

# Introduction to Code-Free Machine Learning

Good Morning!

- 1) Download the presentation slides and activity worksheets at [http://bit.ly/cfml\\_nov20](http://bit.ly/cfml_nov20)
  - 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
- Sit back and relax for now 😊



# Download from Github

[http://bit.ly/cfml\\_nov20](http://bit.ly/cfml_nov20)

The screenshot shows the GitHub repository page for `kwseow/aicfml_nov20`. The repository is currently on the `main` branch, which has 1 branch and 0 tags. The repository contains 4 commits and 6 files. The files listed are:

| File Name                     | Action               | Time        |
|-------------------------------|----------------------|-------------|
| 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 |

The README.md file is displayed below the file list, showing the title "An Introduction to Code-Free Machine Learning (Nov 2020)".

On the right side of the repository page, there are sections for "About", "Releases", and "Packages". The "About" section states "No description, website, or topics provided." The "Releases" section states "No releases published" and includes a link to "Create a new release". The "Packages" section states "No packages published" and includes a link to "Publish your first package".





# Warm up!

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

[http://bit.ly/cfml\\_warmup](http://bit.ly/cfml_warmup)



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

- 1) **Write down what you know about code-free and machine learning**
- 2) **What do you hope to gain from this workshop.**



**3 mins**



# Programme

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|            |  |
|------------|--|
| Section 1: | What is Machine Learning<br>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      |
|            | Lunch Break  |
| Section 4: | Transfer Learning<br>Computer Vision:<br>Activity 3 – Car Damage Assessment Classification |
| Section 5: | Natural Language Processing<br>Activity 4 – Book Genre Classifier                          |
| Section 6: | Linking them together  |
| Section 7: | Debrief  |



# Introduction of trainer

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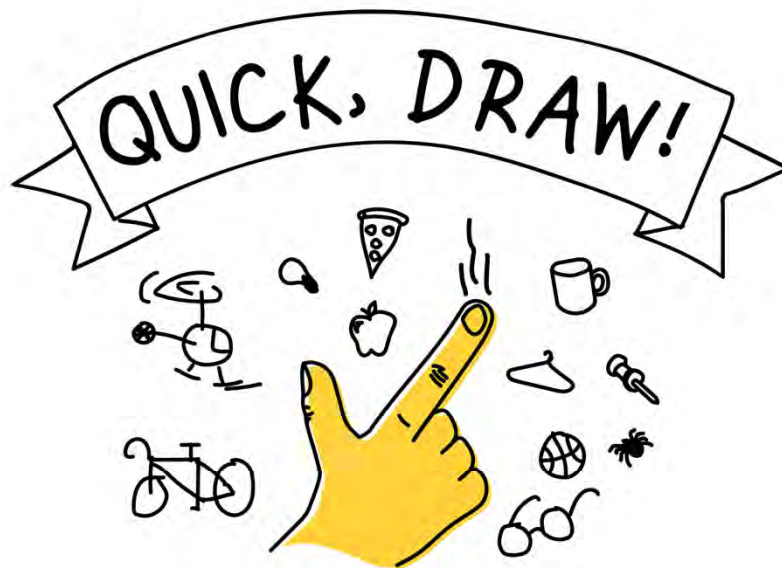






# Quickdraw Game

<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**

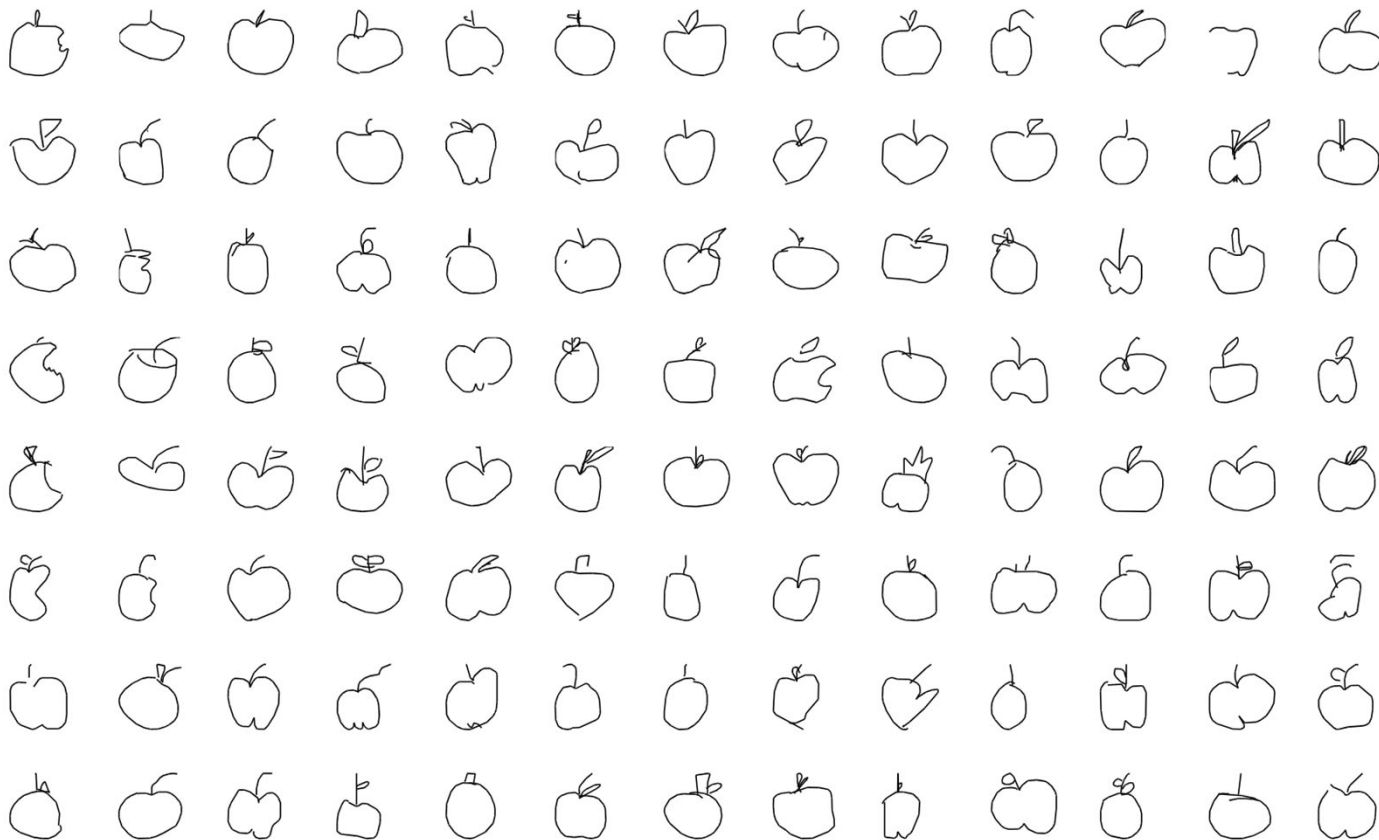


5 mins



# How does ML work in QuickDraw?

- <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.

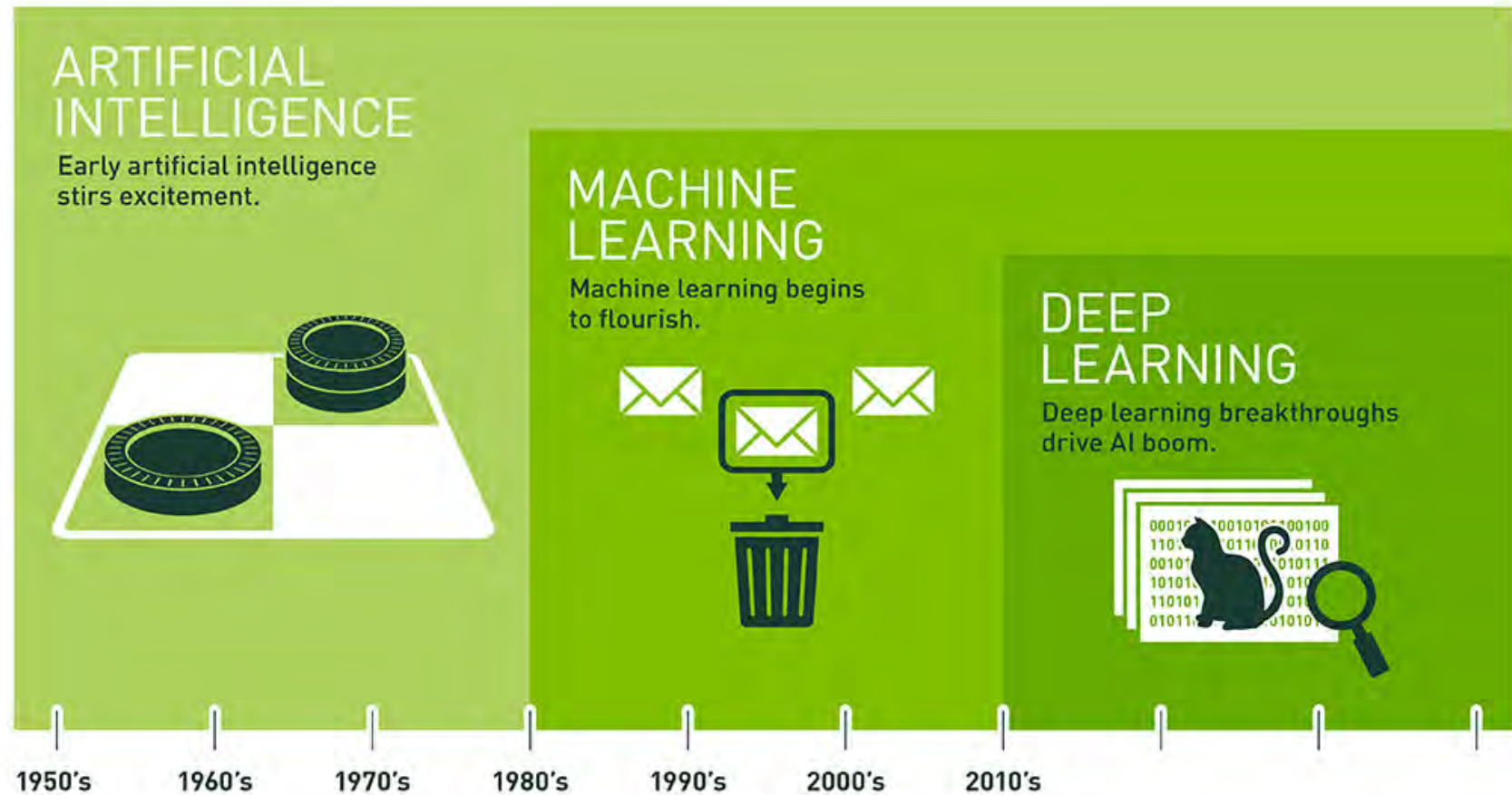


In WIRED's tests, Google Photos did identify some primates, but no gorillas like this one were to be found. RICK MADONIK/TORONTO STAR/GETTY IMAGES

<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.

