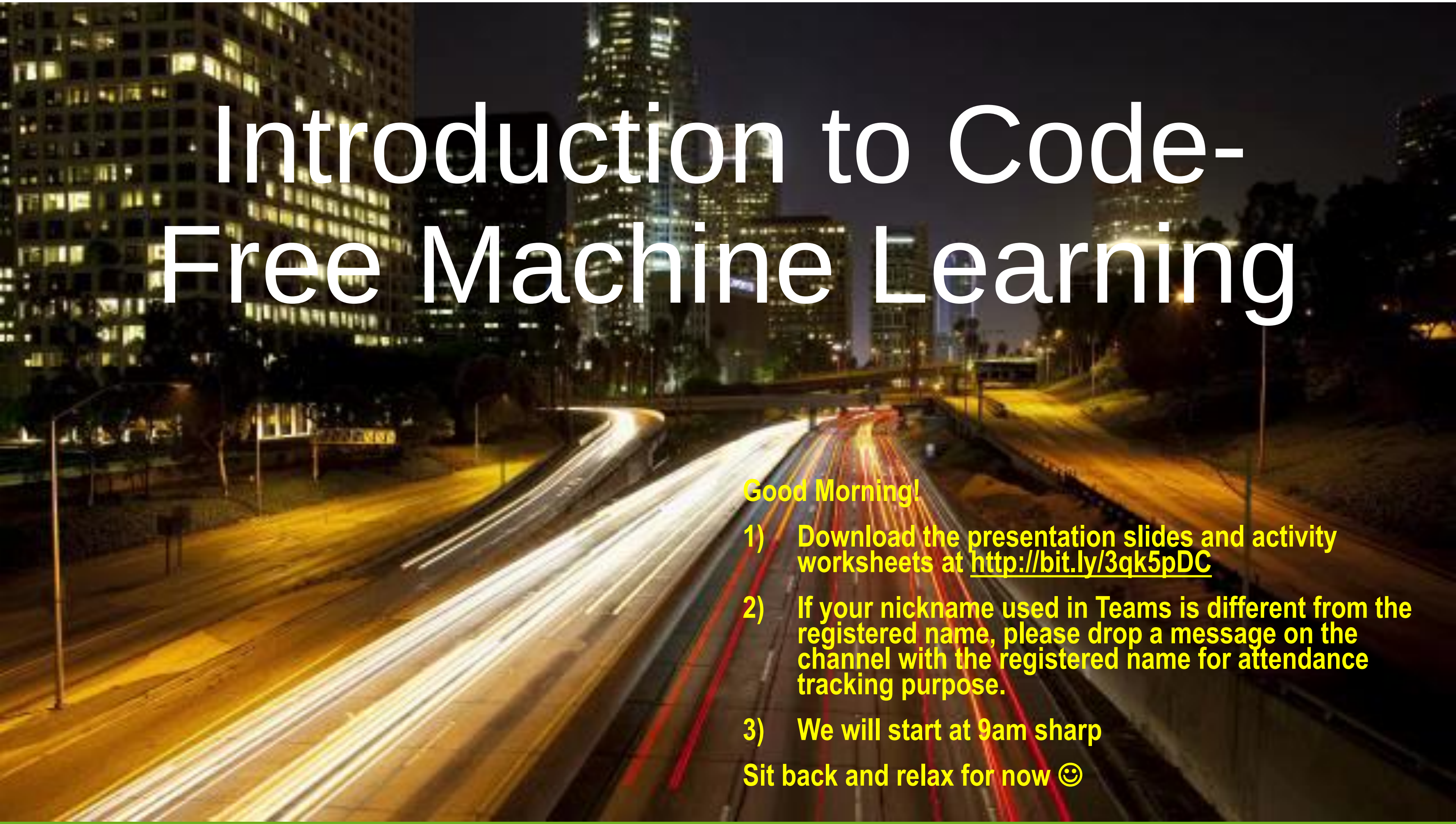
REPUBLIC POLYTECHNIC
DISCOVER. TRANSFORM. ACHIEVE



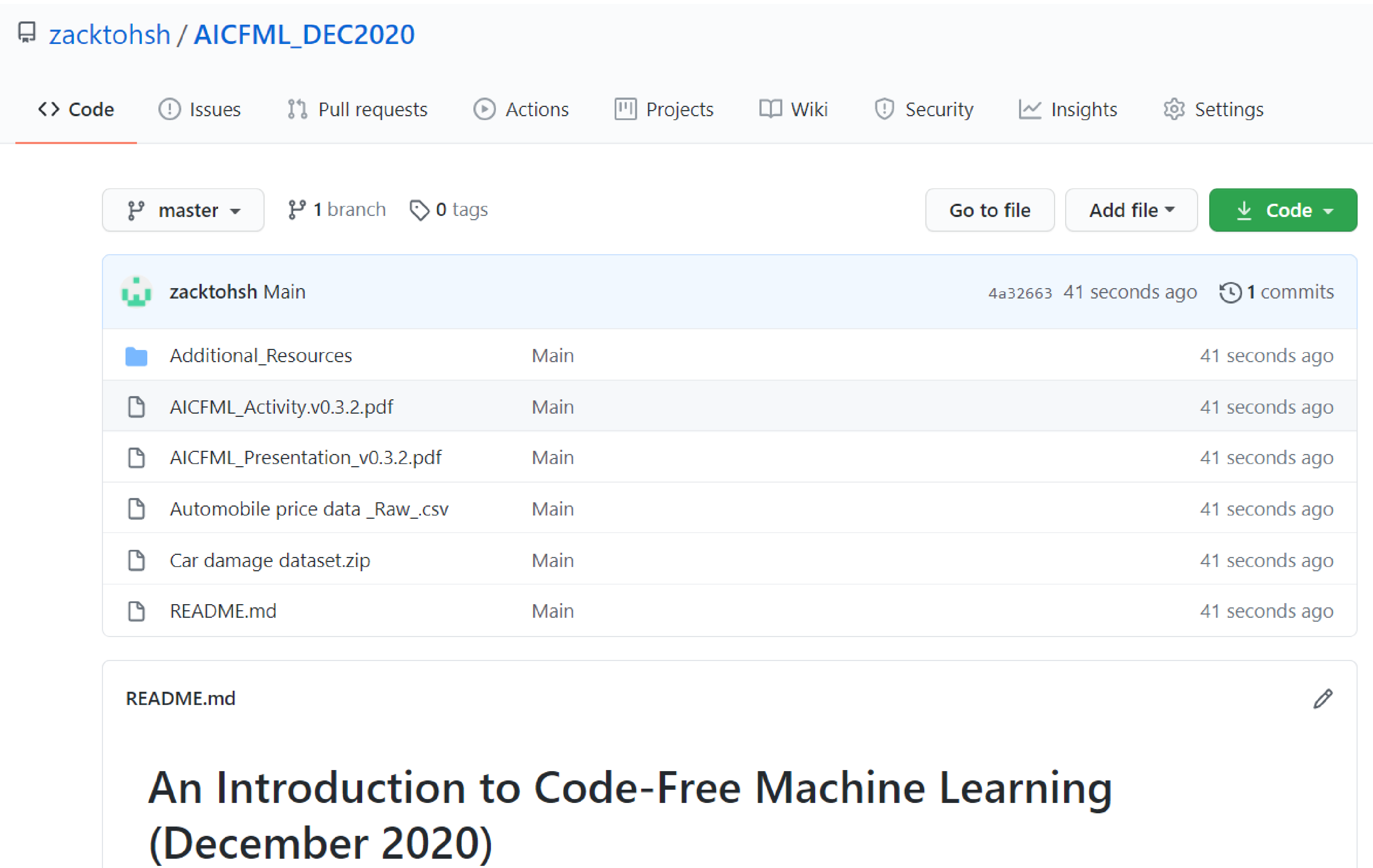
Introduction to Code-Free Machine Learning

Good Morning!

1) Download the presentation slides and activity worksheets at http://bit.ly/3qk5pDC
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



Programme

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
	Lunch Break
Section 4:	Transfer Learning Computer Vision: Activity 3 – Car Damage Assessment Classification
Section 5:	Natural Language Processing Activity 4 – Creating a Sentiment Analyser
Section 6:	Linking them together
Section 7:	Debrief

Introduction of trainer

Name
Zack Toh

Telegram
@zacktohsh

Email
Zack_toh@rp.edu.sg

Past Projects (Crowd Detection) **(18RIGO09)**

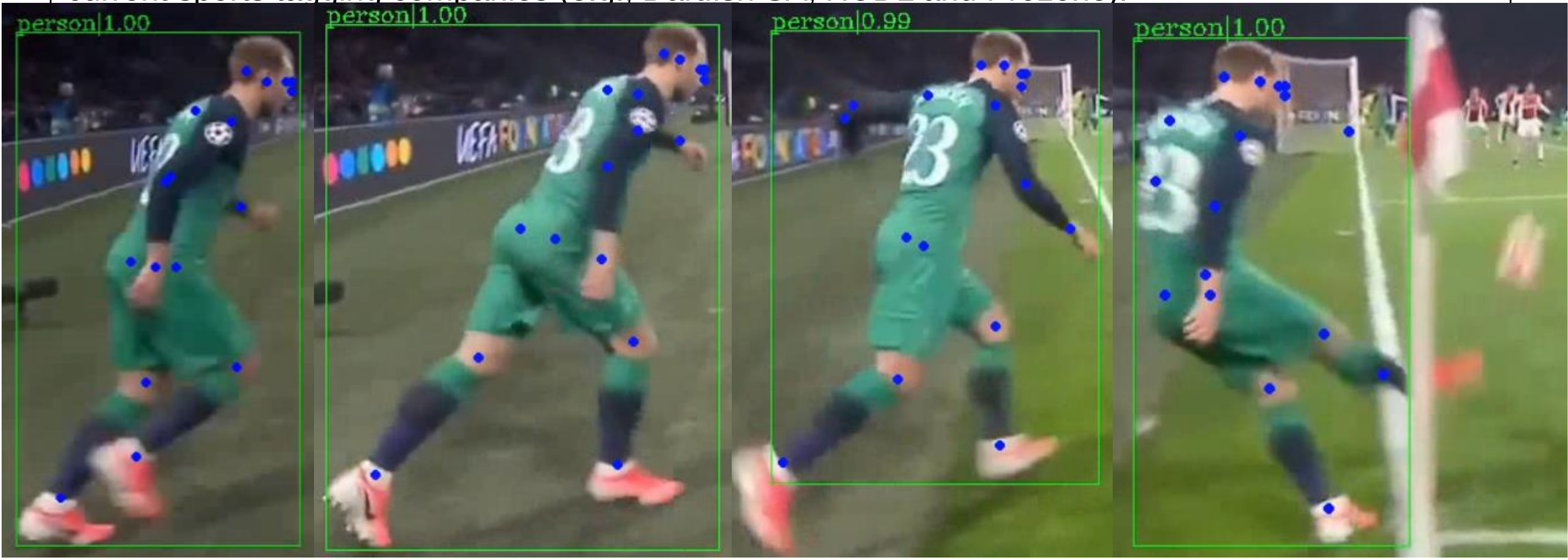
SSDv1

SSDv2

Yolo

Deep Learning for Sports Tagging (19RBRF07)

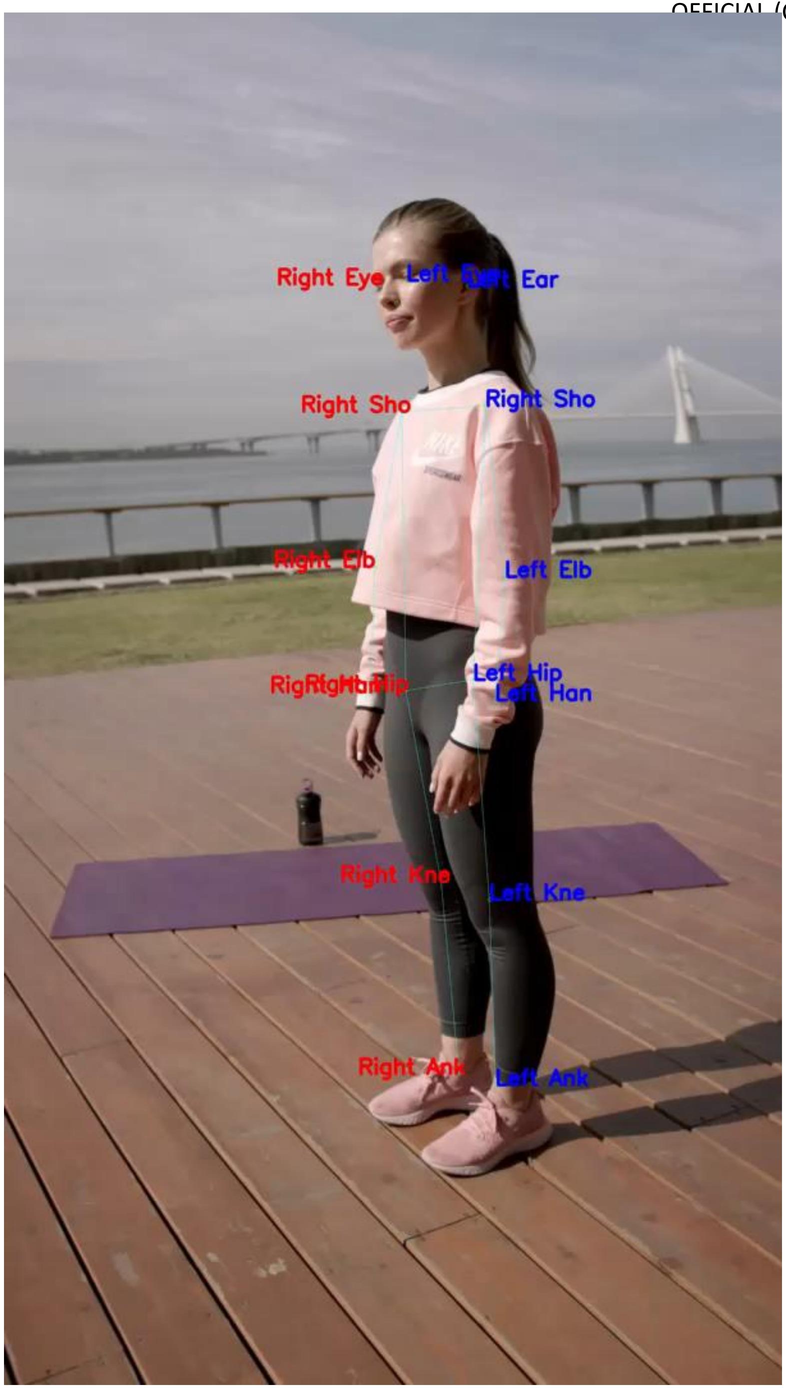
Contextual awareness is the holy grail of computer vision. It aims at equipping a machine with the ability of deciphering what is happening in any given image. The automated tagging in sports is a new emerging area in sports industry. This project would contribute tremendously to the productivity and efficiency of sports tagging and dramatically reduce the labor needed in curating the sports statistic. The proposed prototype has high commercialization potential as shared by current sports tagging companies (e.g., Dartfish SA, HUDL and Prozone).



