



COM5940 NEW MEDIA BUSINESS MODEL & INNOVATION: LESSON 10-INNOVATIVE APPLICATIONS OF MACHINE LEARNING II

Bernard Suen
Center for Entrepreneurship
Chinese University of Hong Kong

Today's agenda.

1. Major branches of AI for practical applications.
2. Review of the modelling **pipeline** and its **applications**.
3. Introduction to Natural Language Processing (**NLP**) and its applications.
4. Introduction to building image classifier pipeline using **Teachable Machine**, **P5.js/ML5.js**, and **TensorFlow/Keras**.
5. Deploy machine learning model using **Flask** and **Docker**.

Recap of CRISP-DM and Methodology Map

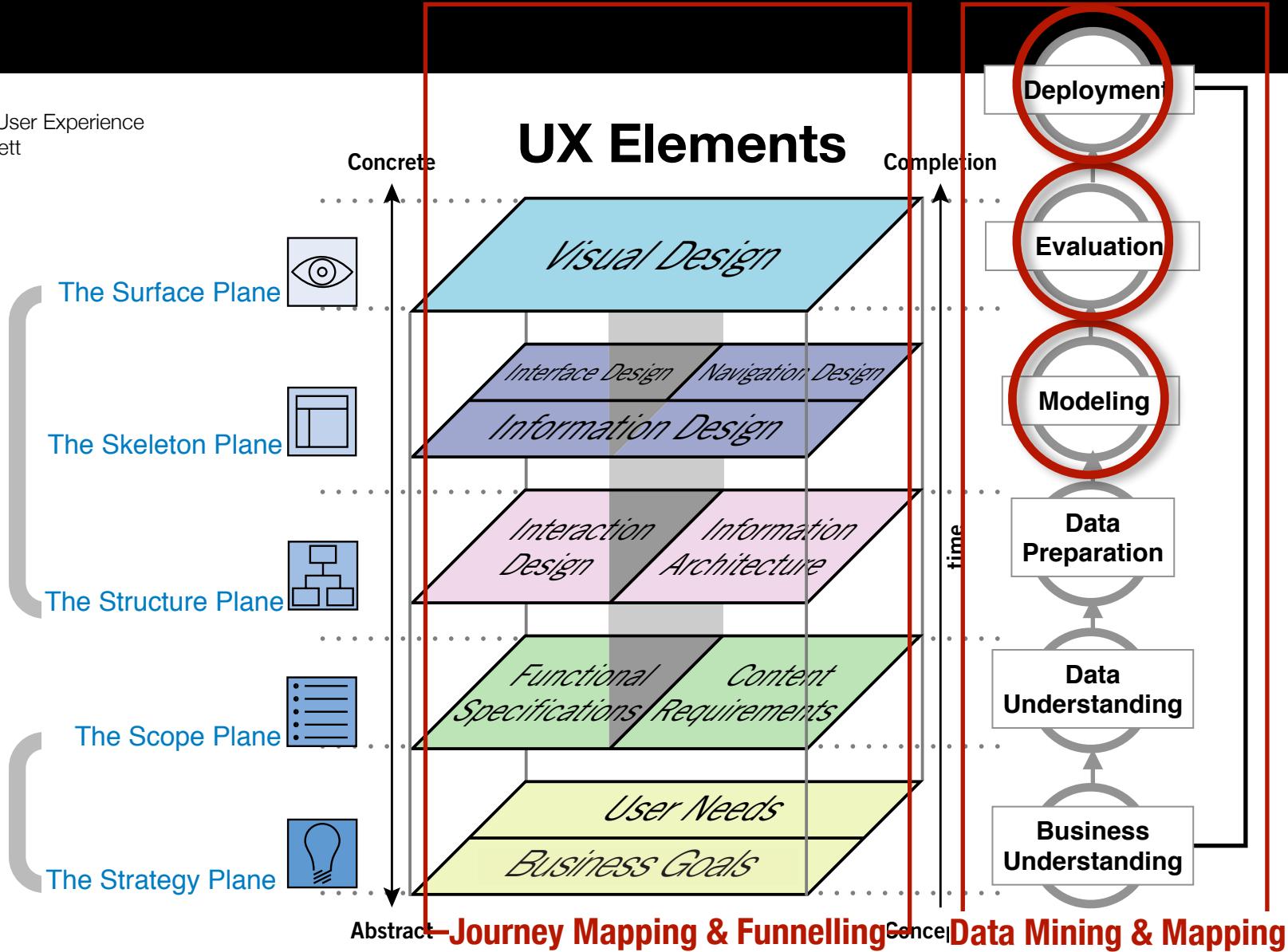
Source: Elements of User Experience
by Jesse James Garrett

Solution Space

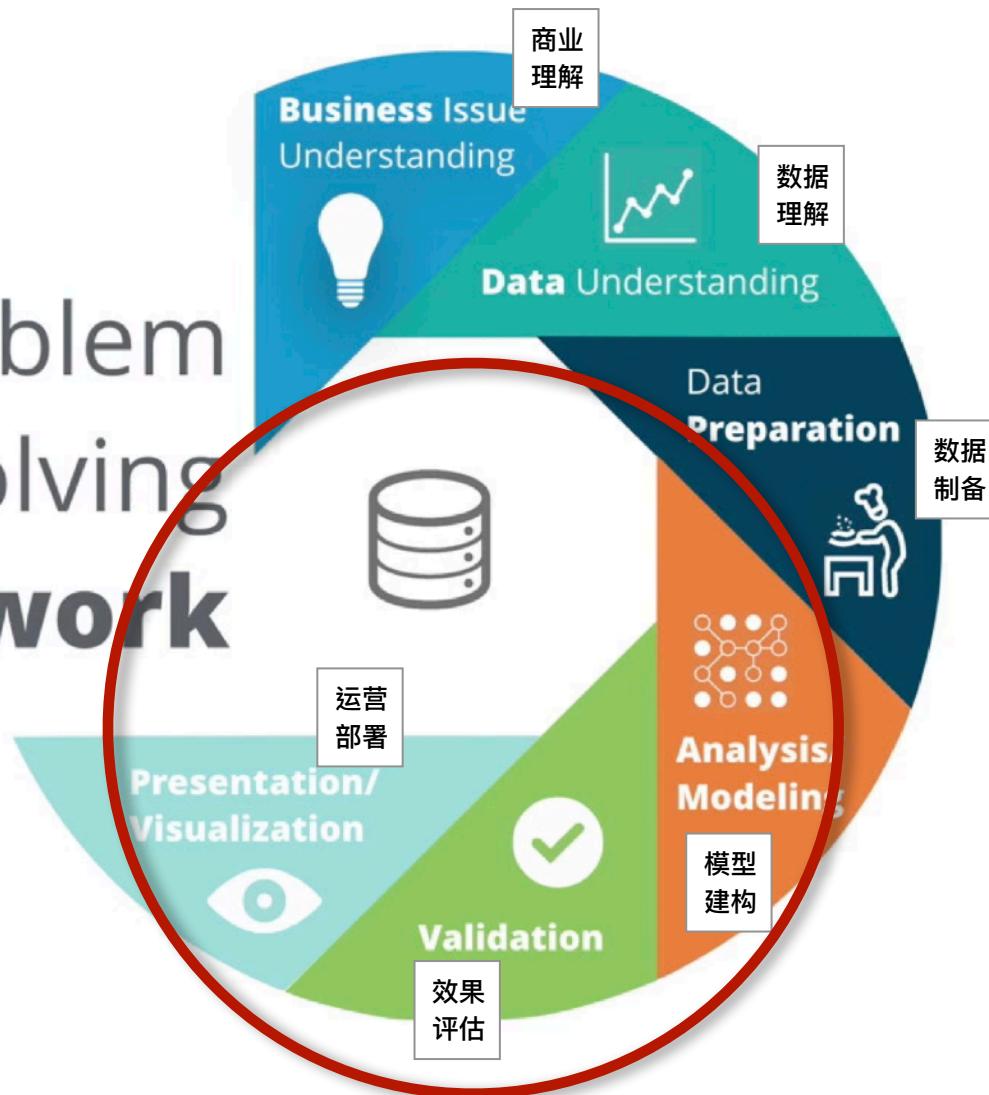
how and
how much

Problem Space

who, what,
and why



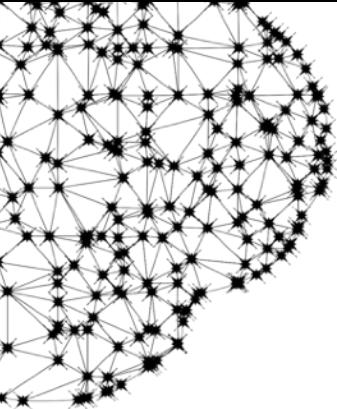
Problem Solving Framework



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"> • Inferential Statistics (t-test, Chi square, etc.) 	Aggregation	Descriptive
<ul style="list-style-type: none"> • Linear Regression, • Multiple Regression 	<ul style="list-style-type: none"> • Count Regression 	<ul style="list-style-type: none"> • Logistic Regression • Decision Tree 	<ul style="list-style-type: none"> • Random Forest • K-Nearest Neighbour 			
e.g. Scikit-learn, Keras, Tensorflow, etc.				e.g. Google Optimize	e.g. SQL, Airtable, GA Descriptive Statistics	

Source: Udacity Model Selection Methodology Map

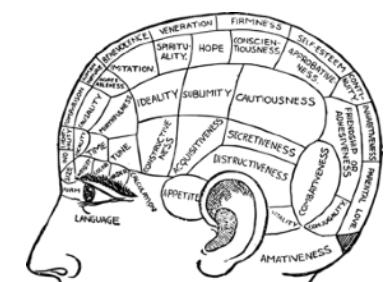
Branches of AI for **practical applications**

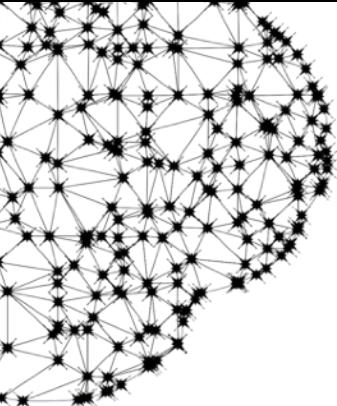


“...to summarize, the discipline of **computer science** has evolved into the following 15 distinct fields:

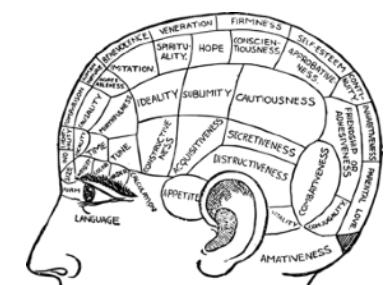
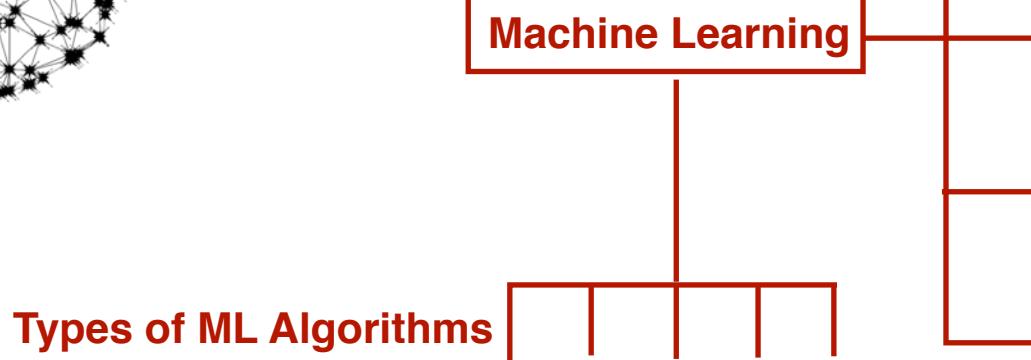
1. Algorithms and complexity
2. Architecture and organization
3. Computational science
4. Graphics and visual computing
5. Human-computer interaction
6. Information management
7. **Artificial Intelligence**
8. Networking and communication
9. Operating systems
10. Parallel and distributed computing
11. Platform-based development
12. Programming languages
13. Security and information assurance
14. Software engineering
15. Social and professional issues

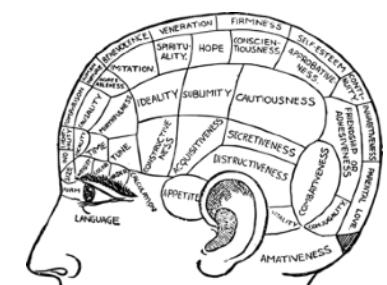
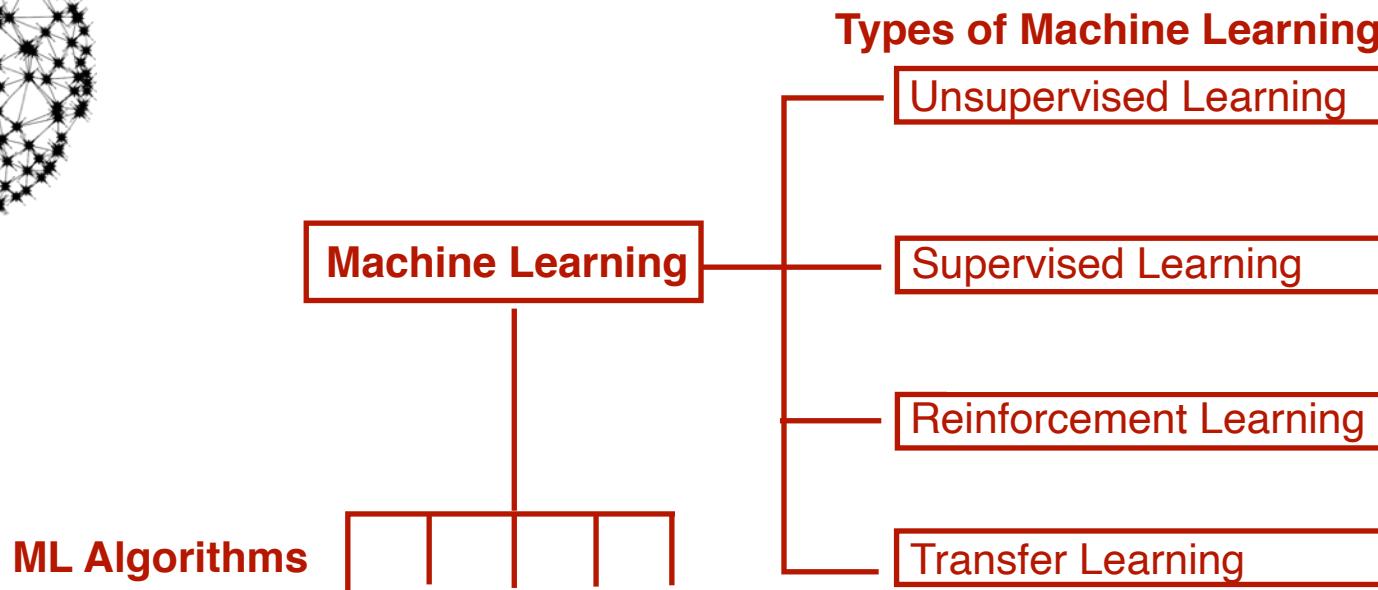
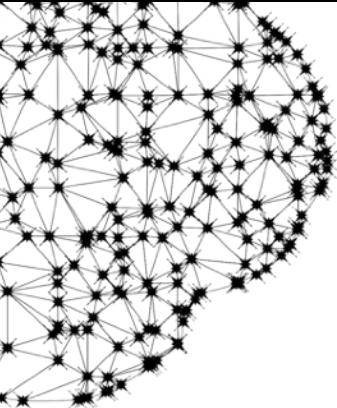
Source: [Encyclopedia Britannica](#)

