

# Introduction to Code-Free Machine Learning

Good Morning!

- 1) Download the presentation slides and activity worksheets at [https://bit.ly/RP\\_AICFML](https://bit.ly/RP_AICFML)
- 2) If your nickname used in Teams is different from the registered name, please drop a message on the channel with the registered name for attendance tracking purpose.
- 3) We will start at 9am sharp

Grab your coffee/team, sit back and relax for now ☺



Before we start...

- **Mute** your microphone when not speaking
- **Unmute** when you are answering questions / or asking questions in class
- Give me **feedback** as I need to know how you are doing so that I can adjust my pace or explain any concepts again.



[source](#)



# Download from Github

[https://bit.ly/RP\\_AICFML](https://bit.ly/RP_AICFML)

Screenshot of a GitHub repository page for 'kwseow/aicfml\_nov20'.

Repository details:

- Code: main branch, 1 branch, 0 tags
- Actions: Unwatched (1), Starred (0), Forked (0)

File list:

- kwseow Add files via upload (3a1d1c6, 10 days ago)
  - AICFML\_Activity\_v0.3.pdf (Add files via upload, 10 days ago)
  - AICFML\_Presentation\_v0.2.pdf (Add files via upload, 10 days ago)
  - Automobile price data \_Raw\_.csv (Add files via upload, 12 days ago)
  - Car damage dataset.zip (Add files via upload, 12 days ago)
  - Iris.csv (Add files via upload, 12 days ago)
  - README.md (Update README.md, 12 days ago)

README.md content:

```
An Introduction to Code-Free Machine Learning (Nov 2020)
```

About section:

No description, website, or topics provided.

Readme link: [Readme](#)

Releases section:

No releases published. [Create a new release](#)

Packages section:

No packages published. [Publish your first package](#)





# Warm up!

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## Step 1: Go to the following url

[https://bit.ly/aicfml\\_warmup](https://bit.ly/aicfml_warmup)



## Step 2: facilitator will walk you through the following question

- 1) **What do you hope to gain from this workshop.**





# Programme

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Section 1:	What is Machine Learning Machine Learning Workflow
Section 2:	Activity 1 – First Machine Learning with Azure
Section 3:	Activity 2 - Deploying your experiment as a Web Service & Make Prediction using Excel
	<b>Lunch Break</b>
Section 4:	Transfer Learning Computer Vision: Activity 3 – Car Damage Assessment Classification
Section 5:	Natural Language Processing Activity 4 (Demo) – Sentiment Analyser
Section 6:	Linking them together
Section 7:	Debrief



# Introduction of trainer

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**Name**  
Shannen Ang

**Telegram**  
@ShannenAng

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[shannen\\_ang@rp.edu.sg](mailto:shannen_ang@rp.edu.sg)



# Background

4 years  
Software  
Engineer

- DSTA

1.5 Years  
in Boulder,  
Colorado

- EDB Overseas Program

1 year  
Senior  
Engineer

- Singapore Technologies

8 years  
Project  
Manager

- PMP Certified
- Lecturer
- Project Manager
- Lab Manager (MOU)
- Internship Coordinator
- TIPP Program Head
- 6 MS AI Certificates

7 years  
Lecturer



# Introduction of trainer

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**Name**  
Seow Khee Wei

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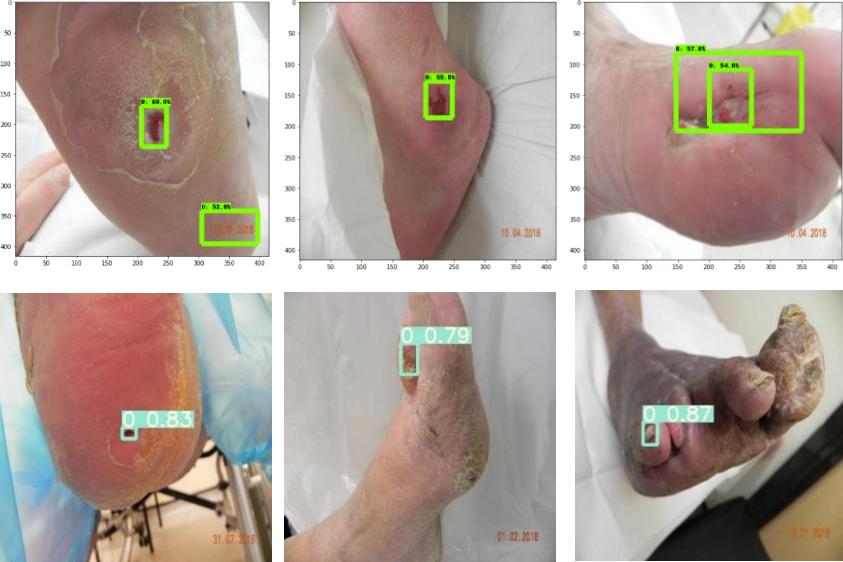


# Projects

## Scene Understanding



## Diabetic Foot At Risk Reconstruction



## Language model for Medical Certificates

SILVER CROSS CLINIC  
COMPANY REGISTRATION NO: 1995000406  
CPT: 00000000000000000000000000000000  
BLK 395 WOODLANDS ST 11, #01-75, SINGAPORE 730355  
TEL: 68333644 / FAX: 68333645

NAME: Dr. LOW SAW WAI  
VISIT DATE: 02-08-2019  
IDENTIFICATION: 700211962  
ID: 508061  
190805-01  
491159

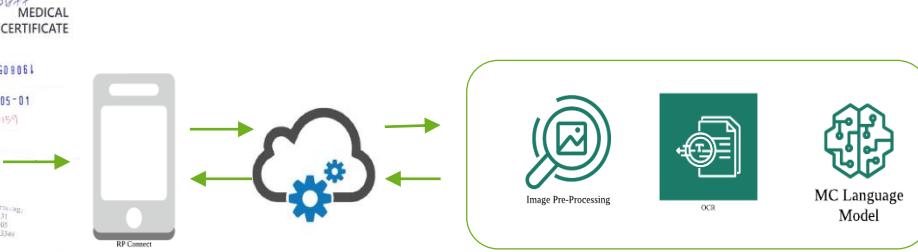
This is to certify that the above mentioned has been given.  
UNFIT FOR SCHOOL for 1 day(s) from 02-08-2019 to 02-08-2019  
REMARKS:

Dr. LOW SAW WAI (M61492)  
Silver Cross Clinic (M277142)  
Blk 395 Woodlands St 11  
#01-75 Singapore 730355  
Tel: 68333644 Fax: 68332154

DR. LOW SAW WAI (M61492)  
DOCTOR

Not Valid for Absence from Court Attendance

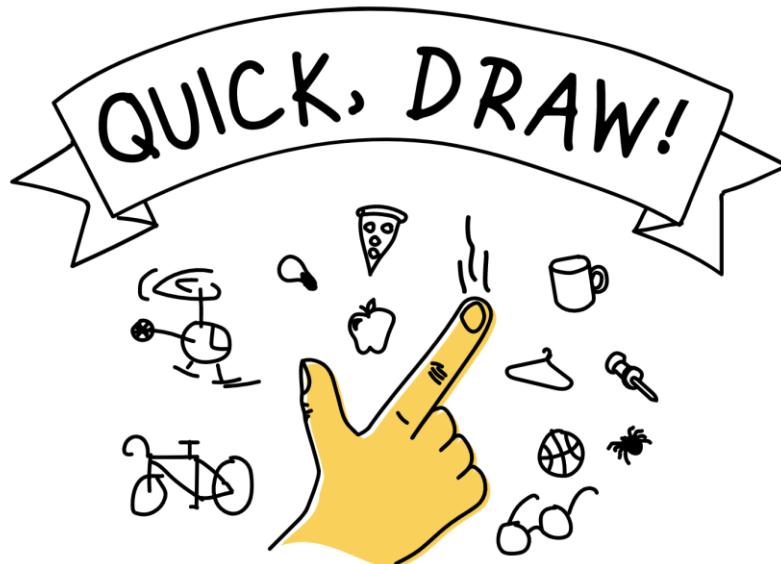
Ref No.: 2019010114256  
Printed By: Clinic Assistant 1 SCWD (02-08-2019)





# Quickdraw Game

<https://quickdraw.withgoogle.com>



Can a neural network learn to recognize doodling?

Help teach it by adding your drawings to the [world's largest doodling data set](#), shared publicly to help with machine learning research.

Let's Draw!

Optional Activity

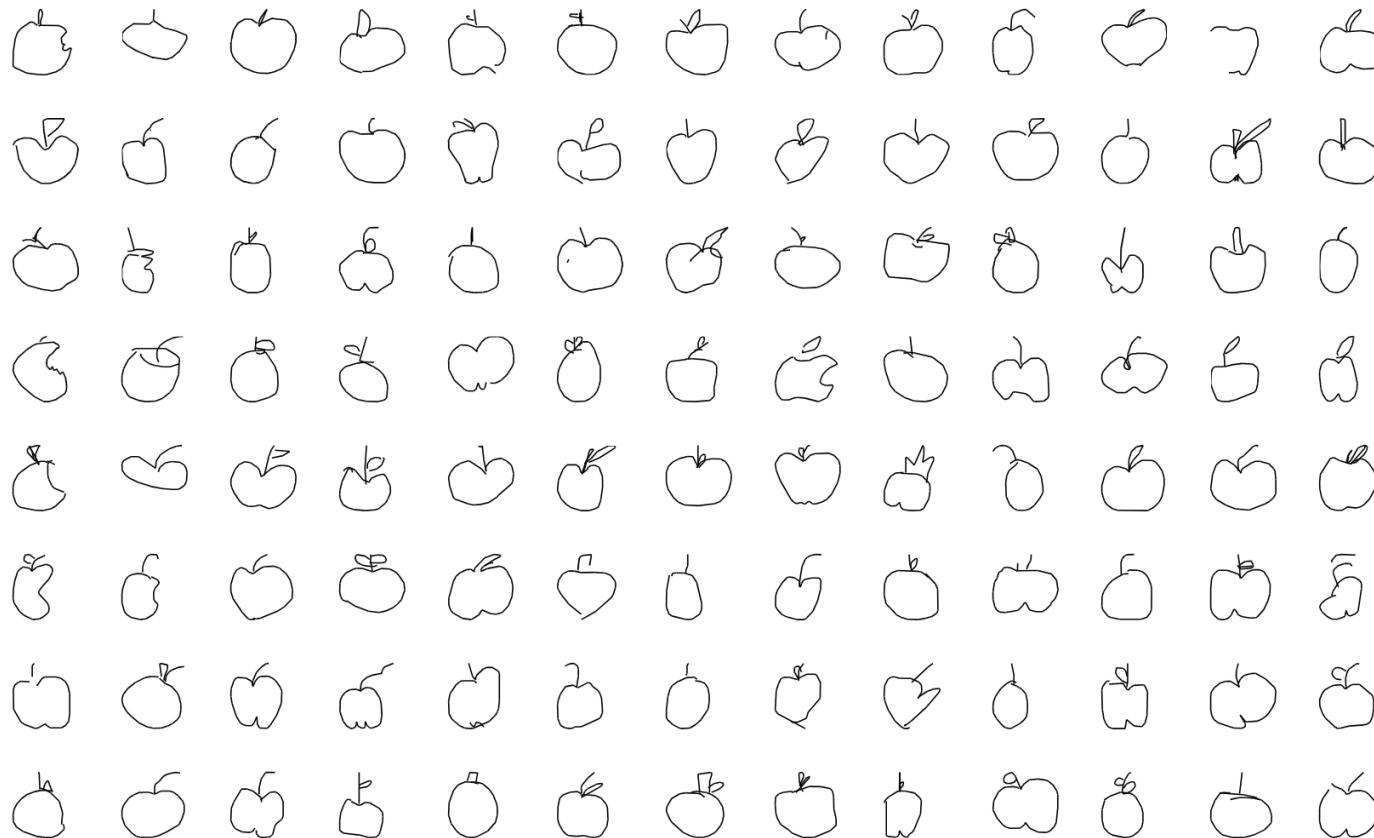




# How does ML work in QuickDraw?

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- <https://quickdraw.withgoogle.com/data/apple>





# Bias Bias Bias

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## When It Comes to Gorillas, Google Photos Remains Blind

Google promised a fix after its photo-categorization software labeled black people as gorillas in 2015. More than two years later, it hasn't found one.