SKILLSfuture SG

Processed Throw-in

Innovative Approach and Value (Current)



Pose Recognition

[Video obtained from: https://www.pexels.com/](https://www.pexels.com/)

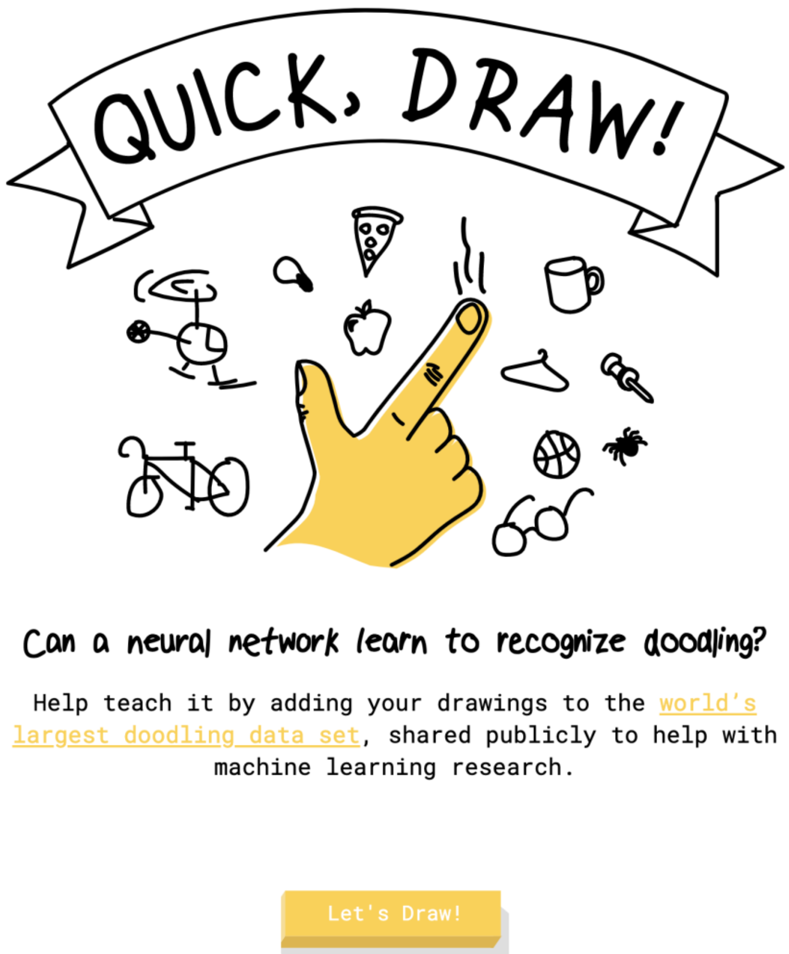
Pose generated with Posenet

Talk to flower

https://www.youtube.com/watch?v=nsPQvZm_rgM

Quickdraw Game

https://quickdraw.withgoogle.com

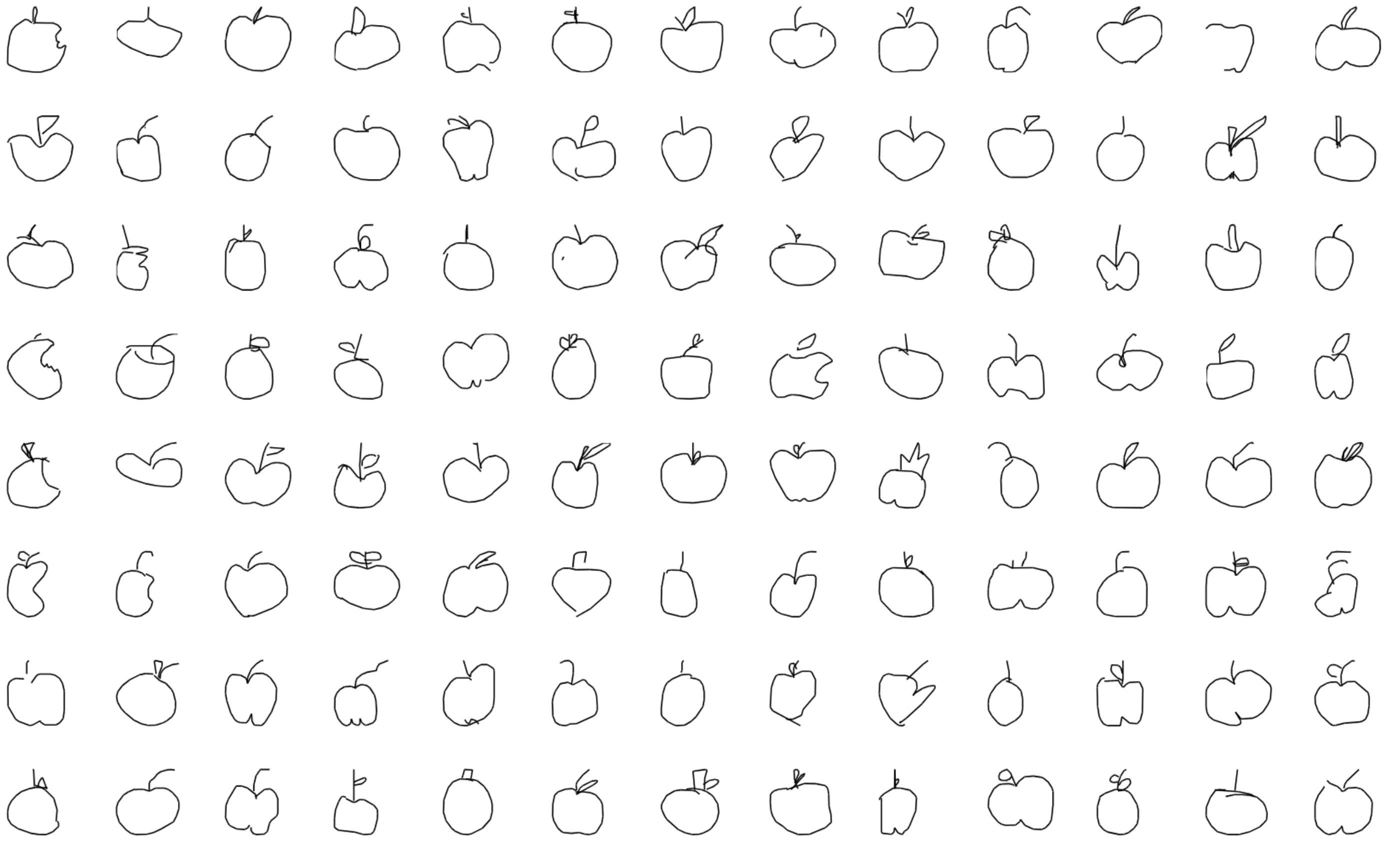


Optional Activity

5 mins

How does ML work in QuickDraw?

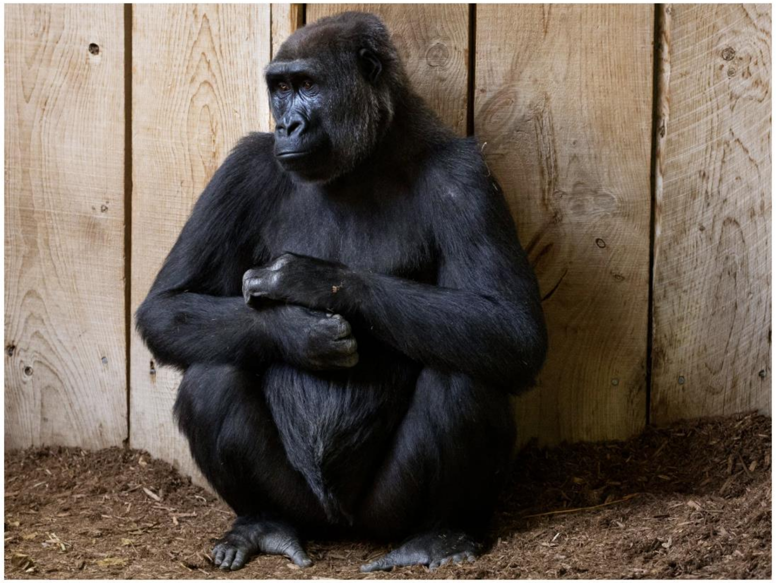
- https://quickdraw.withgoogle.com/data/apple



Bias Bias Bias

When It Comes to Gorillas, Google Photos Remains Blind

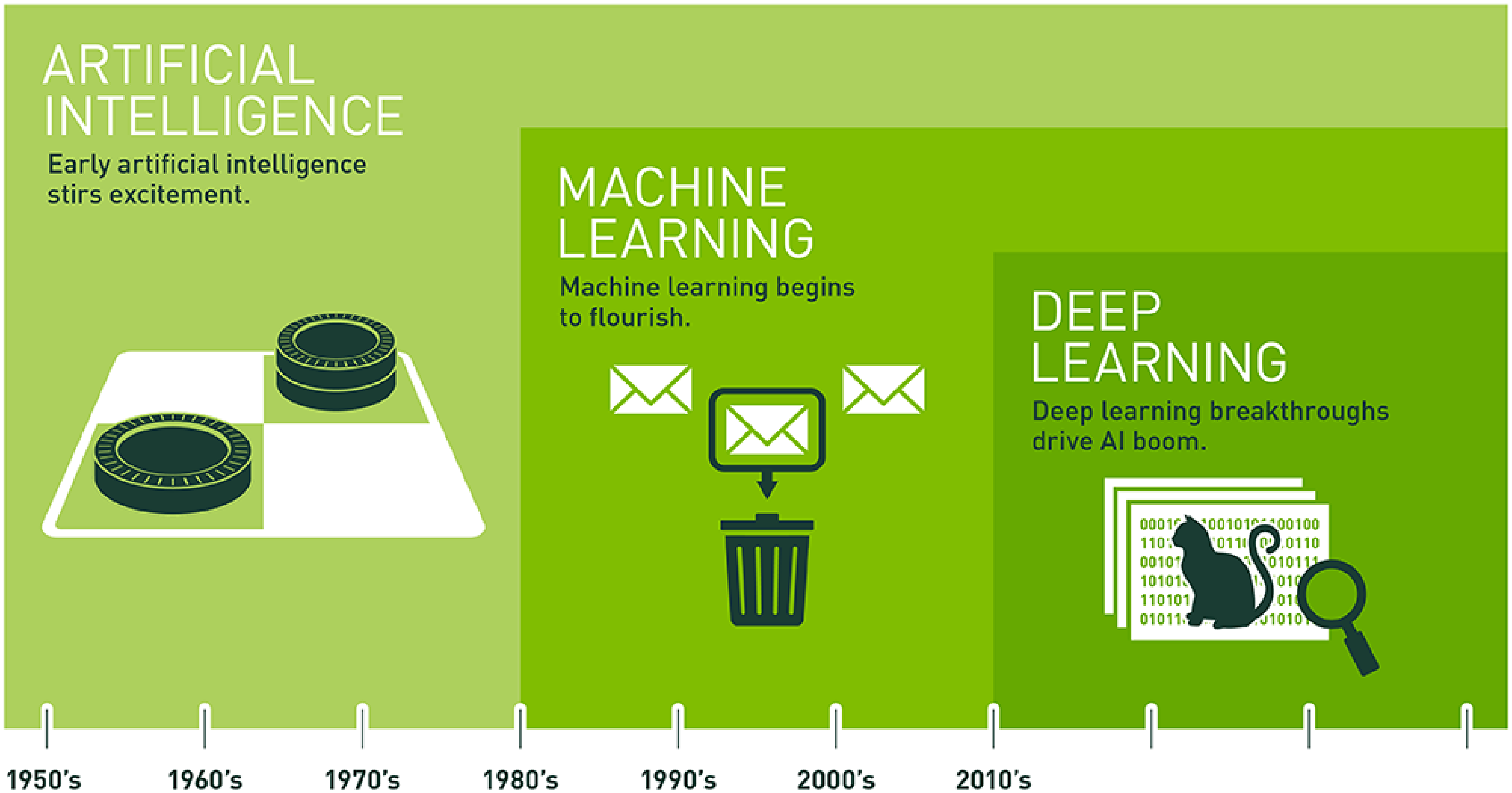
Google promised a fix after its photo-categorization software labeled black people as gorillas in 2015. More than two years later, it hasn't found one.



