

Introduction to Code-Free Machine Learning

Good Morning!

- 1) Download the presentation slides and activity worksheets at 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 😊



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README.md

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

About

No description, website, or topics provided.

Readme

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Warm up!

Step 1: Go to the following url

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

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 – Book Genre Classifier
Section 6:	Linking them together
Section 7:	Debrief



Introduction of trainer



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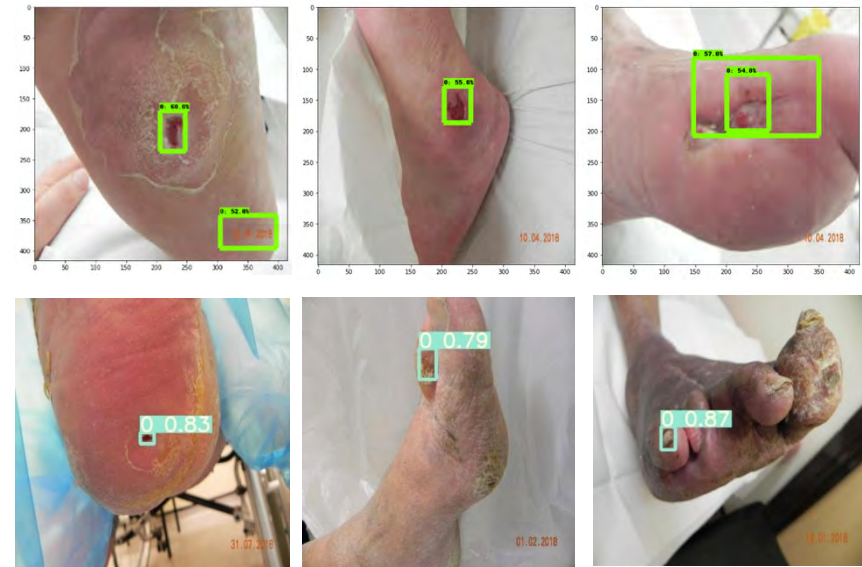