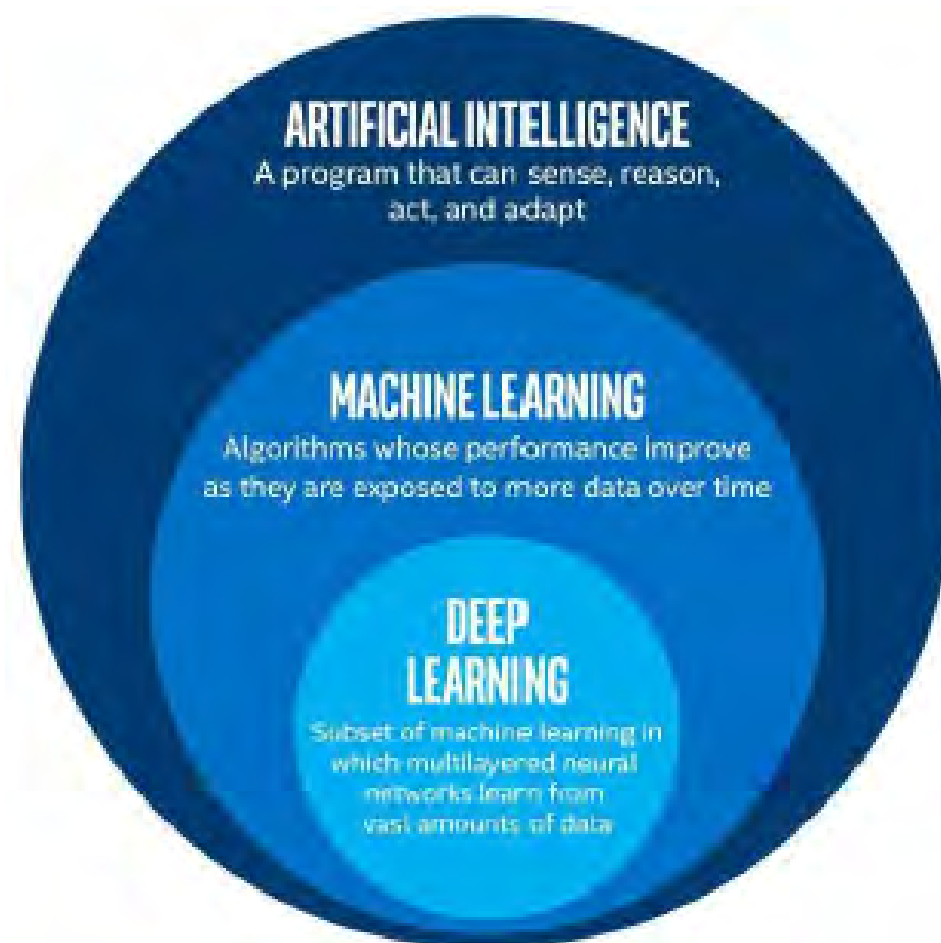
Source: Nvidia



# Machine Learning

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





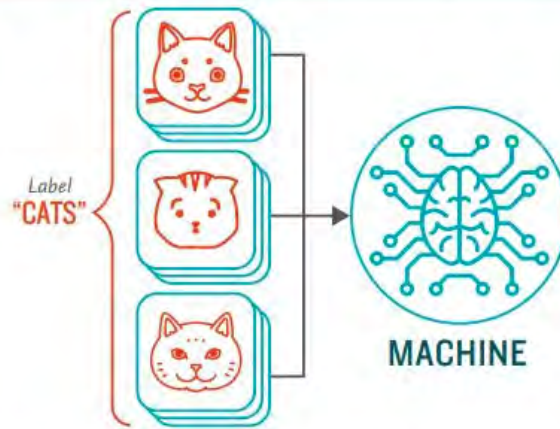
# Supervised Learning

Data points have **known** outcome

## How Supervised Machine Learning Works

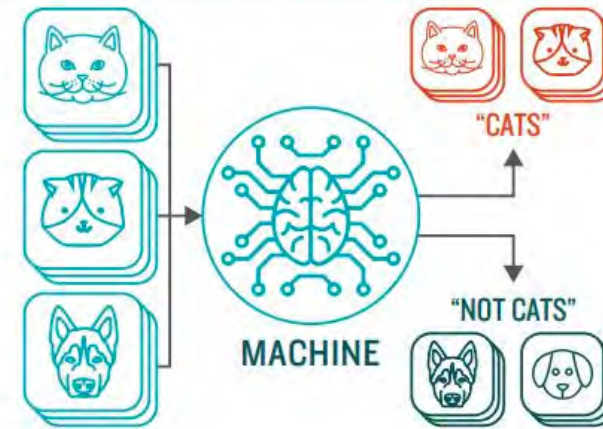
### STEP 1

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

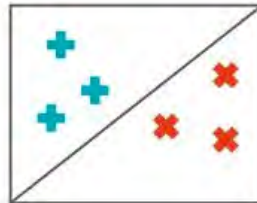


### STEP 2

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

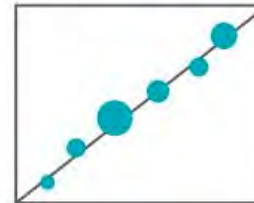


## TYPES OF PROBLEMS TO WHICH IT'S SUITED



### CLASSIFICATION

Sorting items into categories



### REGRESSION

Identifying real values (dollars, weight, etc.)





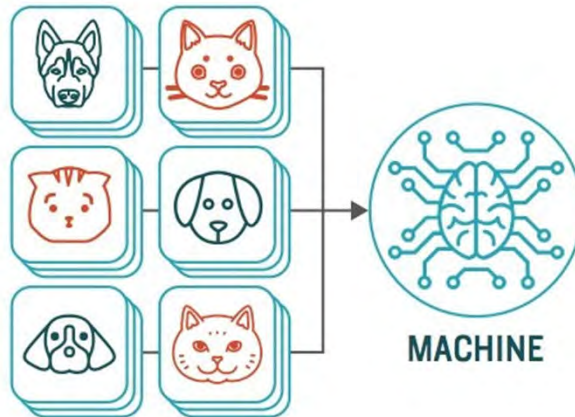
# Unsupervised Learning

Data points have **unknown** outcome

## How **Unsupervised** Machine Learning Works

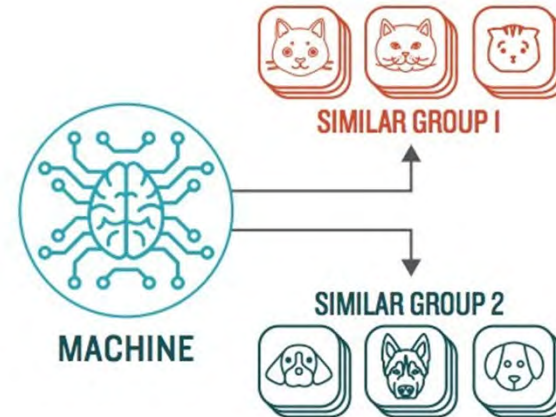
### STEP 1

Provide the machine learning algorithm uncategorized, unlabeled input data to see what patterns it finds

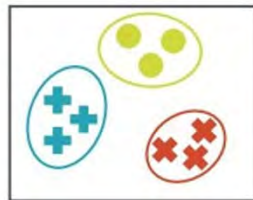


### STEP 2

Observe and learn from the patterns the machine identifies



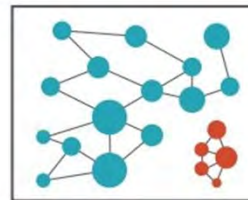
## TYPES OF PROBLEMS TO WHICH IT'S SUITED



### CLUSTERING

Identifying similarities in groups

*For Example: Are there patterns in the data to indicate certain patients will respond better to this treatment than others?*



### ANOMALY DETECTION

Identifying abnormalities in data

*For Example: Is a hacker intruding in our network?*





# Machine Learning

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- Applications in our daily lives

Spam Filtering

Web Search

Postal Mail Routing

Fraud Detection

Movie  
Recommendations

Vehicle Driver  
Assistance

Web Advertisements

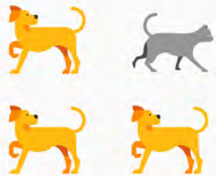
Social Networks

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)



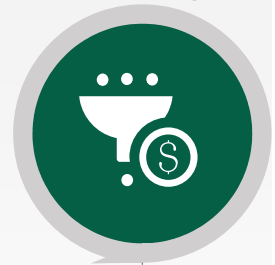
What will the temperature be next Tuesday?  
What will my fourth quarter sales be?