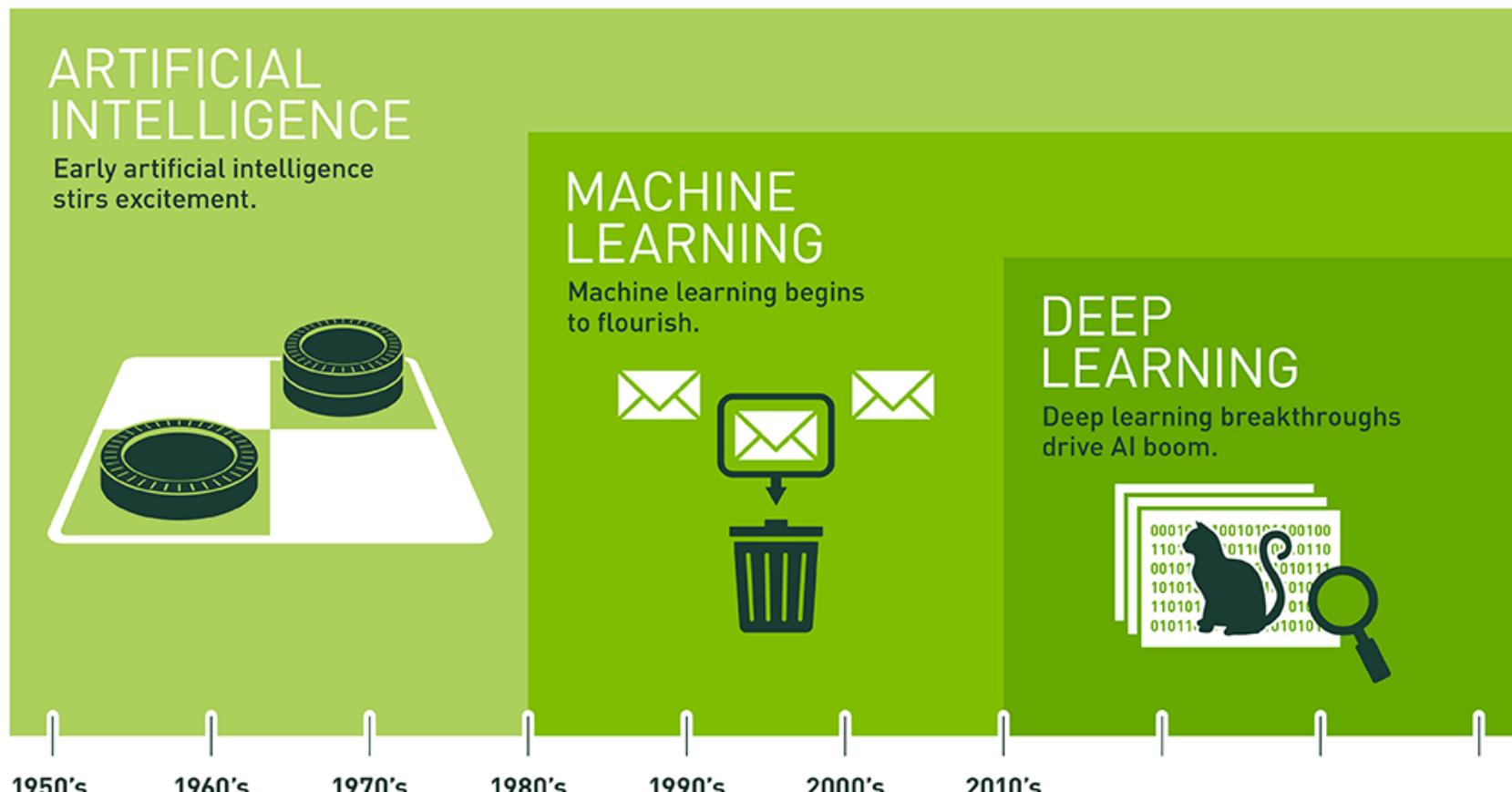


In WIRED's tests, Google Photos did identify some primates, but no gorillas like this one were to be found. RICK MADONIK/TORONTO STAR/GETTY IMAGES

<https://www.wired.com/story/when-it-comes-to-gorillas-google-photos-remains-blind/>



# AI Time line



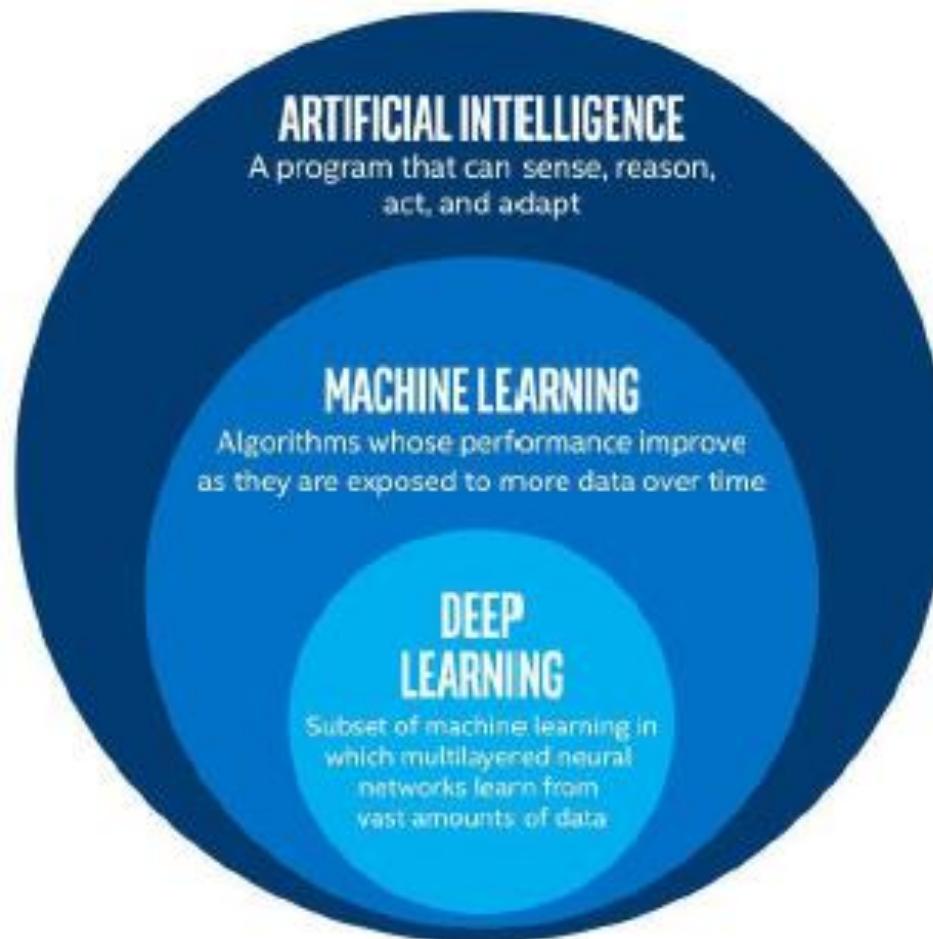
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Source: Nvidia



# Machine Learning

- These programs learn from repeatedly seeing data, rather than being explicitly programmed by humans





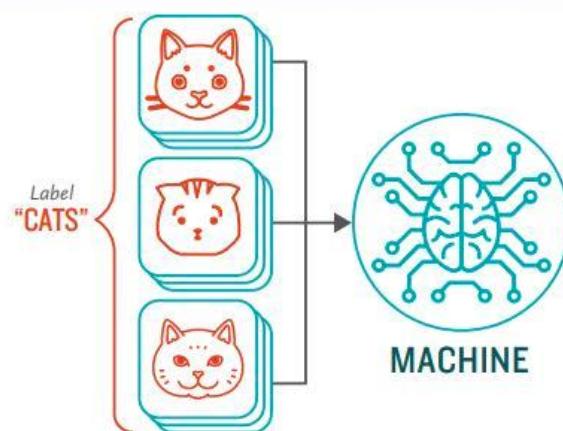
# Supervised Learning

Data points have **known** outcome

## How **Supervised** Machine Learning Works

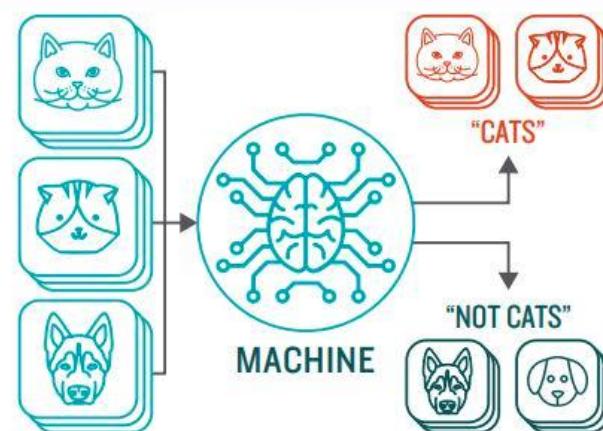
### STEP 1

Provide the machine learning algorithm categorized or "labeled" input and output data from to learn

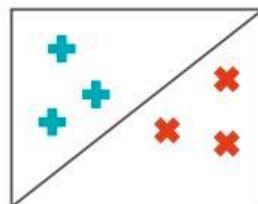


### STEP 2

Feed the machine new, unlabeled information to see if it tags new data appropriately. If not, continue refining the algorithm