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

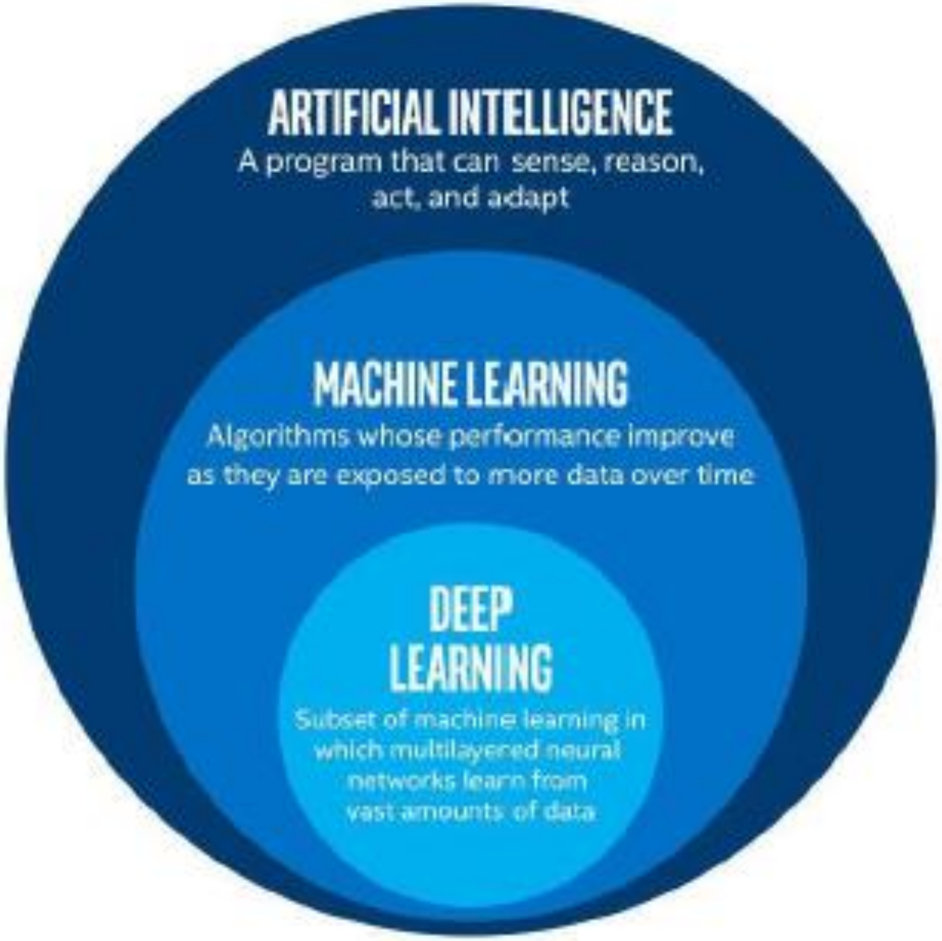


Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

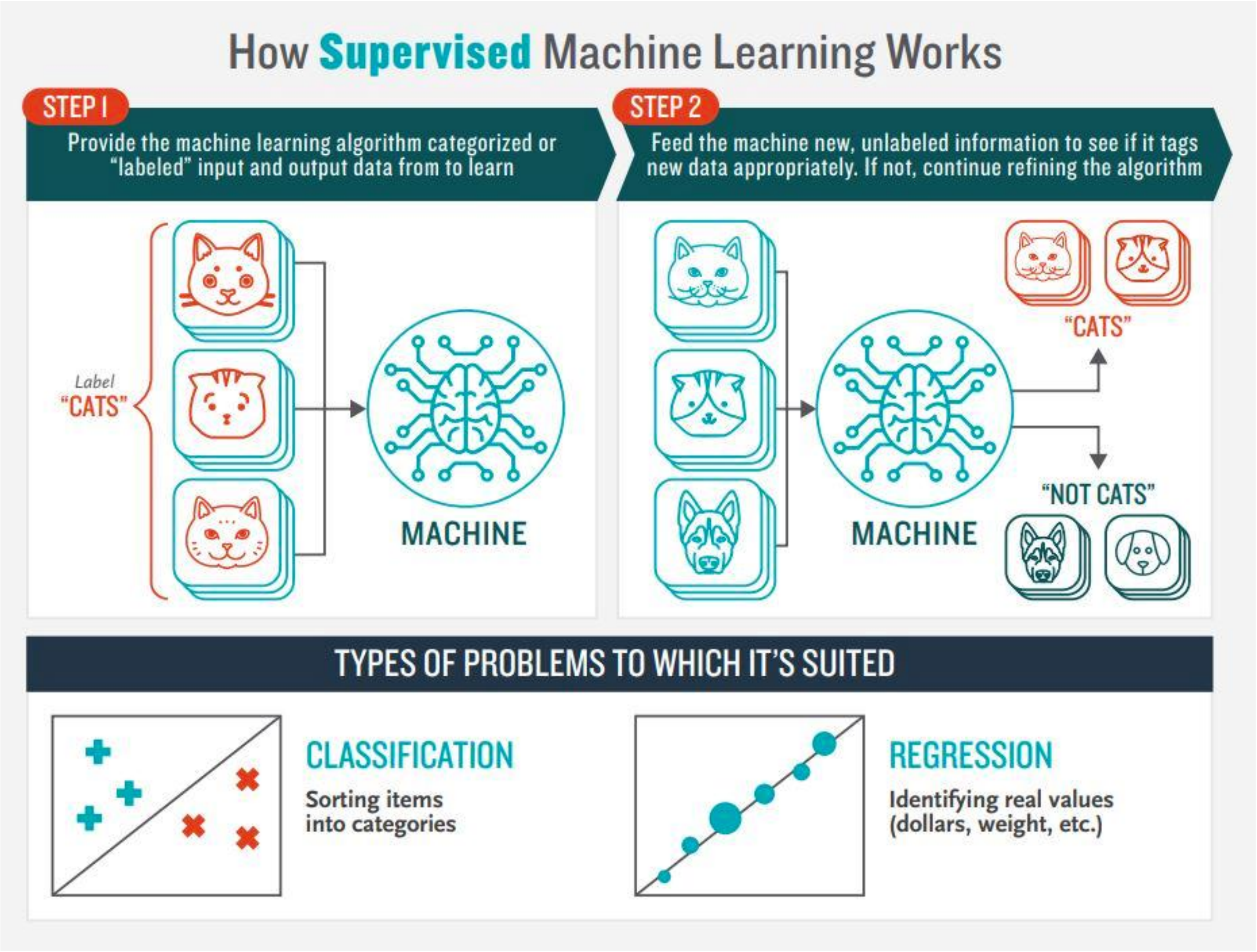
Source: Nvidia

Machine Learning

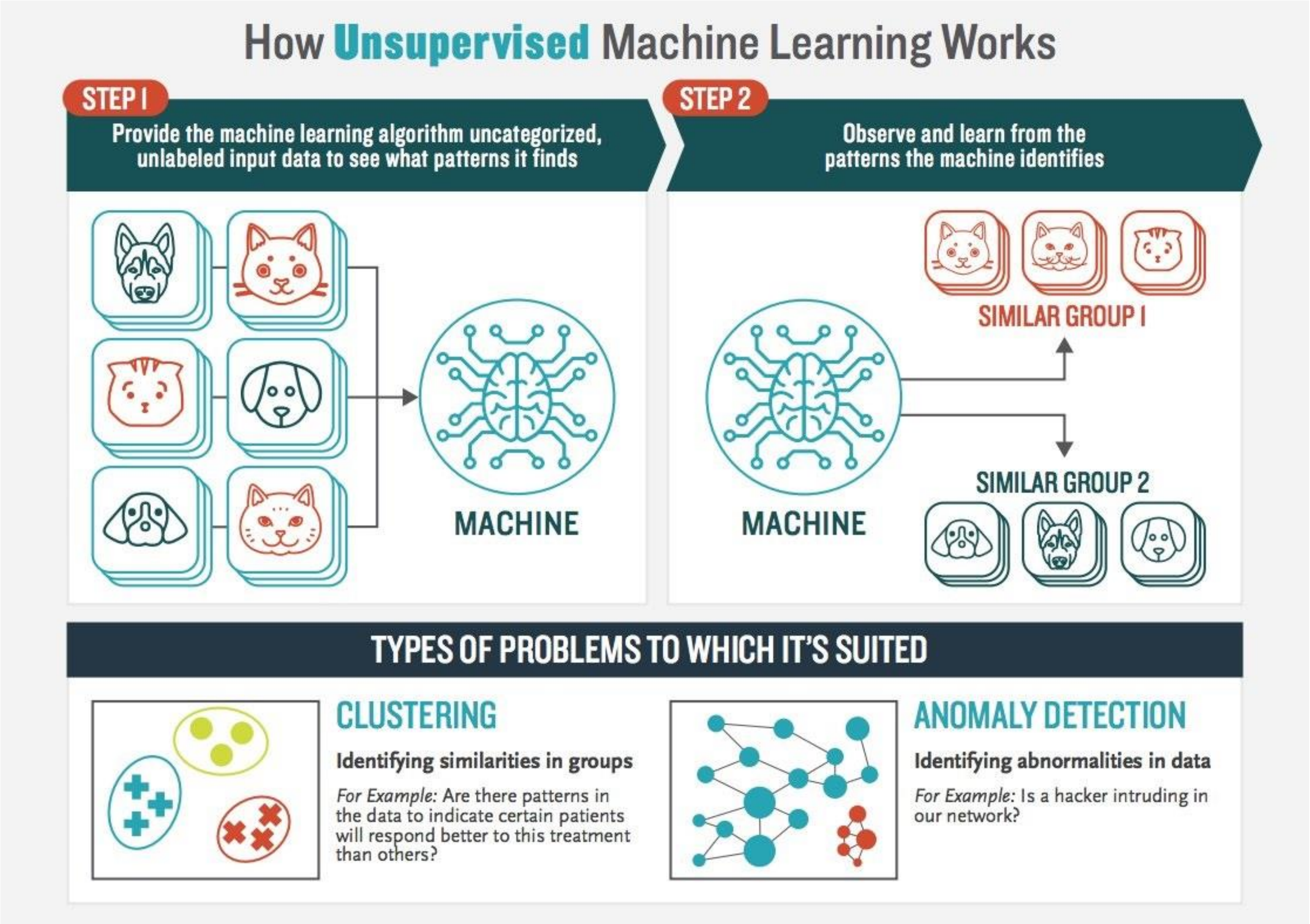
- These programs learn from repeatedly seeing data, rather than being explicitly programmed by humans



Supervised Learning



Unsupervised Learning



Machine Learning

- **Two main types of learning**
  - Supervised Learning
    - Data points have known outcome
    - Goal is to make predictions - Classification and Regression
  - Unsupervised Learning
    - Data points have unknown outcome
    - Goal is to find structure within the data – Clustering
- **Other types of learning**
  - Reinforcement Learning
  - Genetic Algorithm

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

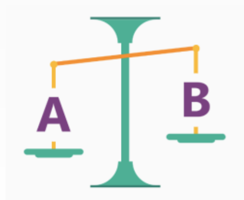
Speech Recognition

5 fundamental questions

Is this weird? (Anomaly detection)

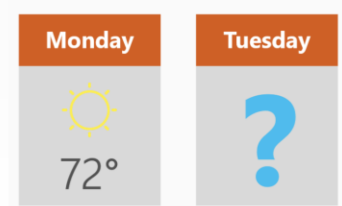
Is this pressure gauge reading normal?
Is this message from the internet typical?

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)

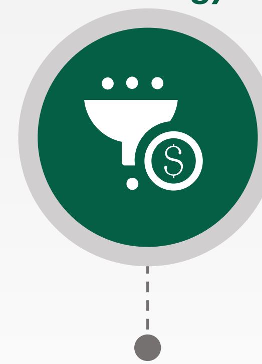


What will the temperature be next Tuesday?
What will my fourth quarter sales be?