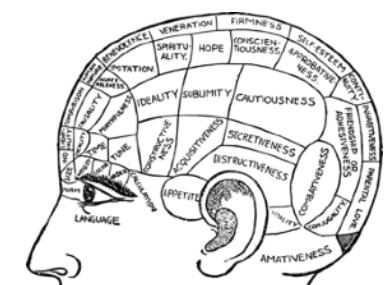
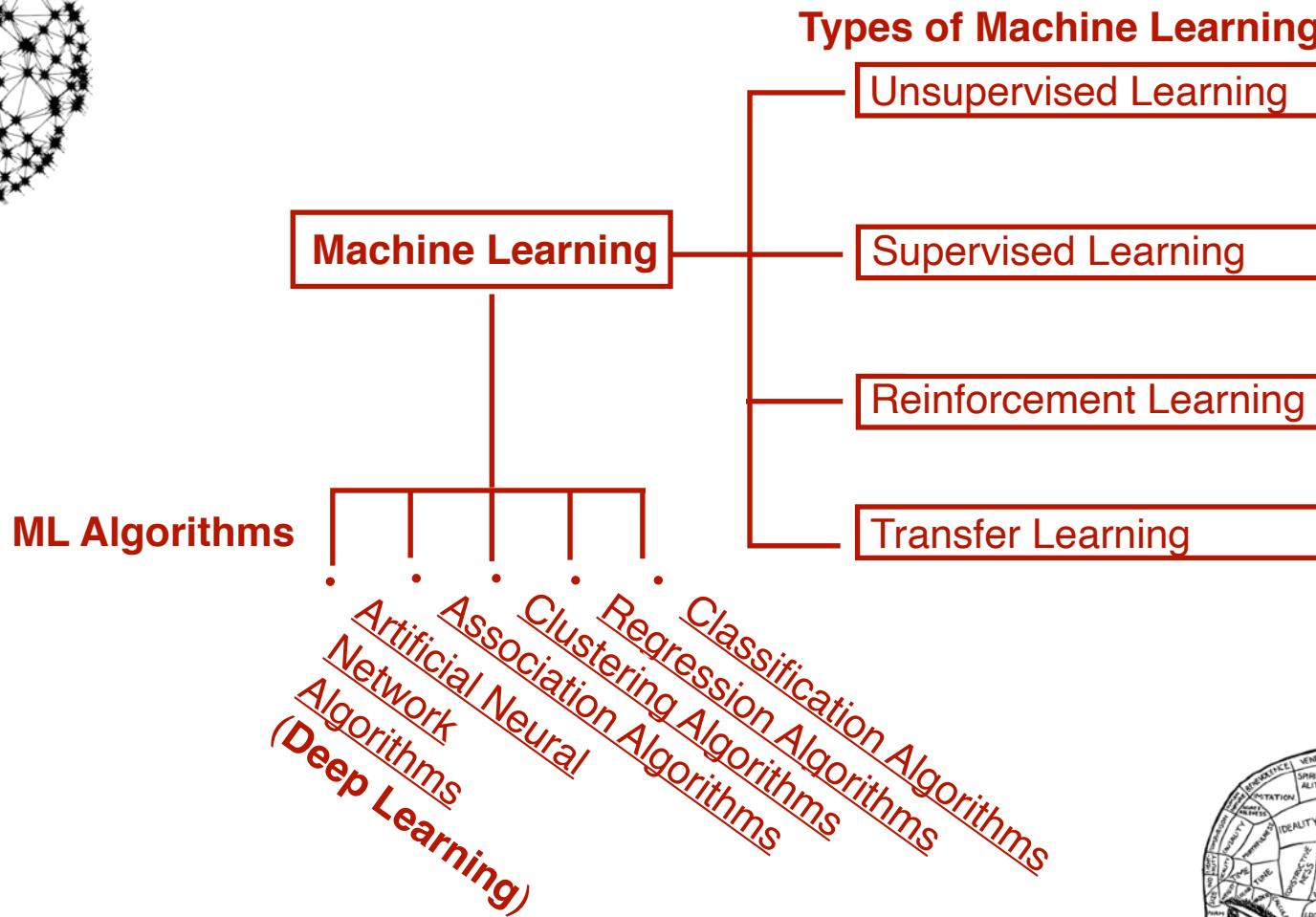
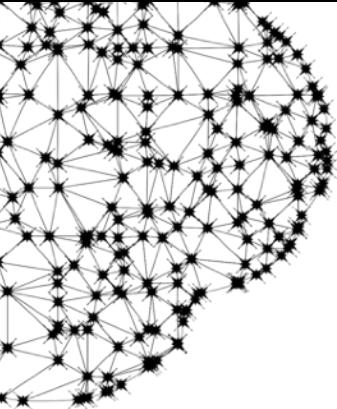


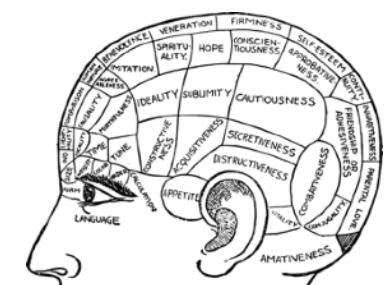
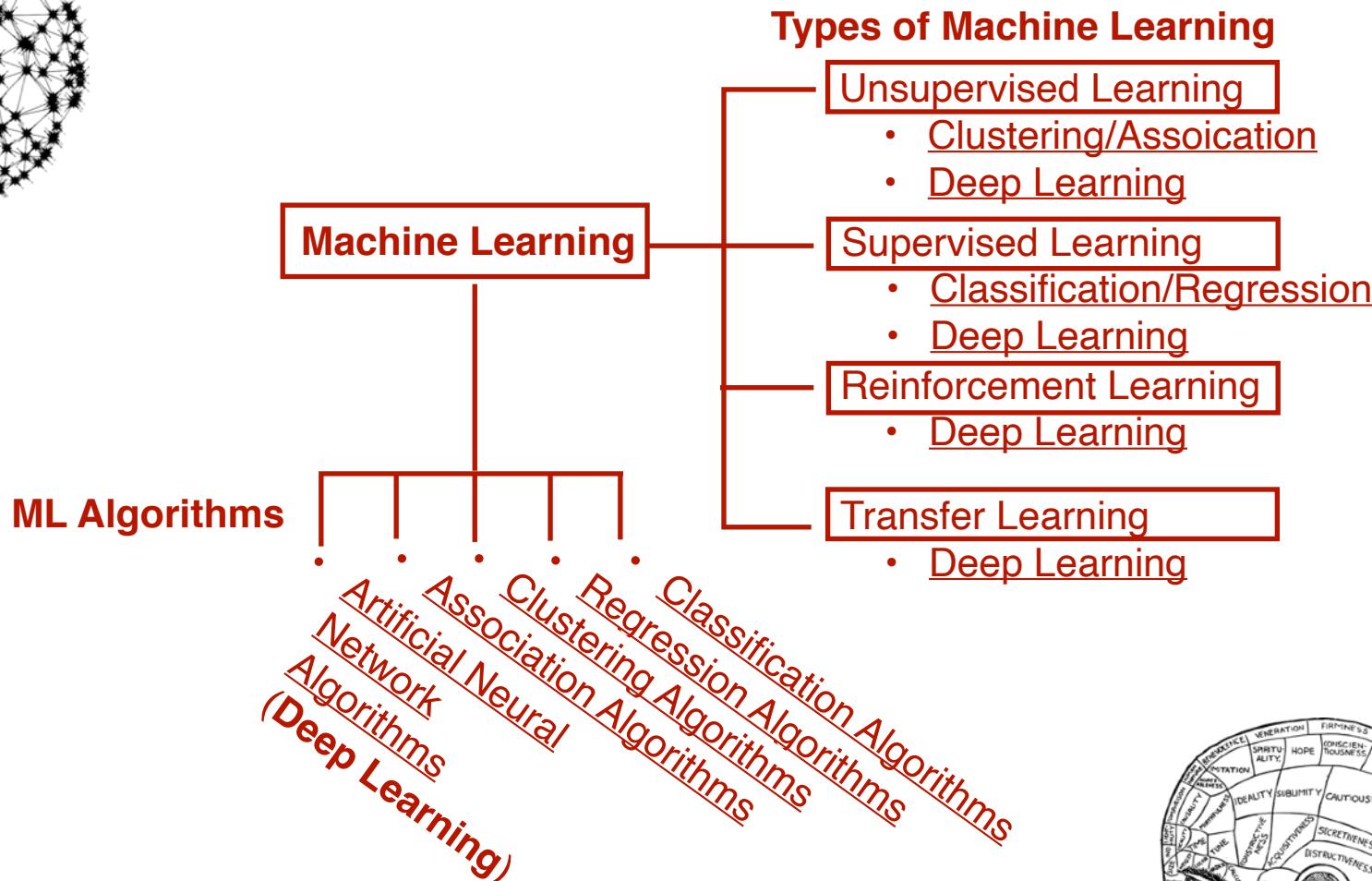
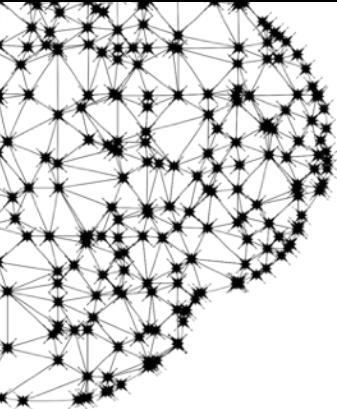