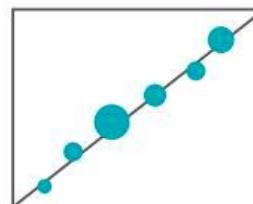


## TYPES OF PROBLEMS TO WHICH IT'S SUITED



### CLASSIFICATION

Sorting items into categories



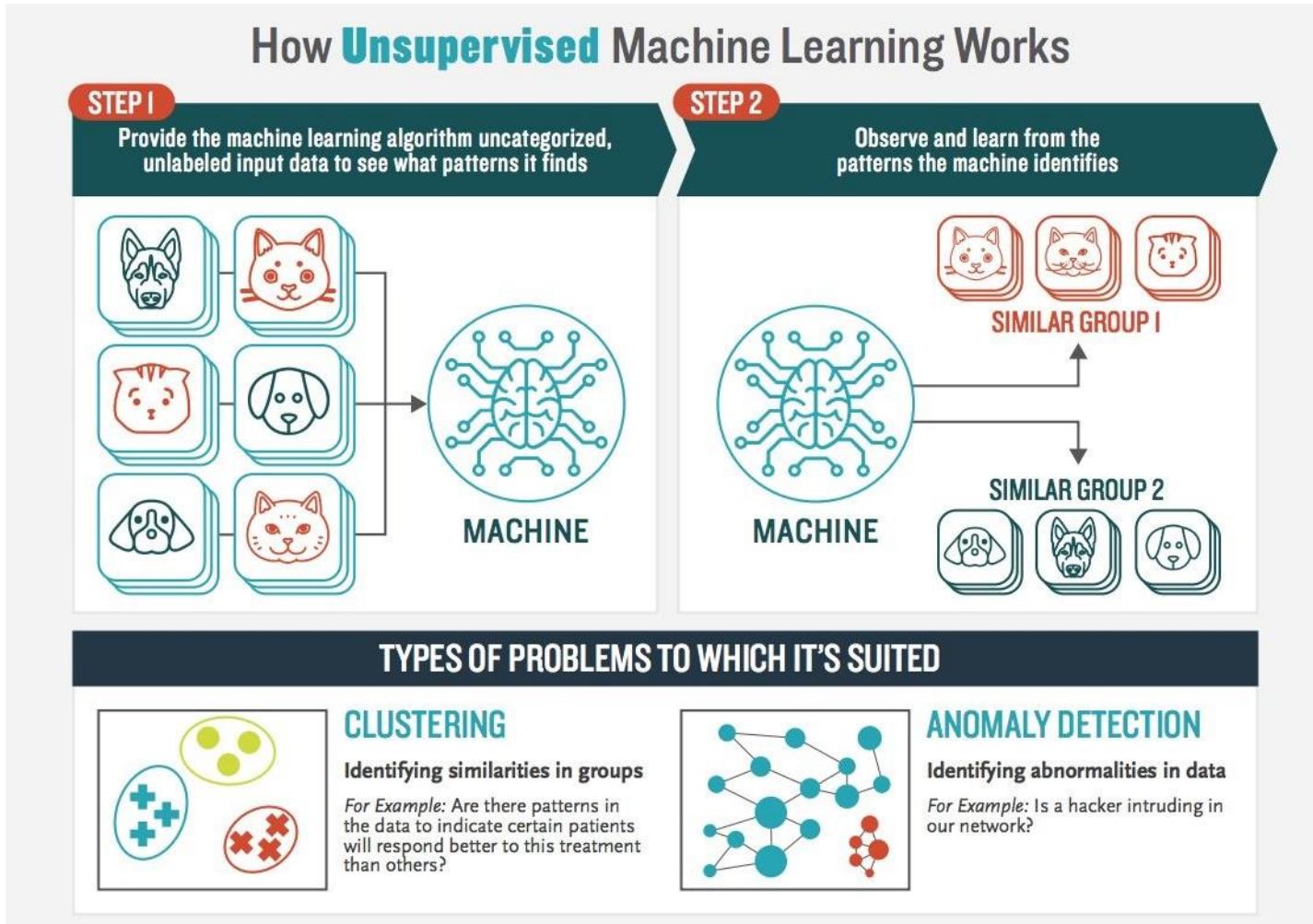
### REGRESSION

Identifying real values (dollars, weight, etc.)



# Unsupervised Learning

Data points have **unknown** outcome





# Machine Learning

- Applications in our daily lives

Spam Filtering

Web Search

Postal Mail Routing

Fraud Detection

Movie  
Recommendations

Vehicle Driver  
Assistance

Web Advertisements

Social Networks

Speech Recognition



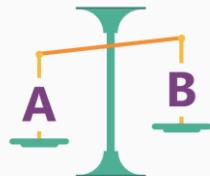
# 5 fundamental questions

**Is this weird?  
(Anomaly detection)**



Is this pressure gauge reading normal?  
Is this message from the internet typical?

**Is this A or B?  
(Classification)  
(discrete values)**



Will this tire fail in the next 1,000 miles: Yes or no?  
Which brings in more customers: a \$5 coupon or a 25% discount?

**How many?  
How Much?  
(Regression)  
(Continuous)**



What will the temperature be next Tuesday?  
What will my fourth quarter sales be?

**How is this organized?  
(Clustering)**



Which viewers like the same types of movies?  
Which printer models fail the same way?

**What should I do?  
(Reinforce Learning)**

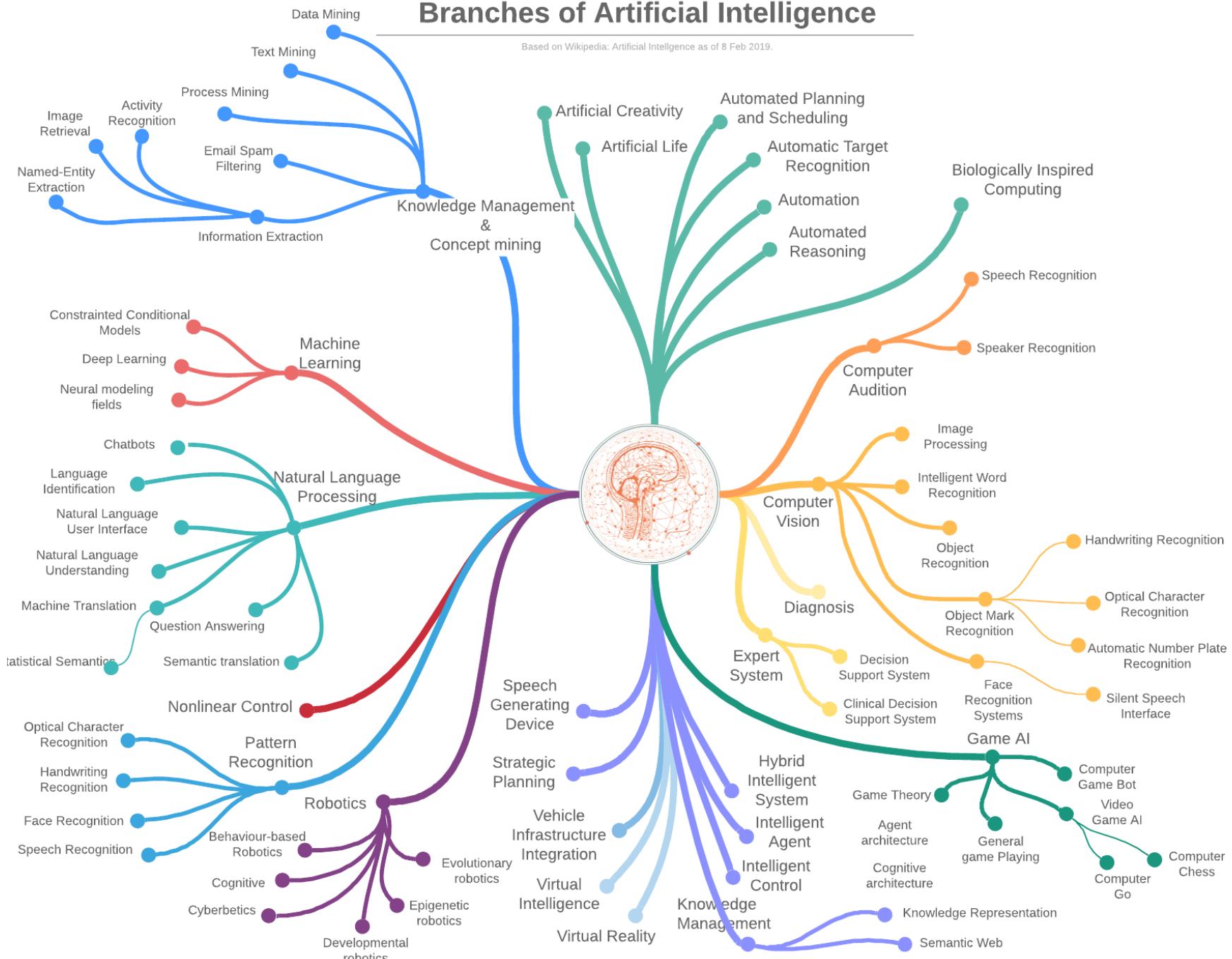


If I'm a self-driving car: At a yellow light, brake or accelerate?  
For a robot vacuum: Keep vacuuming, or go back to the charging station?



# Branches of Artificial Intelligence

Based on Wikipedia: Artificial Intelligence as of 8 Feb 2019.





# Machine Learning Example

- Suppose you wanted to identify fraudulent credit card transactions.
- You could define features to be:
  - Transaction time
  - Transaction amount
  - Transaction location
  - Category of purchase
- The algorithm could learn what feature combinations suggest unusual activity.





# Machine Learning Limitations

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- Suppose you wanted to determine if an image is of a cat or a dog.
- What features would you use?
- This is where **Deep Learning** can come in.



*Dog and cat recognition*

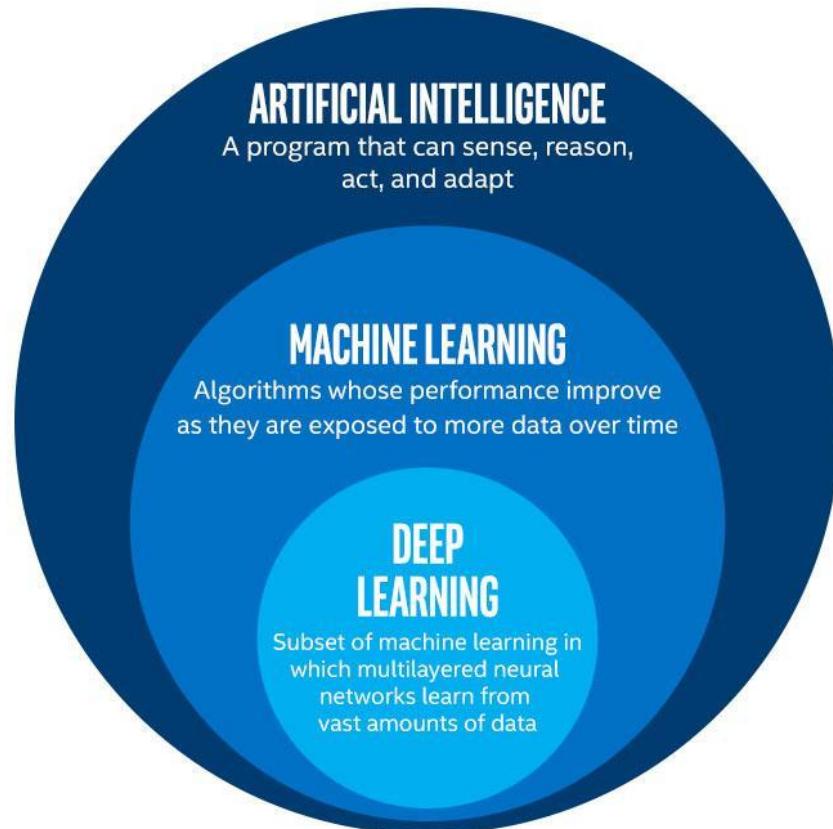


# What is deep learning?

## Deep Learning

“Machine learning that involves using very complicated models called “deep neural networks”.”  
(Intel)

*Models determine best representation of original data; in classic machine learning, humans must do this.*

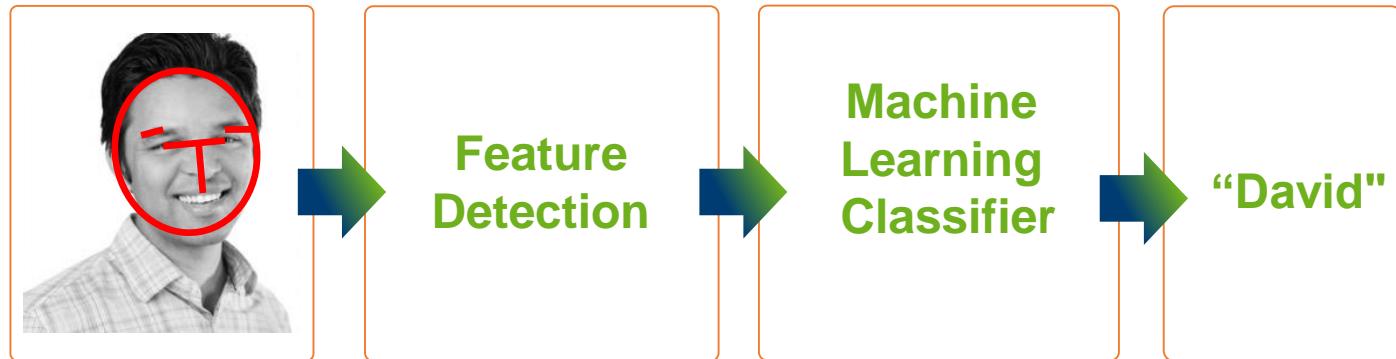




# Deep Learning Example

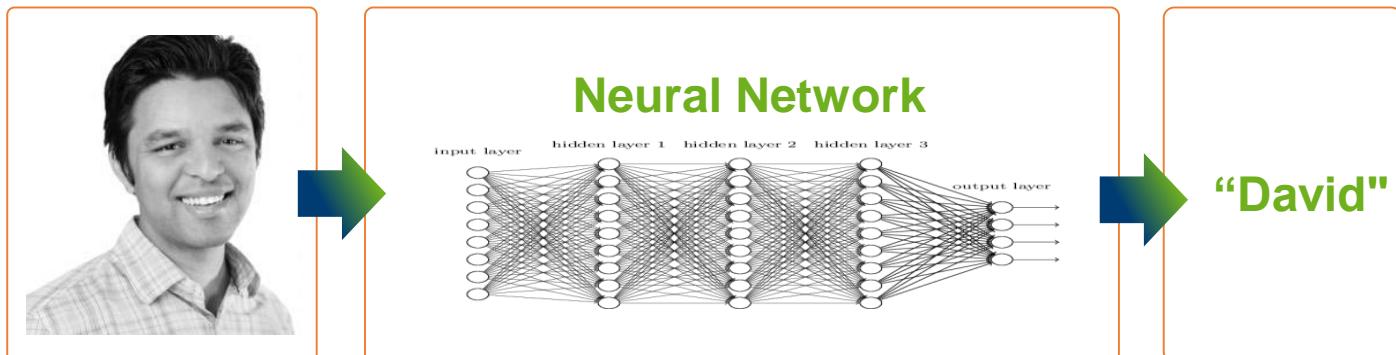
## Classic Machine Learning

Step 1: Determine features.  
Step 2: Feed them through model.



