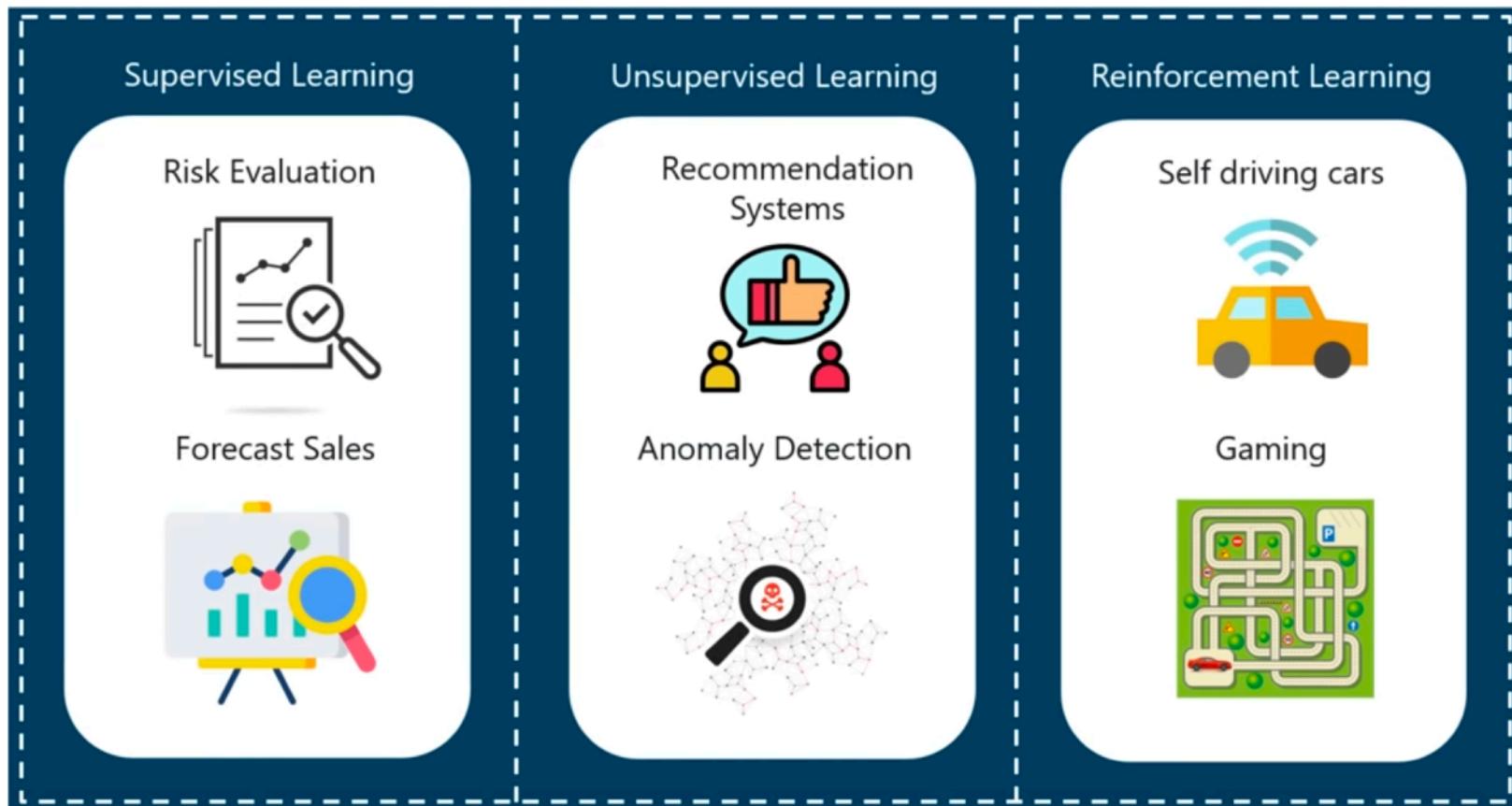
Source: Edureka!