Types of Machine Learning

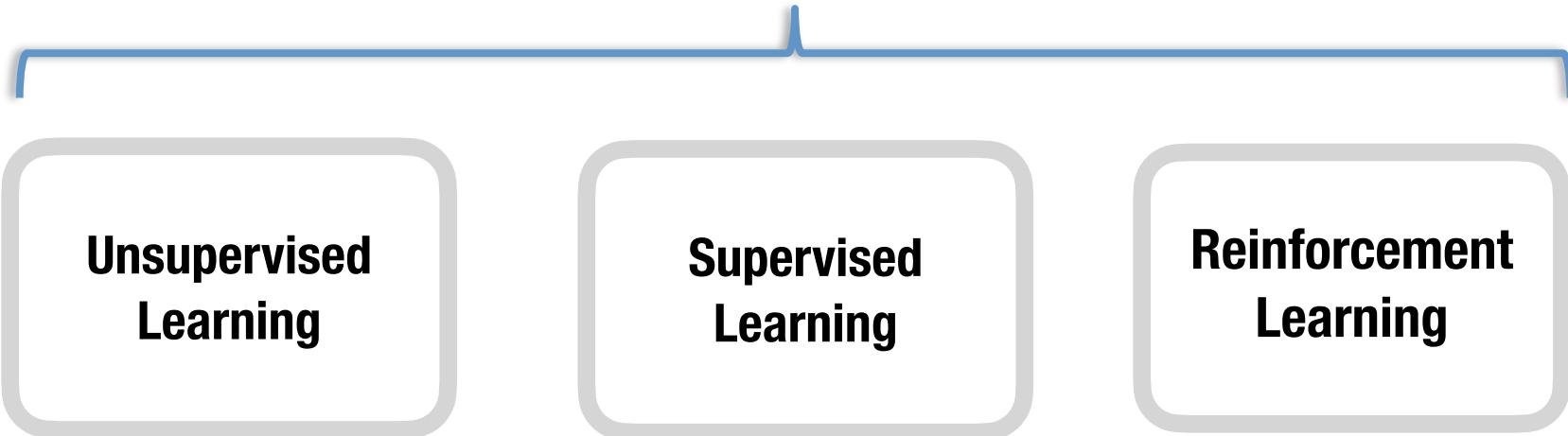








Machine Learning



```
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.

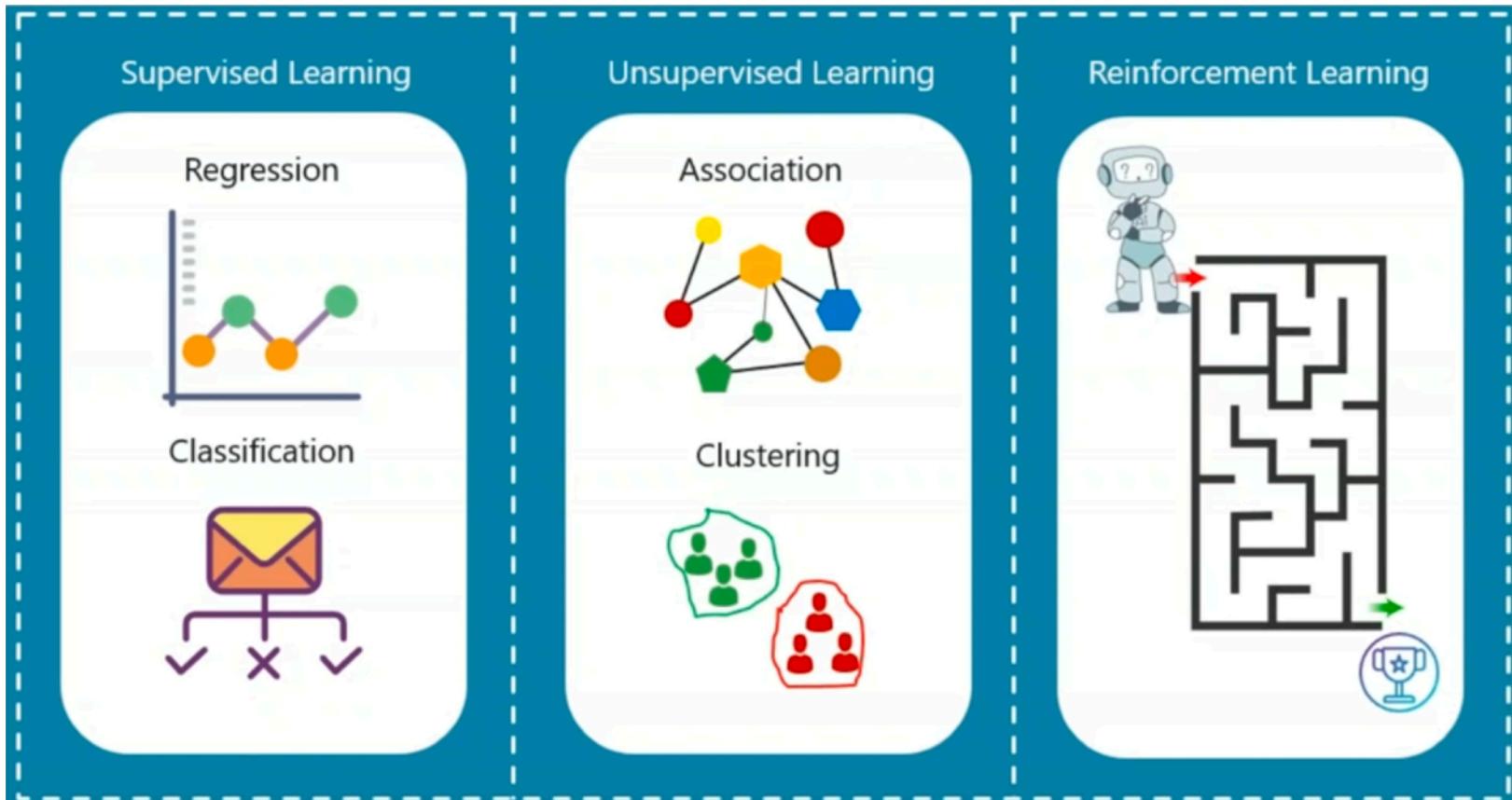
Unsupervised Learning

- 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

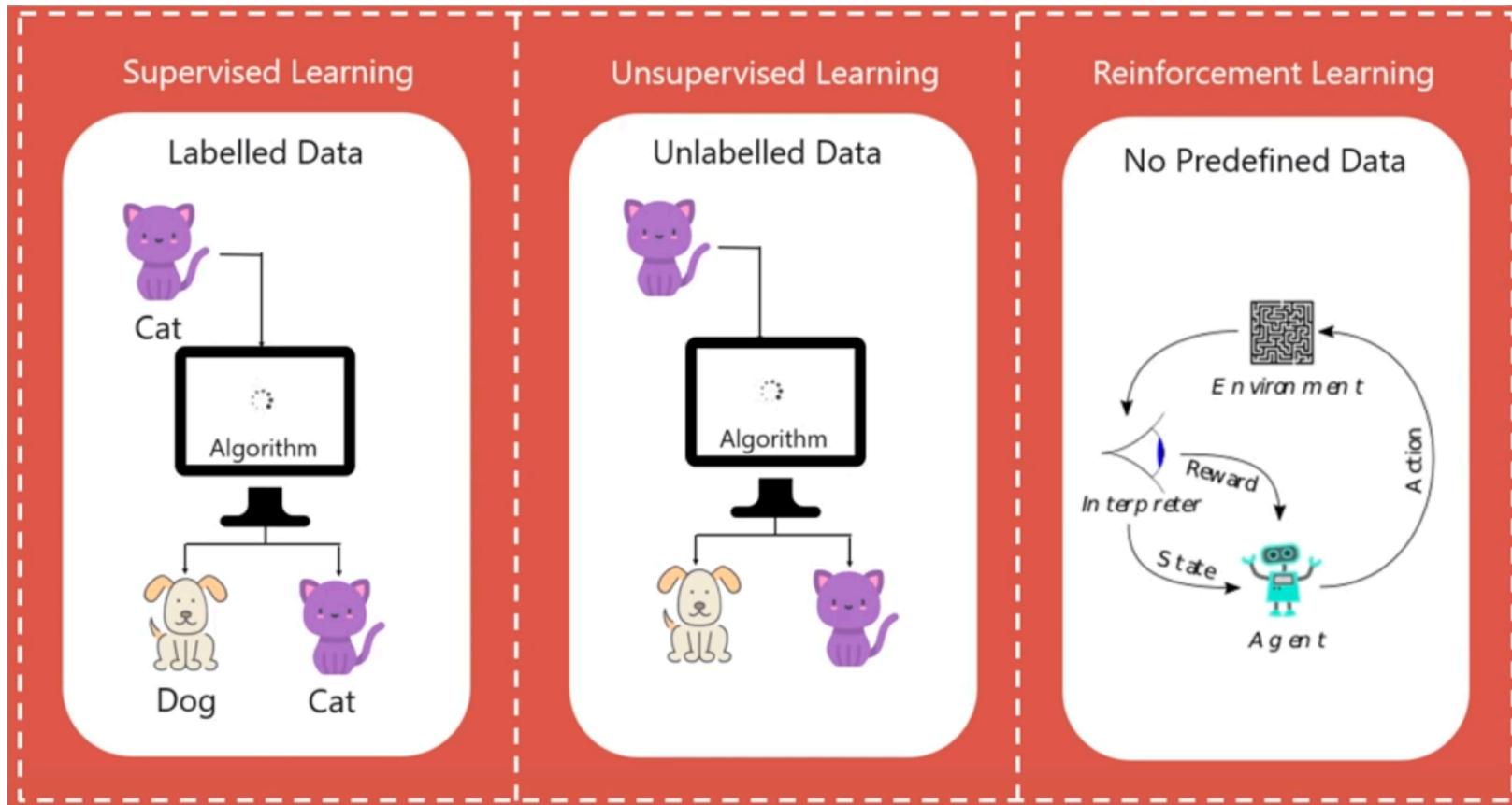
- The ML program is turned into a software agent, navigating through a problem space to reach a goal by trial and error.
- Throughout the course of interaction with the environment, feedbacks will be given to steer the agent toward the goal.

Type of Problems



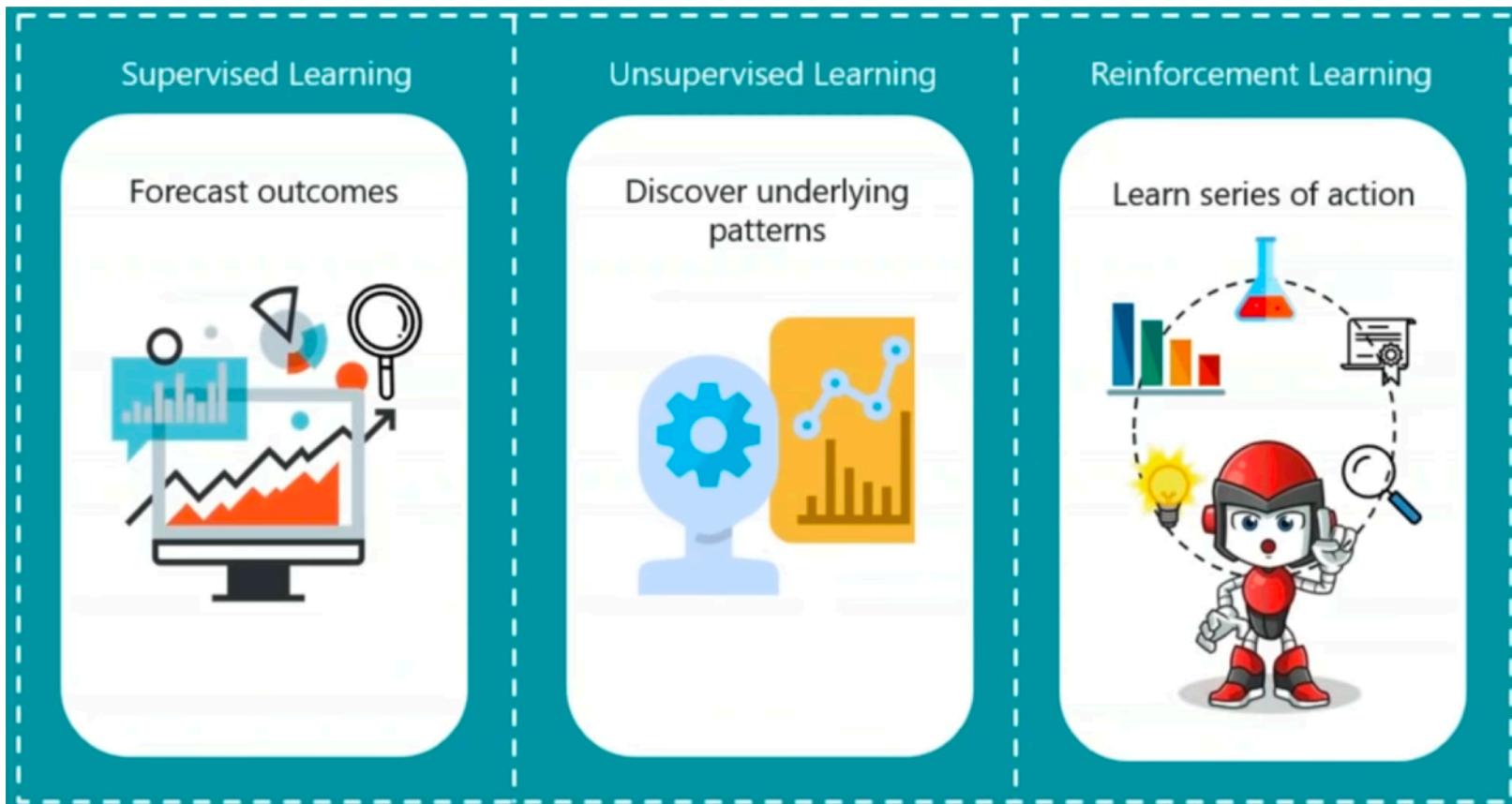
Source: Edureka!

Type of Data



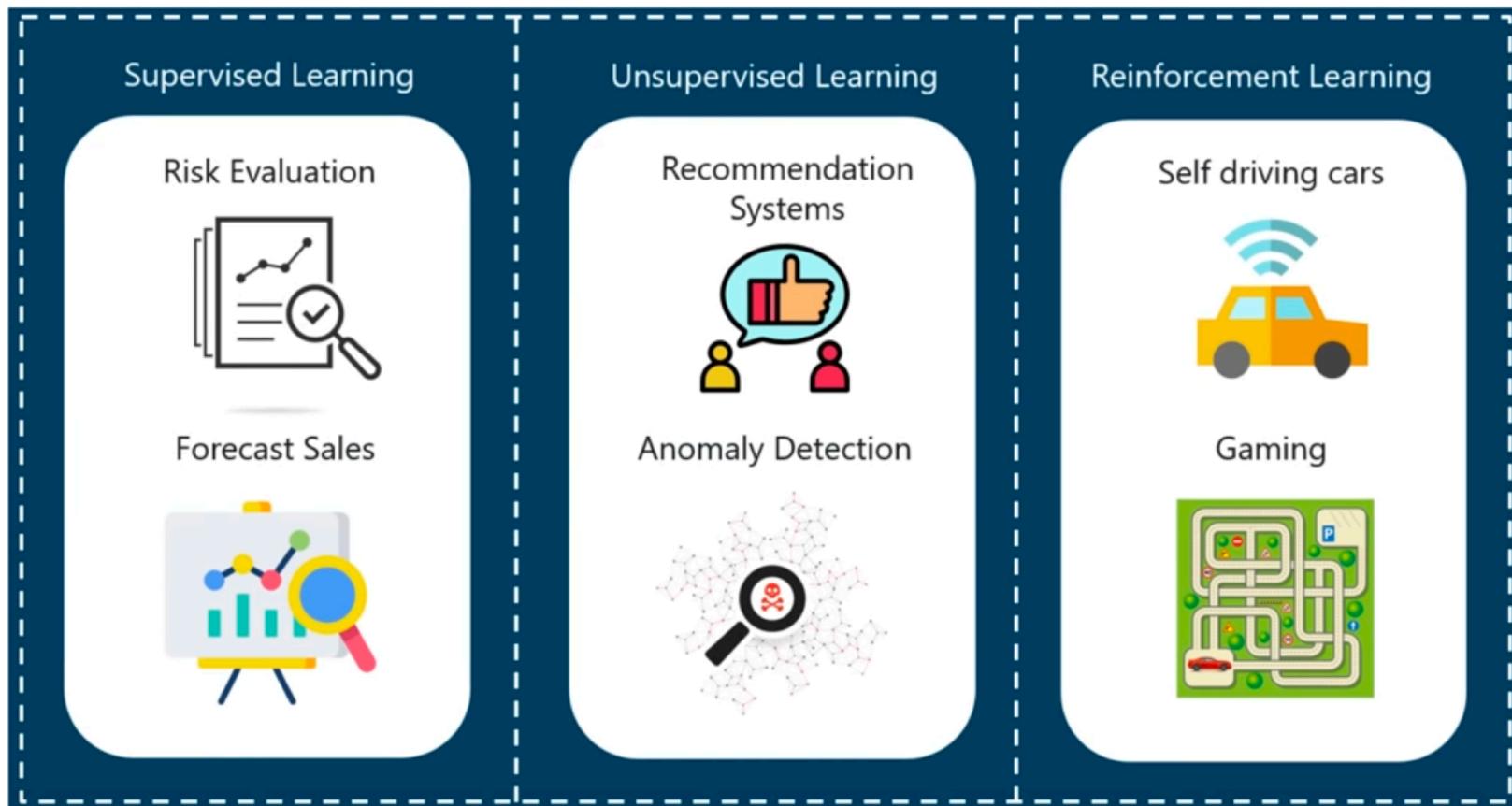
Source: Edureka!

Aim



Source: Edureka!

Applications



Source: Edureka!

How does the machine perform its “magic”?



Google Cloud

AI Adventures

7 Steps of Machine Learning



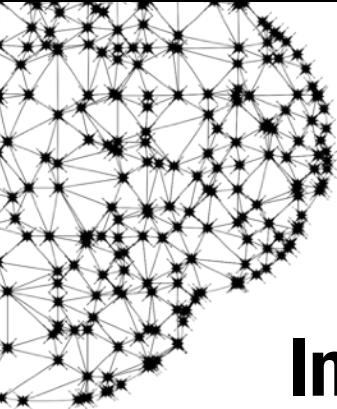
“A machine learning pipeline is used to help **automate machine learning workflows**. They operate by enabling a sequence of data to be transformed and correlated together in a model that can be tested and evaluated to achieve an outcome, whether positive or negative.”

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



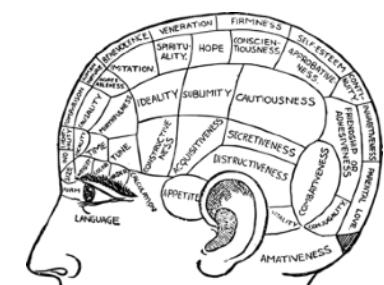
What data scientists do. We now know how data science works, at least in the tech industry. First, data scientists lay a solid data foundation in order to perform robust analytics. Then they use online experiments, among other methods, to achieve sustainable growth. Finally, they build machine learning 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



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

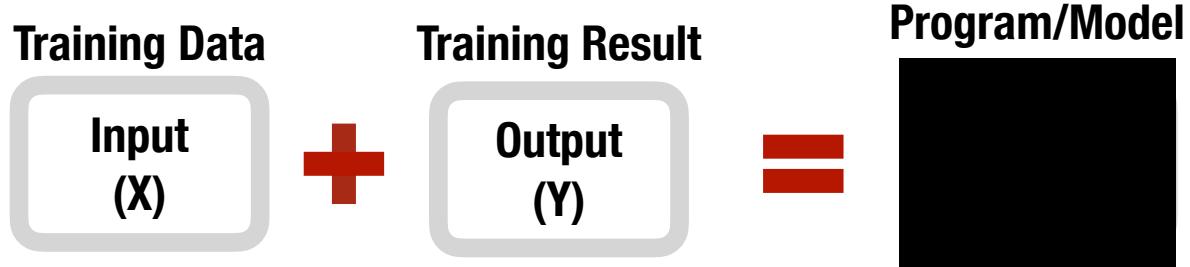
In machine learning, the **computer is the
main programmer?**



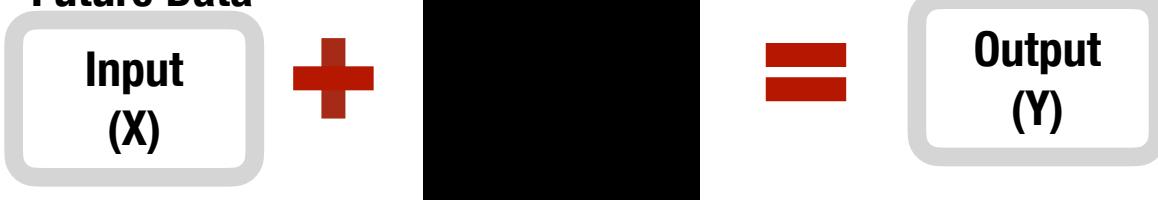
**Traditional
Programming**



**Machine
Learning**



**Testing/
Future Data**

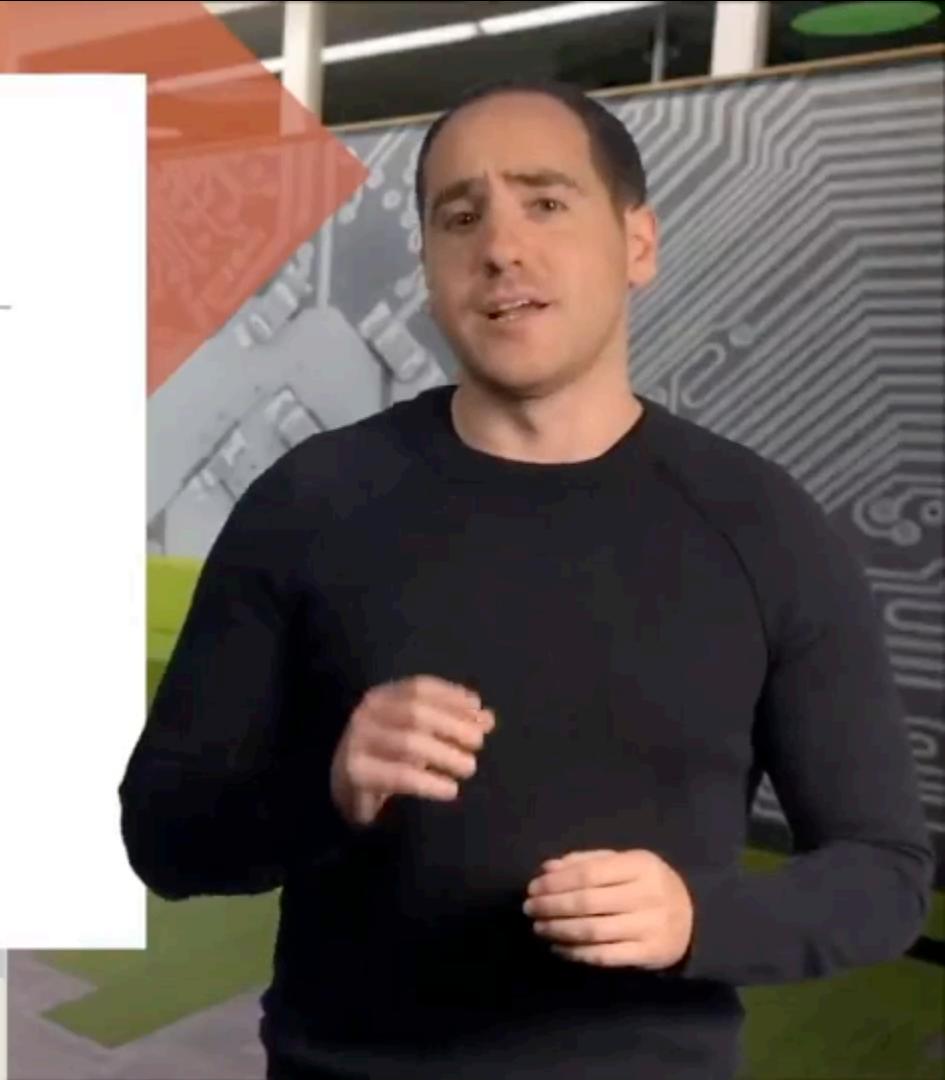


{ML} Recipes

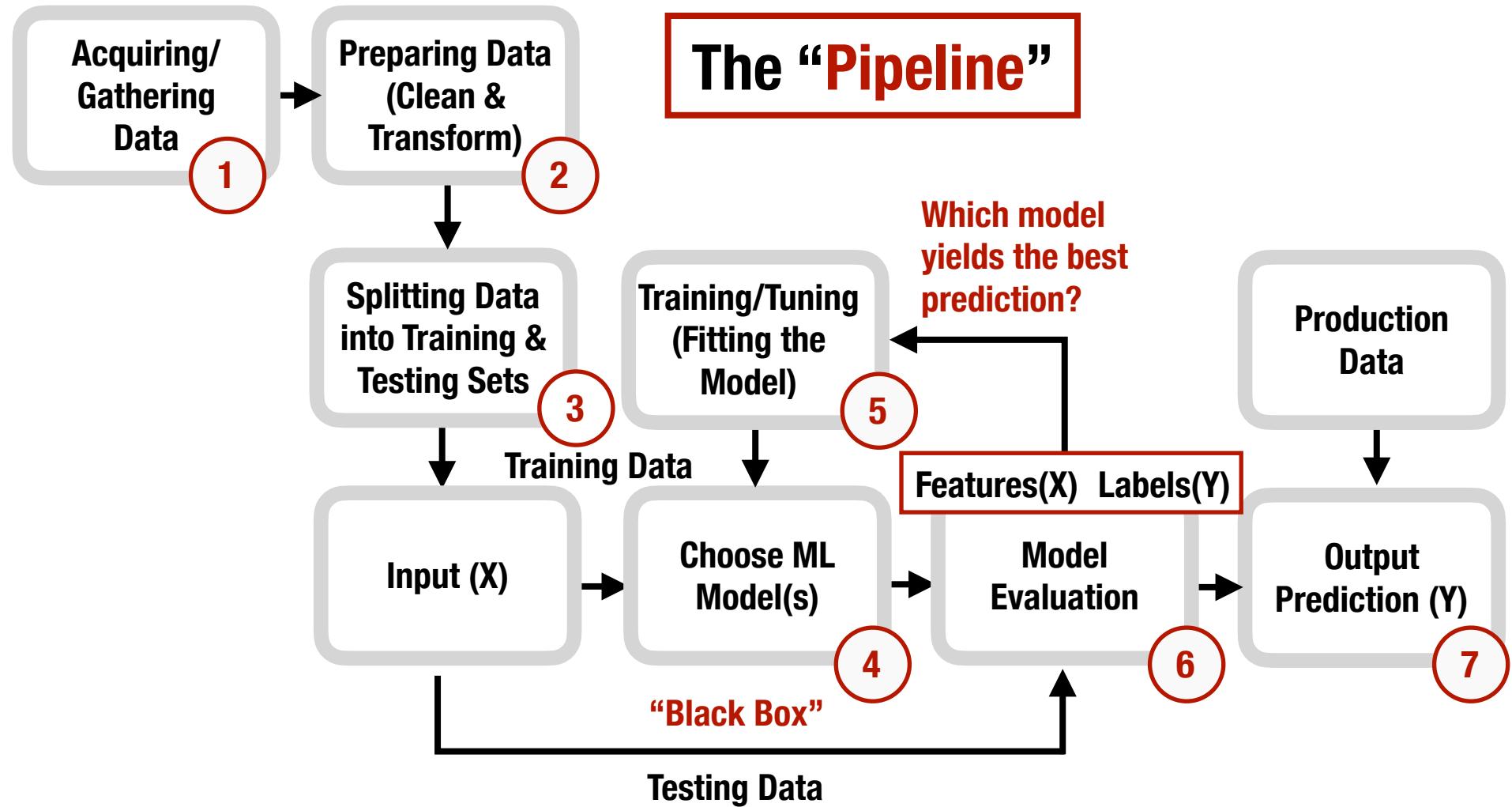
Josh Gordon presents:

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

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https://hbr.org/2018/08/what-data-scientists-really-do-according-to-35-data-scientists?referral=03758&cm_vc=rr_item_page.top_right

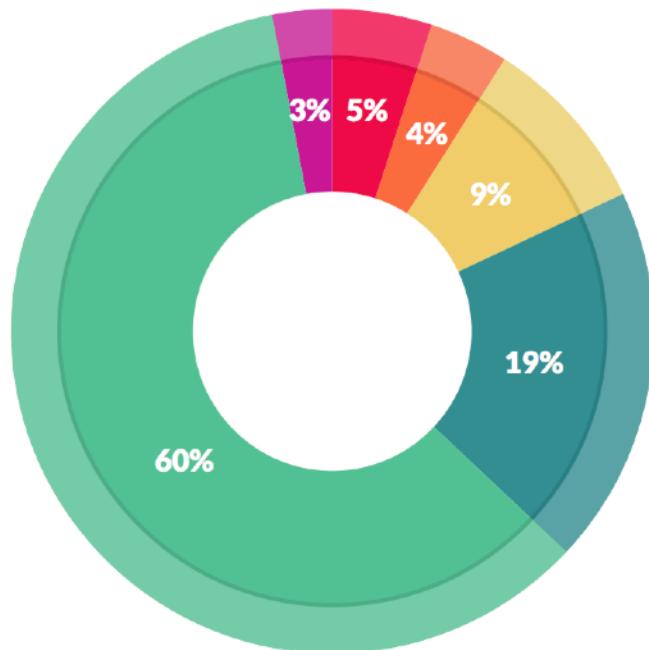


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Source: By Hugo Bowen-Anderson
August 15, 2018
Harvard Business Review

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

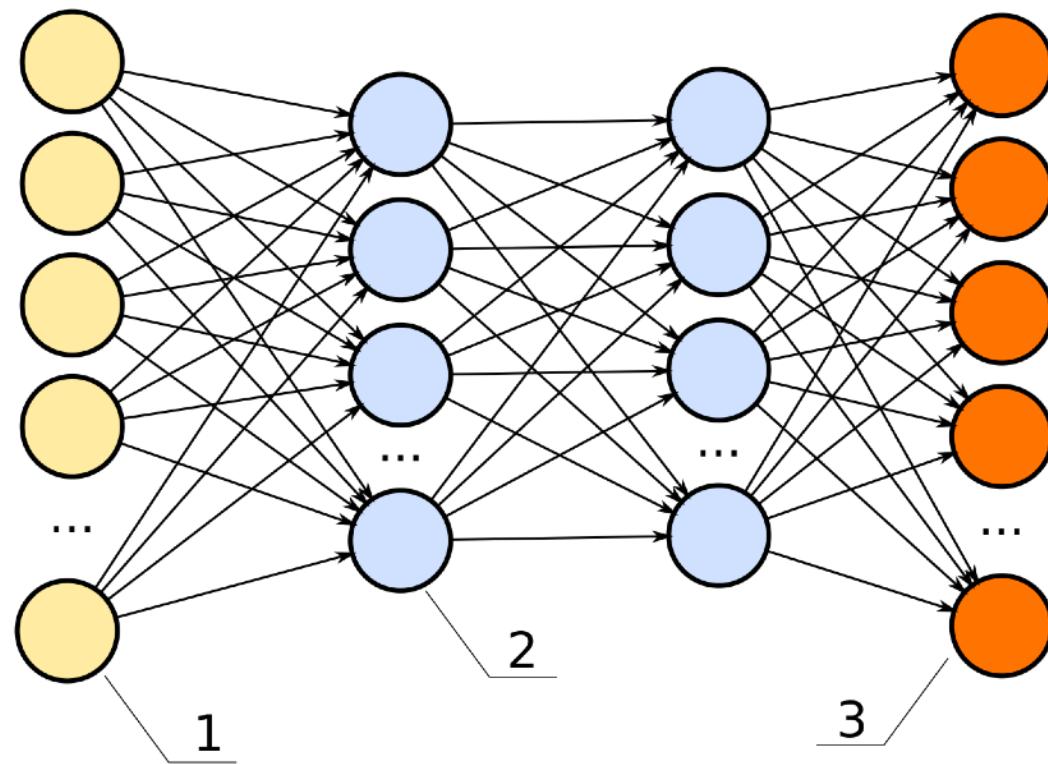
Introduction to “Deep Learning”

“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

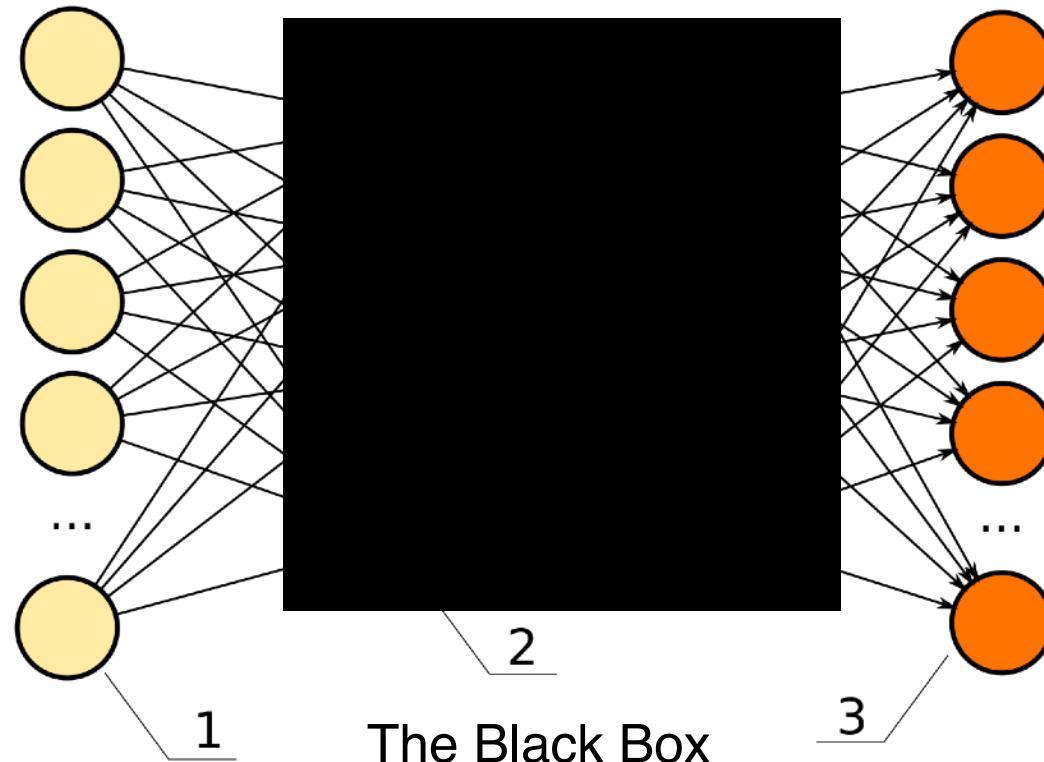


Source: Wikipedia

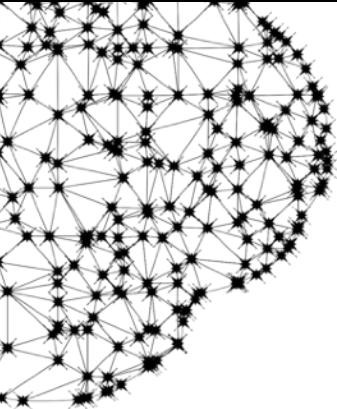
Input Layer

Hidden Layers

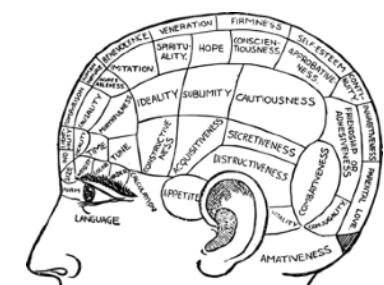
Output Layer



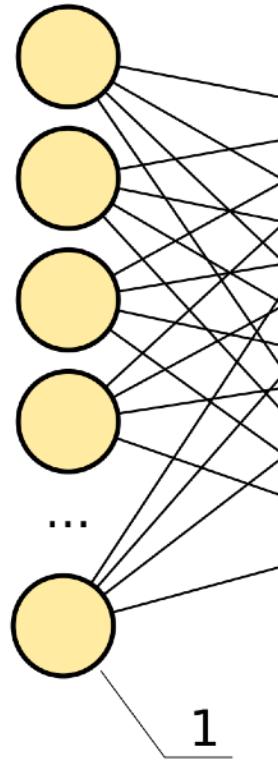
Source: Wikipedia



The Deep Learning “Blackbox”



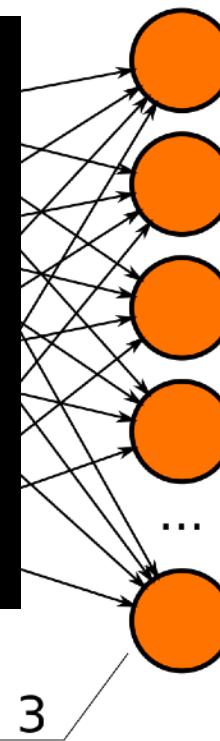
Input Layer



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)

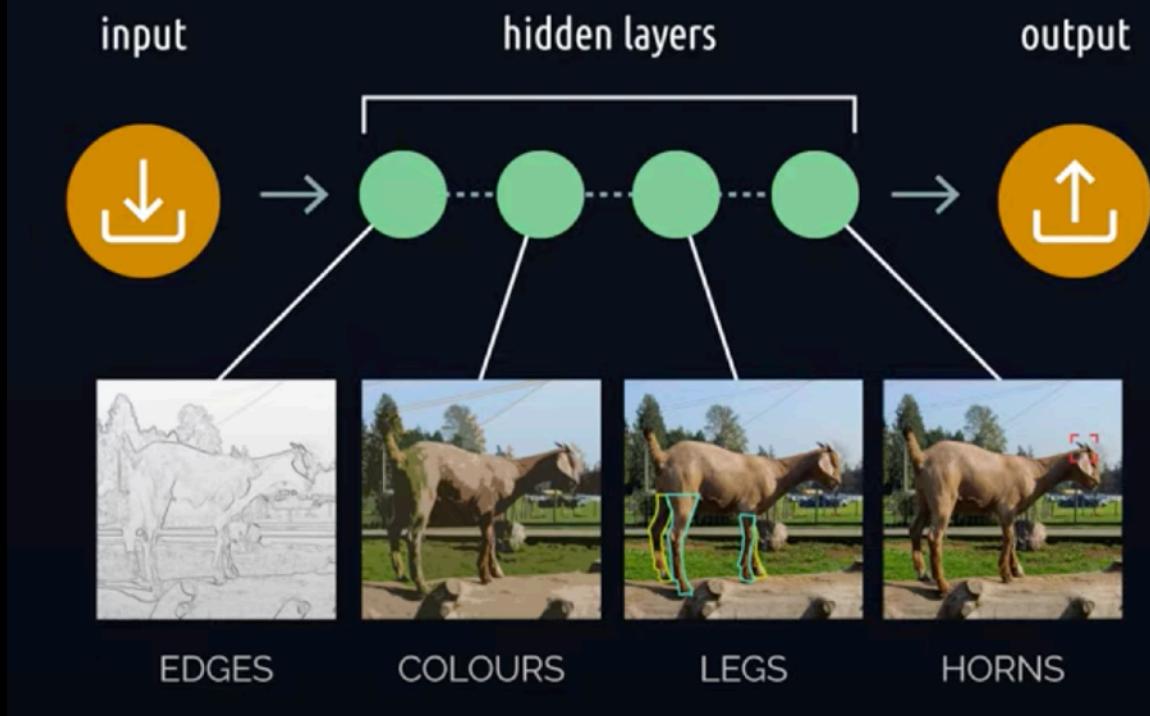
Output Layer



The Black Box

Source: Wikipedia

Hidden Layers



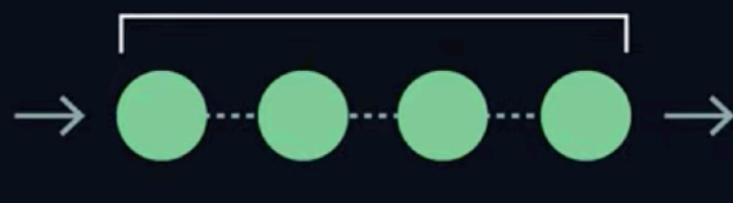
Source: [Python Simplified](#)

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

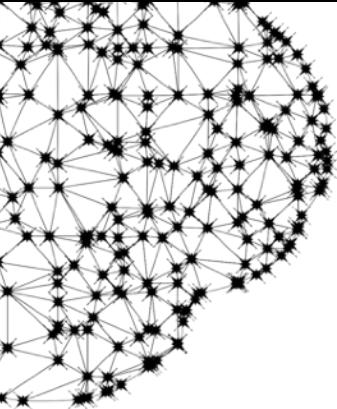
we keep **adjusting** the weights until
most of our examples are **correctly**
classified / predicted.



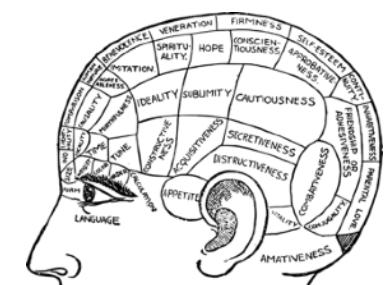
Source: [Python Simplified](#)

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

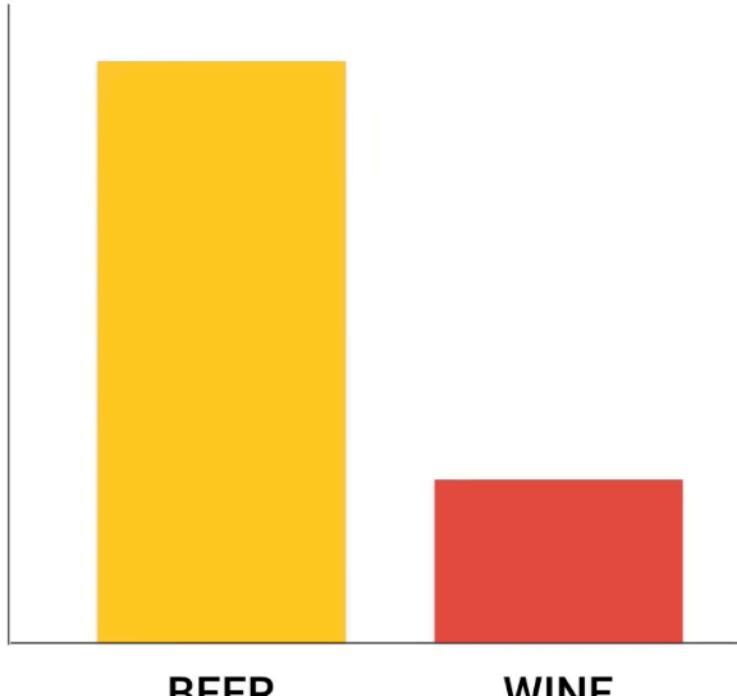




To work with Machine Learning, **data** is the **key**.



Data Preparation



Ensure the dataset is not biased.

Data Preparation



Training

Evaluation

Random partition (e.g. 80/20 rule) of training and evaluation data has to be done before training to ensure the evaluation data is impartial.

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

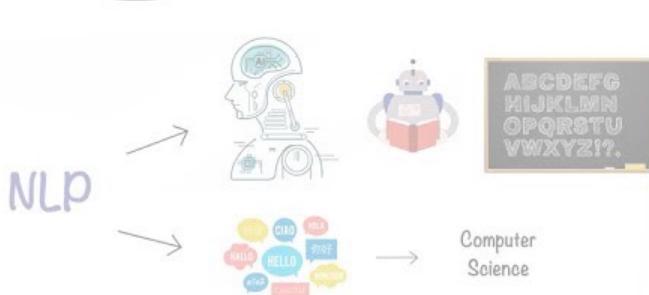