## Deep Learning

Steps 1 and 2 are combined into 1 step.

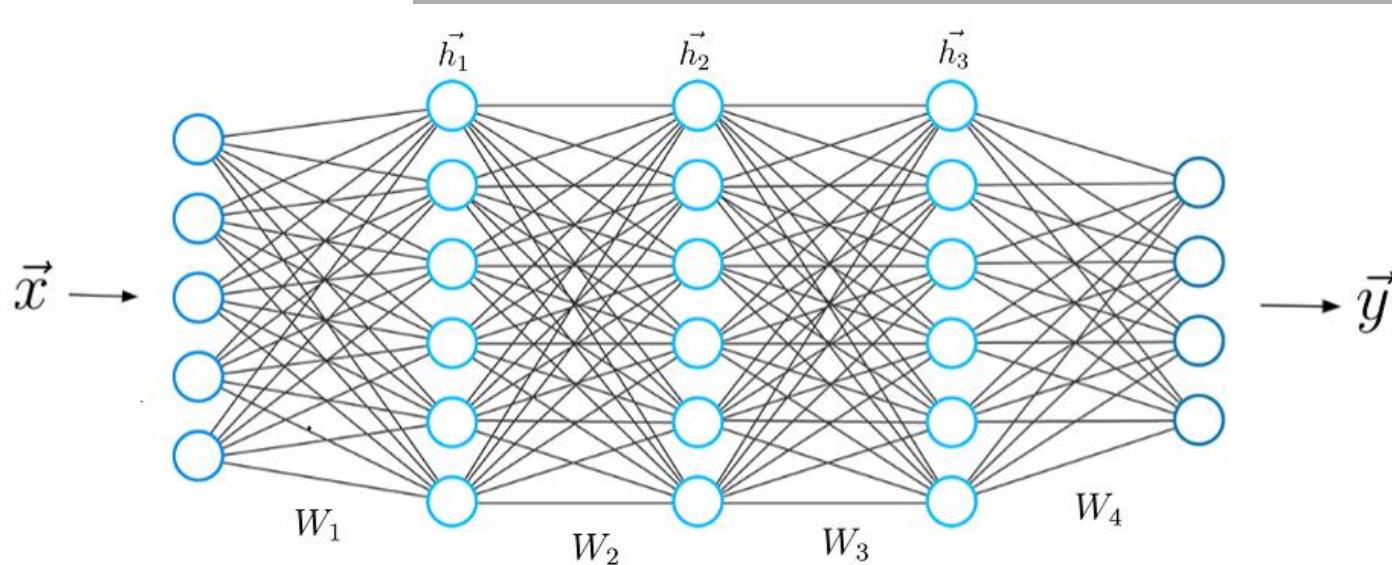




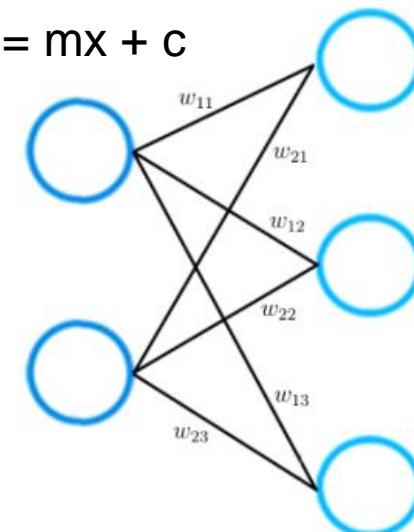
# What is neural network?



# Neural Networks

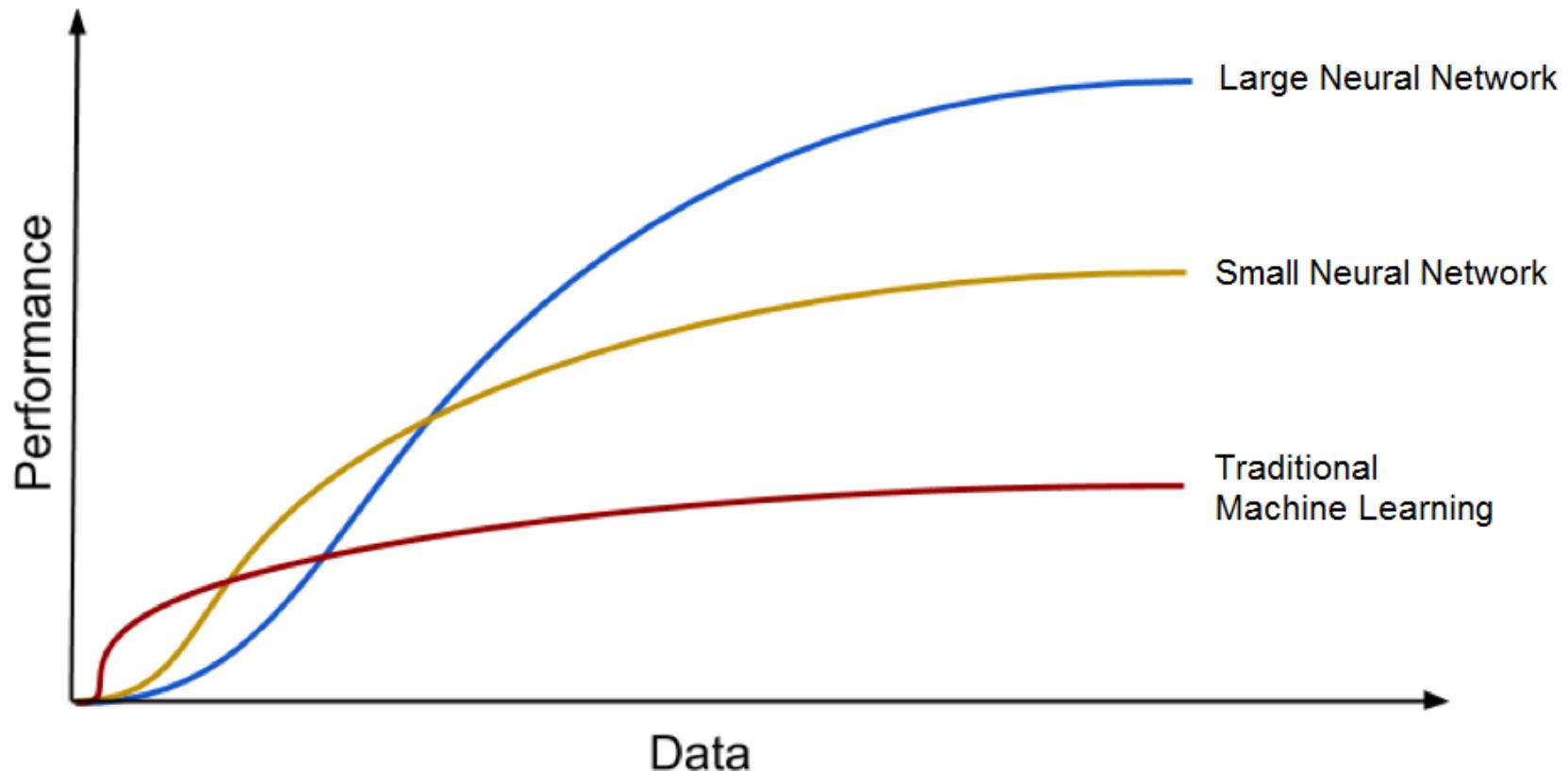


The challenge in training a neural network is finding a set of weights that give the most accurate output.





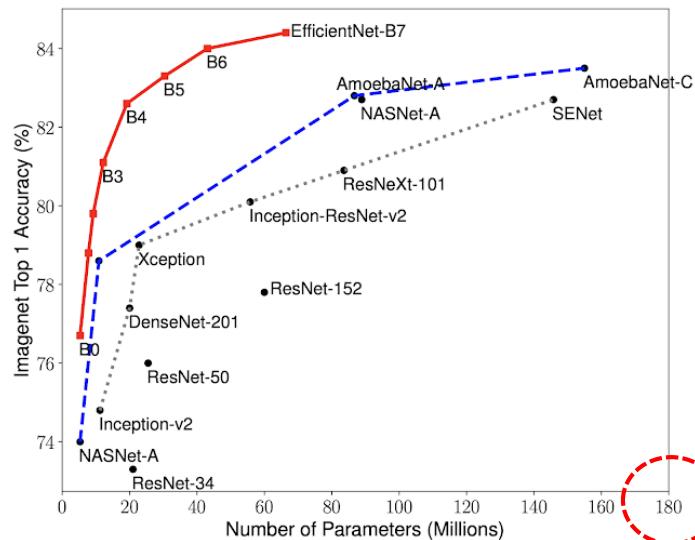
# Performance



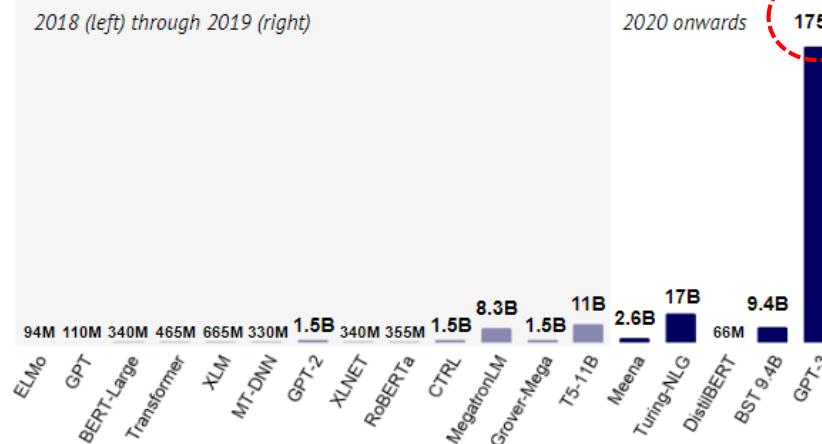
Deep Learning Algorithms get better with the increasing amount of data.



# Size



► Huge models, large companies and massive training costs dominate the hottest area of AI today, NLP.



Note: The number of parameters indicates how many different coefficients the algorithm optimizes during the training process.