## Aim



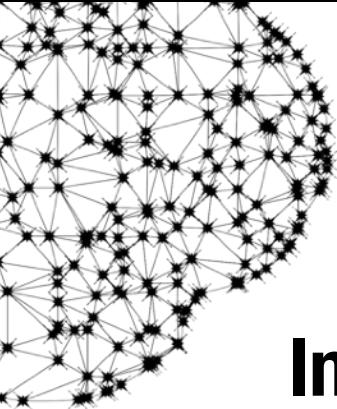
Source: Edureka!

# Applications



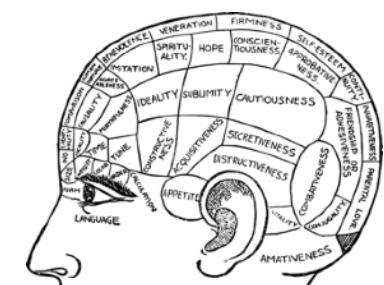
Source: Edureka!

**How does the machine perform its “magic”?**



**In traditional programming, **human** is the  
main programmer?**

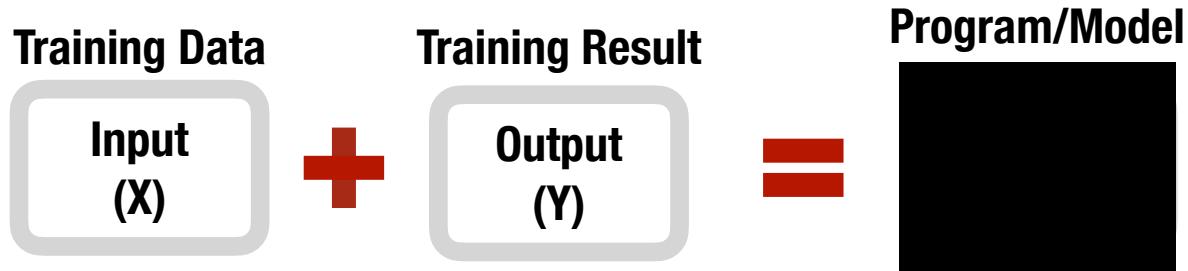
**In machine learning, the **computer** is the  
main programmer?**