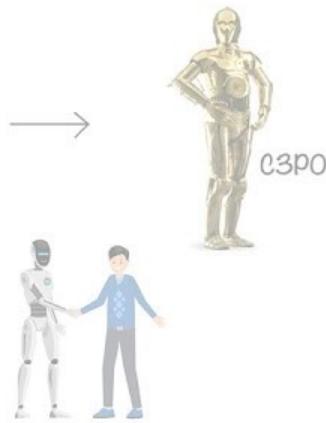


Comparison Between PA, ML & DL

	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

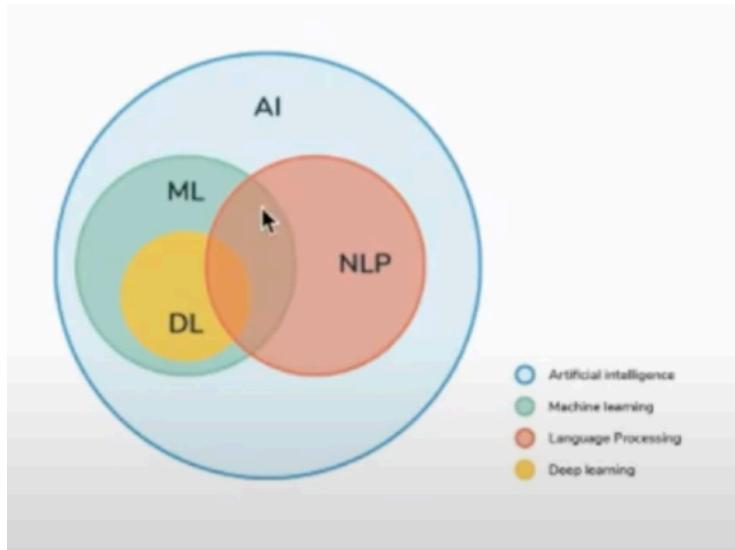
Natural Language Processing (NLP)

**STAR
WARS**



What is NLP?



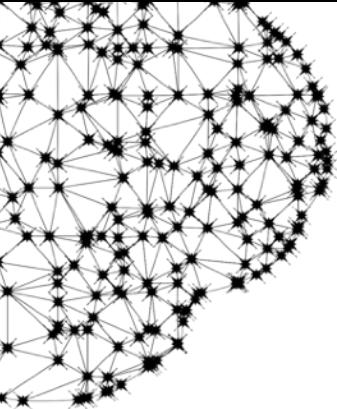


Where is it used?

- Email spam filtering
- Deriving customer sentiment
- Fake news identification
- Automatic language translation
- Speech Recognition (Siri, Alexa)
- Chatbots

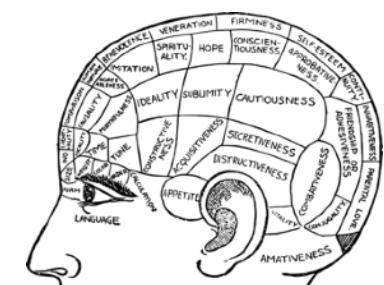
- Normalization
- Stop Word Removal
- Stemming/Lemmatization
- Tokenization

Source: [Dataiku](#)



From Internet Mindset to AI Mindset in Product Management

从互联网思维到人工智能思维的产品管理





人民网 >> 科普中国 >> 科技点亮智慧生活



“互联网思维”过时了？“人工智能思维”正当红

2017年06月02日13:40 来源：人民网-人民日报海外版

分享到：

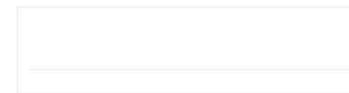
...

不敌人工智能“阿尔法狗”之后，中国棋手柯洁“回归”了“人类赛场”。在近日举行的LG杯上，他多次模仿“阿尔法狗”下出妙手，连战连捷。有人笑称，柯洁学会了用“人工智能思维”下棋。

此话虽是笑谈，但“人工智能思维”却着实存在。近日，百度创始人兼首席执行官李彦宏表示，以人工智能为核心的“新一代技术革命”正在掀起，成为人类社会又一次全新变革与发展的开端，创业者必须将自己的思维方式调转到“（人工智能）频道”，才能拥抱时代变革。

人工智能是“主菜”

几年前，人们还在大谈特谈“互联网思维”。在李彦宏看来，互联网只是“前菜”，人工智能才是“主菜”。他认为，在互联网出现之前，人与人可以交流，人与物却无法沟通。互联网时代到来后，提高了人与人的沟通效率。但人工智能时代从根本上解决了人与万物交流的问题，使“唤醒万物”成为可能。



视频新闻



Source: <http://kpzg.people.com.cn/n1/2017/0602/c404389-29314493.html>

What is a **data-driven** product?

1. The **platform** is the product. And the data provides the glue to link everybody in the platform **eco-system** together to create values.
2. The data makes the product **smarter** and **more connected**. Being smarter allows the product to improve its performance over time through **analytics** and being more connected allows the product to amplify the **network effect** by linking with more stakeholders and complementary products.
3. The **API** based services form an extended data infrastructure to **capture values** created by other stakeholders within the eco-system.

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Translate app

The translate app uses a [Google Cloud Translate API key](#) to translate the contents of any text-based field from one language to another. You can choose from over a hundred different languages. **Please note that you need a Google Cloud Translate API key in order to use this app.**

The translate app is part of [Airtable Apps](#), a [Pro plan feature](#). Apps let you extend the functionality of your bases: you can use apps to bring new information into Airtable, visualize and summarize your records in colorful ways, and even directly integrate your Airtable bases with your favorite apps.

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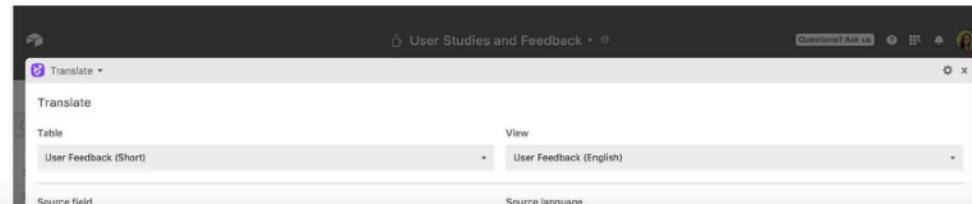
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[Alerts for text that needs to be re-translated](#)

Watch this video to learn more about how to set up and use a translate app, or read on for further information.



A Translate

Translate text in your base using the Google Translate API

[Add app](#)

Useful for logging international user feedback, assigning tasks to remote teams, or any other situation in which you'd need to translate many records, the translate app uses the Google Cloud Translation API to translate the contents of any text-based field from one language to another. Choose from over a hundred different languages—from Afrikaans to Zulu.

Please note that you need : [Google Cloud Translation API key to use this app.](#)

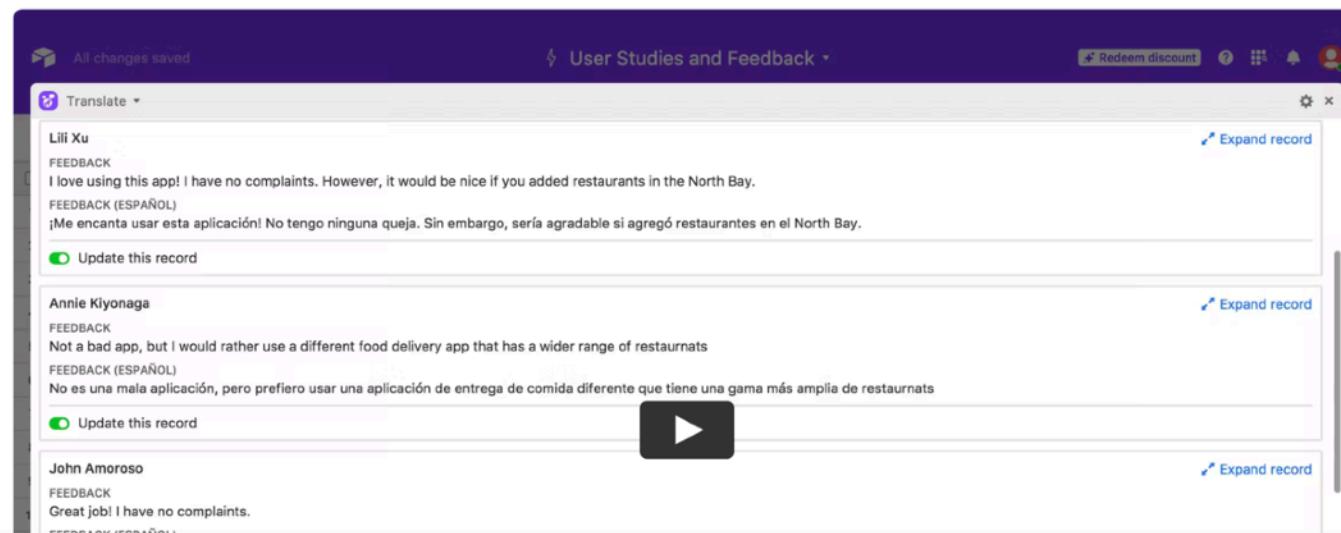
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Last updated

September 14th, 2020



Lili Xu
FEEDBACK
I love using this app! I have no complaints. However, it would be nice if you added restaurants in the North Bay.
FEEDBACK (ESPAÑOL)
¡Me encanta usar esta aplicación! No tengo ninguna queja. Sin embargo, sería agradable si agregó restaurantes en el North Bay.

Update this record

Annie Kiyonaga
FEEDBACK
Not a bad app, but I would rather use a different food delivery app that has a wider range of restaurants
FEEDBACK (ESPAÑOL)