# Deep Learning in Action

[bit.ly/google\\_teachable](https://bit.ly/google_teachable)

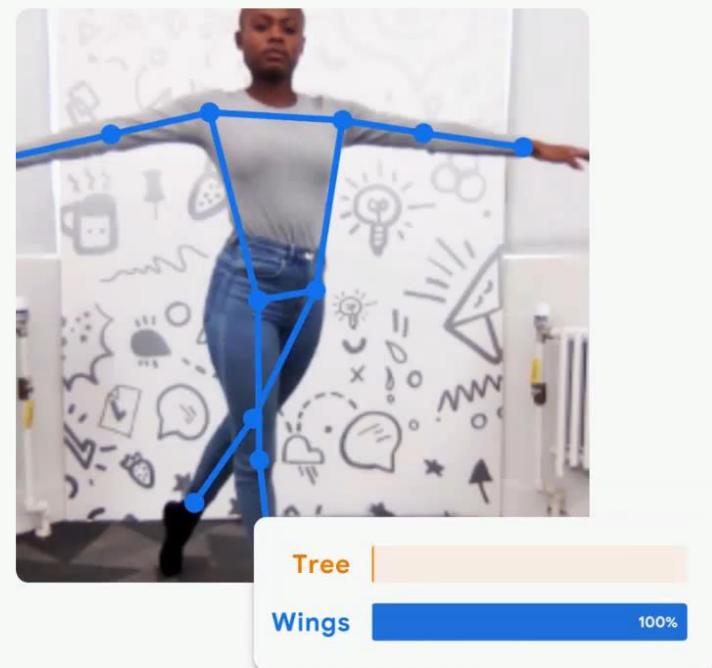
## Teachable Machine



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



ml<sup>6</sup>

p5.js

Coral



node<sub>js</sub>



Optional Activity



# 15 Mins Break

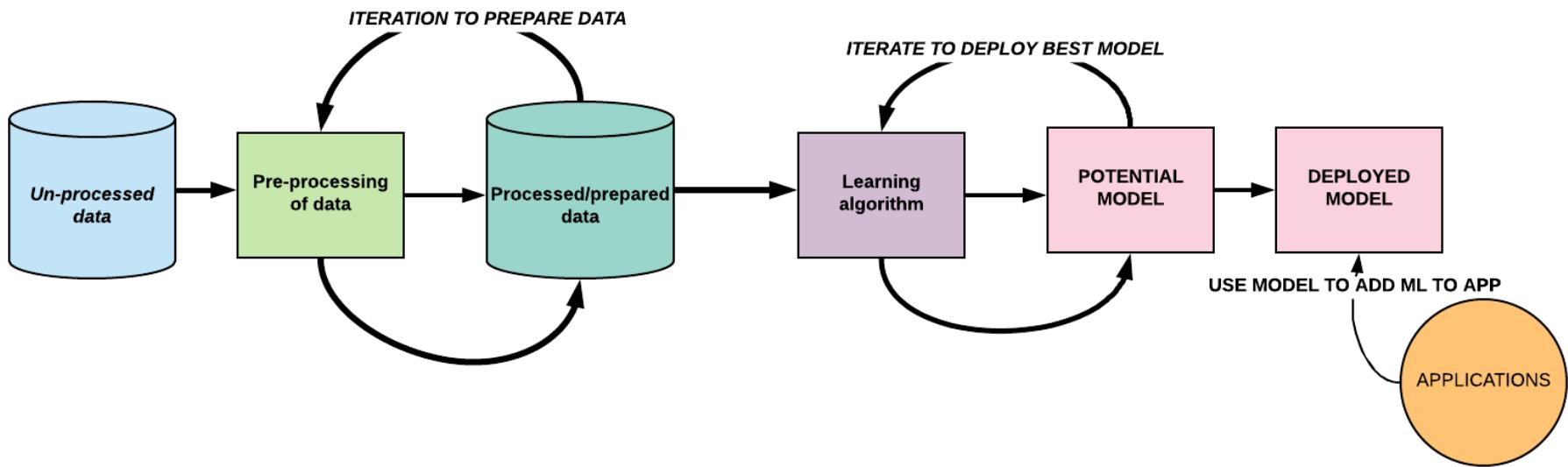


[bit.ly/top10\\_2020](https://bit.ly/top10_2020)





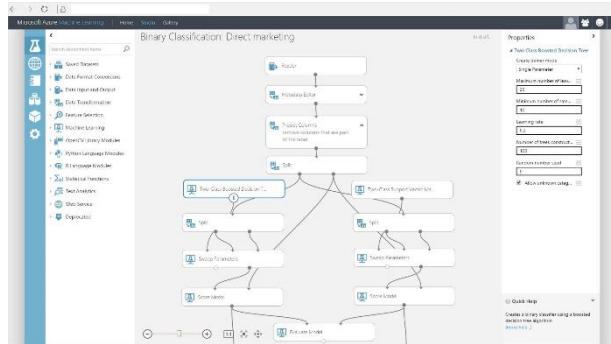
# Machine Learning workflow



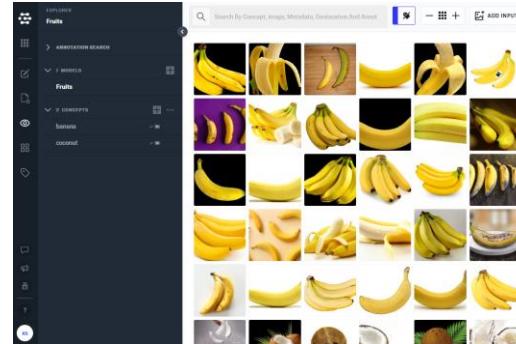


# Code-Free Machine Learning tools

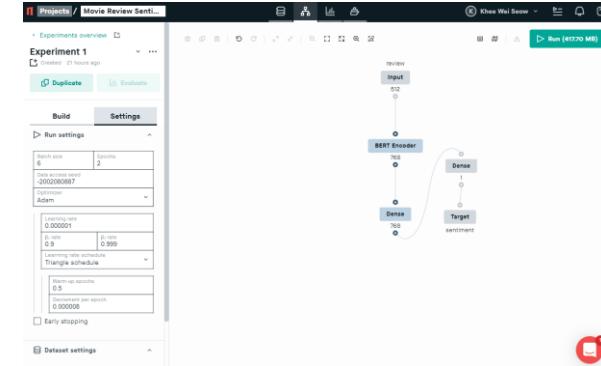
Microsoft Azure  
Machine Learning Studio  
(Classic)



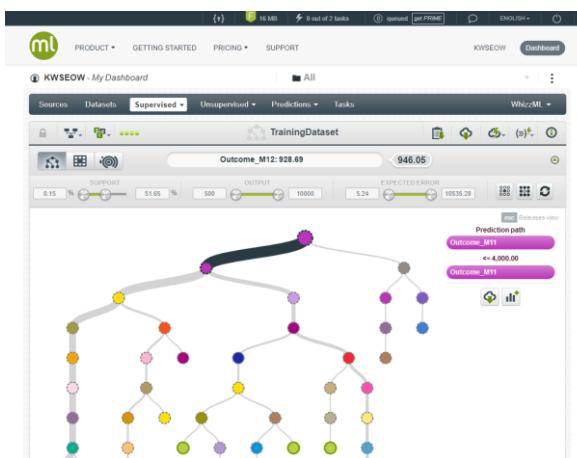
Clarifai



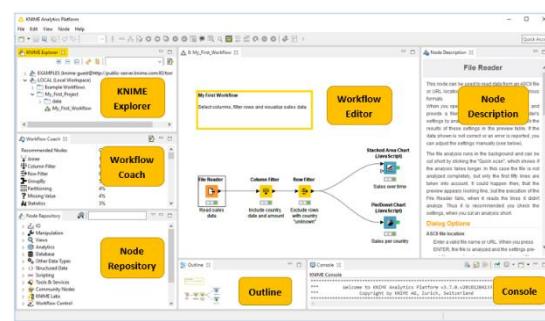
Peltarion



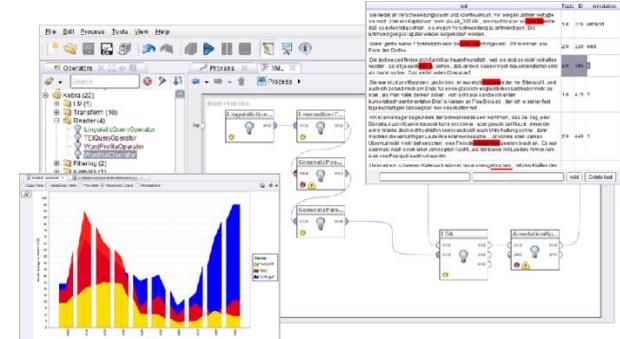
bigml



KNIME



Rapidminer







# Recap

## Machine Learning in ML Studio

### Anomaly Detection

- One-class Support Vector Machine
- Principal Component Analysis-based Anomaly Detection
- Time Series Anomaly Detection\*

### Classification

#### Two-class Classification

- Averaged Perceptron
- Bayes Point Machine
- Boosted Decision Tree
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- Support Vector Machine

#### Multi-class Classification

- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- One-vs-all

### Clustering

#### K-means Clustering

### Recommendation

#### Matchbox Recommender

### Regression

- Bayesian Linear Regression
- Boosted Decision Tree
- Decision Forest
- Fast Forest Quantile Regression
- Linear Regression
- Neural Network Regression
- Ordinal Regression
- Poisson Regression

### Statistical Functions

- Descriptive Statistics
- Hypothesis Testing T-Test
- Linear Correlation
- Probability Function Evaluation

### Text Analytics

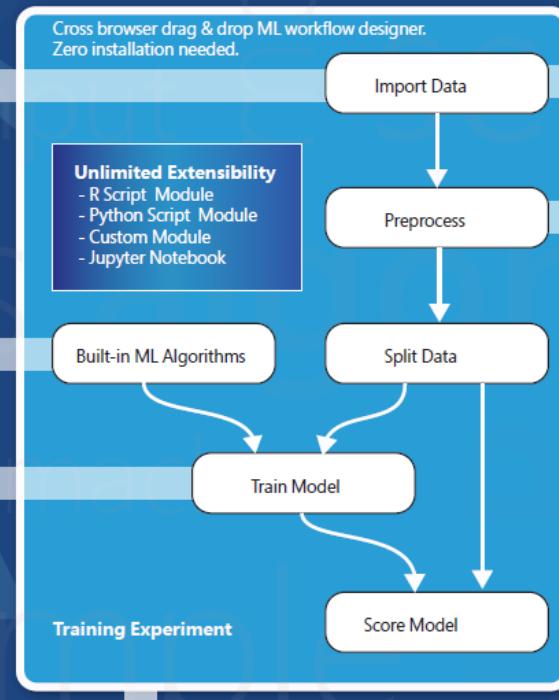
- Feature Hashing
- Named Entity Recognition
- Vowpal Wabbit

### Computer Vision

- OpenCV Library

<https://studio.azureml.net>

Guest Access Workspace: Free trial access without logging in.  
 Free Workspace: Free persisted access, no Azure subscription needed.  
 Standard Workspace: Full access with SLA under an Azure subscription.