**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)

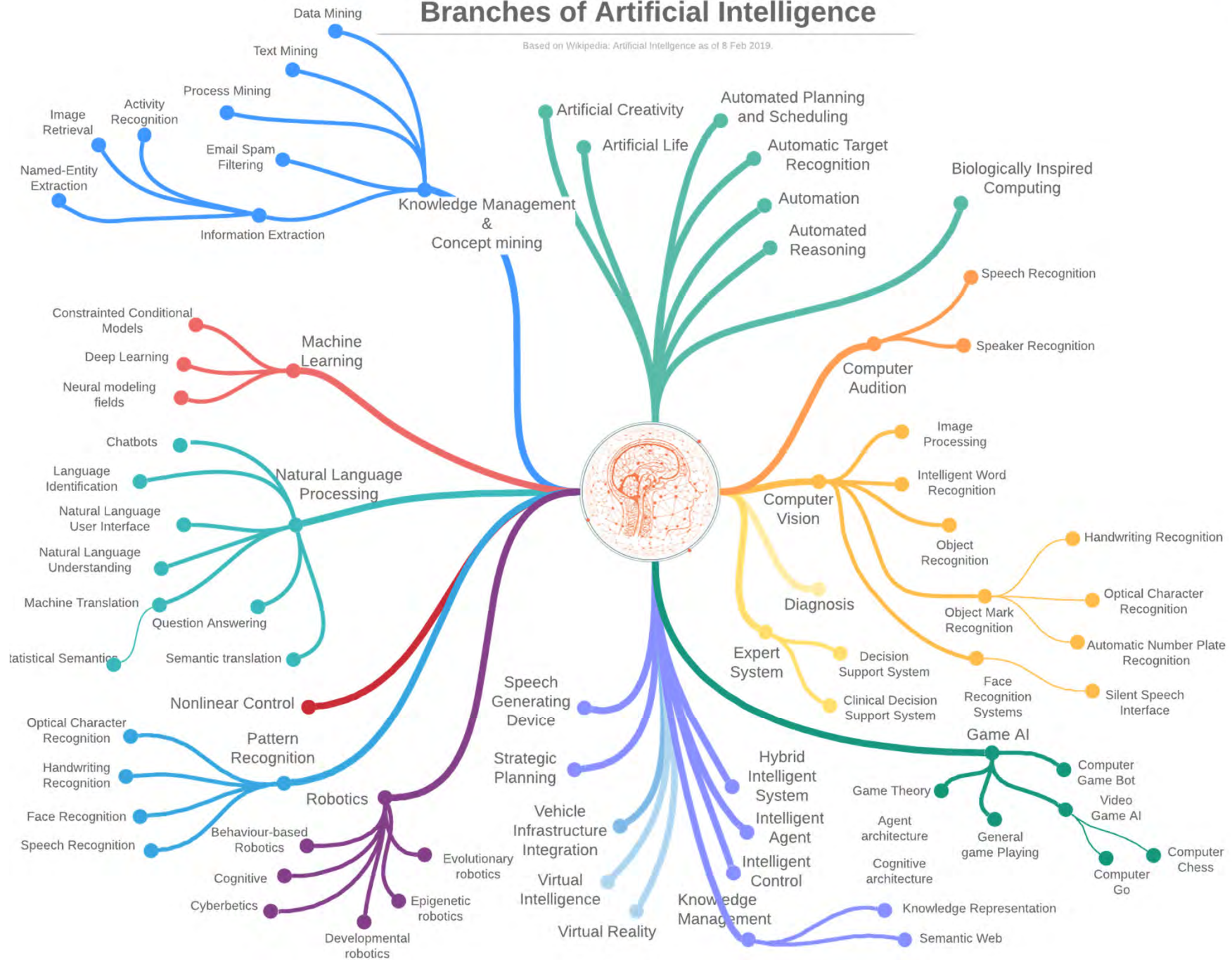


If I'm a self-driving car: At a yellow light, brake or accelerate?  
For a robot vacuum: Keep vacuuming, or go back to the charging station?



# Branches of Artificial Intelligence

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





# Machine Learning Example

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- 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*



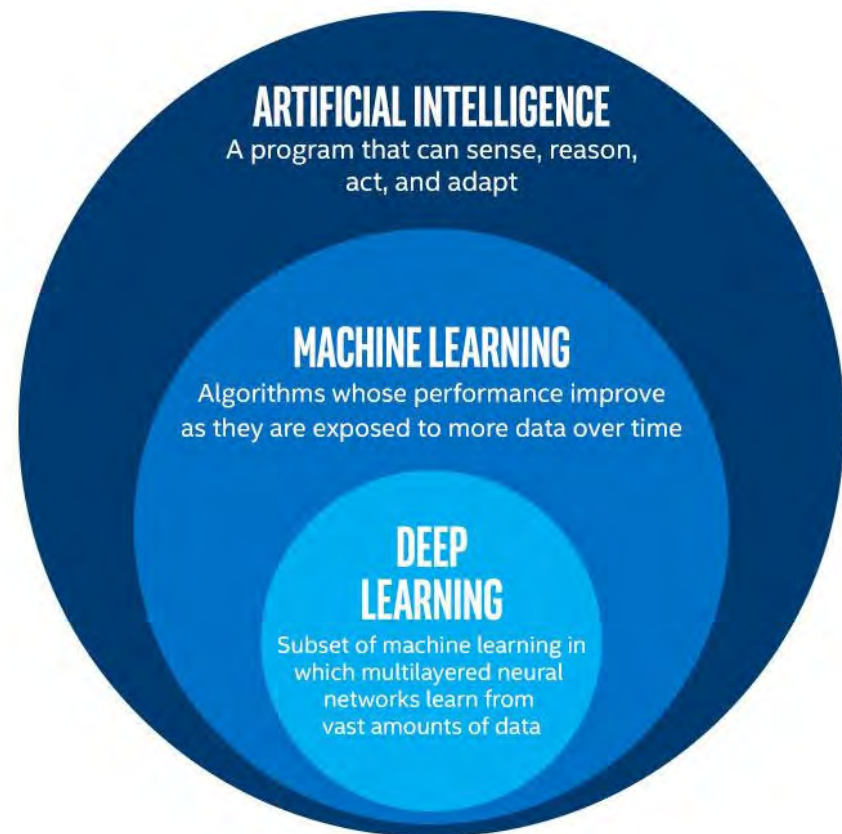


# What is deep learning?

## 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.*

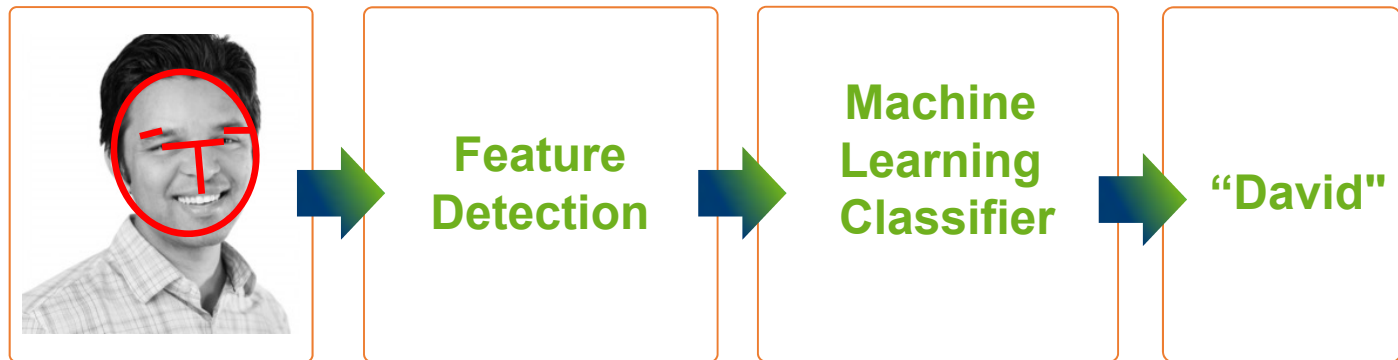




# Deep Learning Example

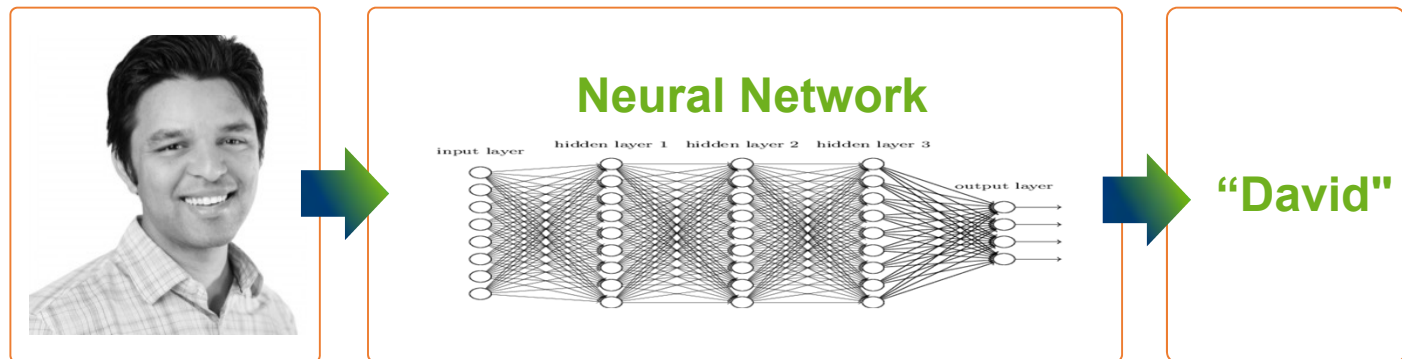
## Classic Machine Learning

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



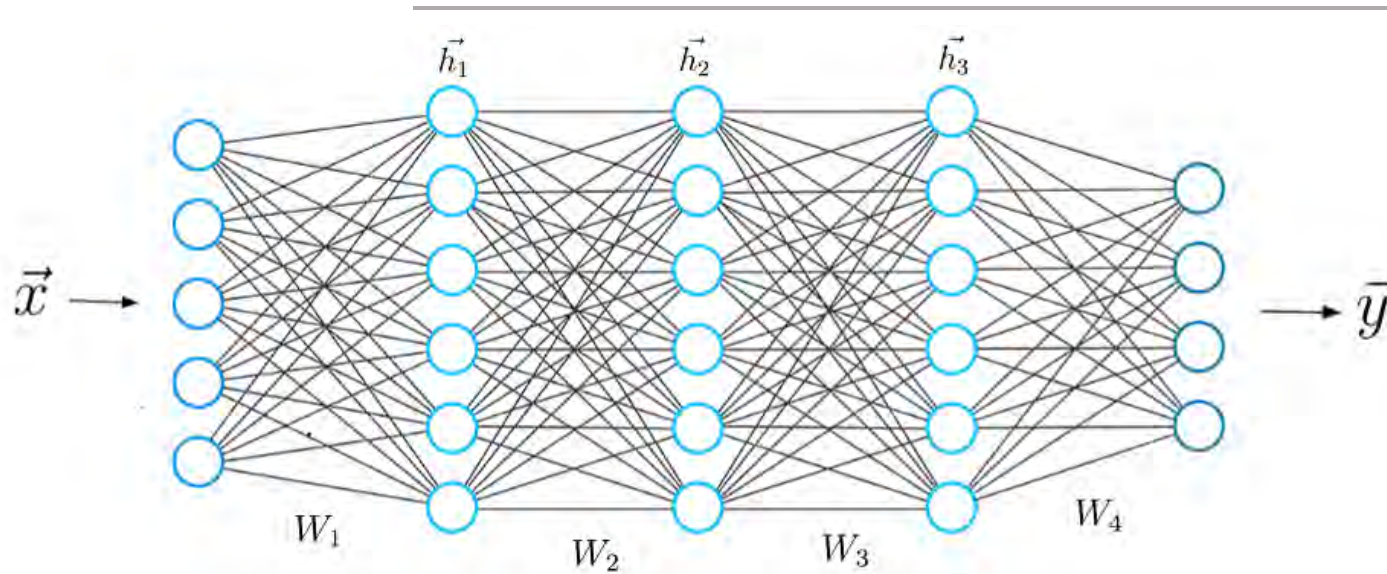
## Deep Learning

Steps 1 and 2 are combined into 1 step.