No es una mala aplicación, pero prefiero usar una aplicación de entrega de comida diferente que tiene una gama más amplia de restaurantes

Update this record

John Amoroso
FEEDBACK
Great job! I have no complaints.
FEEDBACK (ESPAÑOL)

Source: <https://airtable.com/marketplace/blkPFliFba9T3b4kF/translate>



Vision

Extract labels, logos, and text from images using Google Cloud Vision

[Add app](#)

Get more insight from your images using Google Cloud Vision.

If you have an attachment field, the [Cloud Vision API](#) can quickly classify your images into thousands of categories (like "dog", "lighthouse", or "Sahara"), and you can extract those labels and save them to a field in your table—meaning that you can tag hundreds of images with just a few clicks. You can also identify logos, or use optical character recognition (OCR) to extract text from images.

Please note that you need a [Google Cloud Vision API key](#) to use this app.

[Learn more](#)

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Last updated

November 9th, 2021

The screenshot shows the Airtable interface with the 'Alpha Events 2017' base open. A modal window titled 'Vision' is displayed. In the 'Table' section, the 'Lost and Found' table is selected. Under the 'View' section, 'Gallery' is chosen. In the 'Attachment field' section, 'Item' is selected. Under the 'Extract labels' checkbox, there is a 'Description' field. Other options like 'Extract logos' and 'Extract text' are available but not selected. The top bar shows 'All changes saved' and the base name 'Alpha Events 2017'. The right side of the interface includes standard Airtable navigation and help icons.

Source: <https://airtable.com/marketplace/b1k8ovCuhVI9unKpT/vision>

demo5961 1 0 + New Delete Cache Howdy, admin Help ▾

Add Plugins [Upload Plugin](#)

A new WordPress version is available! Please update from [your Pantheon dashboard](#).
For details on applying updates, see the [Applying Upstream Updates](#) documentation.
If you need help, open a support chat on Pantheon.

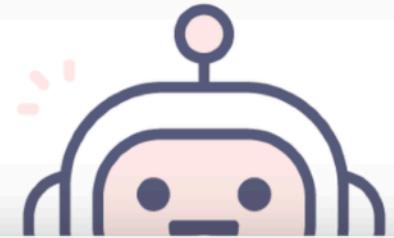
Search Results Featured Popular Recommended Favorites Keyword AI Content Bot 46 items 1 of 2 << < > >>

Plugin Name	Description	Rating	Last Updated	Active Installations	Compatibility
AI Content Bot	The first AI Content Plugin in WordPress using OpenAI's GPT-3 autoregressive language model.	 (12)	8 months ago	600+ Active Installations	Untested with your version of WordPress
Wootomation – Machine Learning AI	Wootomation allows to add "People who bought these, also bought..." feature to your WooCommerce site....	 (7)	8 months ago	100+ Active Installations	Compatible with your version of WordPress
ChatBot	Native WordPress ChatBot plugin - WPBot. Use with or without DialogFlow. Easy to use as...	 (50)	1 week ago	3,000+ Active Installations	Compatible with your version of WordPress

Overcome writer's block

AI Content Bot

Find inspiration for blog topics, blog post content,



Description Installation FAQ Changelog Screenshots Reviews

The first AI Content Plugin in WordPress using OpenAI's GPT-3 autoregressive language model.

Create amazing human-like content snippets for your product or blog with the click of a button.

Features

- Generate up to 60 AI content snippets a day with the free version.
- Create product descriptions
- Generate blog topic ideas
- Create a blog intro for your next article
- Generate page headline Ideas
- Create blog outlines
- Rewrite sentences
- Change the tone of your sentencees
- Generate listicles
- Use our bullet point expander to create paragraphs

Version: 1.1.00

Author: [NickDuncan](#)

Last Updated: 8 months ago

Requires WordPress Version: 3.8 or higher

Compatible up to: 5.6.8

Requires PHP Version: 5.6 or higher

Active Installations: 600+

[WordPress.org Plugin Page »](#)

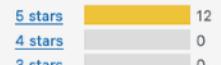
[Plugin Homepage »](#)

AVERAGE RATING

★★★★★
(based on 12 ratings)

REVIEWS

Read all reviews on WordPress.org or write your own!



[Install Now](#)