## One-click Operationalization

### Make Prediction with Elastic APIs

- Request-Response Service (RRS)
- Batch Execution Service (BES)
- Retraining API

### Data Source

- Azure Blob Storage
- Azure SQL DB
- Azure SQL DW\*
- Azure Table
- Desktop Direct Upload
- Hadoop Hive Query
- Manual Data Entry
- OData Feed
- On-prem SQL Server\*
- Web URL (HTTP)

### Data Format

- ARFF
- CSV
- SVMLight
- TSV
- Excel
- ZIP

### Data Preparation

- Clean Missing Data
- Clip Outliers
- Edit Metadata
- Feature Selection
- Filter
- Learning with Counts
- Normalize Data
- Partition and Sample
- Principal Component Analysis
- Quantize Data
- SQLite Transformation
- Synthetic Minority Oversampling Technique

### Enterprise Grade Cloud Service

- SLA: 99.95% Guaranteed Up-time
- Azure AD Authentication
- Compute at Large Scale
- Multi-geo Availability
- Regulatory Compliance\*

### Community

- Gallery (<http://gallery.azureml.net>)
- Samples & Templates
- Workspace Sharing and Collaboration
- Live Chat & MSDN Forum Support

\* Feature Coming Soon

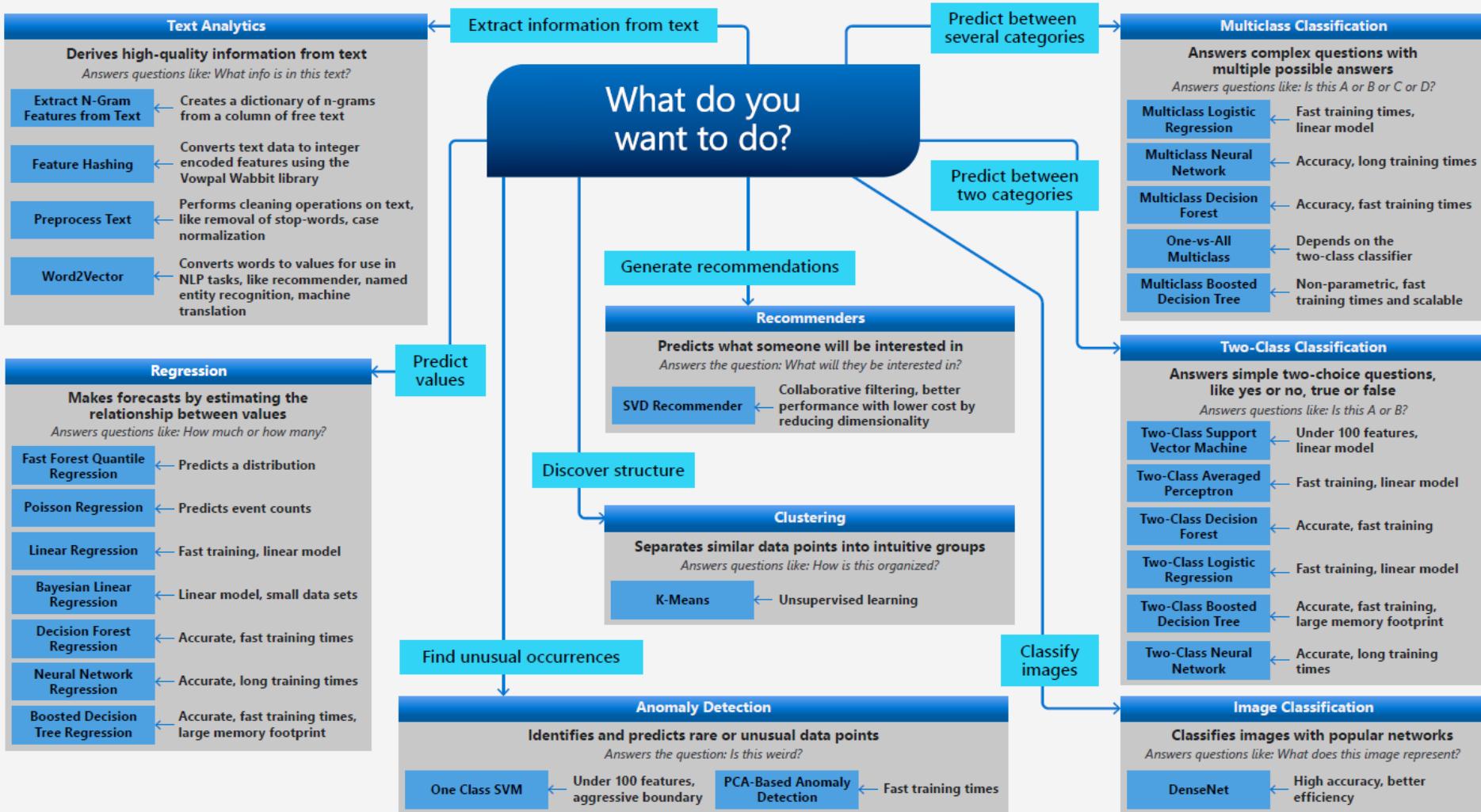


# Azure ML Algorithm Cheat Sheet



## Microsoft Azure Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.





# Activity 2

- Deploying your experiment as a Web Service & Make Prediction using Excel

	A	B	C	D	E	F	G	H	I	J	
1	symboling	normalized	make	fuel-type	aspiration	num-of-doors	body-style	drive-wheel	engine-location	wheel-base	length
2	3	1	alfa-romero	gas	std	two	convertible	rwd	front	88.6	
3	3	1	alfa-romero	gas	std	two	convertible	rwd	front	88.6	
4	1	1	alfa-romero	gas	std	two	hatchback	rwd	front	94.5	
5	2	164	audi	gas	std	four	sedan	fwd	front	99.8	
6	2	164	audi	gas	std	four	sedan	4wd	front	99.4	
7											
8											
9											
10	make	body-style	wheel-base	engine-size	horsepower	peak-rpm	highway-mpg	price	Scored Labels		
11	alfa-romero	convertible	88.6	130	111	5000	27	13495	13498.476		
12	alfa-romero	convertible	88.6	130	111	5000	27	16500	13498.476		
13	alfa-romero	hatchback	94.5	152	154	5000	26	16500	14329.816		
14	audi	sedan	99.8	109	102	5500	30	13950	15696.502		
15	audi	sedan	99.4	136	115	5500	22	17450	17161.153		
16											

Azure Machine Learning interface showing the prediction process:

- 1. VIEW SCHEMA
- 2. PREDICT
  - Input: input1 (Sheet1!A1:Z6, My data has headers checked)
  - Output: output1 (Sheet1!A10, Include headers checked)
  - Predict button (disabled)
  - Auto-predict checkbox
  - Predicting will override existing values. This can't be undone. Got it!
- 3. ERRORS

**Step 1:**  
Watch and listen to the instructor's demonstration



**Step 2:**  
Work through the activities

Individual Activity





# 60 mins Lunch Break

**Some interesting videos**

<https://www.youtube.com/watch?v=bmNaLtC6vkU>

[https://www.youtube.com/watch?v=Nnf8P5A\\_saE](https://www.youtube.com/watch?v=Nnf8P5A_saE)

Lunch break XX:XX-YY:YY

**LUNCH BREAK**



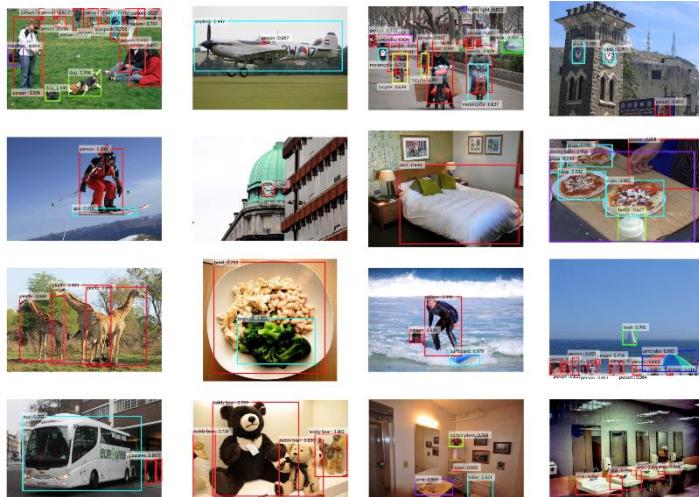
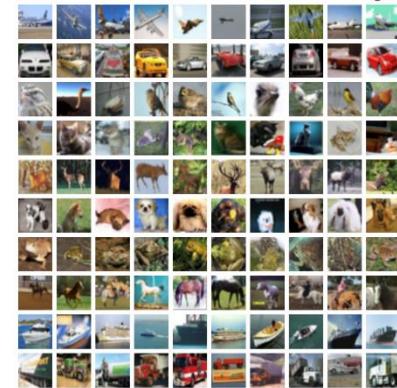


# Applications of Computer Vision

- Image Classification
- Image Classification With Localization
- Object Detection
- Object Segmentation



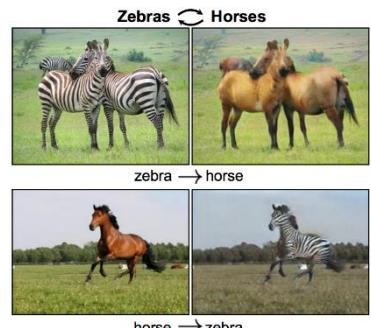
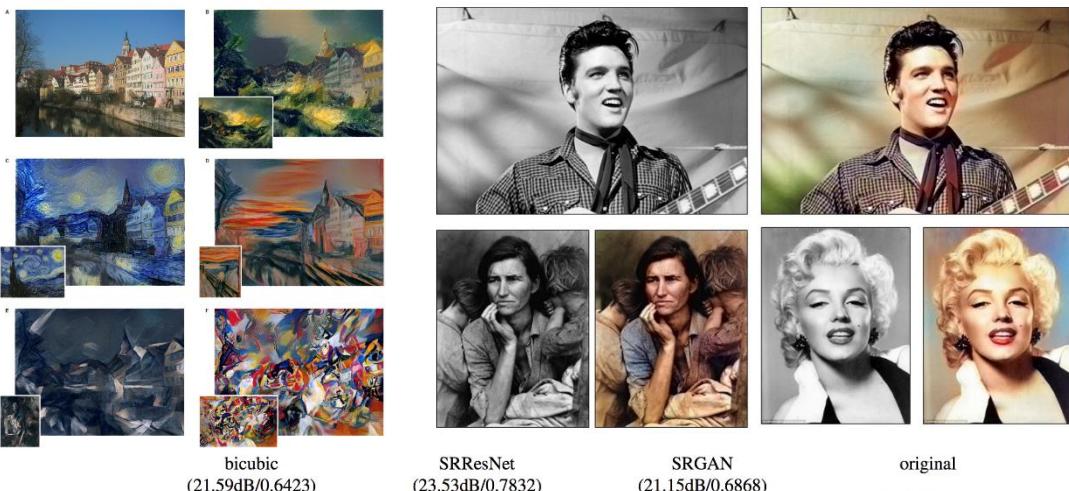
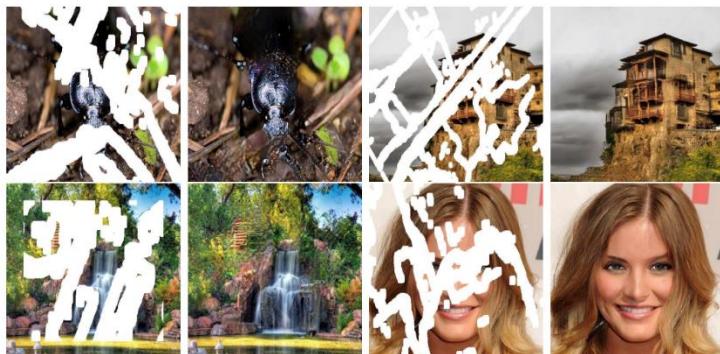
airplane  
automobile  
bird  
cat  
deer  
dog  
frog  
horse  
ship  
truck





# Applications of Computer Vision

- Image Style Transfer
- Image Colorization
- Image Reconstruction
- Image Super-Resolution
- Image Synthesis
- Other Problems





# Transfer Learning

Models are difficult to train from scratch

- Huge datasets (like ImageNet - ~14mil images, 22000 classes)
- Long number of training iterations
- Very heavy computing machinery
- Time experimenting to get hyper-parameters just right



Humans have an inherent ability to transfer knowledge across tasks.

What we acquire as knowledge while learning about one task, we utilize in the same way to solve related tasks.

The more related the tasks, the easier it is for us to transfer, or cross-utilize our knowledge.