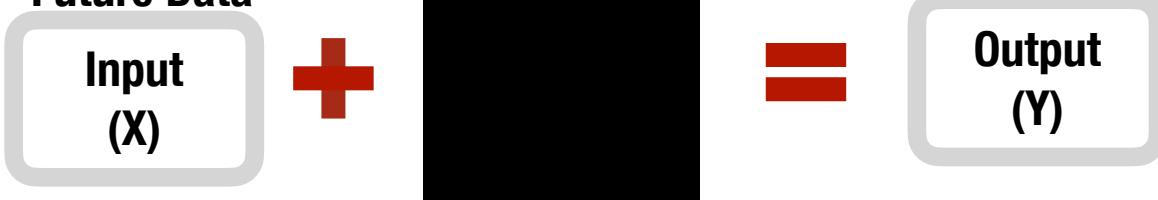
**Traditional  
Programming**



**Machine  
Learning**



**Testing/  
Future Data**



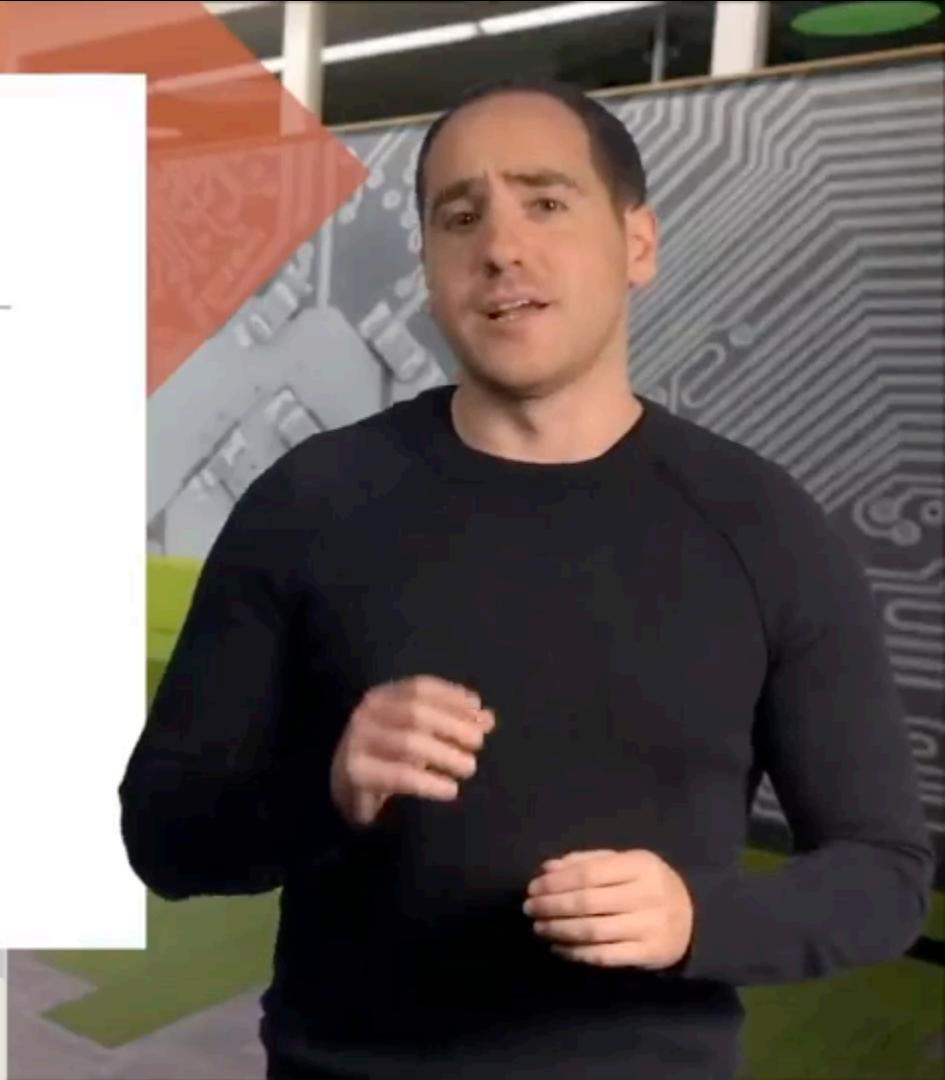
# {ML} Recipes

---

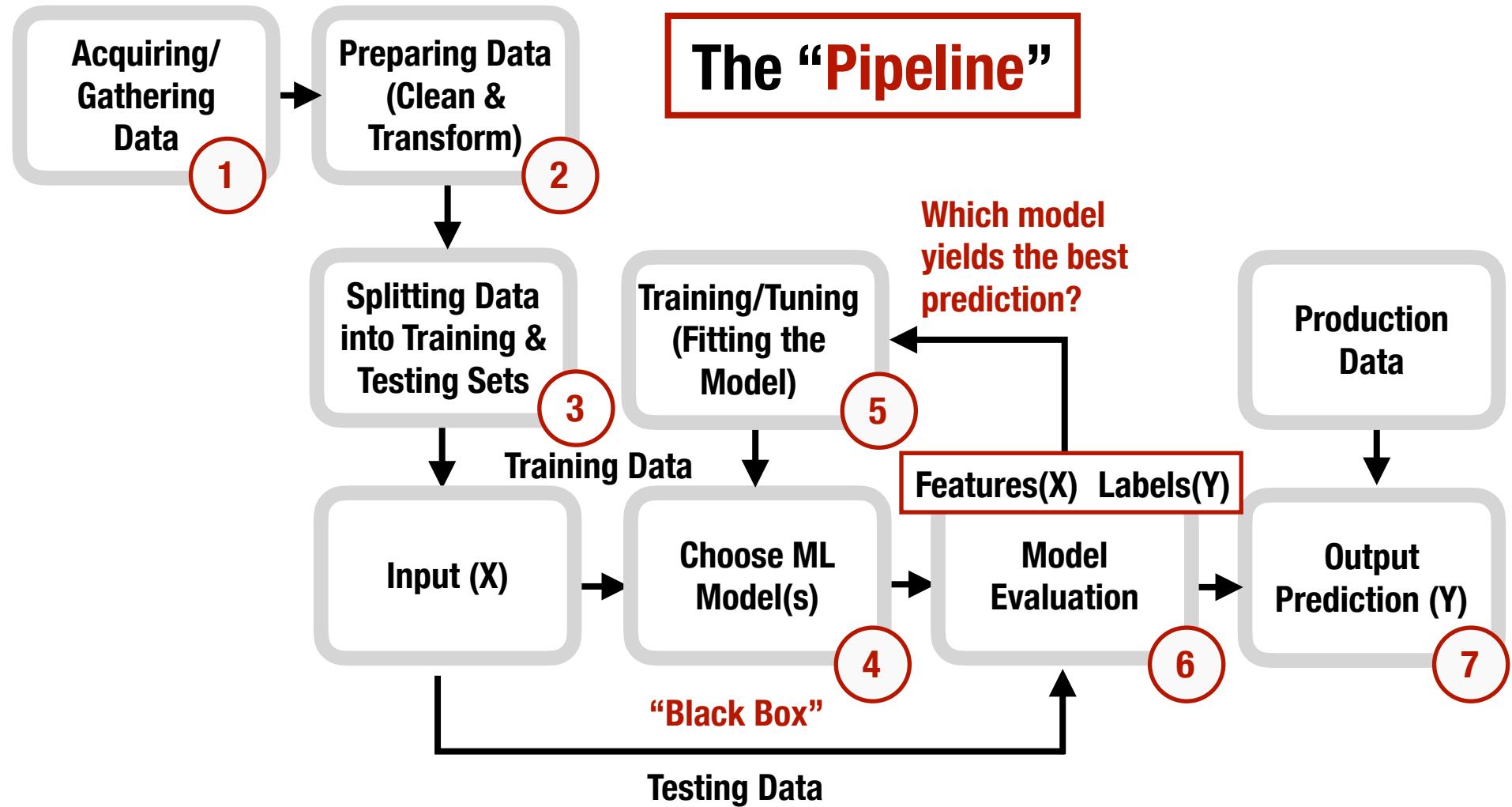
Josh Gordon presents:

Let's Write a Pipeline

 Google Developers



## The “Pipeline”



**“A machine learning pipeline** is used to help **automate machine learning workflows**. They operate by enabling a sequence of data to be transformed and correlated together in a model that can be tested and evaluated to achieve an outcome, whether positive or negative.”

Source: What is a Pipeline in Machine Learning? How to create one? by Shashanka M



ANALYTICS

# What Data Scientists Really Do, According to 35 Data Scientists

by Hugo Bowne-Anderson

August 15, 2018

[Summary](#) [Save](#) [Share](#) [Comment 8](#) [Print](#) **\$8.95** Buy Copies



[https://hbr.org/2018/08/what-data-scientists-really-do-according-to-35-data-scientists?referral=03758&cm\\_vc=rr\\_item\\_page.top\\_right](https://hbr.org/2018/08/what-data-scientists-really-do-according-to-35-data-scientists?referral=03758&cm_vc=rr_item_page.top_right)