Source: https://dev-cuhk.pantheonsite.io/wp-admin/plugin-install.php?tab=plugin-information&plugin=content-bot&TB_iframe=true&width=600&height=550



Wootomation – Machine Learning AI



Description Installation FAQ Changelog Screenshots Reviews

Imagine you run an e-commerce grocery store. Wootomation's AI will analyze all the past and future orders and realizes that a lot of people buy milk, bread, and butter together. This means that even for brand new customers, when they add bread to their basket, they will be recommended milk and butter.

Wootomation uses Machine Learning Artificial Intelligence to recommend the best products to your customers, based on their cart items.

This very light plugin adds a section, similar to up-sells/cross-sales, in the cart before totals, which suggests what other people have also bought. It silently analyses all sales of your store and processes it in order to train the AI. It only works in the background, when new data is being added, so it is not disruptive to the customers' journey.

Using the same concept, Amazon have increased their sales by 35%.

Version: 2.0.3

Author: [Dragos Micu](#)

Last Updated: 8 months ago

Requires WordPress Version: 4.9 or higher

Compatible up to: 5.8.4

Requires PHP Version: 7.2 or higher

Active Installations: 100+

[WordPress.org Plugin Page »](#)

[Plugin Homepage »](#)

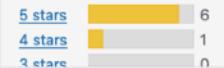
AVERAGE RATING



(based on 7 ratings)

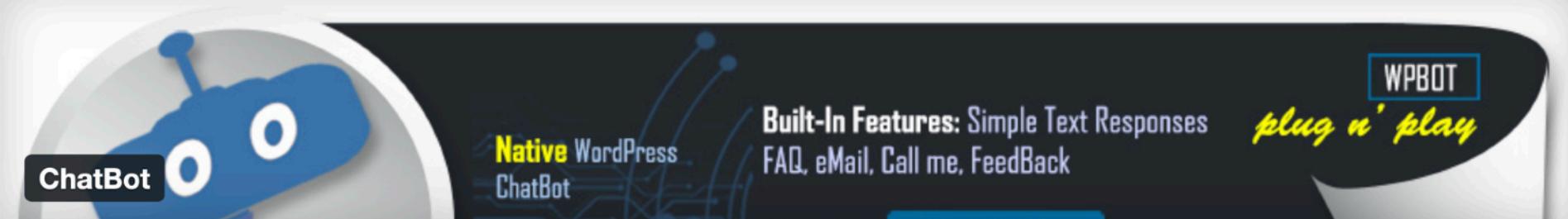
REVIEWS

Read all reviews on WordPress.org or write your own!



[Install Now](#)

Source: https://dev-cuhk.pantheonsite.io/wp-admin/plugin-install.php?tab=plugin-information&plugin=wootomation&TB_iframe=true&width=600&height=550



ChatBot

Description Installation FAQ Changelog Screenshots Reviews

What is ChatBot for WordPress – WPBot?

WPBot is an easy to use, native WordPress ChatBot plugin.

You can use WPBot as a plug n' play ChatBot without any technical knowledge at all. Just install it and the ChatBot can chat with the website users, show text responses you created from the WordPress backend, display a small set of FAQs, let users email you for support or leave their phone numbers like a floating HelpDesk or a Conversational Floating Contact bot.

This ChatBot can work in Natural Language Processing Mode or Menu Driven Mode or a Combination of both.

[Support](#), [Bug Report](#), [Feature Requests](#) | [Live ChatBot Pro Version Demo](#) | [Upgrade to WPBOT Pro Now!](#)

Use the Free [Conversational Form Builder](#) AddOn to create conversations and forms to build a completely native, menu driven WordPress ChatBot experience without any DialogFlow and 3rd party integrations.

You can also integrate this ChatBot for WordPress with the Google's Dialogflow or OpenAI GPT-3 (Pro version addon) and give it AI and natural language processing powers and disable the built-in features. WPBot free version supports Dialogflow intents and text responses automatically once you integrate with your Dialogflow V2 agent.

ChatBot for WordPress WPBot is fully compatible with DialogFlow V2.

OpenAI GPT-3 is supported as an AddOn for WPBot Pro version. OpenAI's API provides access to GPT-3, for a wide variety of natural language tasks

Change all the WPBOT live chat bot responses and make this ChatBot to work in any language with very little effort. RTL is supported. Use this handy tool as a practical means for your website users to save time, improve engagement, generate leads, handle FAQs, showcase your stuff – everything with a single chatbot plugin! It is great as a HelpDesk, Contact Bot or feedback bot to increase user conversions and customer leads.

Free Conversational Forms AddOn is now available for WPBot Lite! Download [Conversational Forms AddOn](#). Create Conversational forms natively from the WordPress backend without Dialogflow using a drag

Version: 3.9.7

Author: [QuantumCloud](#)

Last Updated: 1 week ago

Requires WordPress Version: 4.6 or higher