Projects

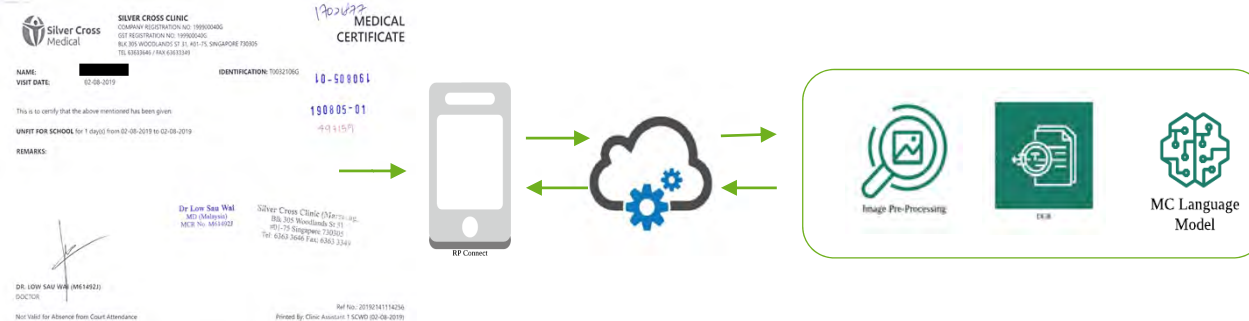
Screen Understanding



Diabetic Foot At Risk Reconstruction



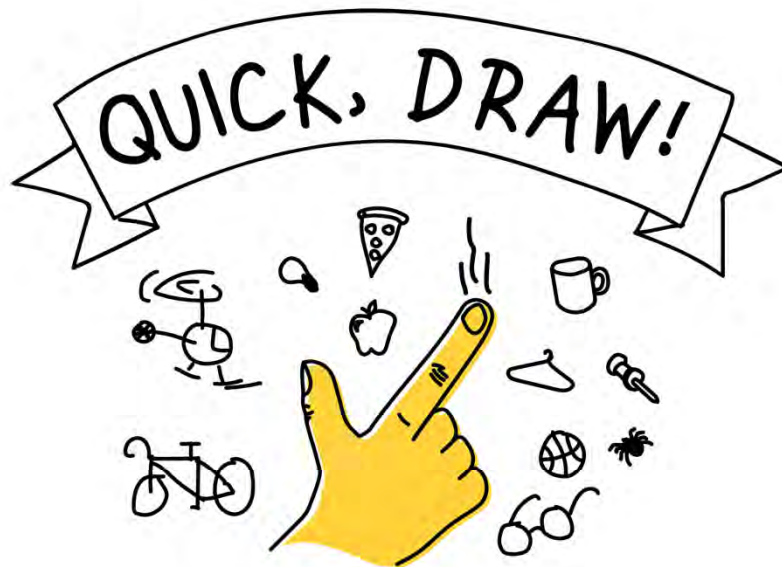
Language model for Medical Certificates





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

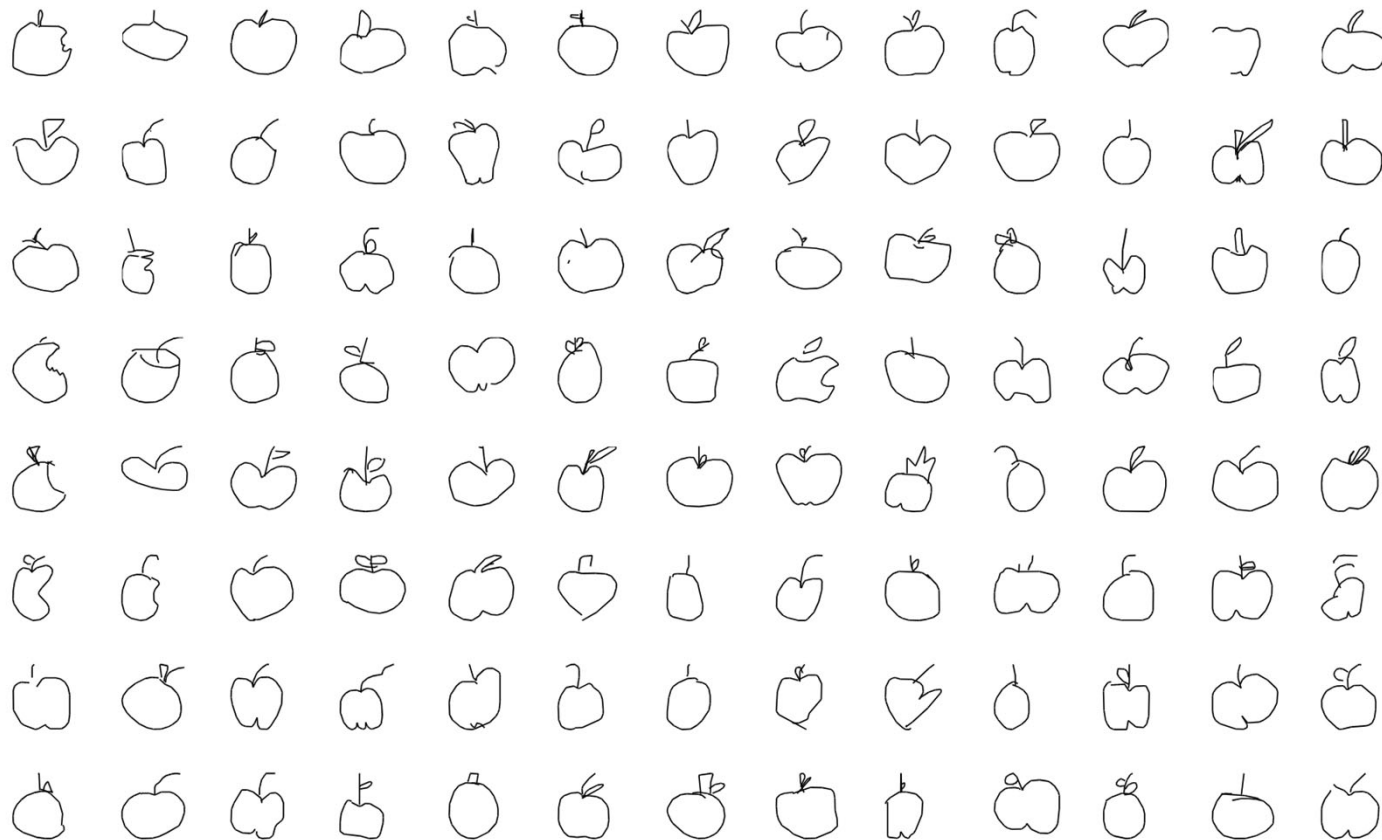


5 mins



How does ML work in QuickDraw?

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





Bias Bias Bias

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.