How is this organized? (Clustering)

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

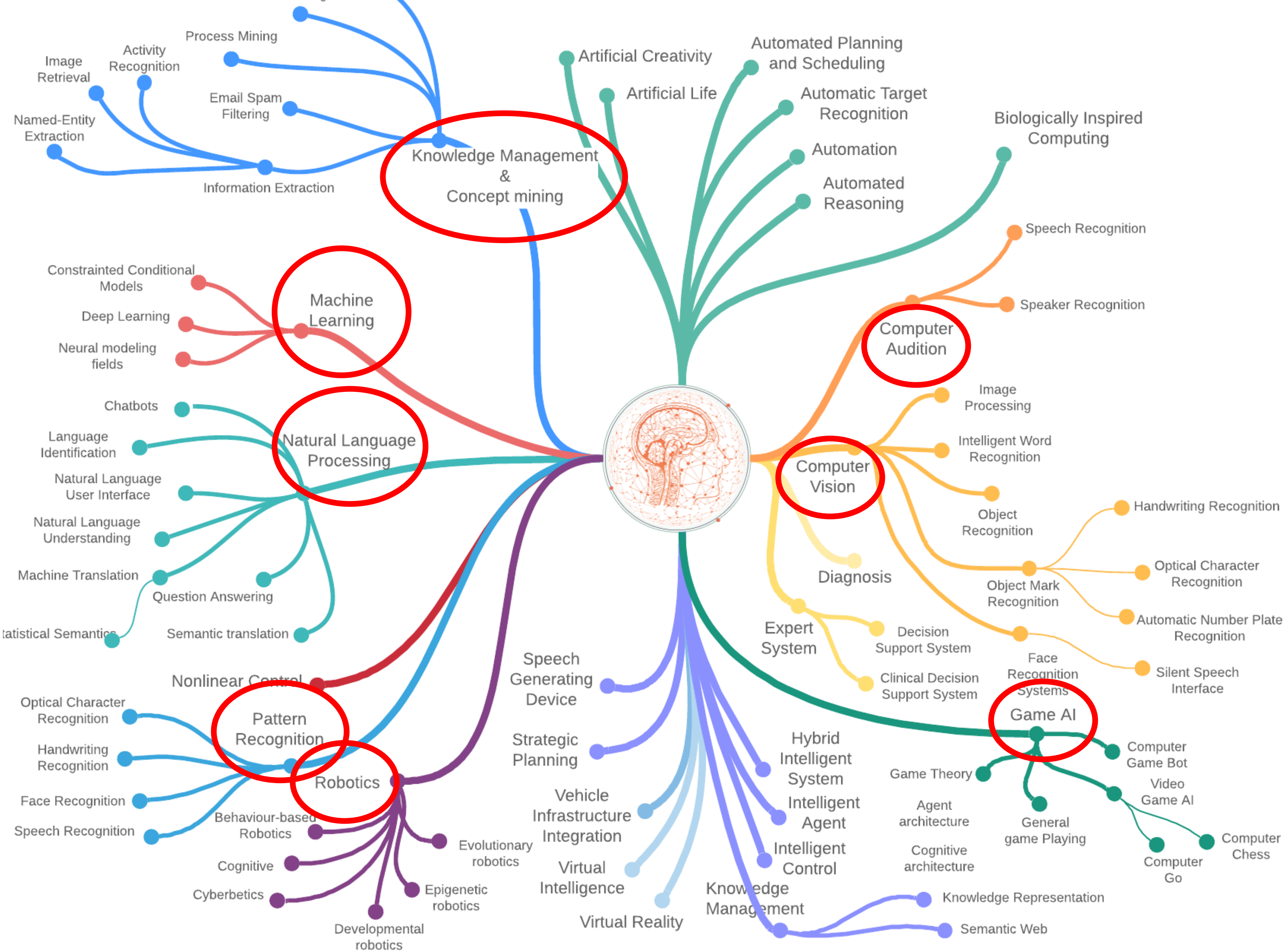
What should I do? (Reinforce Learning)



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

- 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.

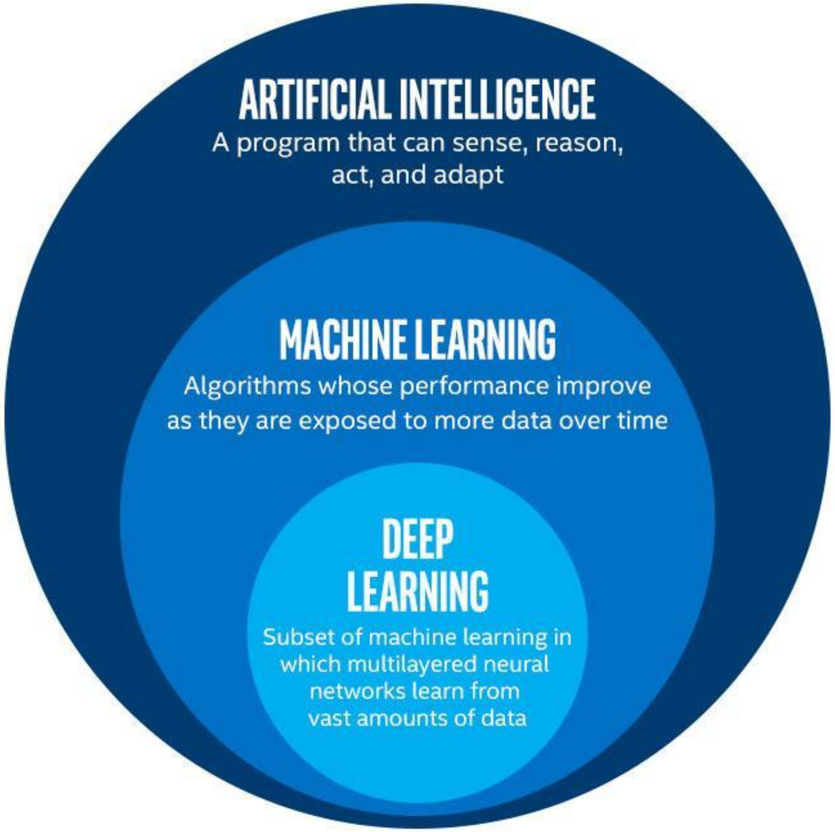
Dog and cat recognition

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.

Feature Detection

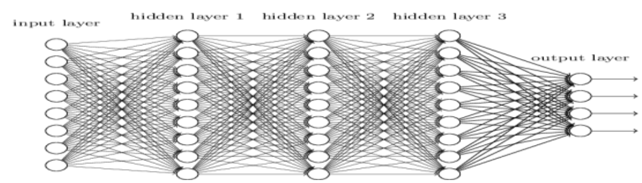
Machine Learning Classifier

“David"

Deep Learning

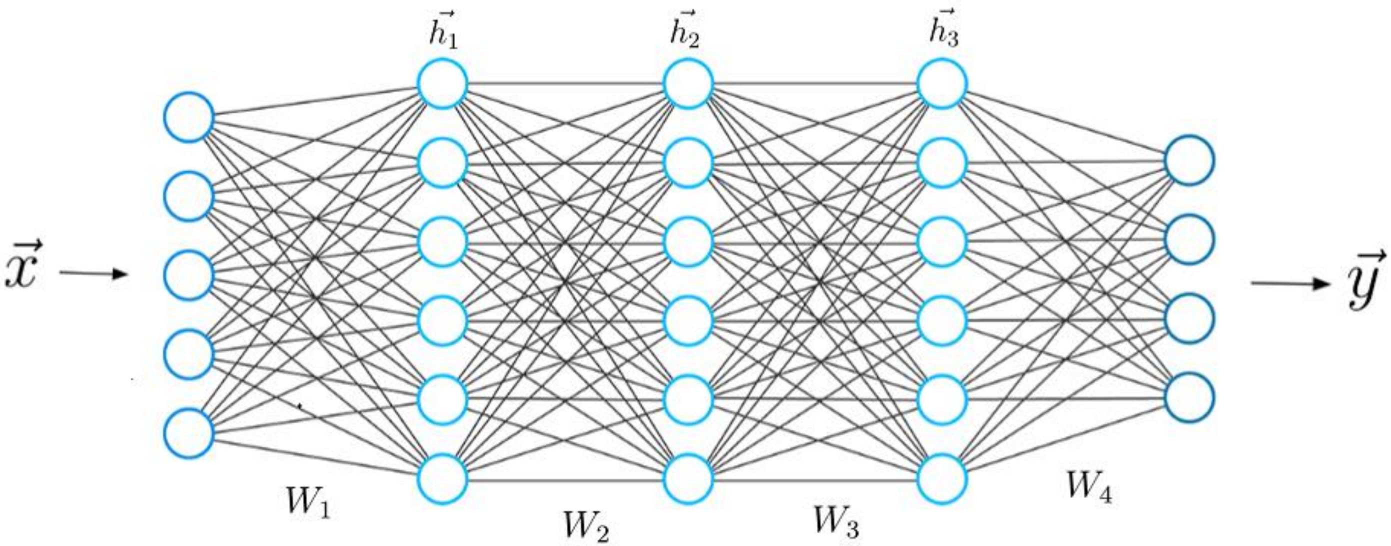
Steps 1 and 2 are combined into 1 step.

Neural Network

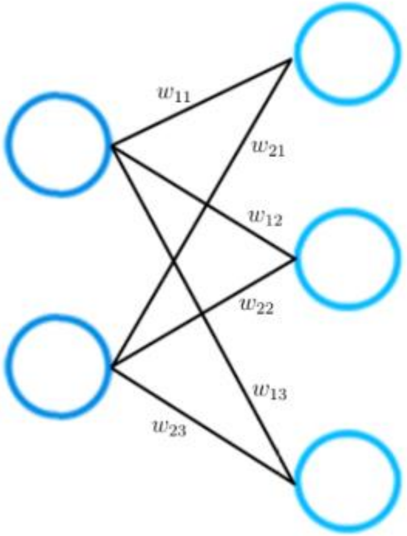


“David"

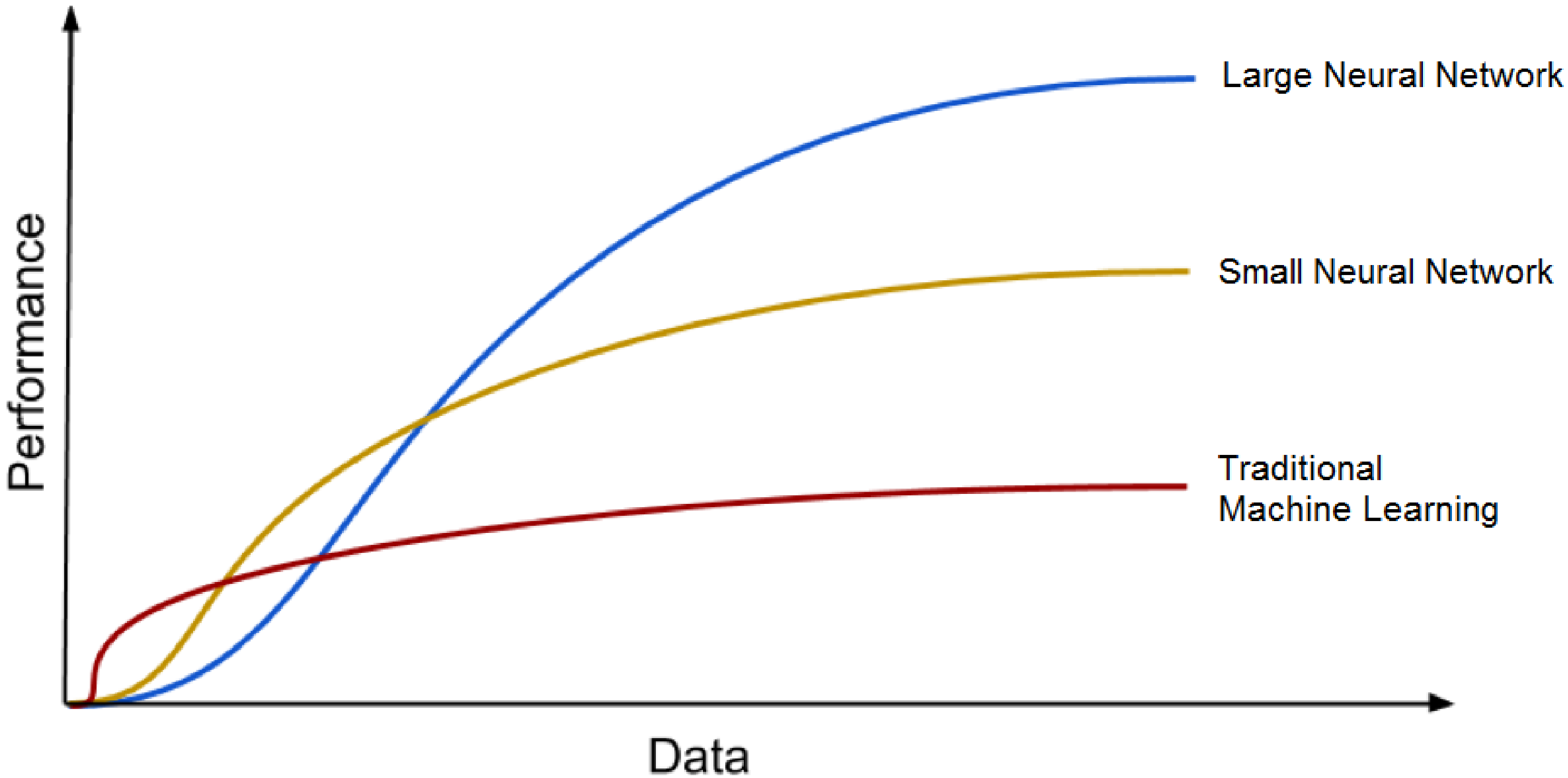
Neural Networks



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

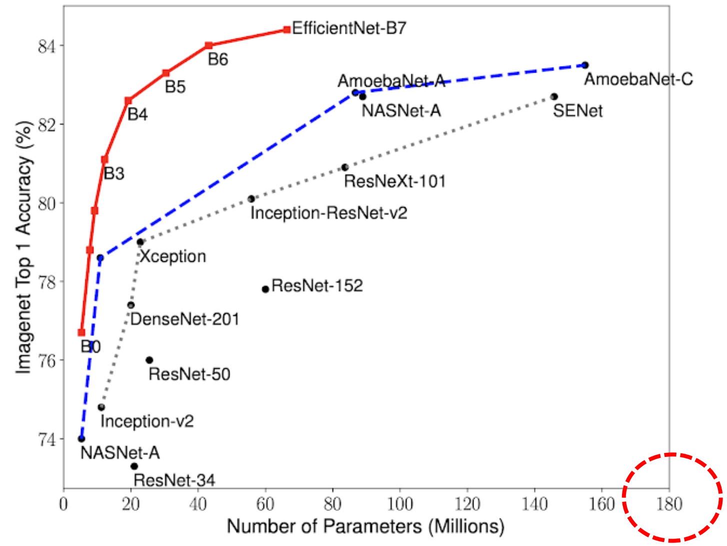


Performance

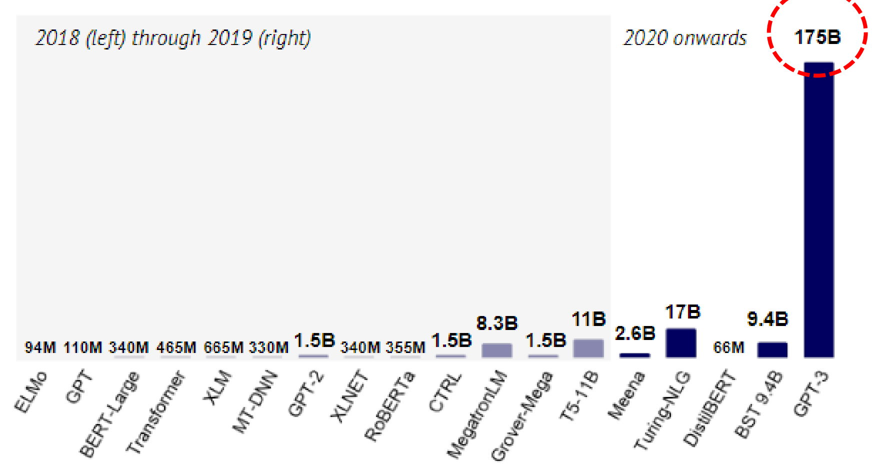


Deep Learning Algorithms get better with the increasing amount of data.