Compatible up to: 5.9.2

Requires PHP Version: 5.6 or higher

Active Installations: 3,000+

[WordPress.org Plugin Page »](#)

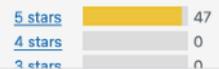
[Plugin Homepage »](#)

AVERAGE RATING

★★★★★
(based on 50 ratings)

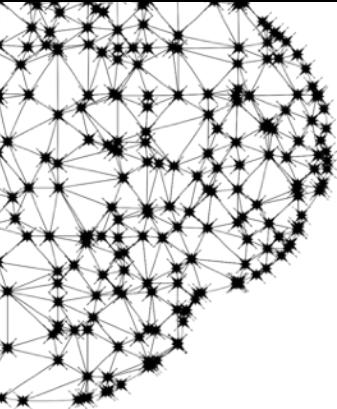
REVIEWS

Read all reviews on WordPress.org or write your own!

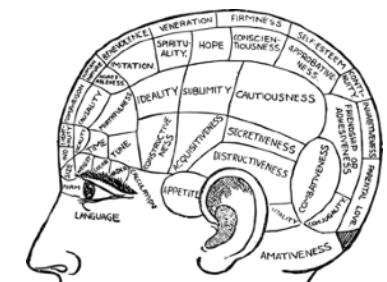


[Install Now](#)

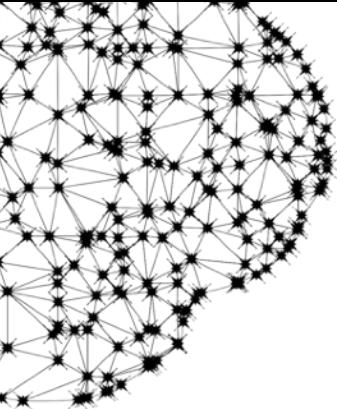
Source: https://dev-cuhk.pantheonsite.io/wp-admin/plugin-install.php?tab=plugin-information&plugin=chatbot&TB_iframe=true&width=600&height=550



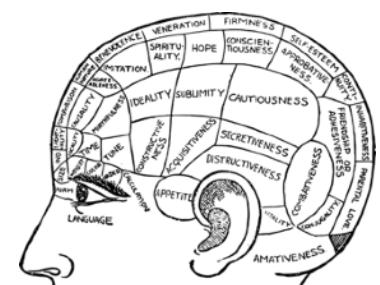
Use of ML/DL in Industries



- 1. Primary Sector (Agriculture)**
- 2. Secondary Sector (Manufacturing)**
- 3. Tertiary Sector (Service)**
- 4. Quaternary sector (Knowledge/IP)**



Rapid Growing Fields Using Deep Learning



- 1. Computer Vision**
- 2. Speech Recognition**
- 3. Natural Language Processing**
- 4. Facial Recognition**
- 5. Medical Diagnosis**
- 6. Driverless Car**



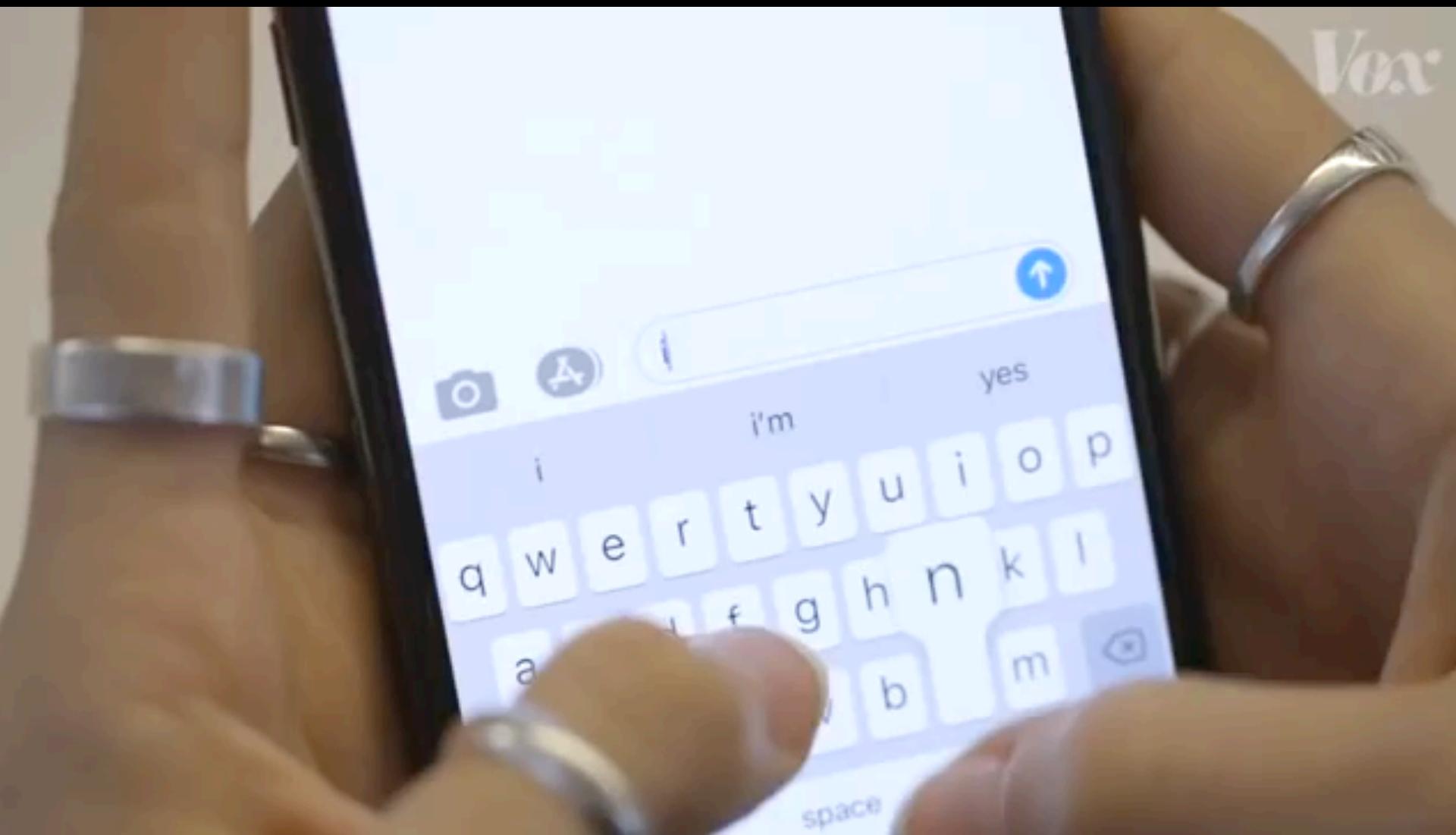
**What kind of ML/DL application
was used in the video?**



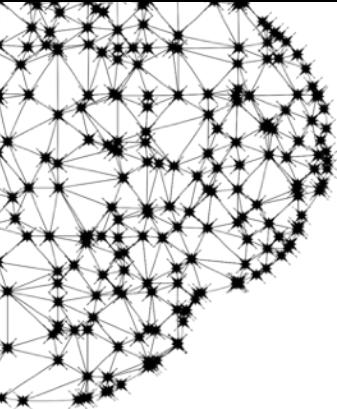
What kind of ML/DL applications was/were used in the video?

What kind of ML/DL application was mentioned in the video?

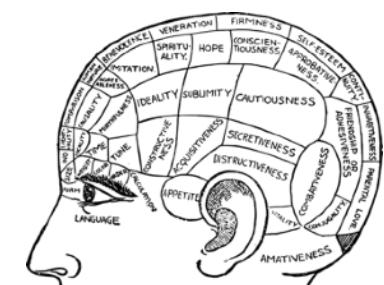
Vox



What kind of ML/DL application was mentioned in the video?



**Will AI take jobs away from us? How can
we equip ourselves for the challenge?**



文西大姐大
SISY BIG DANG

天下文化

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天下文化

遠見

天

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天下文化

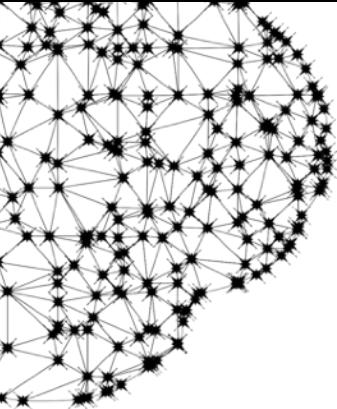
天下文化

创新工场董事长 | 李开复

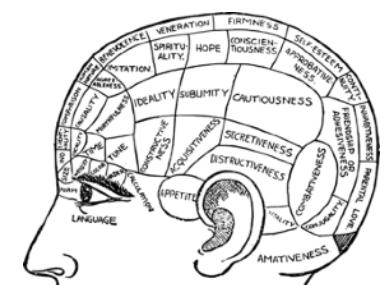
我们今天请来的贵宾是李开复先生

遠見





Applications of Machine Learning



Machine Learning Program

Input (X)

Intruder Detection

Spam Mail Detection

**Program
 $f(X)$**

Output (Y)

Machine Learning Program

Input (X)

**Program
 $f(X)$**

Output (Y)

Intruder Detection

Sensor

**Regression/
Classification**

**Failure Freq/
Alarm Yes/No**

Spam Mail Detection

Machine Learning Program

Input (X)

**Program
 $f(X)$**

Output (Y)

Intruder Detection

Sensor

**Regression/
Classification**

**Failure Freq/
Alarm Yes/No**

Spam Mail Detection

Mail

**Classifi-
cation**

**Spam or
Not-Spam**

Machine Learning Program

COVID-19 Diagnosis

Car Insurance Underwriting

Input (X)

**Program
 $f(X)$**

Output (Y)

Machine Learning Program

Input (X)

Program
 $f(X)$

Output (Y)

COVID-19 Diagnosis

Patient Synopsis

Classifier

Positive or Negative

Car Insurance Underwriting

Machine Learning Program

Input (X)

Program
 $f(X)$

Output (Y)

COVID-19 Diagnosis

Patient Synopsis

Classifier

Positive or Negative

Car Insurance Underwriting

Accident Details

Regression

Insurance Amount

Machine Learning Program

Input (X)

Recommend Movies

Robocon Competition

Program
 $f(X)$

Output (Y)

Machine Learning Program

Input (X)

Program
 $f(X)$

Output (Y)

Recommend Movies

Movie Viewing

Association

Robocon Competition

Recommendation

Machine Learning Program

Input (X)

Program
 $f(X)$

Output (Y)

Recommend Movies

Movie Viewing

Association

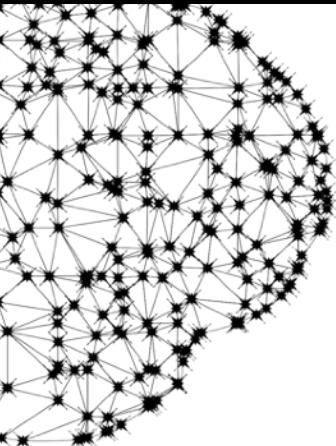
Recommendation

Driverless Car

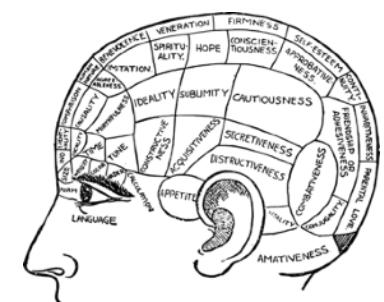
Moves & Results

Reinforcement

Action to Score



In-class exercise: Building a image **Classifier** using **Neural Network** (Deep Learning for Everyone)



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

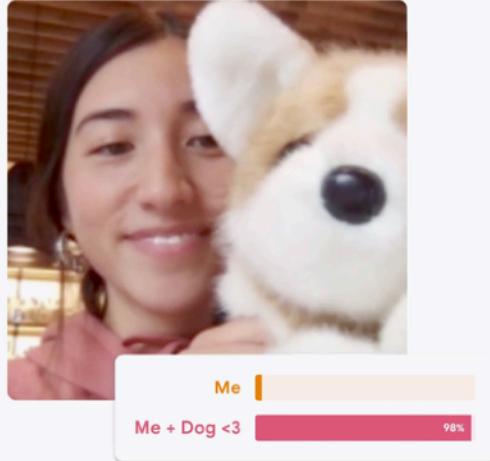
Teachable Machine

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



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

Export your model to use it in projects.

Tensorflow.js (i) **Tensorflow** (i) **Tensorflow Lite** (i)

Export your model:

Upload (shareable link) Download [Download my model](#)

Code snippets to use your model:

[Javascrip](#) **p5.js** [Contribute on Github](#)

Learn more about how to use the code snippet on [github](#).