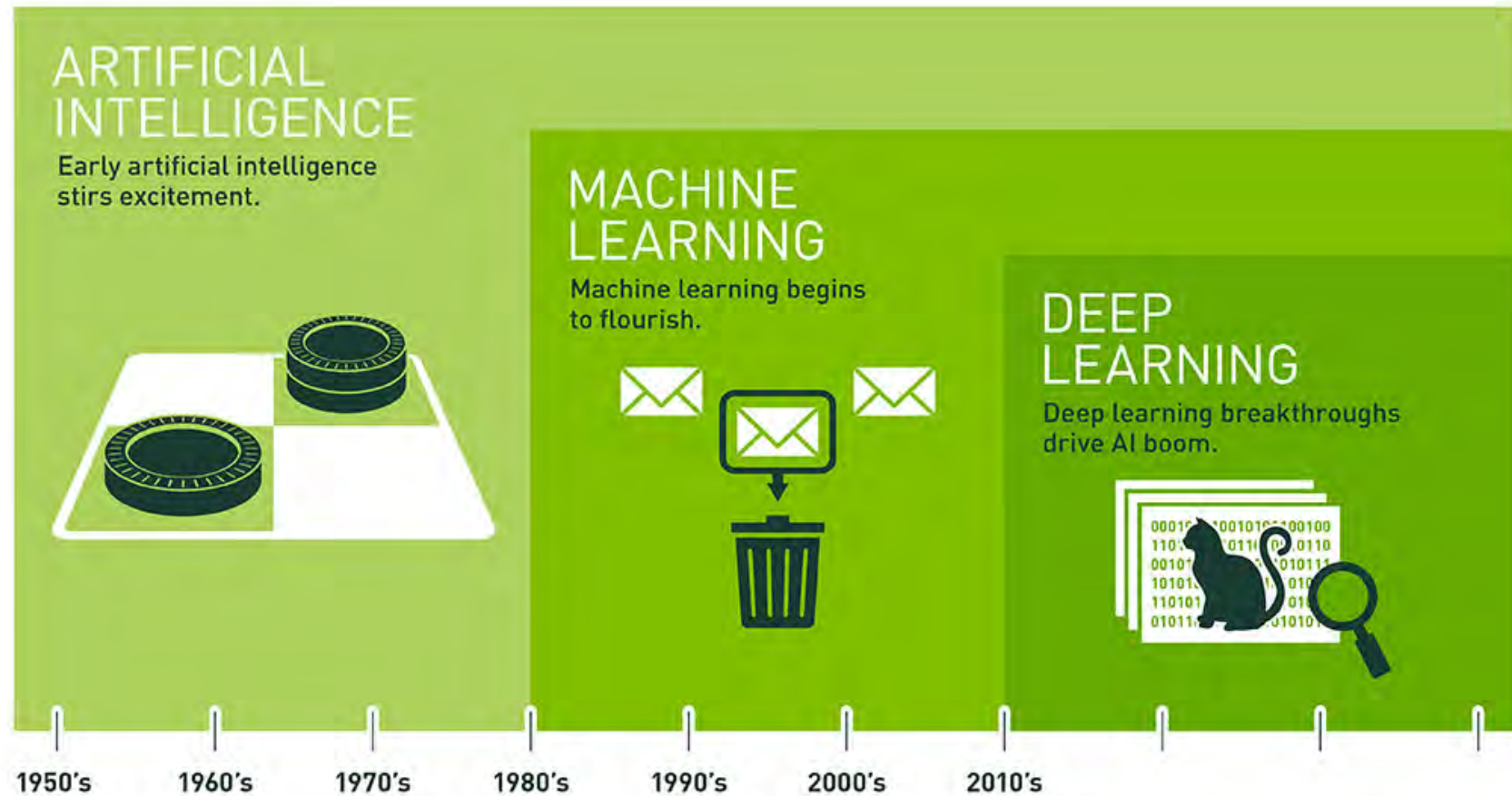


In WIRED's tests, Google Photos did identify some primates, but no gorillas like this one were to be found. RICK MADONIK/TORONTO STAR/GETTY IMAGES