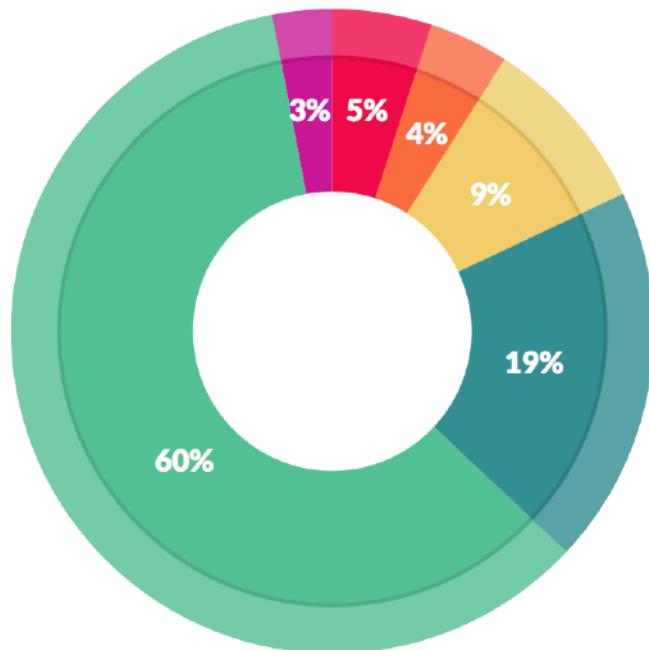


**What data scientists do.** We now know how data science works, at least in the tech industry. First, data scientists lay a solid data foundation in order to perform robust analytics. Then they use online experiments, among other methods, to achieve sustainable growth. Finally, they build machine learning pipelines and personalized data products to better understand their business and customers and to make better decisions. In other words, in tech, data science is about infrastructure, testing, machine learning for decision making, and data products.

Source: By Hugo Bowen-Anderson  
August 15, 2018  
Harvard Business Review

## How a Data Scientist Spends Their Day

Here's where the popular view of data scientists diverges pretty significantly from reality. Generally, we think of data scientists building algorithms, exploring data, and doing predictive analysis. That's actually not what they spend most of their time doing, however.



What data scientists spend the most time doing

- Building training sets: 3%
- Cleaning and organizing data: 60%
- Collecting data sets; 19%
- Mining data for patterns: 9%
- Refining algorithms: 4%
- Other: 5%