```
<div>Teachable Machine Image Model</div>
<button type="button" onclick="init()">Start</button>
<div id="webcam-container"></div>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm/@teachablemachine/image@0.8/dist/teachablemachine-image.min.js"></script>
<script type="text/javascript">
  // More API functions here:
  // https://github.com/googlecreativelab/teachablemachine-community/tree/master/libraries/image

  // the link to your model provided by Teachable Machine export panel
  const URL = "./my_model/";

  let model, webcam, labelContainer, maxPredictions;

  // Load the image model and setup the webcam
  async function init() {
    const modelURL = URL + "model.json";
    
```

Export your model to use it in projects.

Tensorflow.js (i) **Tensorflow** (i) **Tensorflow Lite** (i)

Model conversion type:

Keras Savedmodel [Download my model](#)

Converts your model to a keras .h5 model. Note the conversion happens in the cloud, but your training data is not being uploaded, only your trained model.

Code snippets to use your model:

Keras [Contribute on Github](#) [Copy](#)

```
from keras.models import load_model
from PIL import Image, ImageOps
import numpy as np

# Load the model
model = load_model('keras_model.h5')

# Create the array of the right shape to feed into the keras model
# The 'length' or number of images you can put into the array is
# determined by the first position in the shape tuple, in this case 1.
data = np.ndarray(shape=(1, 224, 224, 3), dtype=np.float32)
# Replace this with the path to your image
image = Image.open('<IMAGE_PATH>')
# resize the image to a 224x224 with the same strategy as in TM2:
# resizing the image to be at least 224x224 and then cropping from the center
size = (224, 224)
image = ImageOps.fit(image, size, Image.ANTIALIAS)

```

1) Export trained model to P5.js as .json file.

2) Export trained model to Python Keras as .h5 file.

An end-to-end open source machine learning platform

[TensorFlow](#)[For JavaScript](#)[For Mobile & IoT](#)[For Production](#)

The core open source library to help you develop and train ML models. Get started quickly by running Colab notebooks directly in your browser.

[Get started with TensorFlow](#)

<https://www.tensorflow.org/>

TensorFlow Core

[Overview](#) [Tutorials](#) [Guide](#) [TF 1](#)

TensorFlow is an end-to-end open source platform for machine learning

TensorFlow makes it easy for beginners and experts to create machine learning models. See the sections below to get started.

[See tutorials](#)[See the guide](#)

Tutorials show you how to use TensorFlow with complete, end-to-end examples.

Guides explain the concepts and components of TensorFlow.



<https://www.tensorflow.org/overview/>



Simple. Flexible. Powerful.

Get started

API docs

Guides

Examples

```
from tensorflow import keras
from tensorflow.keras import layers

# Instantiate a trained vision model
vision_model = keras.applications.ResNet50()

# This is our video encoding branch using the trained vision_model
video_input = keras.Input(shape=(100, None, None, 3))
encoded_frame_sequence = layers.TimeDistributed(vision_model)(video_input)
encoded_video = layers.LSTM(256)(encoded_frame_sequence)

# This is our text-processing branch for the question input
question_input = keras.Input(shape=(100,), dtype='int32')
embedded_question = layers.Embedding(10000, 256)(question_input)
encoded_question = layers.LSTM(256)(embedded_question)

# And this is our video question answering model:
merged = keras.layers.concatenate([encoded_video, encoded_question])
output = keras.layers.Dense(1000, activation='softmax')(merged)
video_qa_model = keras.Model(inputs=[video_input, question_input],
                             outputs=output)
```

Deep learning for humans.

Keras is an API designed for human beings, not machines. Keras follows best practices for reducing cognitive load: it offers consistent & simple APIs, it minimizes the number of user actions required for common use cases, and it provides clear & actionable error messages. It also has extensive documentation and developer guides.

Source: <https://keras.io/>

[Introduction to Deep Learning - Deep Learning basics with Python, TensorFlow and Keras by sentdex](#)

```
In [17]:  
1 import tensorflow as tf # deep learning library. Tensors are just multi-dimensional arrays  
2  
3 mnist = tf.keras.datasets.mnist # mnist is a dataset of 28x28 images of handwritten digits and their labels  
4 (x_train, y_train),(x_test, y_test) = mnist.load_data() # unpacks images to x_train/x_test and labels to y_train/y_test  
5  
6 x_train = tf.keras.utils.normalize(x_train, axis=1) # scales data between 0 and 1  
7 x_test = tf.keras.utils.normalize(x_test, axis=1) # scales data between 0 and 1  
8  
9 model = tf.keras.models.Sequential() # a basic feed-forward model  
10 model.add(tf.keras.layers.Flatten()) # takes our 28x28 and makes it 1x784  
11 model.add(tf.keras.layers.Dense(128, activation=tf.nn.relu)) # a simple fully-connected layer, 128 units, relu activation function  
12 model.add(tf.keras.layers.Dense(128, activation=tf.nn.relu)) # a simple fully-connected layer, 128 units, relu activation function  
13 model.add(tf.keras.layers.Dense(10, activation=tf.nn.softmax)) # our output layer. 10 units for 10 classes. Softmax activation function  
14  
15 model.compile(optimizer='adam', # Good default optimizer to start with  
16                 loss='sparse_categorical_crossentropy', # how will we calculate our "error." Neural network aims to minimize this value  
17                 metrics=['accuracy']) # what to track  
18  
19 model.fit(x_train, y_train, epochs=3) # train the model  
20  
21 val_loss, val_acc = model.evaluate(x_test, y_test) # evaluate the out of sample data with model  
22 print(val_loss) # model's loss (error)  
23 print(val_acc) # model's accuracy  
24 model.save('epic_num_reader.model')
```

```
Epoch 1/3  
1875/1875 [=====] - 2s 893us/step - loss: 0.2608 - accuracy: 0.9227  
Epoch 2/3  
1875/1875 [=====] - 2s 876us/step - loss: 0.1057 - accuracy: 0.9672  
Epoch 3/3  
1875/1875 [=====] - 2s 869us/step - loss: 0.0718 - accuracy: 0.9777  
313/313 [=====] - 0s 596us/step - loss: 0.0901 - accuracy: 0.9723  
0.09005739539861679  
0.9722999930381775  
WARNING:tensorflow:From /Users/suen/anaconda3/lib/python3.7/site-packages/tensorflow/python/ops/resource_variable_ops.py:1817: calling BaseResourceVariable.__init__ (from tensorflow.python.ops.resource_variable_ops) with constraint is deprecated and will be removed in a future version.  
Instructions for updating:  
If using Keras pass *_constraint arguments to layers.  
INFO:tensorflow:Assets written to: epic_num_reader.model/assets
```

```

1 # Load the model and display result
2 new_model = tf.keras.models.load_model('epic_num_reader.model')
3 predictions = new_model.predict(x_test)
4 print(predictions)
5 import numpy as np
6 print(np.argmax(predictions[0]))
7 plt.imshow(x_test[0],cmap=plt.cm.binary)
8 plt.show()

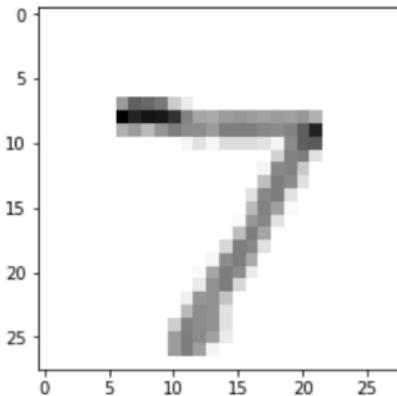
```

```

[[5.40963763e-09 2.17245983e-07 4.53704928e-07 ... 9.99988556e-01
 2.93256221e-07 3.99603181e-07]
 [5.08492448e-08 6.40611572e-04 9.99068320e-01 ... 3.08700379e-07
 3.97349004e-06 1.09171228e-09]
 [7.58169207e-08 9.99564111e-01 1.05341765e-04 ... 1.95724177e-04
 1.04180843e-04 5.91715335e-08]
...
[8.32861247e-09 1.61753678e-06 7.21784318e-07 ... 2.75833794e-04
 5.03456286e-05 1.88904451e-04]
[1.54516401e-05 1.56179540e-05 4.11833696e-08 ... 5.07680634e-05
 3.35724792e-03 1.43138635e-07]
[9.07798210e-07 7.29966914e-08 4.41378052e-06 ... 1.32655700e-08
 3.78075242e-07 1.66799810e-10]]

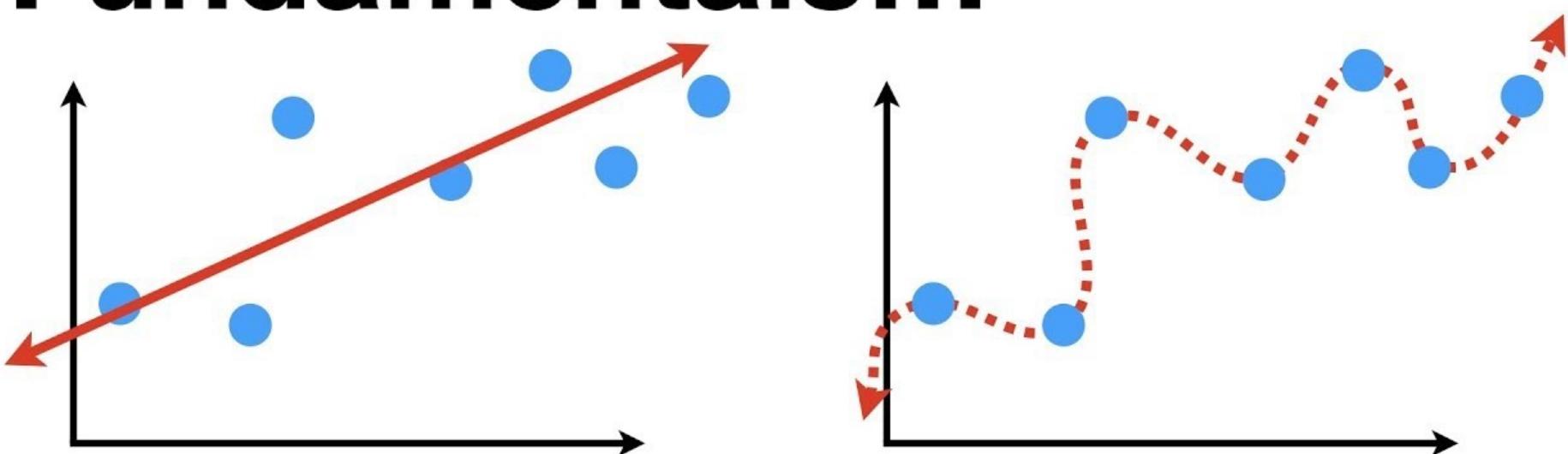
```

7

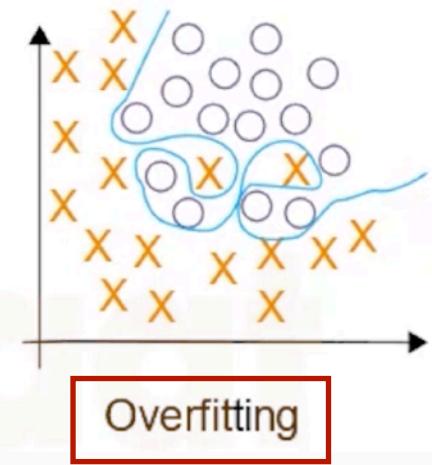
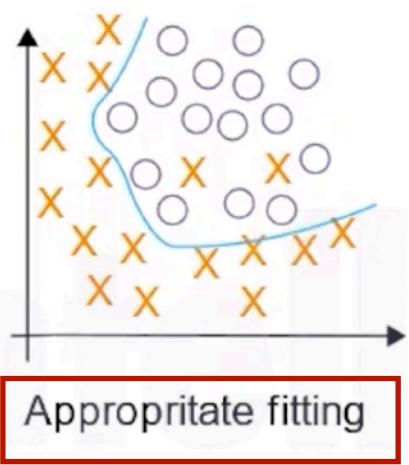
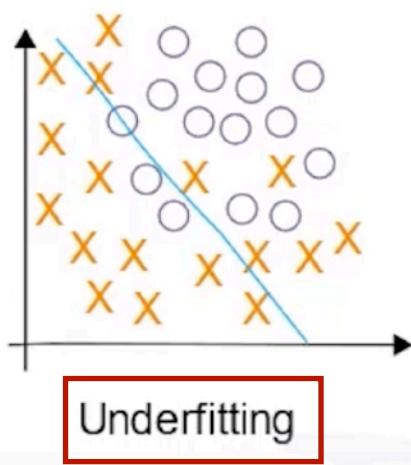


**Evaluate bias in data
through testing.**

Machine Learning Fundamentals...



...Bias and Variance!!!



Source: Data School (<https://www.youtube.com/channel/UCnVzApLJE2ljPZSeQyISEyg>)



{ML} what makes a good
feature?

Deploying ML+ Applications in Flask



生产环境中进行机器学习模型部署 (using Flask)



数据蛙datafrog

59 人赞同了该文章

我们原来一直看的文章，大都是在讲机器学习原理、如何构造特征、如何调参之类的，但是实际中模型是如何进行部署的呢？下面的这篇文章就是在讲用Flask框架进行模型部署（注明：这篇文章基本是翻译国外大神的著作。如果英文不错建议直接看原作。英文不好的话也要尽量看下原作）

▲ 赞同 59



● 添加评论



分享



喜欢



收藏



申请转载

...

Source: <https://zhuanlan.zhihu.com/p/42418356>

**Key concepts for
takeaway.**

- 1. Data pipeline**
- 2. Supervised vs. Unsupervised learning**
- 3. Descriptive/Inferential Statistics vs. Predictive Analytics**
- 4. Types of data: Categorical vs. Numerical**
- 5. Classification vs. Regression.**
- 6. Neural Network algorithm and Deep Learning**
- 7. Training and Testing: Model fitting**
- 8. Feature engineering**
- 9. Development and deployment of models.**
- 10. From Internet+ to AI+ for product management.**

Thank you for your time!