Some simple examples would be,

- \* Know how to ride a motorbike → Learn how to ride a car
- \* Know how to play classic piano → Learn how to play jazz piano

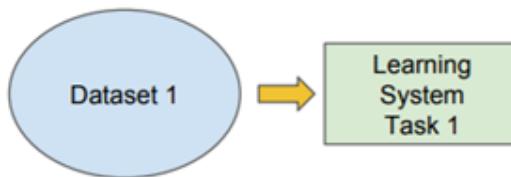


# Transfer Learning

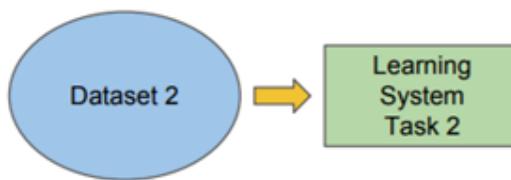
## Traditional ML

## vs Transfer Learning

- Isolated, single task learning:
  - Knowledge is not retained or accumulated. Learning is performed w.o. considering past learned knowledge in other tasks



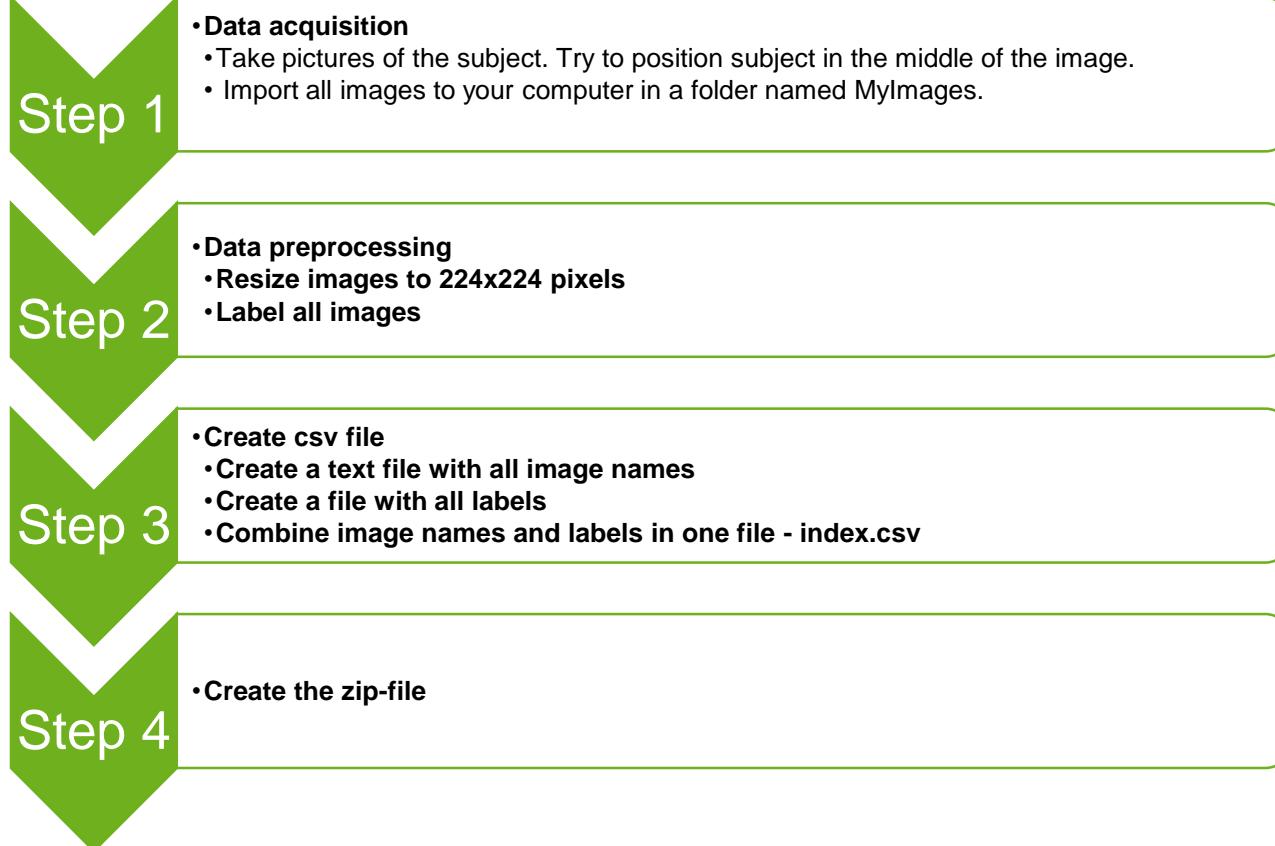
- Learning of a new tasks relies on the previous learned tasks:
  - Learning process can be faster, more accurate and/or need less training data



**Pre-trained model** is a model created by some one else to solve a similar problem. Instead of building a model from scratch to solve a similar problem, you use the model trained on other problem as a starting point.



# Creating a new dataset





# Example

The diagram illustrates the structure of a car damage dataset. It shows a file tree, a preview of images, and a CSV metadata file.

**File Tree:**

- < Dataset > Car damage dataset >
- Name
  - image (highlighted with a red dashed box)
  - test\_images
  - index.csv (highlighted with a red dashed box)
  - metadata.json

A green arrow points from the 'image' folder in the file tree to the 'image' column in the CSV file.

**Image Preview:**

Dataset > Car damage dataset > image

Search image

0.jpeg 1.jpeg 2.jpeg 3.jpeg 4.jpeg 5.jpeg

6.jpeg 7.jpeg 8.jpeg 9.jpeg 10.jpeg 11.jpeg

12.jpeg 13.jpeg 14.jpeg 15.jpeg 16.jpeg 17.jpeg

**CSV Metadata File:**

A1	A	B	C
1	image	class	subset
2	image/0.jpeg	unknown	T
3	image/1.jpeg	head_lamp	T
4	image/2.jpeg	door_scratch	T
5	image/3.jpeg	head_lamp	T
6	image/4.jpeg	unknown	T
7	image/5.jpeg	unknown	T
8	image/6.jpeg	glass_shatter	T



# Activity 3 – Car Damage Classifier

A close-up photograph of a car's headlight that has been shattered into many pieces.	A photograph of a car's rear right light assembly, which appears to be broken or severely damaged.	A photograph of a car's side window that has been shattered, showing a large hole and broken glass shards.	A photograph of a car's white door panel with a visible horizontal scratch.
A photograph of a car's white door panel with a prominent dent.	A photograph of a dark-colored car's front bumper that has been dented.	A photograph of a white car's side bumper with a visible scratch.	A photograph of a silver SUV parked in a showroom setting.

**Step 1:**  
Watch and listen to the  
instructor's demonstration



**Step 2:**  
- Do on your own

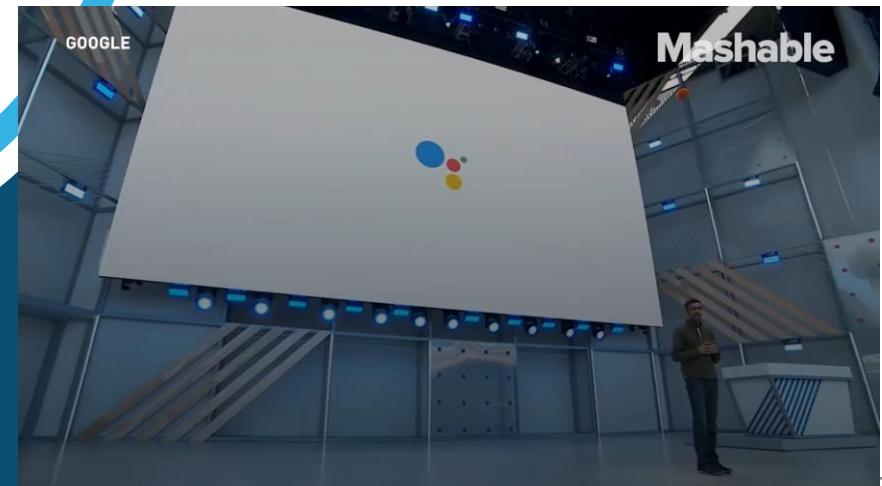
**Individual Activity**





# 15 Mins Break

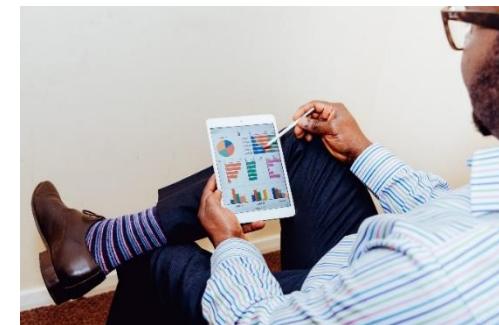
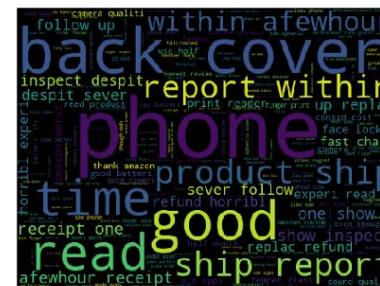
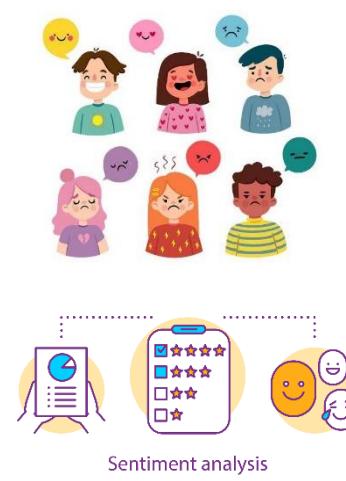
[bit.ly/google\\_duplex2019](http://bit.ly/google_duplex2019)





# Natural Language Processing

- Search Autocorrect and Autocomplete
- Language Translator
- **Social Media Monitoring**
- Chatbots
- **Survey Analysis**
- Targeted Advertising
- Hiring and Recruitment
- Voice Assistants
- Grammar Checkers
- Email Filtering





# Dataset

review	sentiment
Encoding Text	Encoding Binary Positive class positive
1 Hubert Selby Jr. gave us the book "Requiem For A Dream" and co-wrote the screenplay to Aronofsky's movie of it. That movie succeeded on every level by delivering an intimate, and unbiased portrait of the horrors of the characters lives and the vices that destroyed them. "Last Exit To Brooklyn" still has the vice and the multiple characters living sad lives, but it hardly does them the same justice Aronofsky did.  The film seems laughably anti-gay at times. Especially when in the film homosexuality equals death. One gay character gets stoned, is launched skyward by a speeding car, and lands dead on the pavement. Another is crucified and still more are simply beat up. Another exaggerated piece of shock value, that might actually hav...	negative
2 There are very few performers today who can keep me captivated throughout an entire film just by their presence. One of those few is Judy Davis, who has built a successful career out of creating characters that are headstrong in attitude but very vulnerable at heart. She takes roles that most other performers would treat melodramatically and adds a fiery, deeply emotional intensity that pulls attention away from everything else on the screen.  Her skills are well displayed in "High Tide," a film that matches her up a second time with director Gillian Armstrong, who gave Davis her first major success with "My Brilliant Career." In that film, Davis played a young woman who was determined to make it in the world, despite the suffocat...	positive
3 C'mon guys some previous reviewers have nearly written a novel commenting on this episode. It's just an old 60's TV show ! This episode of Star Trek is notable	negative

## Information

Creator

Review, Sentiment

Rows

25 000

Size

13 MB

Categories

Text, Classification



# Activity 4 - Creating a Sentiment Analyser



## About this dataset

This dataset contains textual movie reviews from IMDB users, together with the rating (simplified as positive or negative) that the user gave to the movie.

## Inspiration

Use this dataset to predict a simple positive or negative category from paragraph-sized text data.