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.

stateof.ai 2020

Deep Learning in Action

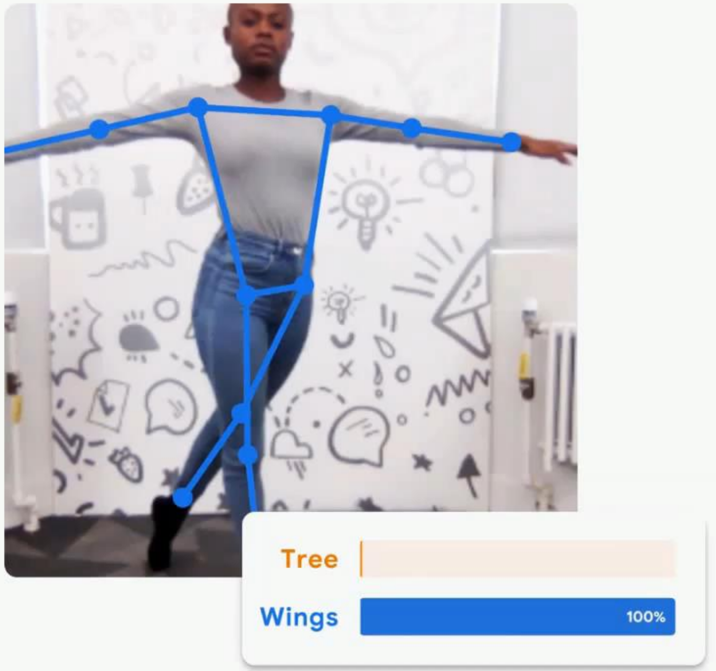
bit.ly/google_teachable

10 mins

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.



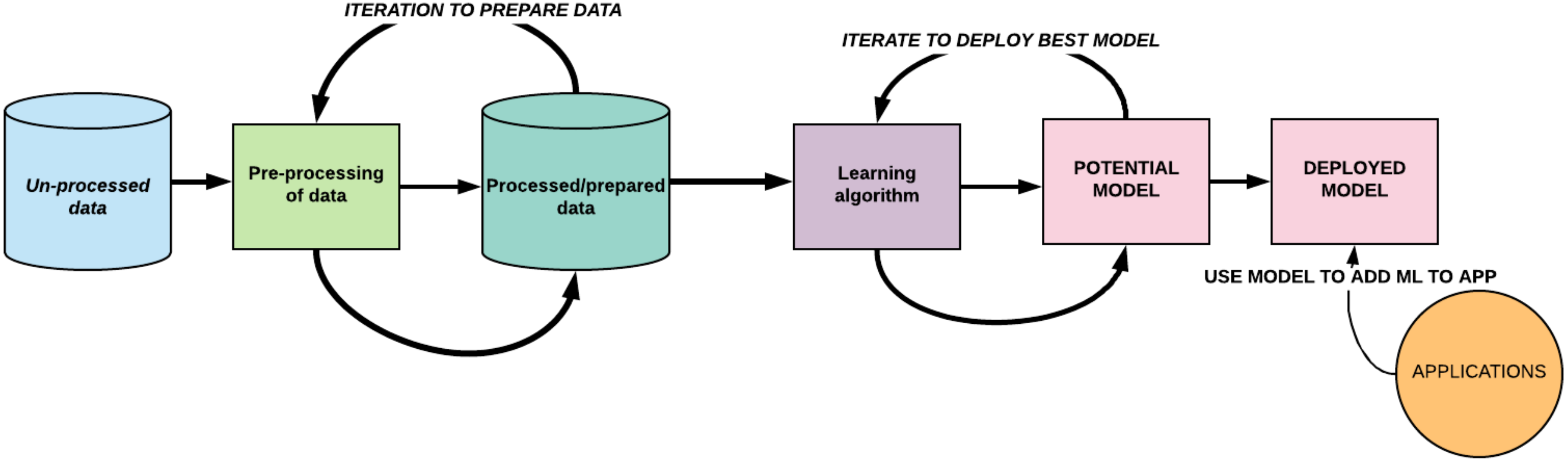
Get Started

Optional Activity

15 Mins Break

bit.ly/top10_2020

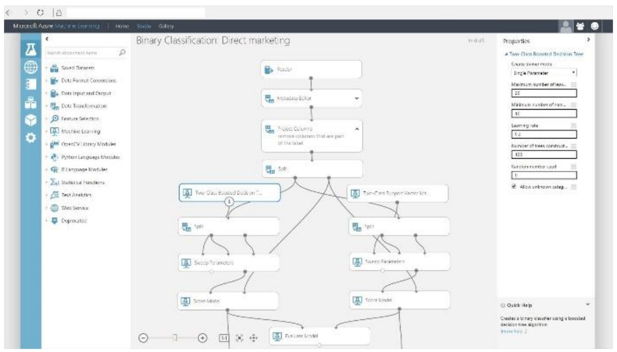
Machine Learning workflow



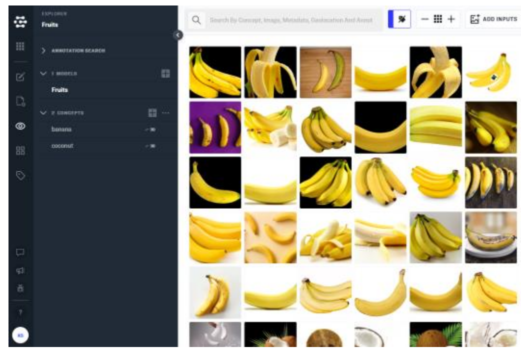
Ref: https://cloudacademy.com/blog/what-is-azure-machine-learning/

Code-Free Machine Learning tools

Microsoft Azure Machine Learning Studio (Classic)



Clarifai



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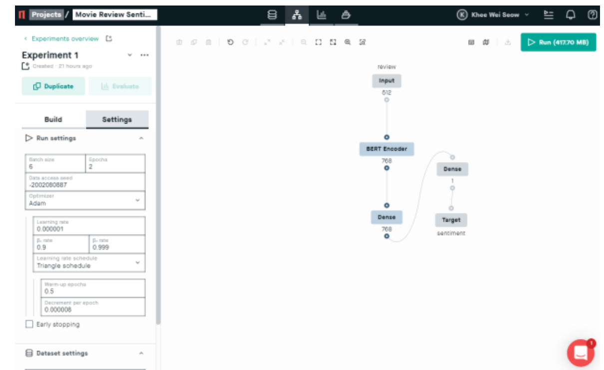
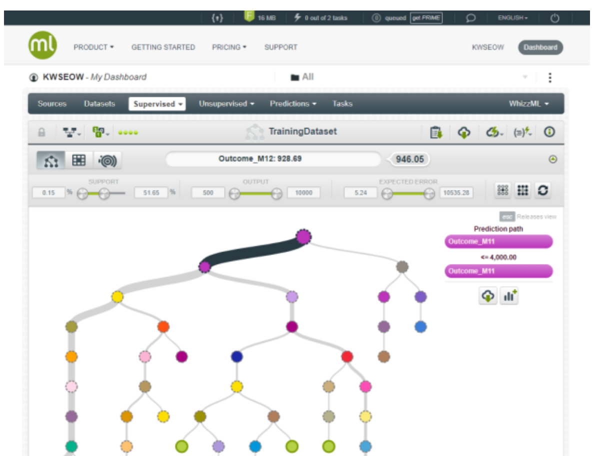
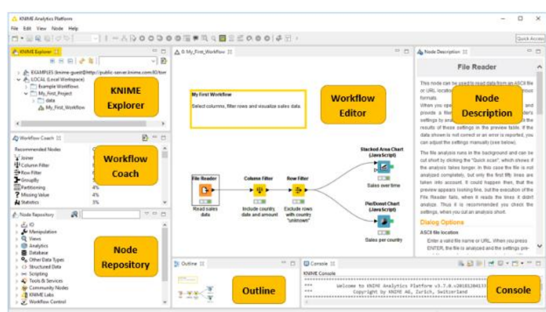


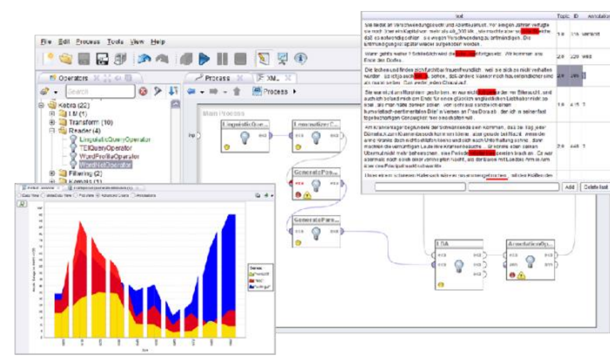
bigml



KNIME

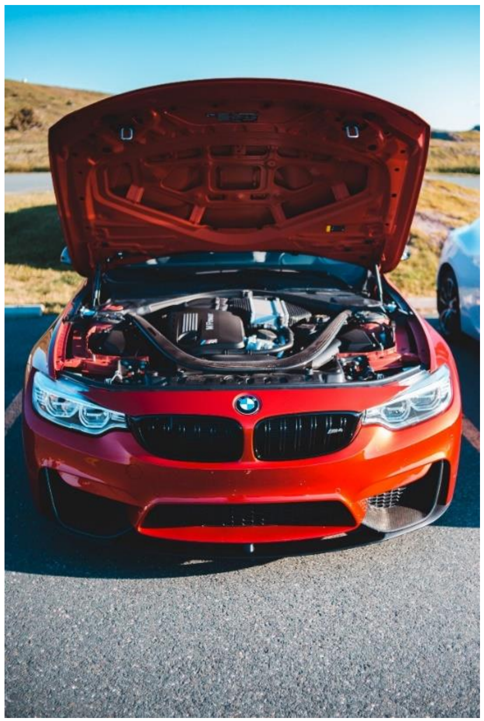


Rapidminer



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	normalizec	make	fuel-type	aspiration	num-of-dc	body-style	drive-whe	engine-loc	wheel-bas	length	width	height	curb-weigh	engine-typ	num-of-cy	engine-siz	fuel-syster	bore	stroke
3	?	alfa-romer	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-romer	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-romer	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	99.8	176.6	66.2	54.3	2337	ohc	four	109	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	1909	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	mfi	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
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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	62.5	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	1909	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