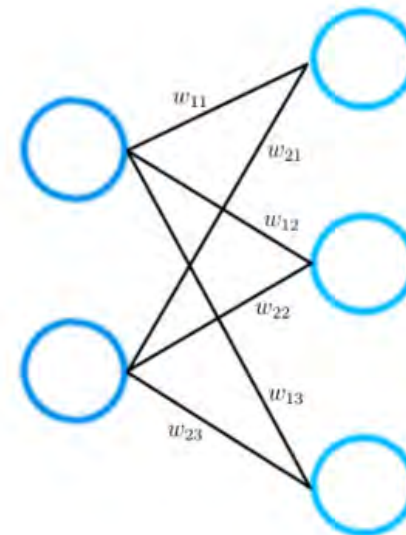




# Neural Networks



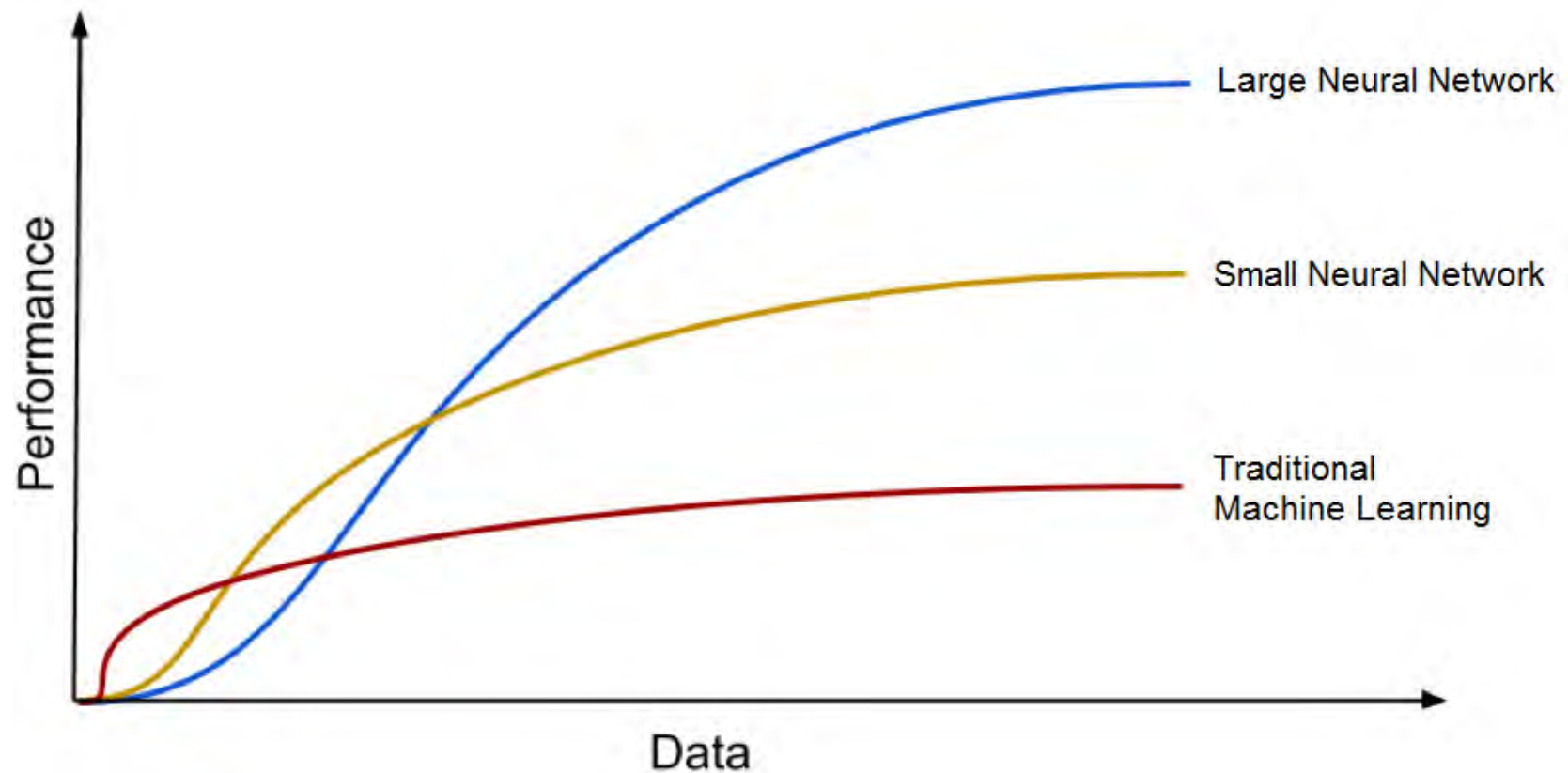
The challenge in training a neural networks is finding a set of weights the give the most accurate output.





# Performance

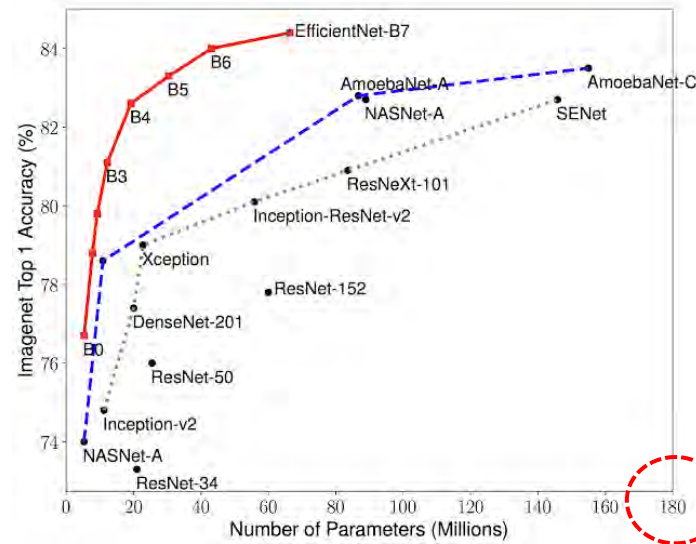
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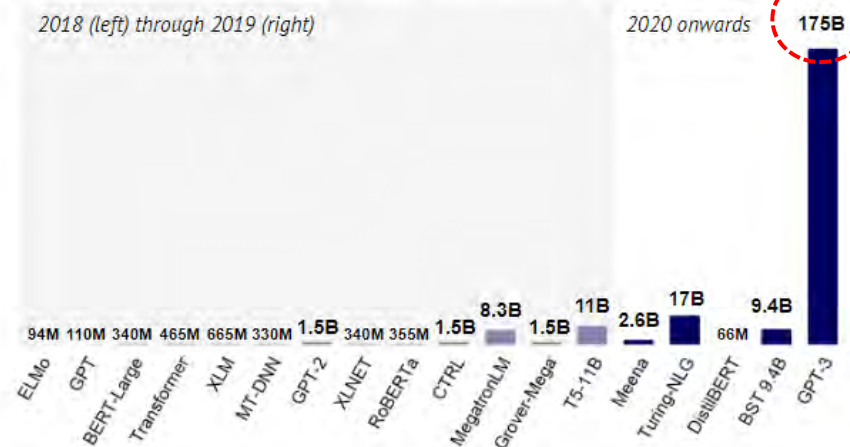
Deep Learning Algorithms get better with the increasing amount of data.