**Modelling  
and  
Evaluation**

Source: Data Science 2016 Report by CrowdFlower

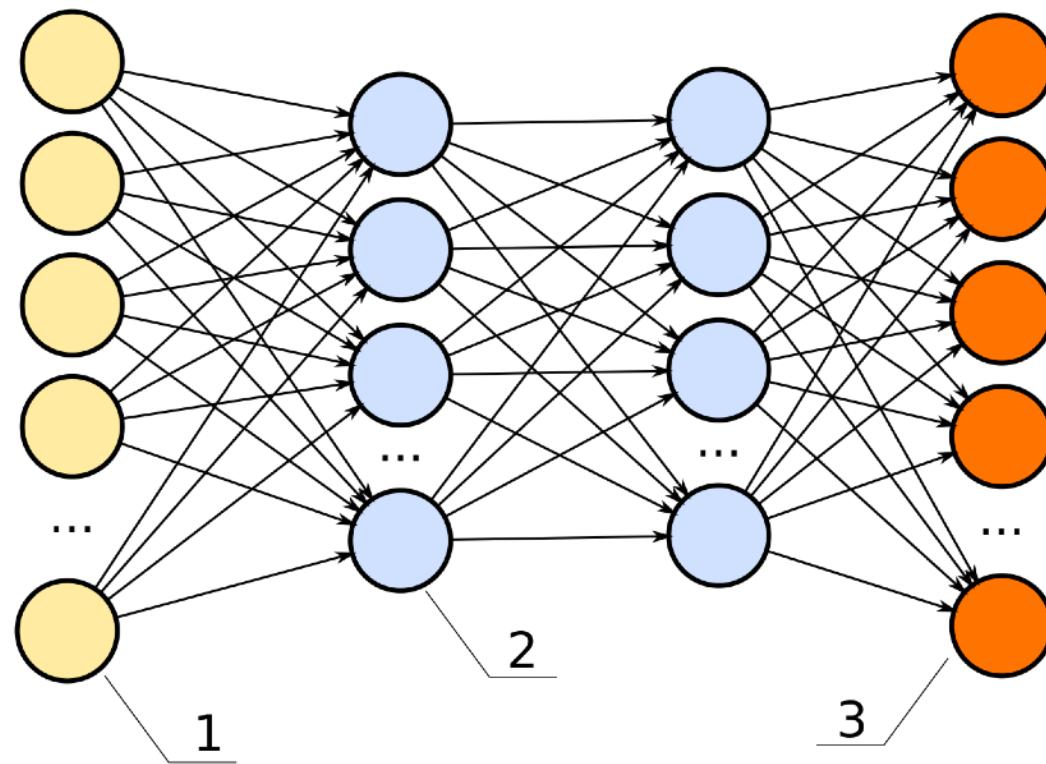
# **Introduction to “Deep Learning”**

**“Deep Learning is a sub-field of Machine Learning which utilises the artificial neural network model to learn on its own from data. The reason that it is called “deep” is because the network is formed with many layers of connection. Output from one layer will become input to another layer, leading to the solution of the problem.”**