Individual Activity

45 mins

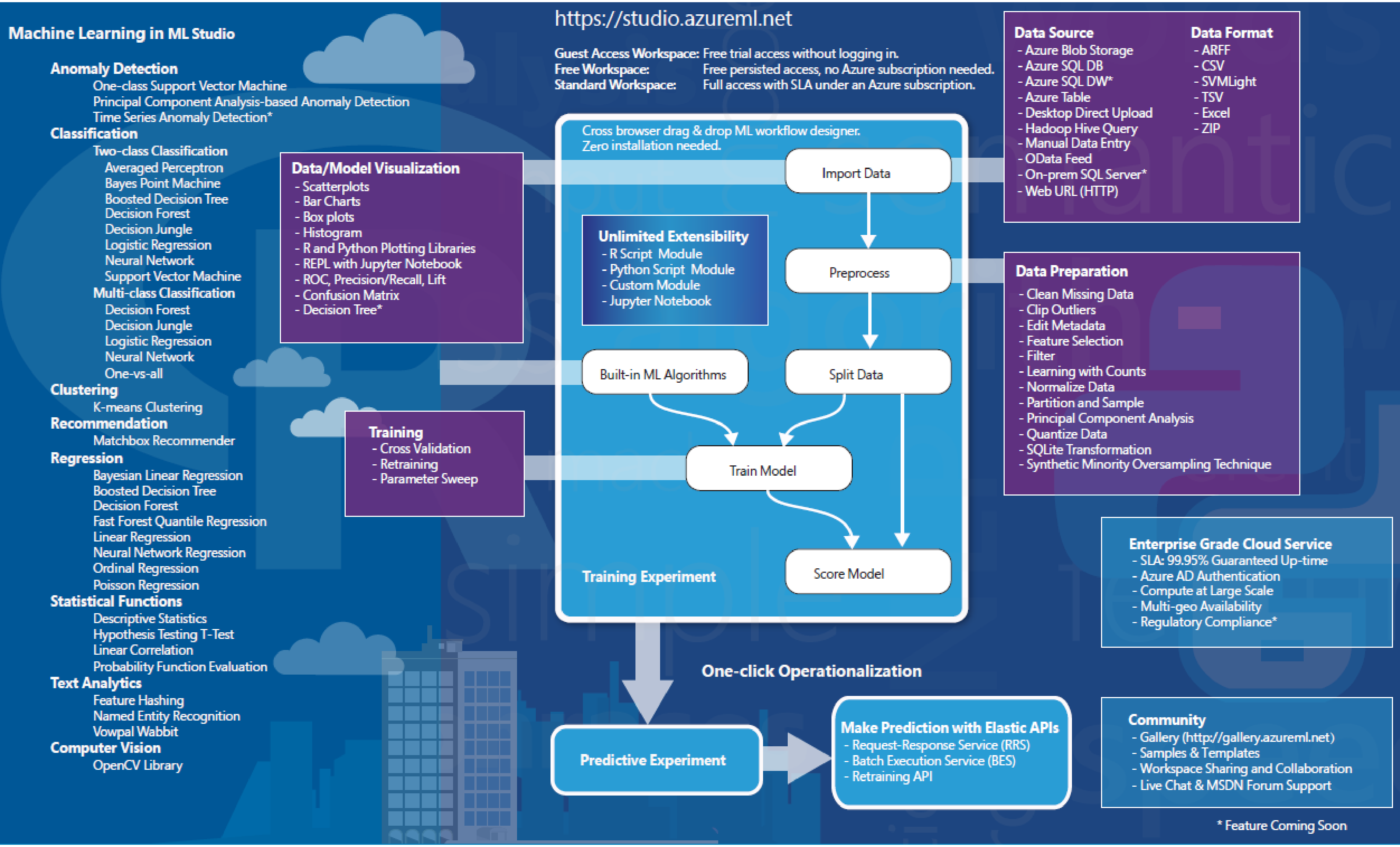
60 mins Lunch Break

Some interesting videos

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

https://www.youtube.com/watch?v=Nnf8P5A_saE

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
Data/Model Visualization
- Scatterplots
- Bar Charts
- Box plots
- Histogram
- R and Python Plotting Libraries
- REPL with Jupyter Notebook
- ROC, Precision/Recall, Lift
- Confusion Matrix
- Decision Tree*
Training
- Cross Validation
- Retraining
- Parameter Sweep
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.
Cross browser drag & drop ML workflow designer.
Zero installation needed.
Import Data
Unlimited Extensibility
- R Script Module
- Python Script Module
- Custom Module
- Jupyter Notebook
Preprocess
Built-in ML Algorithms
Split Data
Train Model
Score Model
Training Experiment
One-click Operationalization
Predictive Experiment
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.

What do you want to do?

- Extract information from text → Text Analytics
- Predict values → Regression
- Find unusual occurrences → Anomaly Detection
- Discover structure → Clustering
- Generate recommendations → Recommenders
- Classify images → Image Classification
- Predict between two categories → Two-Class Classification
- Predict between several categories → Multiclass Classification

Text Analytics

Derives high-quality information from text

Answers questions like: What info is in this text?

Extract N-Gram Features from Text	Creates a dictionary of n-grams from a column of free text
Feature Hashing	Converts text data to integer encoded features using the Vowpal Wabbit library
Preprocess Text	Performs cleaning operations on text, like removal of stop-words, case normalization
Word2Vector	Converts words to values for use in NLP tasks, like recommender, named entity recognition, machine translation

Regression

Makes forecasts by estimating the relationship between values

Answers questions like: How much or how many?

Fast Forest Quantile Regression	Predicts a distribution
Poisson Regression	Predicts event counts
Linear Regression	Fast training, linear model
Bayesian Linear Regression	Linear model, small data sets
Decision Forest Regression	Accurate, fast training times
Neural Network Regression	Accurate, long training times
Boosted Decision Tree Regression	Accurate, fast training times, large memory footprint

Recommenders

Predicts what someone will be interested in

Answers the question: What will they be interested in?

SVD Recommender	Collaborative filtering, better performance with lower cost by reducing dimensionality

Clustering

Separates similar data points into intuitive groups

Answers questions like: How is this organized?

K-Means	Unsupervised learning

Anomaly Detection

Identifies and predicts rare or unusual data points

Answers the question: Is this weird?

One Class SVM	Under 100 features, aggressive boundary
PCA-Based Anomaly Detection	Fast training times

Multiclass Classification

Answers complex questions with multiple possible answers

Answers questions like: Is this A or B or C or D?

Multiclass Logistic Regression	Fast training times, linear model
Multiclass Neural Network	Accuracy, long training times
Multiclass Decision Forest	Accuracy, fast training times
One-vs-All Multiclass	Depends on the two-class classifier
Multiclass Boosted Decision Tree	Non-parametric, fast training times and scalable

Two-Class Classification

Answers simple two-choice questions, like yes or no, true or false

Answers questions like: Is this A or B?

Two-Class Support Vector Machine	Under 100 features, linear model
Two-Class Averaged Perceptron	Fast training, linear model
Two-Class Decision Forest	Accurate, fast training
Two-Class Logistic Regression	Fast training, linear model
Two-Class Boosted Decision Tree	Accurate, fast training, large memory footprint
Two-Class Neural Network	Accurate, long training times

Image Classification

Classifies images with popular networks

Answers questions like: What does this image represent?

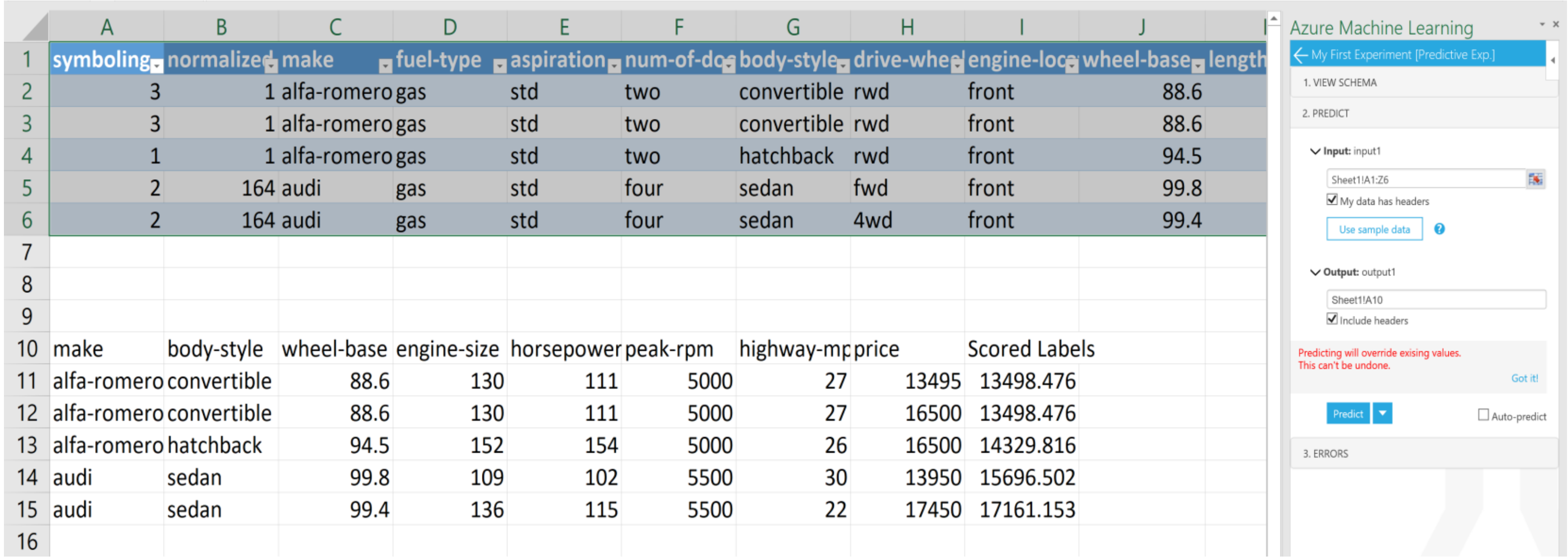
DenseNet	High accuracy, better efficiency

 Share this poster: aka.ms/mlcheatsheet

Microsoft

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-doo	body-style	drive-whe	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-mp	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

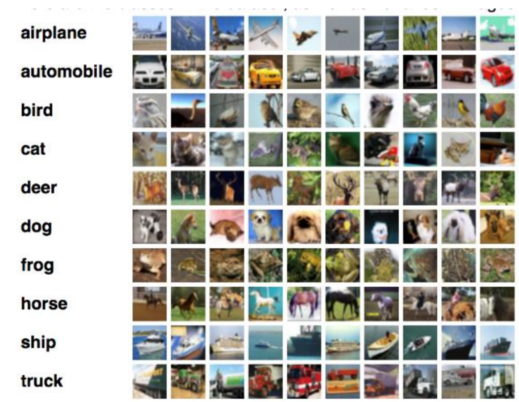
Step 2:
Work through the activities

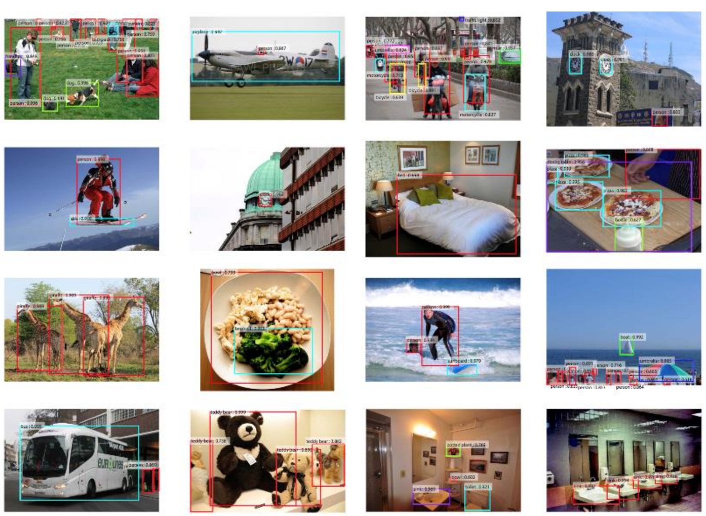
Individual Activity

45 mins

Applications of Computer Vision

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

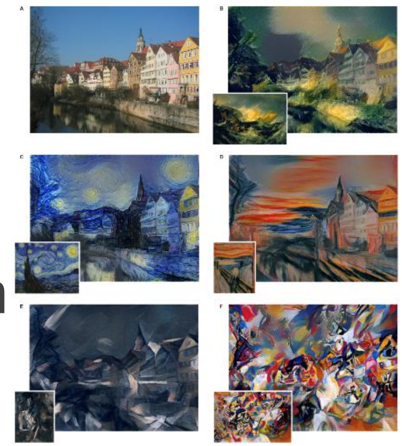


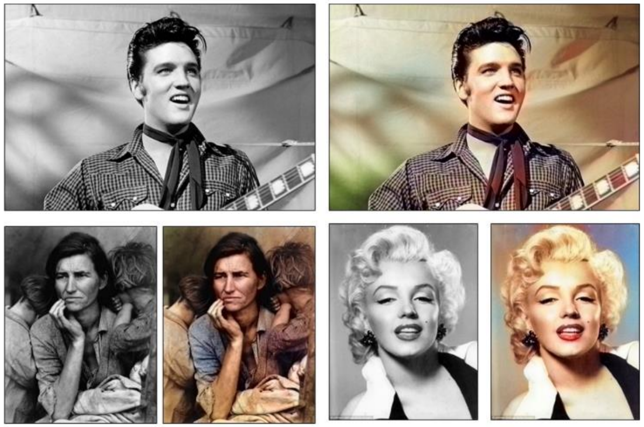


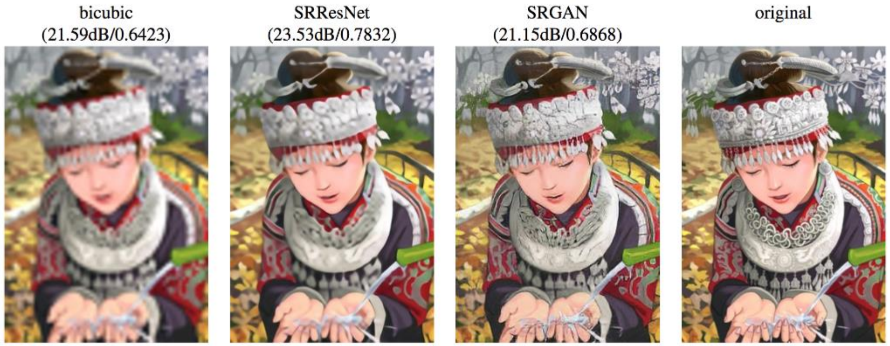
https://machinelearningmastery.com/applications-of-deep-learning-for-computer-vision/