# 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.

stateof.ai 2020





# Deep Learning in Action



10 mins

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

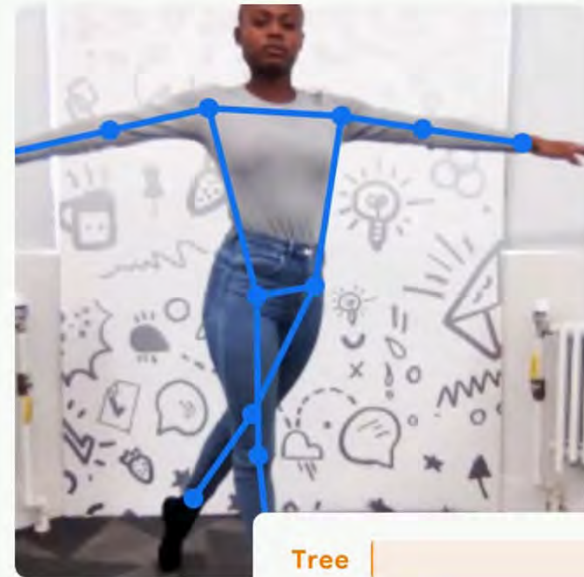


## Teachable Machine

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



Optional Activity



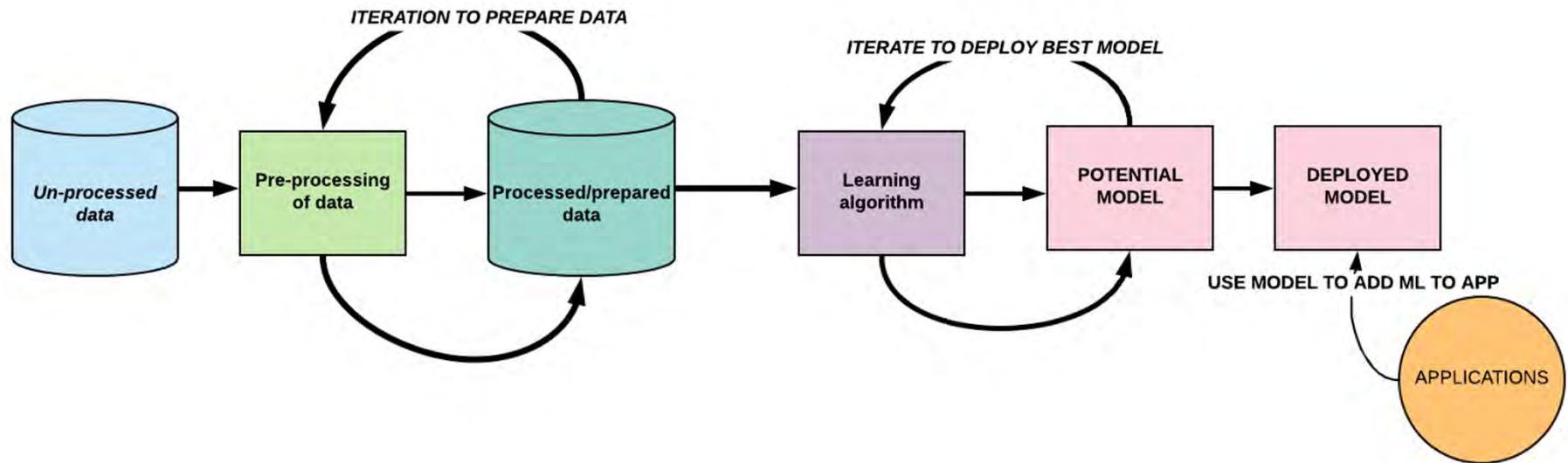
# ***15 Mins Break***

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





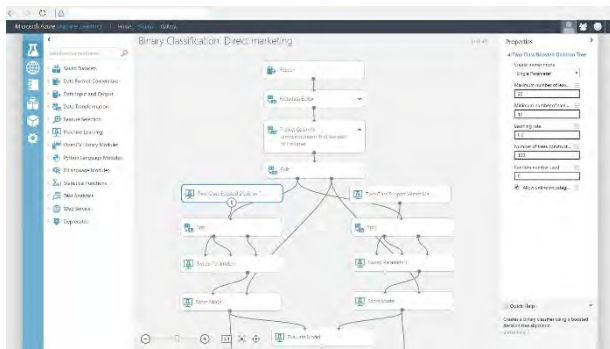
# Machine Learning workflow



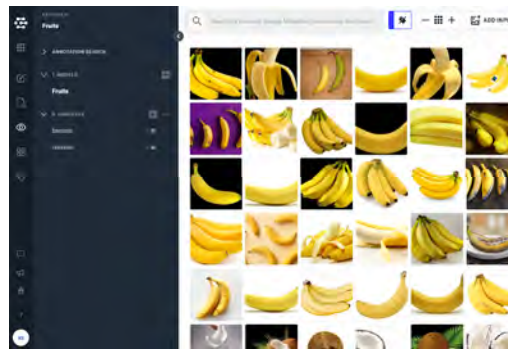


# Code-Free Machine Learning tools

Microsoft Azure  
Machine Learning Studio  
(Classic)



Clarifai



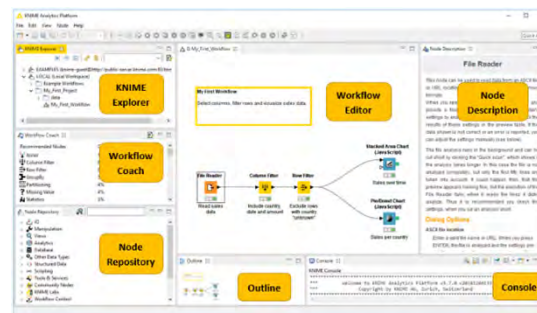
Peltarion



bigml



KNIME



Rapidminer





# Activity 1 – First Machine Learning with Azure



## • Automobile Price Prediction

Given some features of a car, e.g. engine capacity, no of doors, horsepower, predict the selling price