Input Layer

Hidden Layers

Output Layer

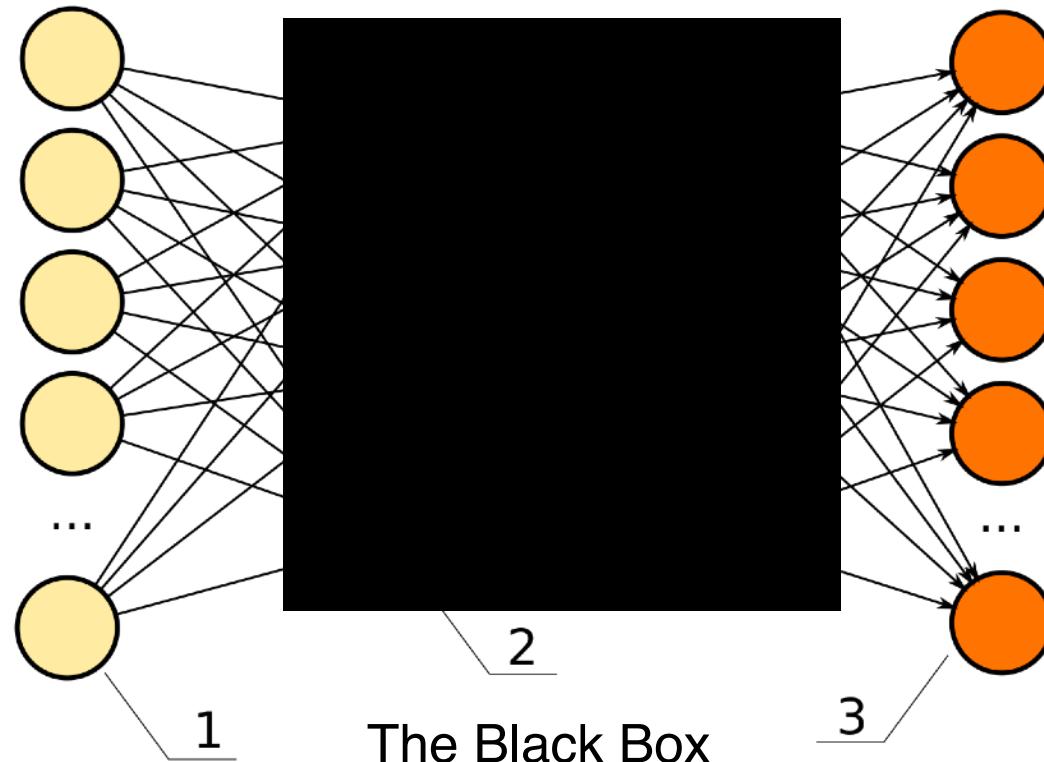


Source: Wikipedia

Input Layer

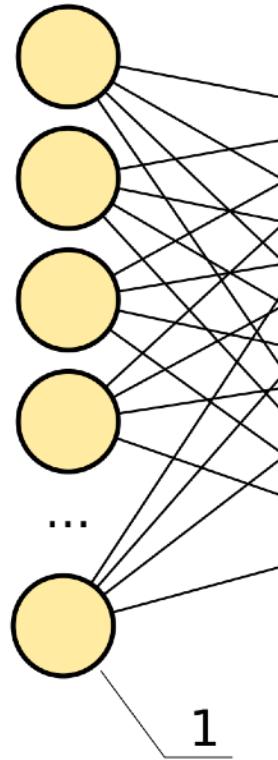
Hidden Layers

Output Layer



Source: Wikipedia

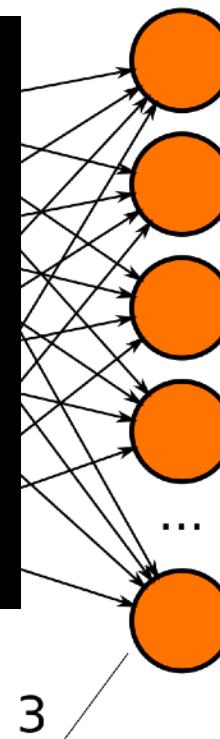
Input Layer



Hidden Layers

- How many hidden layers?
- How many nodes in each layer?
- Activation function
- The effect of learning rate and momentum (how fast and accurate) on the weight and bias.
- Iteration and desired error level (optimisation)

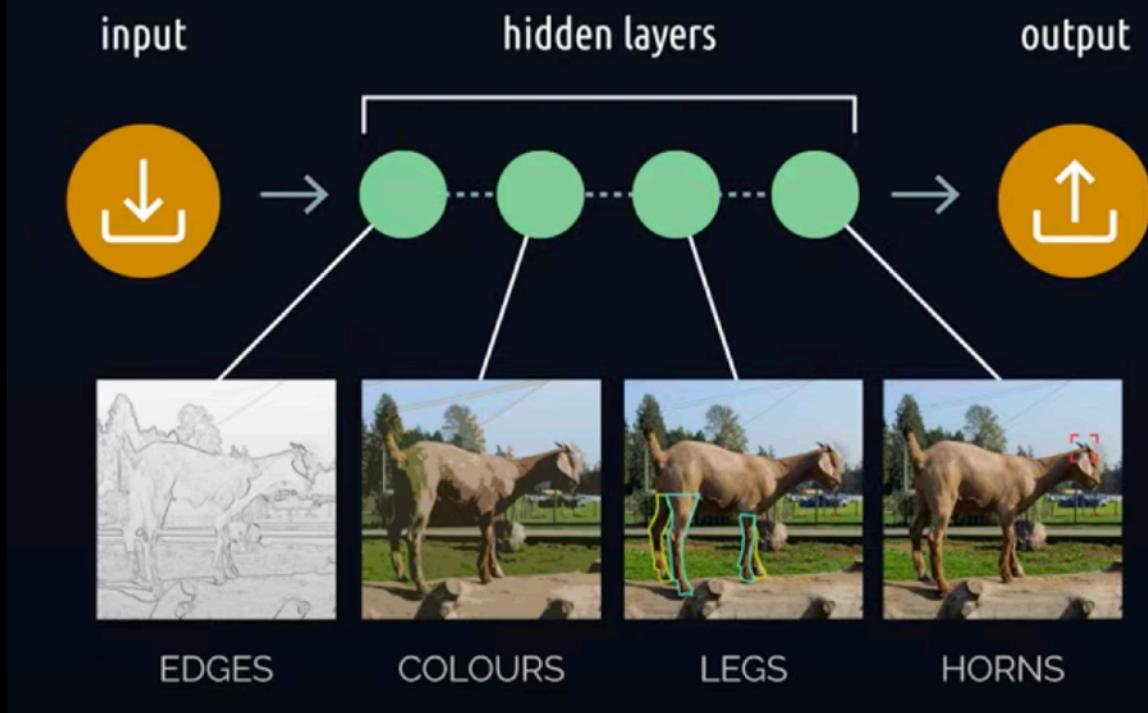
Output Layer



The Black Box

Source: Wikipedia

# *Hidden Layers*



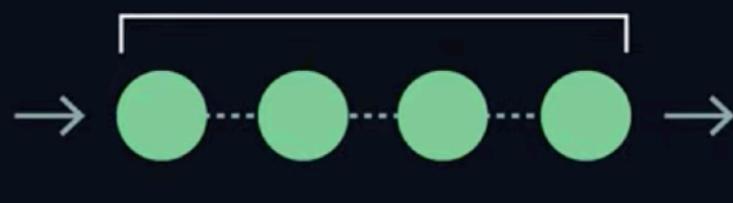
Source: [Python Simplified](#)