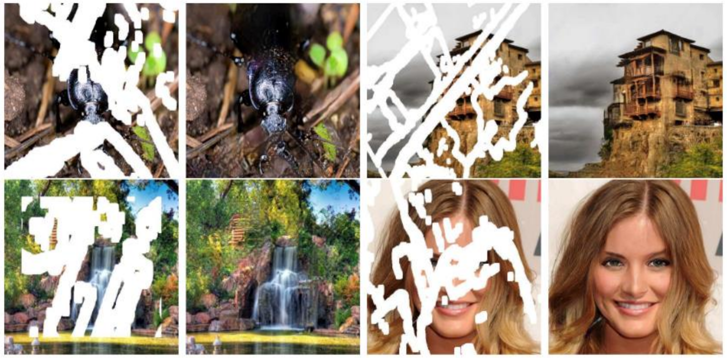
Applications of Computer Vision

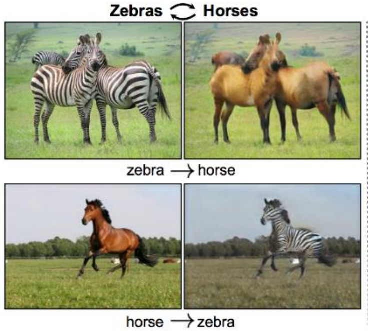
- Image Style Transfer
- Image Colorization
- Image Reconstruction
- Image Super-Resolution
- Image Synthesis
- Other Problems



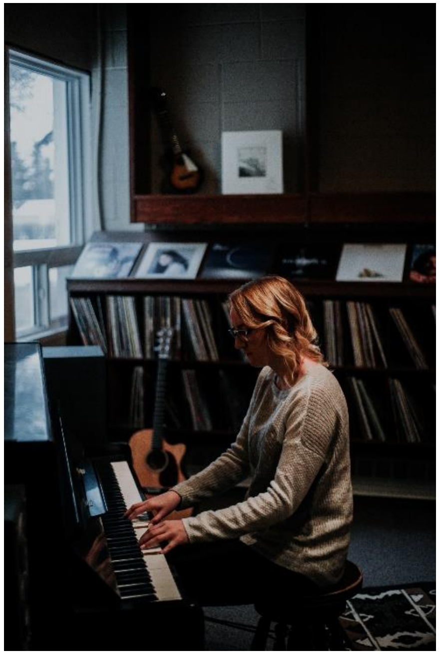








Transfer Learning



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.

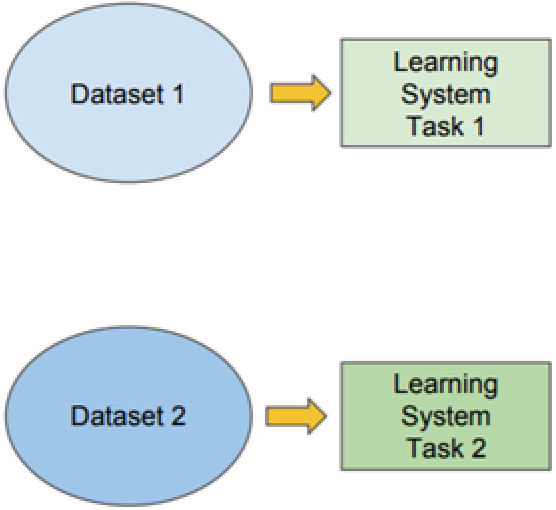
Some simple examples would be,
* Know how to ride a motorbike ➦ Learn how to ride a car
* Know how to play classic piano ➦ Learn how to play jazz piano

- 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

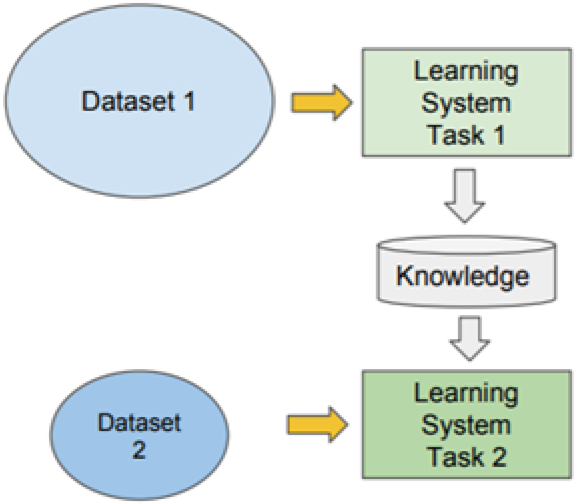
Transfer Learning

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



https://towardsdatascience.com/a-comprehensive-hands-on-guide-to-transfer-learning-with-real-world-applications-in-deep-learning-212bf3b2f27a

Creating a new dataset

Step 1

- **Data acquisition**
  - Take pictures of the subject. Try to position subject in the middle of the image.
  - Import all images to your computer in a folder named MyImages.

Step 2

- **Data preprocessing**
  - **Resize images to 224x224 pixels**
  - **Label all images**

Step 3

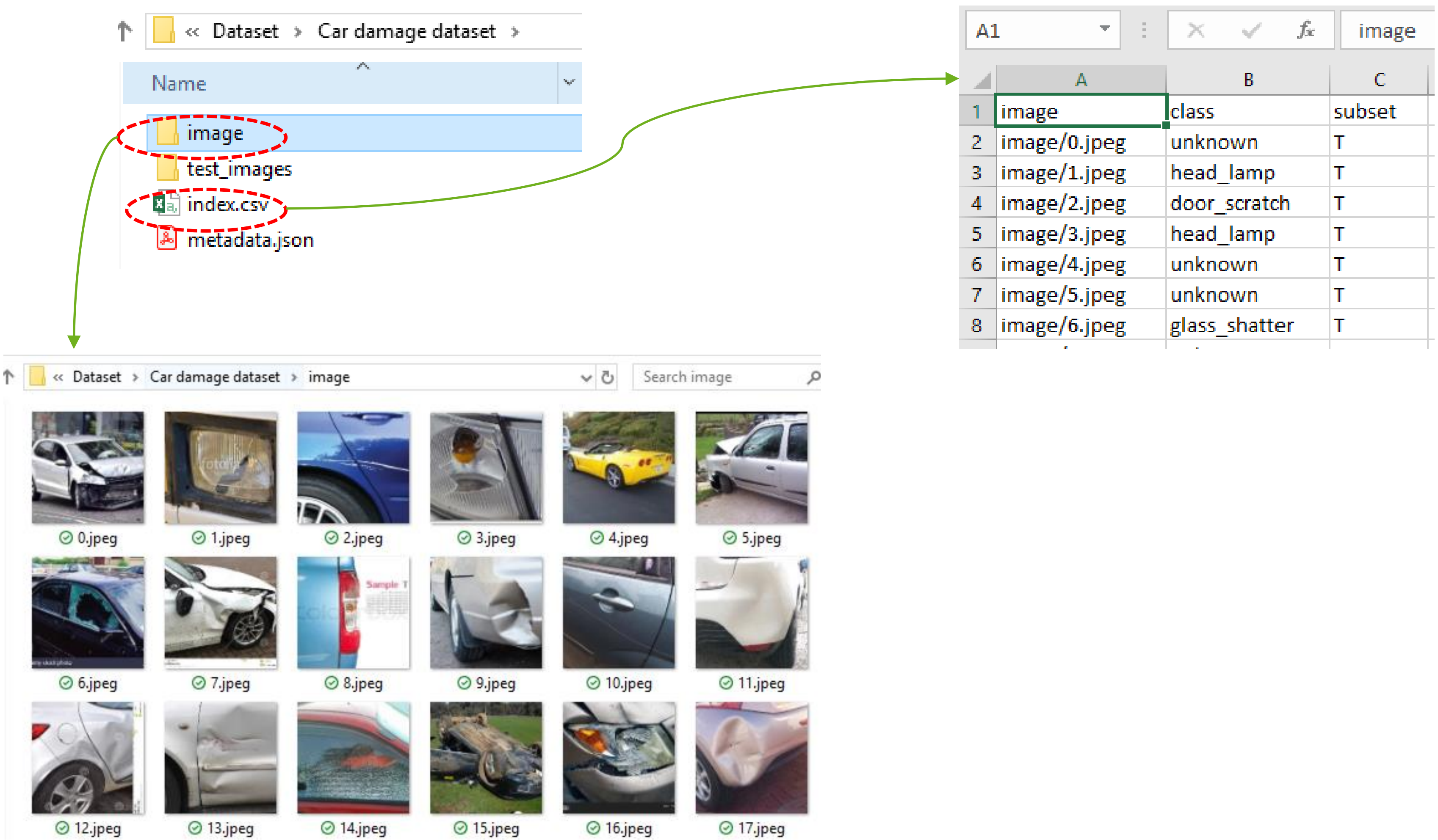
- **Create csv file**
  - **Create a text file with all image names**
  - **Create a file with all labels**
  - **Combine image names and labels in one file - index.csv**

Step 4

- **Create the zip-file**

https://peltarion.com/knowledge-center/documentation/datasets-view/example-workflows---datasets-view/create-new-dataset-/-example-workflow

Example



« Dataset › Car damage dataset ›
Name
image
test_images
index.csv
metadata.json
A1
image
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
« 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

Activity 3 – Car Damage Classifier

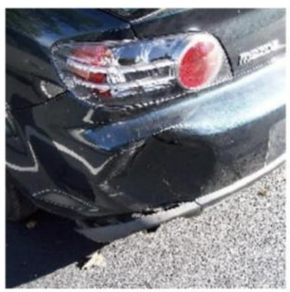

Broken headlamp


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

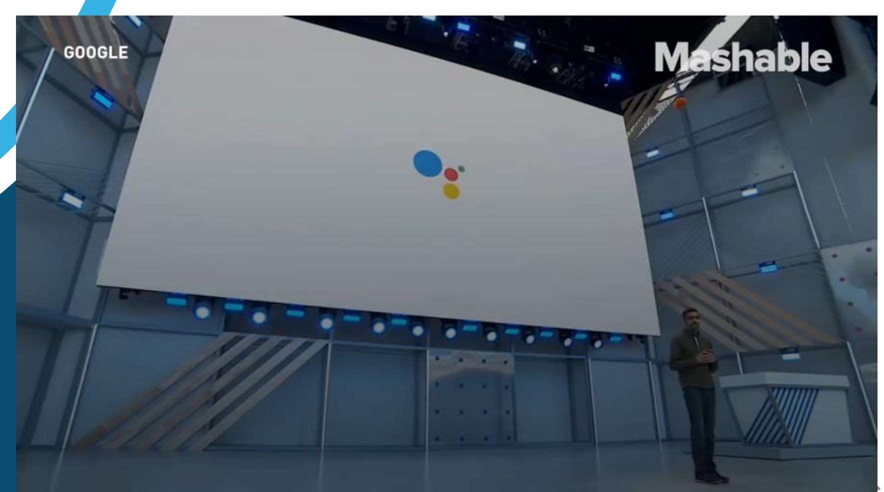
Step 2:
- Do on your own

40 mins

Individual Activity

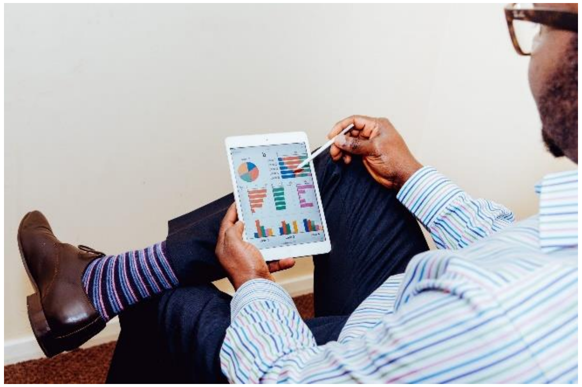
15 Mins Break

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



https://www.analyticsvidhya.com/blog/2020/07/top-10-applications-of-natural-language-processing-nlp/

Dataset

	review Encoding Text	sentiment 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	-
Features	**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.