| symboling | normalized | make       | fuel-type | aspiration | num-of-cyl | body-style | drive-wheel | engine-loc | wheel-base | length | width | height | curb-weight | engine-type | num-of-cyl | engine-size | fuel-system | bore | stroke |
|-----------|------------|------------|-----------|------------|------------|------------|-------------|------------|------------|--------|-------|--------|-------------|-------------|------------|-------------|-------------|------|--------|
| 3         | ?          | alfa-romeo | gas       | std        | two        | convertibl | rwd         | front      | 88.6       | 168.8  | 64.1  | 48.8   | 2548        | dohc        | four       | 130         | mpfi        | 3.47 | 2.68   |
| 3         | ?          | alfa-romeo | gas       | std        | two        | convertibl | rwd         | front      | 88.6       | 168.8  | 64.1  | 48.8   | 2548        | dohc        | four       | 130         | mpfi        | 3.47 | 2.68   |
| 1         | ?          | alfa-romeo | gas       | std        | two        | hatchback  | rwd         | front      | 94.5       | 171.2  | 65.5  | 52.4   | 2823        | ohcv        | six        | 152         | mpfi        | 2.68 | 3.47   |
| 2         | 164        | audi       | gas       | std        | four       | sedan      | fwd         | front      | 99.9       | 176.6  | 66.2  | 54.3   | 2337        | ohc         | four       | 100         | mpfi        | 3.19 | 3.4    |
| 2         | 164        | audi       | gas       | std        | four       | sedan      | 4wd         | front      | 99.4       | 176.6  | 66.4  | 54.3   | 2824        | ohc         | five       | 136         | mpfi        | 3.19 | 3.4    |
| 2         | ?          | audi       | gas       | std        | two        | sedan      | fwd         | front      | 99.8       | 177.3  | 66.3  | 53.1   | 2507        | ohc         | five       | 136         | mpfi        | 3.19 | 3.4    |
| 1         | 158        | audi       | gas       | std        | four       | sedan      | fwd         | front      | 105.8      | 192.7  | 71.4  | 55.7   | 2844        | ohc         | five       | 136         | mpfi        | 3.19 | 3.4    |
| 1         | ?          | audi       | gas       | std        | four       | wagon      | fwd         | front      | 105.8      | 192.7  | 71.4  | 55.7   | 2954        | ohc         | five       | 136         | mpfi        | 3.19 | 3.4    |
| 1         | 158        | audi       | gas       | turbo      | four       | sedan      | fwd         | front      | 105.8      | 192.7  | 71.4  | 55.9   | 3086        | ohc         | five       | 131         | mpfi        | 3.13 | 3.4    |
| 0         | ?          | audi       | gas       | turbo      | two        | hatchback  | 4wd         | front      | 99.5       | 178.2  | 67.9  | 52     | 3053        | ohc         | five       | 131         | mpfi        | 3.13 | 3.4    |
| 2         | 192        | bmw        | gas       | std        | two        | sedan      | rwd         | front      | 101.2      | 176.8  | 64.8  | 54.3   | 2395        | ohc         | four       | 108         | mpfi        | 3.5  | 2.8    |
| 0         | 192        | bmw        | gas       | std        | four       | sedan      | rwd         | front      | 101.2      | 176.8  | 64.8  | 54.3   | 2395        | ohc         | four       | 108         | mpfi        | 3.5  | 2.8    |
| 0         | 188        | bmw        | gas       | std        | two        | sedan      | rwd         | front      | 101.2      | 176.8  | 64.8  | 54.3   | 2710        | ohc         | six        | 164         | mpfi        | 3.31 | 3.19   |
| 0         | 188        | bmw        | gas       | std        | four       | sedan      | rwd         | front      | 101.2      | 176.8  | 64.8  | 54.3   | 2765        | ohc         | six        | 164         | mpfi        | 3.31 | 3.19   |
| 1         | ?          | bmw        | gas       | std        | four       | sedan      | rwd         | front      | 103.5      | 189    | 66.9  | 55.7   | 3055        | ohc         | six        | 164         | mpfi        | 3.31 | 3.19   |
| 0         | ?          | bmw        | gas       | std        | four       | sedan      | rwd         | front      | 103.5      | 189    | 66.9  | 55.7   | 3230        | ohc         | six        | 209         | mpfi        | 3.62 | 3.39   |
| 0         | ?          | bmw        | gas       | std        | two        | sedan      | rwd         | front      | 103.5      | 193.8  | 67.9  | 53.7   | 3380        | ohc         | six        | 209         | mpfi        | 3.62 | 3.39   |
| 0         | ?          | bmw        | gas       | std        | four       | sedan      | rwd         | front      | 110        | 197    | 70.9  | 56.3   | 3505        | ohc         | six        | 209         | mpfi        | 3.62 | 3.39   |
| 2         | 121        | chevrolet  | gas       | std        | two        | hatchback  | fwd         | front      | 88.4       | 141.1  | 60.3  | 53.2   | 1488        | l           | three      | 61          | 2bbl        | 2.91 | 3.03   |
| 1         | 98         | chevrolet  | gas       | std        | two        | hatchback  | fwd         | front      | 94.5       | 155.9  | 63.6  | 52     | 1874        | ohc         | four       | 90          | 2bbl        | 3.03 | 3.11   |
| 0         | 81         | chevrolet  | gas       | std        | four       | sedan      | fwd         | front      | 94.5       | 158.8  | 63.6  | 52     | 1900        | ohc         | four       | 90          | 2bbl        | 3.03 | 3.11   |
| 1         | 118        | dodge      | gas       | std        | two        | hatchback  | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.8   | 1876        | ohc         | four       | 90          | 2bbl        | 2.97 | 3.23   |
| 1         | 118        | dodge      | gas       | std        | two        | hatchback  | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.8   | 1876        | ohc         | four       | 90          | 2bbl        | 2.97 | 3.23   |
| 1         | 118        | dodge      | gas       | turbo      | two        | hatchback  | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.8   | 2128        | ohc         | four       | 98          | mpfi        | 3.03 | 3.39   |
| 1         | 148        | dodge      | gas       | std        | four       | hatchback  | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.6   | 1967        | ohc         | four       | 90          | 2bbl        | 2.97 | 3.23   |
| 1         | 148        | dodge      | gas       | std        | four       | sedan      | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.6   | 1989        | ohc         | four       | 90          | 2bbl        | 2.97 | 3.23   |
| 1         | 148        | dodge      | gas       | std        | four       | sedan      | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.6   | 1989        | ohc         | four       | 90          | 2bbl        | 2.97 | 3.23   |
| 1         | 148        | dodge      | gas       | turbo      | ?          | sedan      | fwd         | front      | 93.7       | 157.3  | 63.8  | 50.6   | 2191        | ohc         | four       | 98          | mpfi        | 3.03 | 3.39   |
| -1        | 110        | dodge      | gas       | std        | four       | wagon      | fwd         | front      | 103.3      | 174.6  | 64.6  | 59.8   | 2535        | ohc         | four       | 122         | 2bbl        | 3.34 | 3.46   |
| 3         | 145        | dodge      | gas       | turbo      | two        | hatchback  | fwd         | front      | 95.9       | 173.2  | 66.3  | 50.2   | 2811        | ohc         | four       | 156         | mpfi        | 3.6  | 3.9    |
| 2         | 137        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 86.6       | 144.6  | 63.9  | 50.8   | 1713        | ohc         | four       | 92          | 1bbl        | 2.91 | 3.41   |
| 2         | 137        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 86.6       | 144.6  | 63.9  | 50.8   | 1810        | ohc         | four       | 92          | 1bbl        | 2.92 | 3.41   |
| 1         | 101        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.7       | 150    | 64    | 52.6   | 1837        | ohc         | four       | 79          | 1bbl        | 2.91 | 3.07   |
| 1         | 101        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.7       | 150    | 64    | 52.6   | 1940        | ohc         | four       | 92          | 1bbl        | 2.91 | 3.41   |
| 1         | 101        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.7       | 150    | 64    | 52.6   | 1956        | ohc         | four       | 92          | 1bbl        | 2.91 | 3.41   |
| 0         | 110        | honda      | gas       | std        | four       | sedan      | fwd         | front      | 96.5       | 163.4  | 64    | 54.5   | 2010        | ohc         | four       | 92          | 1bbl        | 2.91 | 3.41   |
| 0         | 78         | honda      | gas       | std        | four       | wagon      | fwd         | front      | 96.5       | 157.1  | 63.9  | 58.3   | 2024        | ohc         | four       | 92          | 1bbl        | 2.92 | 3.41   |
| 0         | 106        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 96.5       | 167.5  | 65.2  | 53.3   | 2236        | ohc         | four       | 110         | 1bbl        | 3.15 | 3.58   |
| 0         | 106        | honda      | gas       | std        | two        | hatchback  | fwd         | front      | 96.5       | 167.5  | 65.2  | 53.3   | 2289        | ohc         | four       | 110         | 1bbl        | 3.15 | 3.58   |
| 0         | 85         | honda      | gas       | std        | four       | sedan      | fwd         | front      | 96.5       | 175.4  | 65.2  | 54.1   | 2304        | ohc         | four       | 110         | 1bbl        | 3.15 | 3.58   |
| 0         | 85         | honda      | gas       | std        | four       | sedan      | fwd         | front      | 96.5       | 175.4  | 65.2  | 54.1   | 2372        | ohc         | four       | 110         | 1bbl        | 3.15 | 3.58   |
| 0         | 85         | honda      | gas       | std        | four       | sedan      | fwd         | front      | 96.5       | 175.4  | 65.2  | 54.1   | 2465        | ohc         | four       | 110         | mpfi        | 3.15 | 3.58   |
| 1         | 107        | honda      | gas       | std        | two        | sedan      | fwd         | front      | 96.5       | 169.1  | 66    | 51     | 2293        | ohc         | four       | 110         | 2bbl        | 3.15 | 3.58   |
| 0         | ?          | isuzu      | gas       | std        | four       | sedan      | rwd         | front      | 94.3       | 170.7  | 61.8  | 53.5   | 2337        | ohc         | four       | 111         | 2bbl        | 3.31 | 3.23   |
| 1         | ?          | isuzu      | gas       | std        | two        | sedan      | fwd         | front      | 94.5       | 155.9  | 63.6  | 52     | 1874        | ohc         | four       | 90          | 2bbl        | 3.03 | 3.11   |
| 0         | ?          | isuzu      | gas       | std        | four       | sedan      | fwd         | front      | 94.5       | 155.9  | 63.6  | 52     | 1900        | ohc         | four       | 90          | 2bbl        | 3.03 | 3.11   |
| 2         | ?          | isuzu      | gas       | std        | two        | hatchback  | rwd         | front      | 96         | 172.6  | 65.2  | 51.4   | 2734        | ohc         | four       | 119         | spfi        | 3.43 | 3.23   |
| 0         | 145        | jaguar     | gas       | std        | four       | sedan      | rwd         | front      | 113        | 199.6  | 69.6  | 52.8   | 4066        | dohc        | six        | 258         | mpfi        | 3.63 | 4.17   |
| 0         | ?          | jaguar     | gas       | std        | four       | sedan      | rwd         | front      | 113        | 199.6  | 69.6  | 52.8   | 4066        | dohc        | six        | 258         | mpfi        | 3.63 | 4.17   |
| 0         | ?          | jaguar     | gas       | std        | two        | sedan      | rwd         | front      | 102        | 191.7  | 70.6  | 47.8   | 3950        | ohcv        | twelve     | 326         | mpfi        | 3.54 | 2.76   |
| 1         | 104        | mazda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.1       | 159.1  | 64.2  | 54.1   | 1890        | ohc         | four       | 91          | 2bbl        | 3.03 | 3.15   |
| 1         | 104        | mazda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.1       | 159.1  | 64.2  | 54.1   | 1900        | ohc         | four       | 91          | 2bbl        | 3.03 | 3.15   |
| 1         | 104        | mazda      | gas       | std        | two        | hatchback  | fwd         | front      | 93.1       | 159.1  | 64.2  | 54.1   | 1905        | ohc         | four       | 91          | 2bbl        | 3.03 | 3.15   |
| 1         | 113        | mazda      | gas       | std        | four       | sedan      | fwd         | front      | 93.1       | 166.8  | 64.2  | 54.1   | 1945        | ohc         | four       | 91          | 2bbl        | 3.03 | 3.15   |
| 1         | 113        | mazda      | gas       | std        | four       | sedan      | fwd         | front      | 93.1       | 166.8  | 64.2  | 54.1   | 1950        | ohc         | four       | 91          | 2bbl        | 3.08 | 3.15   |
| 3         | 150        | mazda      | gas       | std        | two        | hatchback  | rwd         | front      | 95.3       | 169    | 65.7  | 49.6   | 2380        | rotor       | two        | 70          | 4bbl        | ?    | ?      |
| 3         | 150        | mazda      | gas       | std        | two        | hatchback  | rwd         | front      | 95.3       | 169    | 65.7  | 49.6   | 2380        | rotor       | two        | 70          | 4bbl        | ?    | ?      |
| 3         | 150        | mazda      | gas       | std        | two        | hatchback  | rwd         | front      | 95.3       | 169    | 65.7  | 49.6   | 2385        | rotor       | two        | 70          | 4bbl        | ?    | ?      |
| 3         | 150        | mazda      | gas       | std        | two        | hatchback  | rwd         | front      | 95.3       | 169    | 65.7  | 49.6   | 2500        | rotor       | two        | 80          | mpfi        | ?    | ?      |
| 1         | 129        | mazda      | gas       | std        | two        | hatchback  | fwd         | front      | 98.8       | 177.8  | 66.5  | 53.7   | 2385        | ohc         | four       | 122         | 2bbl        | 3.39 | 3.39   |
| 0         | 115        | mazda      | gas       | std        | four       | sedan      | fwd         | front      | 98.8       | 177.8  | 66.5  | 55.5   | 2410        | ohc         | four       | 122         | 2bbl        | 3.39 | 3.39   |
| 1         | 129        | mazda      | gas       | std        | two        | hatchback  | fwd         | front      | 98.8       | 177.8  | 66.5  | 53.7   | 2385        | ohc         | four       | 122         | 2bbl        | 3.39 | 3.39   |
| 0         | 115        | mazda      | gas       | std        | four       | sedan      | fwd         | front      | 98.8       | 177.8  | 66.5  | 55.5   | 2410        | ohc         | four       | 122         | 2bbl        | 3.39 | 3.39   |
| 0         | ?          | mazda      | diesel    | std        | ?          | sedan      | fwd         | front      | 98.8       | 177.8  | 66.5  | 55.5   | 2443        | ohc         | four       | 122         | idi         | 3.39 | 3.39   |

## Step 1:

Watch and listen to the instructor's demonstration



30 mins

## Step 2:

- Do on your own



30 mins

**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 12:20-13:20

**LUNCH BREAK**

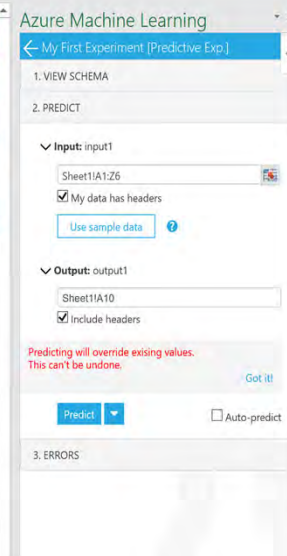




# Activity 2

- 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-loc    | 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 |             |             |             |             |            |              |             |             |               |            |        |