# *Training*

input



hidden layers



output



goat



goat

prediction

Source: [Python Simplified](#)

# *Weights*

connect between the nodes of our layers  
and help us determine how much impact  
each node has on the input.



Source: [Python Simplified](#)

# *Weights*

Optimization

we keep **adjusting** the weights until  
most of our examples are **correctly**  
**classified** / predicted.



Source: [Python Simplified](#)

# **The “Black Box” *vs.* Explainable & Interpretable AI**



# Comparison Between PA, ML & DL

	Predictive Analytics	Machine Learning	Deep Learning
Supervised Learning	X	X	X
Unsupervised Learning		X	X
Reinforcement Learning		X	X
Data Intensive			X
GPU Processing Intensive			X

# **Timeline for Problem Sets and Progress. Reports**

## **Problem Set #1**

- 1. Create a Postman folder consisted of CRUD and authentication tests to your Flask database from last term's final project.**
- 2. Export the Postman folder and include with your Jupyter Notebook.**

## **Problem Set #2**

- 1. Create an Airtable base (i.e. derived from your SQLite database) and table (e.g. blog tables)**
- 2. Create a Jupyter Notebook which includes the use of the Python requests module to access Airtable.**
- 3. Perform CRUD requests demonstrating how to exchange data between a Python application and Airtable.**

## **Problem Set #3 (Due on Feb 27th)**

- 1. Make your COM5961 final project into a PWA.**
- 2. Create an Airtable base of keeping count on number of registration and login or perform email confirmation.**
- 3. Use Flask REST API request to trigger Airtable automation (i.e. the registration and login will activate Airtable triggers to take action for creating or updating records or sending emails).**

## **Problem Set #4 (Due March 13)**

- 1. Use your Flask Website to conduct registration and login authentication.**
- 2. Create a WordPress website using the Kadence theme and Gutenberg blocks and let it communicate with the Flask website through REST API (Once registered in Flask, automatically register with WordPress. Similarly once login with Flask, login with WordPress).**
- 3. Create a Pods with custom defined table(s) that will suit your needs for supporting your own Flask website development.**

## **Problem Set #5 (Due March 27)**

- 1. Apply what you've learned about REST API, PWA, Airtable automation, machine learning, blockchain, or whatever combinations you can think of to enrich your Flask website with additional content, community, and commercialisation (3C) enhancement features.**

# **Project Progress Report #2**

## **(Due Apr 3rd - Monday)**

1. Conduct market/user research and usability study on your chosen project after discussion with Bernard on your 2nd proposal (Remember to schedule meeting).
2. Develop project story map and product backlog using the **Lean Method** (Business Model Canvas and Value Proposition Canvas) for the future journey.
3. Implement the result in Airtable using the SCRUM template with the backlog listed and 1st sprint scheduled (with clear task assignment).
4. Submit status report (minimum 5 pages) with findings. The appendix section of the report should include:
  - Usability test dashboard, usability test script and result (screen capture with audio recording) for future journey.
  - Business model canvas and value proposition canvas (can be conducted online using Figma Jamboard) related to early adopter segment targeted.
  - Story map with each story card clearly specifying persona, feature (what - gain creator and pain reliever), benefit (why - gain and pain), and acceptance criteria for future journey.
5. The report findings should explain clearly the choice of persona segment targeted and how the product backlog is developed and the first sprint is prioritised (with OKR specified).
6. All project communication must be conducted through Airtable so I can be notified.

**Thank you for your time!**