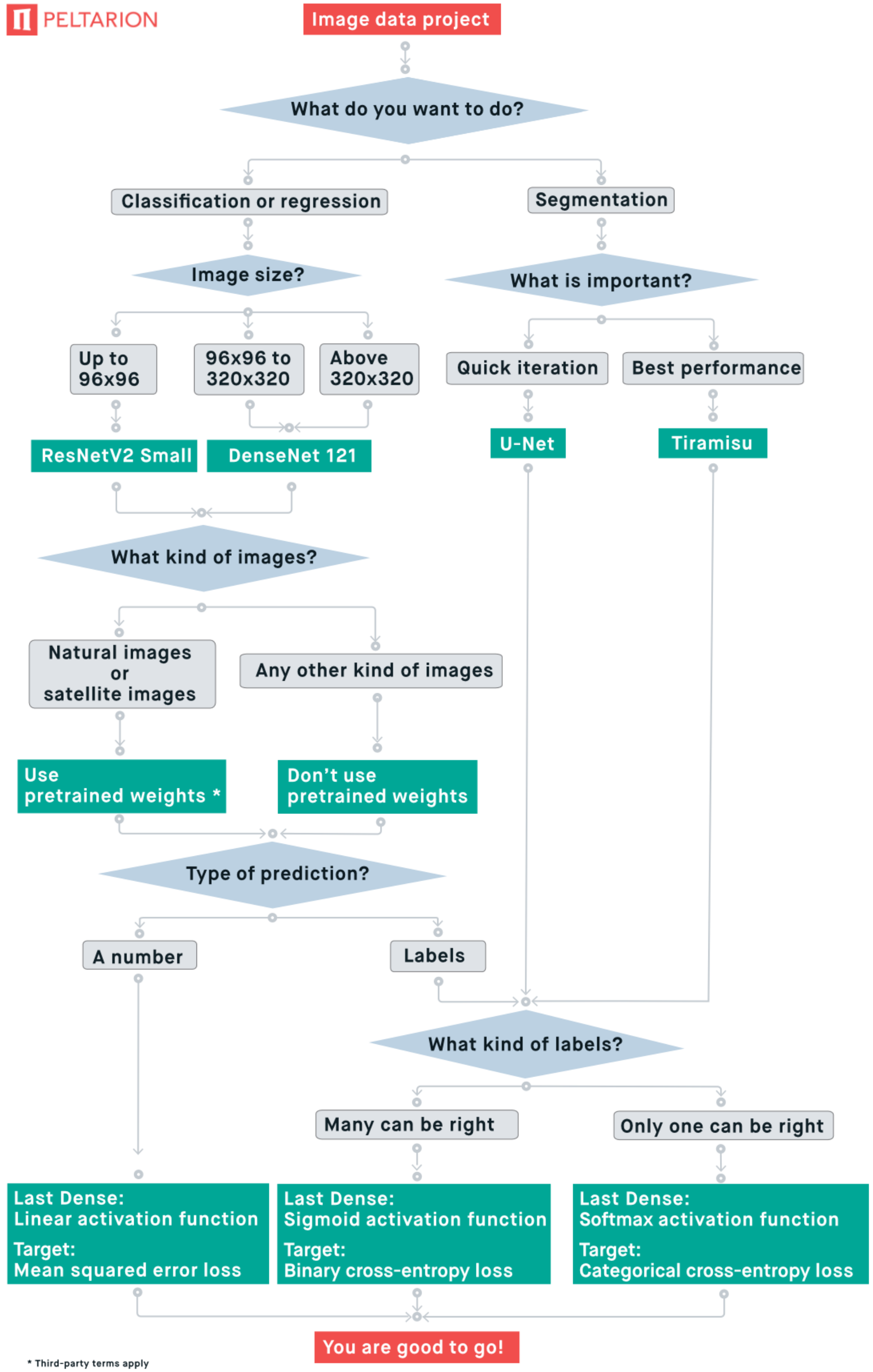
Step 1:
Watch and listen to the instructor's demonstration

20 mins

Step 2:
- Do on your own

40 mins

Individual Activity



Cheatsheet

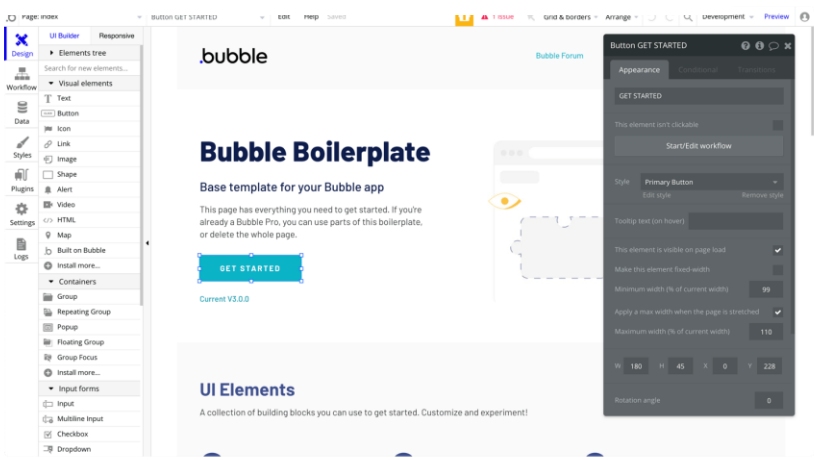
https://peltarion.com/knowledge-center/documentation/cheat-sheets

Linking Them Together

App Development

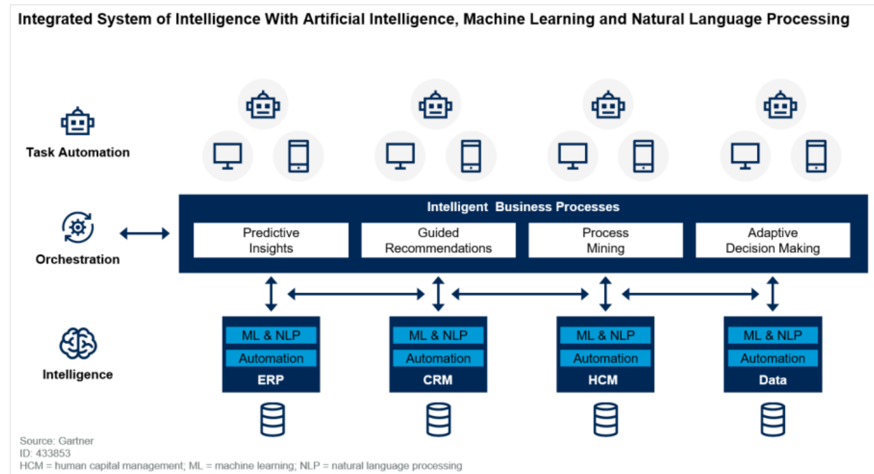
Top 9 No-Code Web App Development Tools that May Compete with Bubble

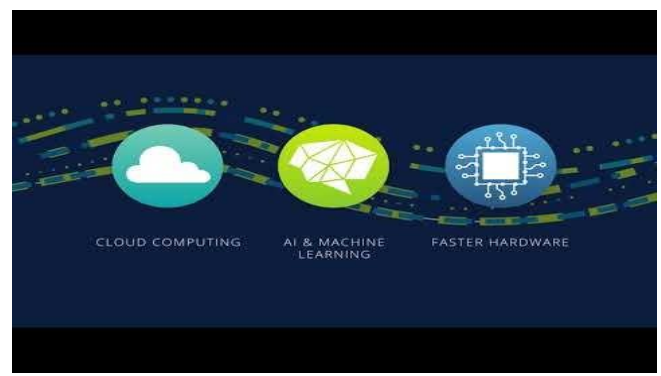
We're here to prove that **"building the best product"** is possible not only with Bubble.
Discover the *5 most powerful Bubble alternatives* in the comparison table below to decide which one fits you best. Find more detailed information about the other Bubble.io alternatives after the table.



https://uibakery.io/bubble-alternatives

RPA





Adobe Acrobat Document

https://www.youtube.com/watch?v=FV8lM9SIFQ8

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

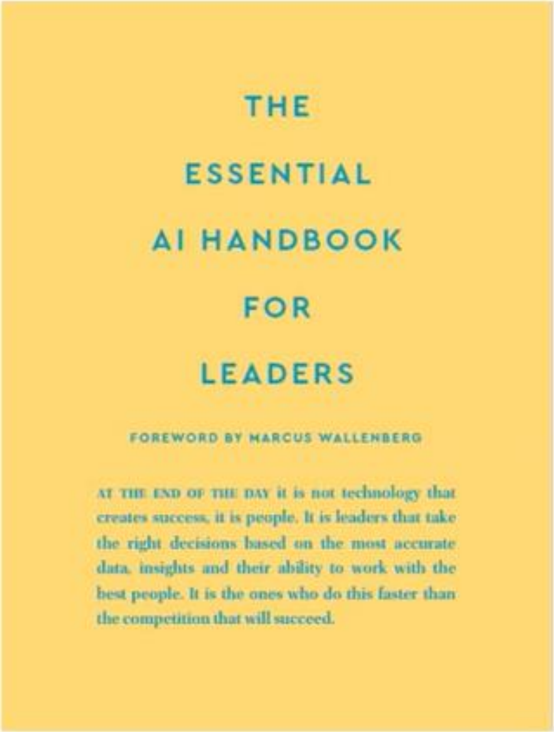
- **What parts of our business generate revenue but currently have low profit margins?**
  - These revenue streams could provide fertile ground for automation and acceleration via AI.

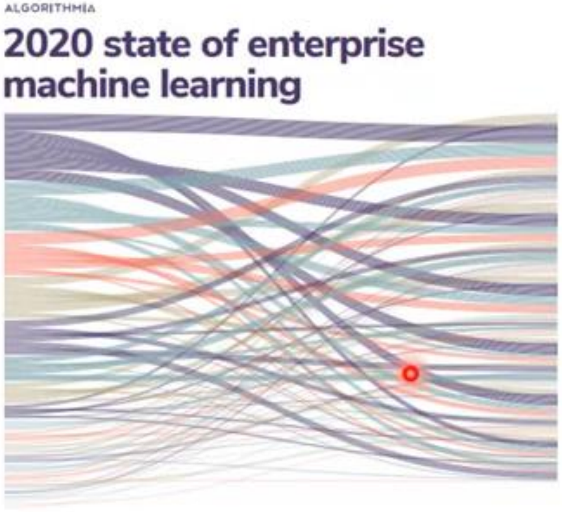
- **Where would we like to cut costs?**
  - Review your costs and pinpoint the ones you'd like to reduce. AI can help you better understand what generates costs and identify areas that could be optimized or changed to reduce them.

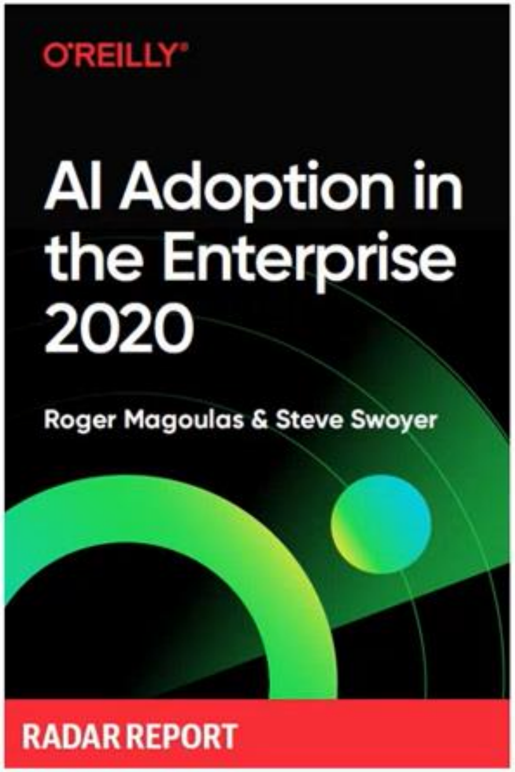
- **Where do we make a high percentage of errors in our work?**
  - A well-trained AI model has the capacity to perform with far less margin of error than humans

- **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







Datasets and Data Prep

GitHub
https://kwseow.github.io/

Google Dataset Search Beta
https://datasetsearch.research.google.com/

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

KDnuggets™
https://www.kdnuggets.com/datasets/index.html

Excel

tableau

Microsoft Power BI

roboflow

Dataset and Data Prep

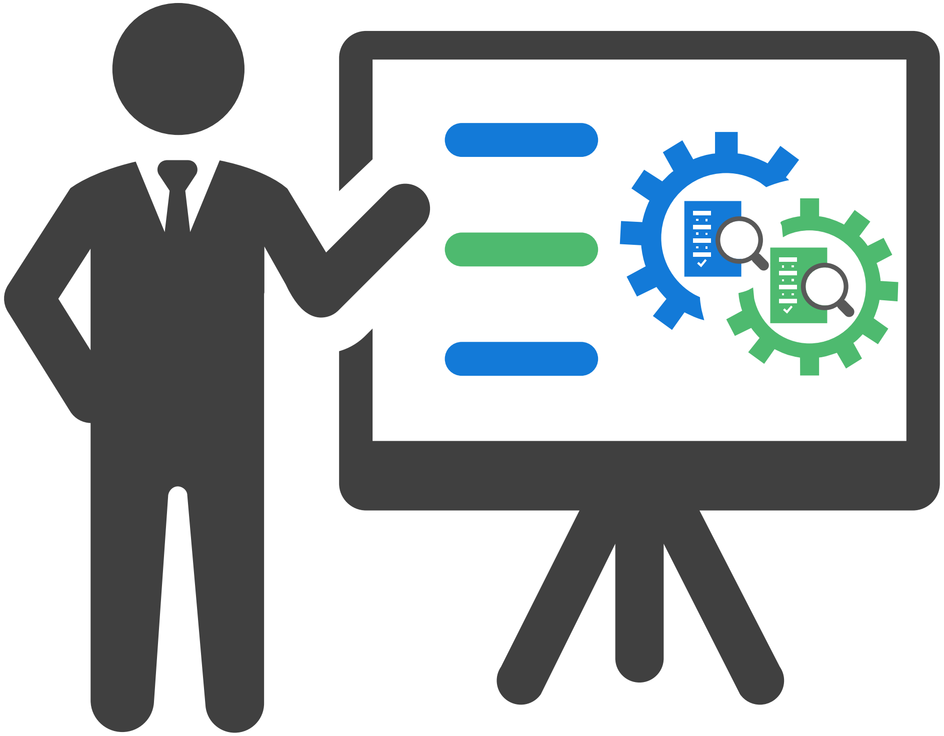
- Datasets
  - http://kwseow.github.io
  - https://datasetsearch.research.google.com/
  - https://www.kaggle.com/

- Data prep
  - Excel
  - Tableau Prep
  - Power BI

Survey

https://bit.ly/3fVYxaF

Summary



Email
zack_toh@rp.edu.sg

Telegram
@zacktohsh

Source code:

Thank you