## Step 1:

Watch and listen to the instructor's demonstration



15 mins

## Step 2:

Work through the activities



30 mins

**Individual Activity**



# Optional Activities

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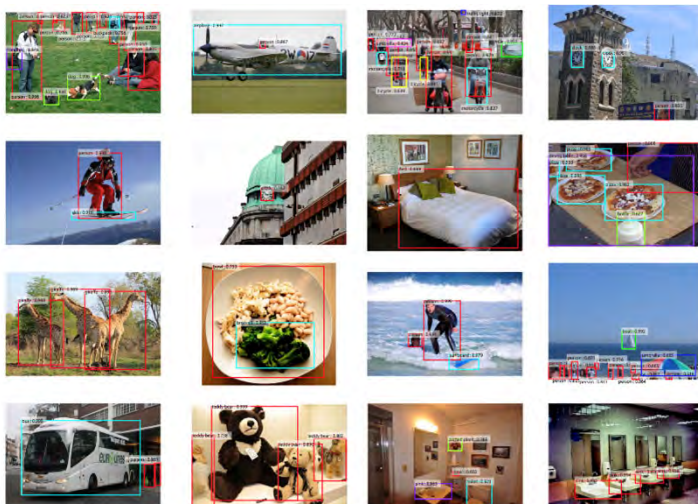
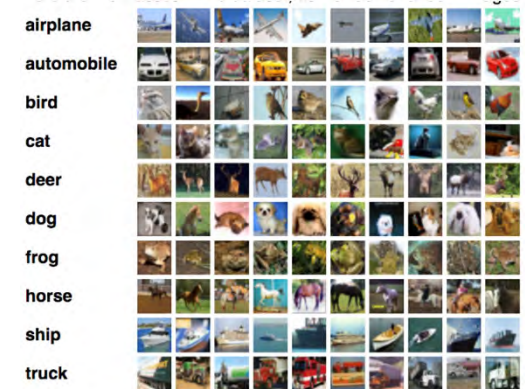
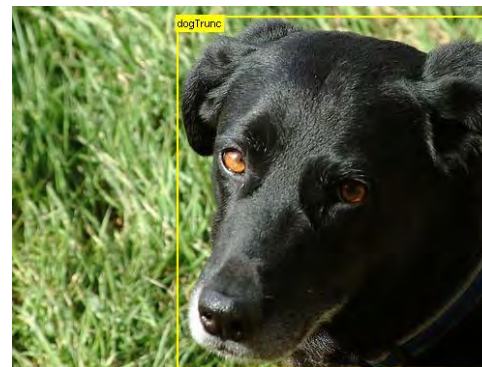
- Activity 6 - Importing data
- Activity 7 - Cleaning and Structuring Data
- Activity 8 - Using Binary Classification Algorithm





# Applications of Computer Vision

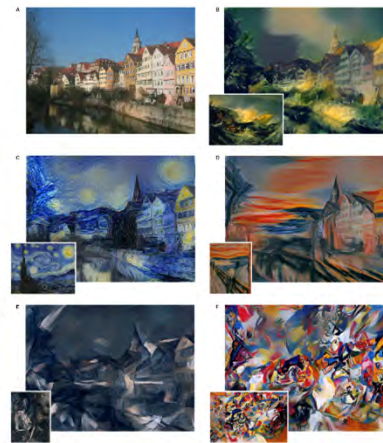
- Image Classification
- Image Classification With Localization
- Object Detection
- Object Segmentation





# Applications of Computer Vision

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

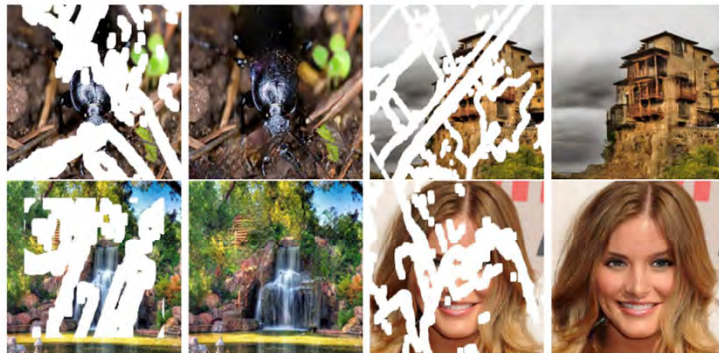


bicubic  
(21.59dB/0.6423)

SRResNet  
(23.53dB/0.7832)

SRGAN  
(21.15dB/0.6868)

original



Zebras ↔ Horses



zebra → horse



horse → zebra





# Transfer Learning



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

- Models are difficult to train from scratch
  - Huge datasets (like ImageNet)
  - Long number of training iterations
  - Very heavy computing machinery
  - Time experimenting to get hyper-parameters just right



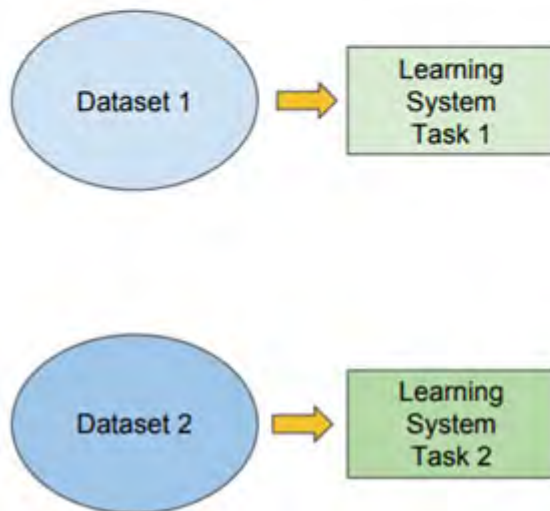
# Transfer Learning

## Traditional ML

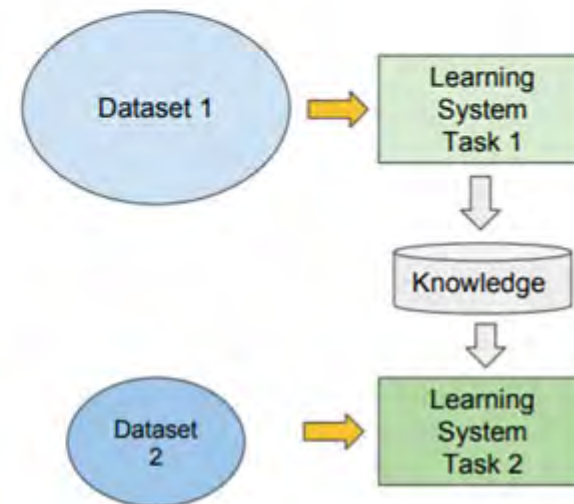
vs

## Transfer Learning

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



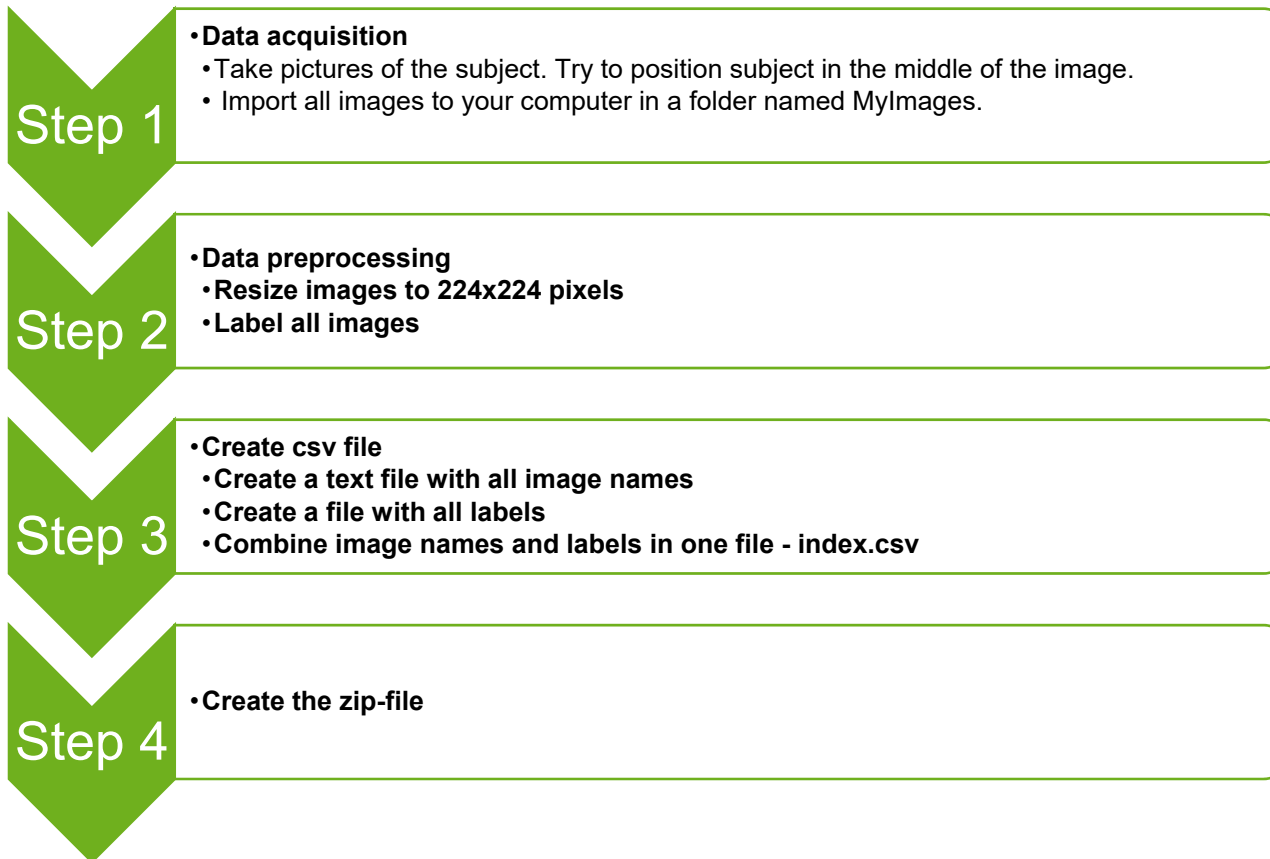
- Learning of a new task relies on the previous learned tasks:
  - Learning process can be faster, more accurate and/or need less training data





# Creating a new dataset

---





# Example

Dataset Explorer: Car damage dataset

- image
- test\_images
- index.csv
- metadata.json

Table view of the 'image' subset:

|   | 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      |

Image gallery view (18 images):

- 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



# Activity 3 – Car Damage Classifier

|  |  |   |  |
|--|--|---|--|
|   |   |   |   |
| Broken headlamp  | Broken tail lamp   | Glass shatter   | Door scratch   |
|  |  |  |  |
| Door dent  | Bumper dent  | Bumper scratch  | Unknown  |