### Step 1:

Watch and listen to the instructor's demonstration



20 mins

### Step 2:

- Do on your own

**Optional Activity**



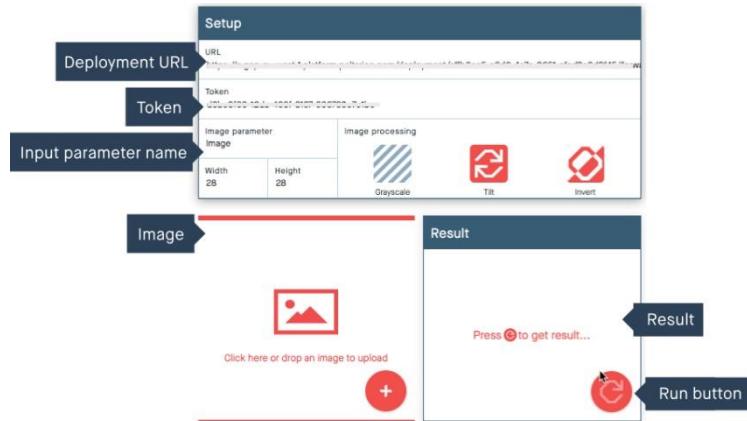
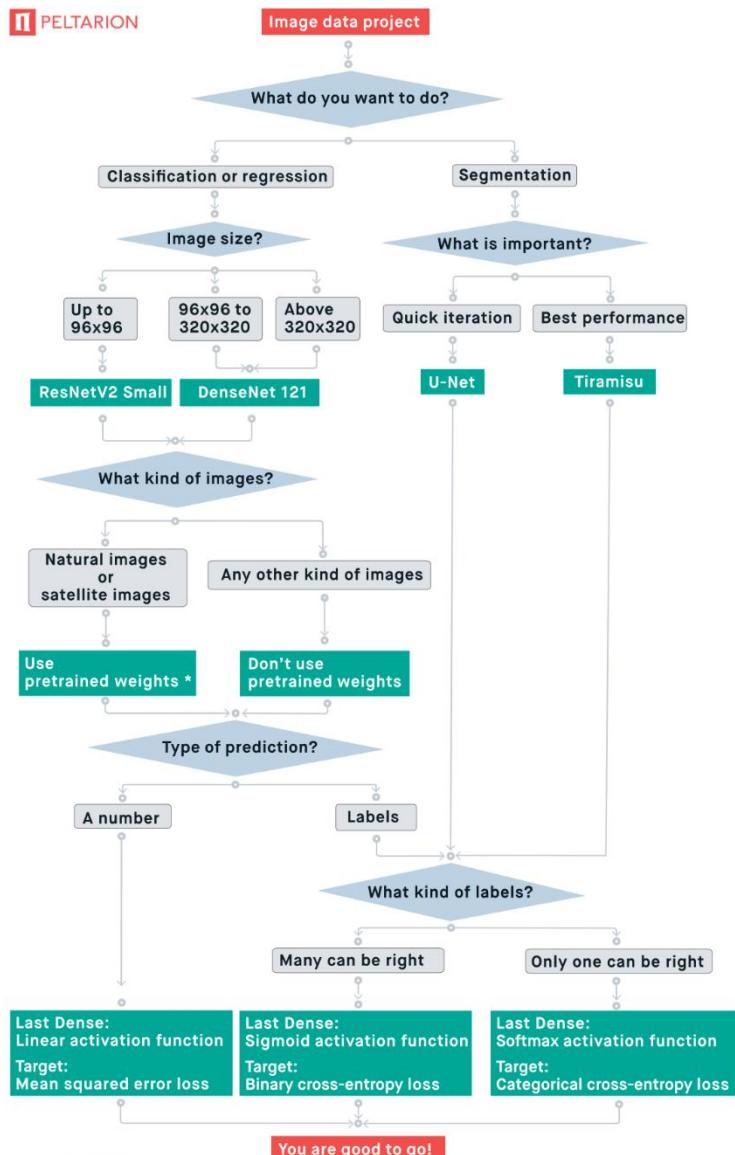
30 mins  
48



# Cheatsheets

<https://peltarion.com/knowledge-center/documentation/cheat-sheets>

PELTARION





# Linking Them Together

## App Development

### Top 9 No-Code Web App Development Tools that May Compete with Bubble

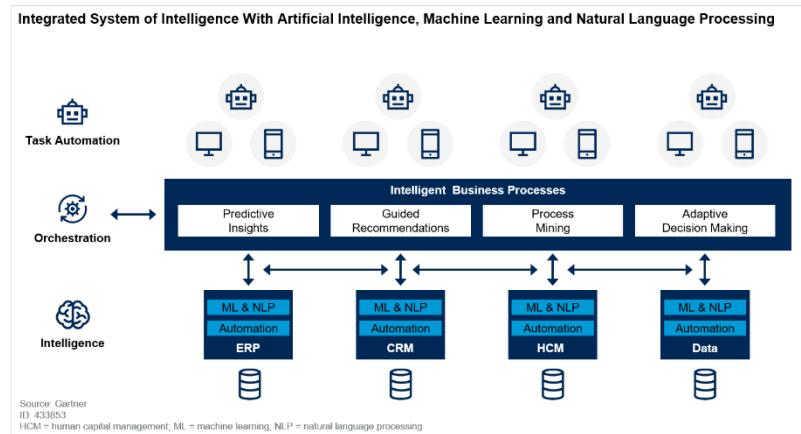
We're here to prove that "building the best product" is possible not only with Bubble.

 Airtable  .bubble 

The screenshot shows the Bubble app builder interface. On the left, there's a sidebar with various tools like Images, Buttons, Text, Icons, Shapes, Plugins, and Settings. The main area displays a preview of a button labeled "GET STARTED". Below the preview, there's a section titled "Bubble Boilerplate" with a "GET STARTED" button and some descriptive text. At the bottom, there's a "UI Elements" section with a collection of building blocks.

<https://uibakery.io/bubble-alternatives>

## RPA - Automation



Adobe Acrobat Document

<https://www.youtube.com/watch?v=FV8IM9SIFQ8> 50



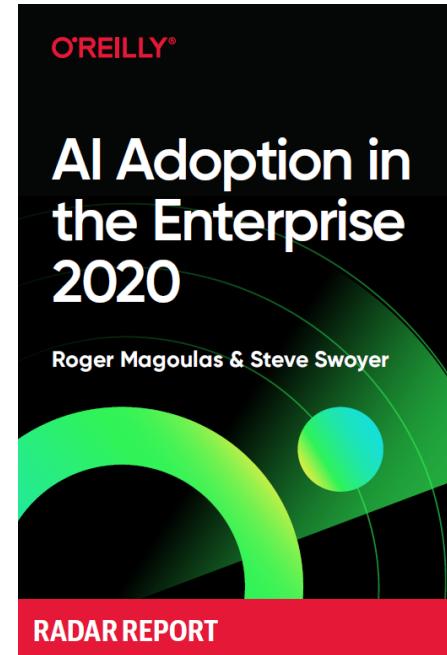
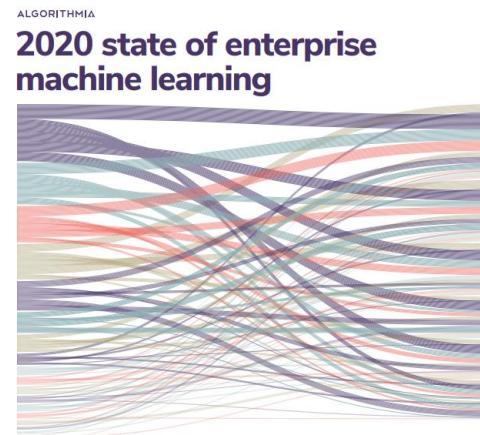
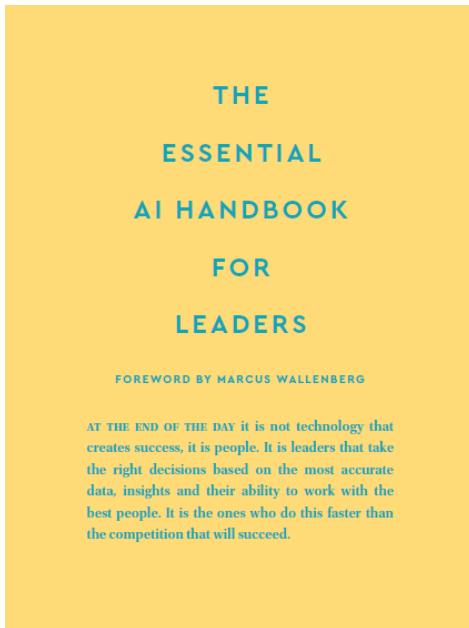
# When to use Machine Learning

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- **What are our most pressing problems right now?**
  - Just like any other tool in business, AI should be viewed as a tool that can help make your organization more effective, profitable or streamlined
- **What parts of our business generate revenue but currently have low profit margins?**
  - These revenue streams could provide fertile ground for automation and acceleration via AI.
- **Where would we like to cut costs?**
  - Review your costs and pinpoint the ones you'd like to reduce. AI can help you better understand what generates costs and identify areas that could be optimized or changed to reduce them.
- **Where do we make a high percentage of errors in our work?**
  - A well-trained AI model has the capacity to perform with far less margin of error than humans
- **What work do our employees do that they don't particularly like?**
  - If it's repetitive or annoying for a human to do, there might be a component of the task better done by AI.



# Some easy readings



Join telegram channel <http://t.me/aicfml>  
or scan the QR code to download all three





# Datasets and Data Prep

## GitHub

<https://kwseow.github.io/>

Google  
Dataset Search Beta

<https://datasetsearch.research.google.com/>

## kaggle

<https://www.kaggle.com/datasets>



<https://www.kdnuggets.com/datasets/index.html>



Microsoft



## roboflow



# Debrief

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**Step 1: Go to the following url**

[http://bit.ly/cfml\\_debrief](http://bit.ly/cfml_debrief)



**Step 2: facilitator will walk you through the following**

- 1) Share 1 insight that you gained from this workshop.**
  
- 2) Share 1 project that you may want to work on.**





# Quiz

[https://bit.ly/kw\\_poll](https://bit.ly/kw_poll)



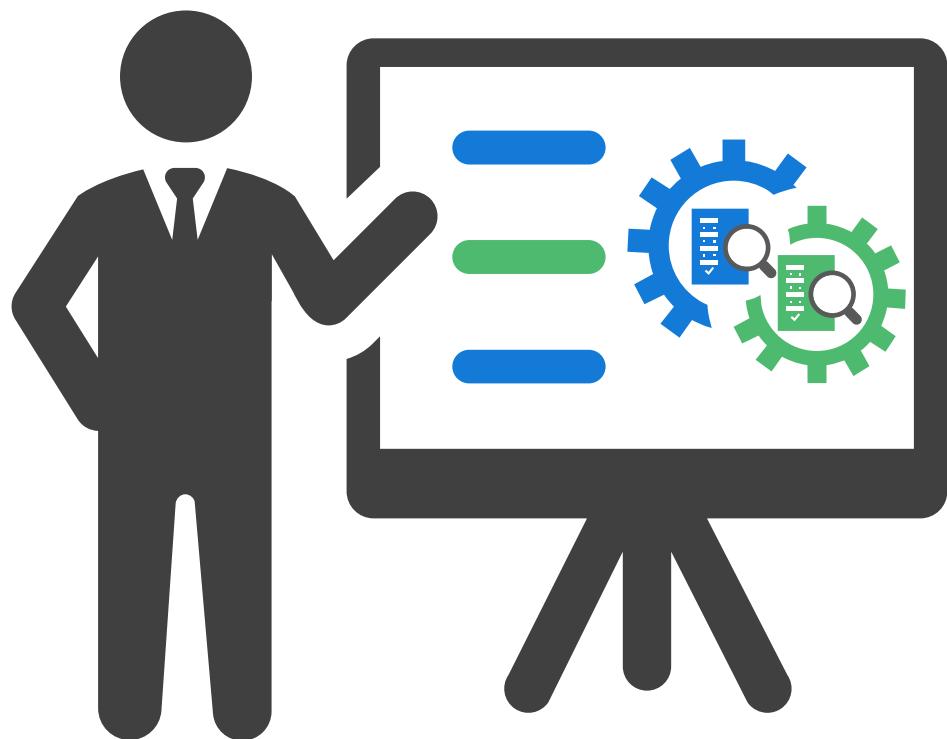
**SCAN ME**



# Survey



# Summary



Email  
[seow\\_khee\\_wei@rp.edu.sg](mailto:seow_khee_wei@rp.edu.sg)

Telegram  
[@kwseow](https://t.me/kwseow)

Source code:



# Thank you