## Step 1:

Watch and listen to the instructor's demonstration



20 mins

## Step 2:

- Do on your own



30 mins

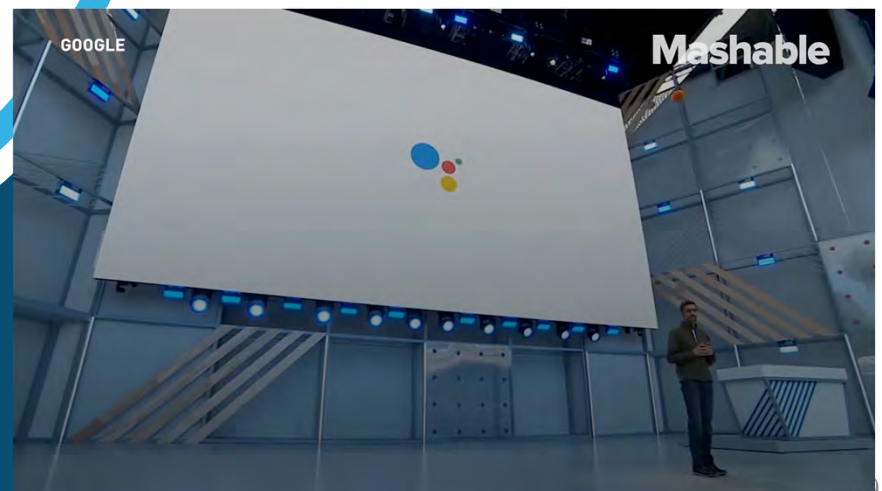
**Individual Activity**





# ***15 Mins Break***

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





# Natural Language Processing

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





# 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



40 mins

**Individual Activity**



# Dataset

|   | <b>review</b><br>Encoding<br>Text   | <b>sentiment</b><br>Encoding<br>Binary<br>Positive class<br>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.<br>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.<br>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    | -                    |
| Features   | Review, Sentiment    |
| Rows       | 25 000               |
| Size       | 13 MB                |
| Categories | Text, Classification |

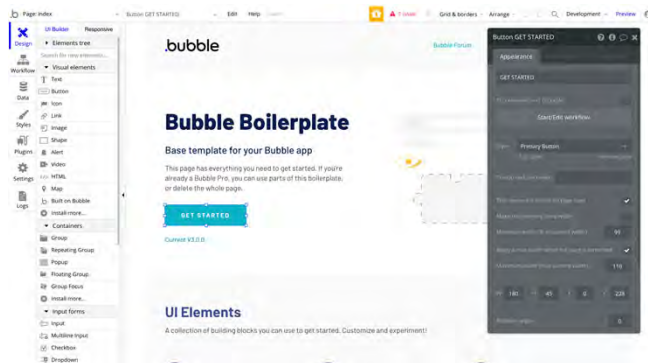


# Linking Them Together

## App Development

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

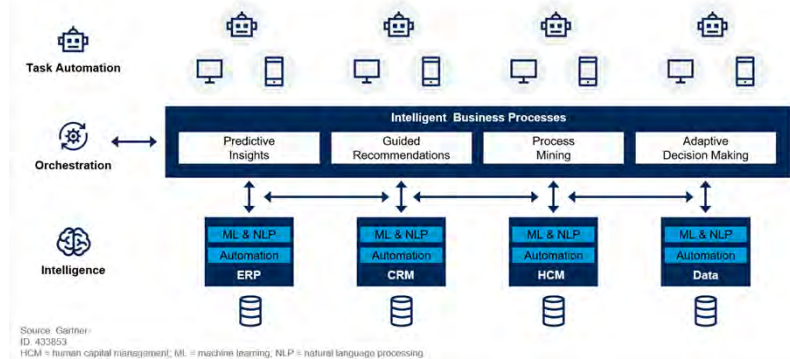
We're here to prove that "building the best product" is possible not only with Bubble.



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

## RPA

Integrated System of Intelligence With Artificial Intelligence, Machine Learning and Natural Language Processing



Adobe Acrobat Document

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





# When to use Machine Learning

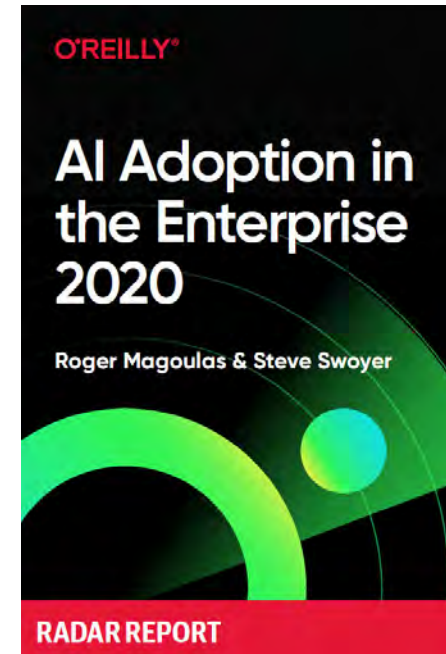
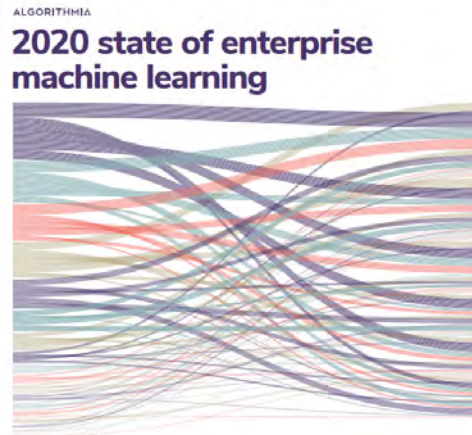
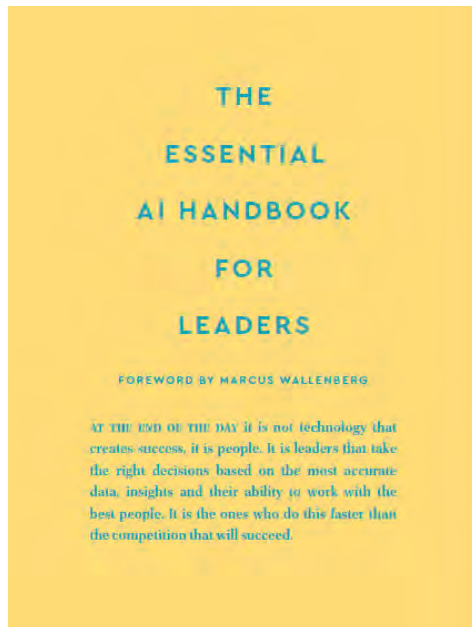
---

- **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

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# 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**

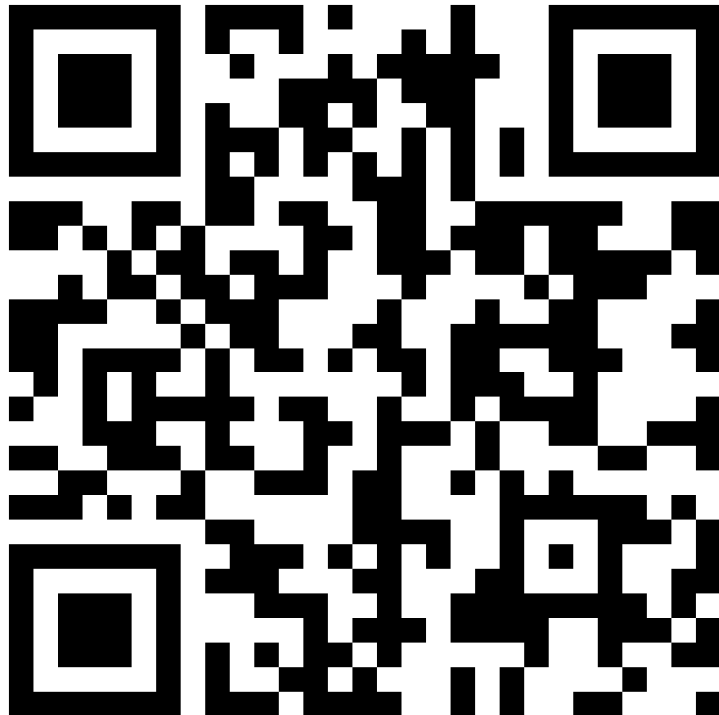


# Debrief

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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.**



**3 mins**

OFFICIAL (CLOSED) \ NON-SENSITIVE



# Quiz

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



**SCAN ME**



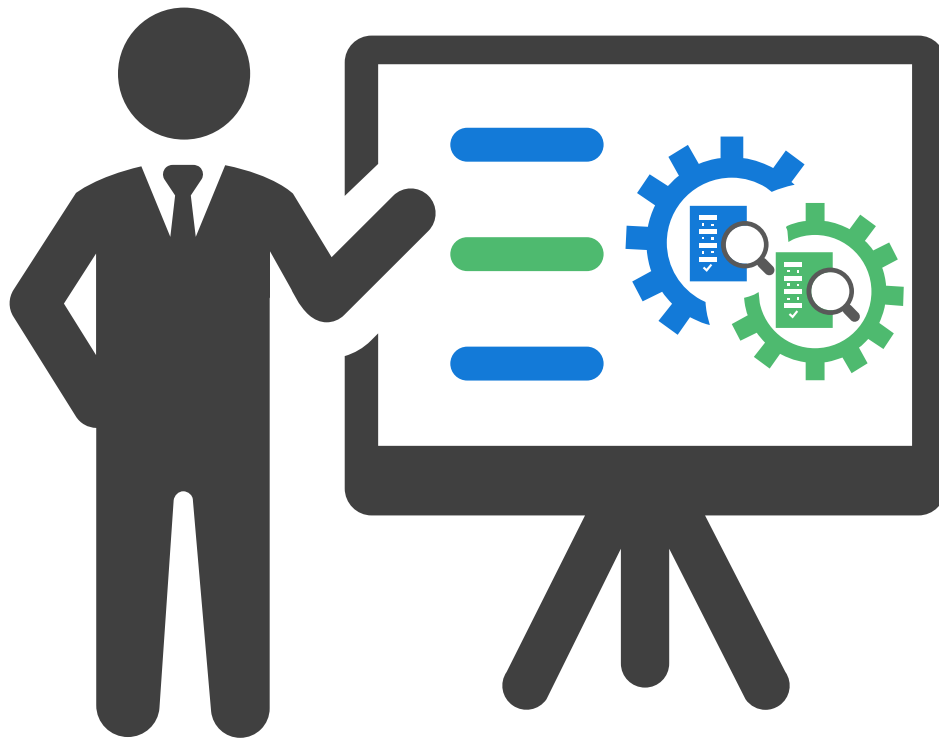
OFFICIAL (CLOSED) \ NON-SENSITIVE



# Survey



# Summary



Email  
seow\_khee\_wei@rp.edu.sg

Telegram  
@kwseow

Source code:

50



Thank you