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



AI Time line



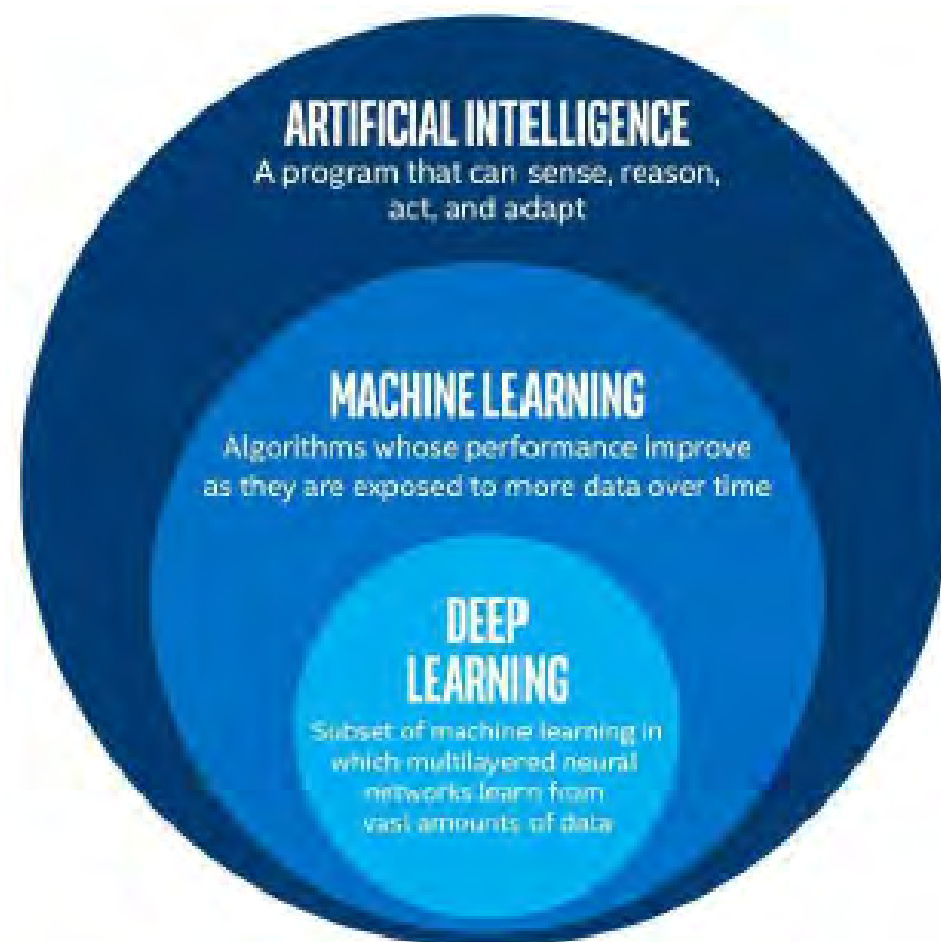
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Source: Nvidia



Machine Learning

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



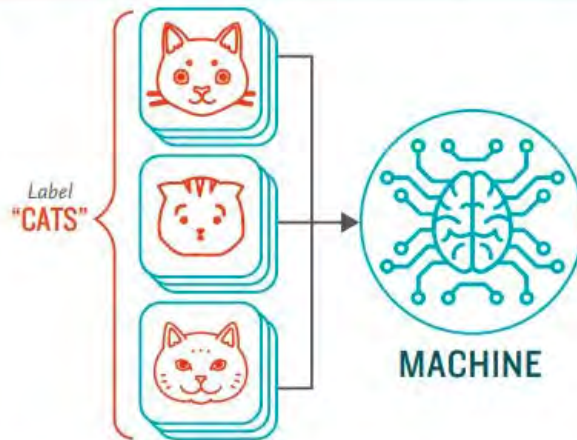


Supervised Learning

How **Supervised** Machine Learning Works

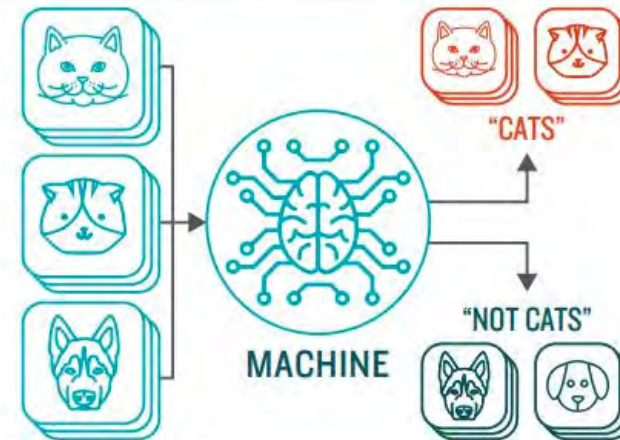
STEP 1

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

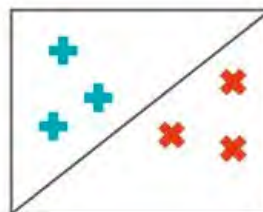


STEP 2

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

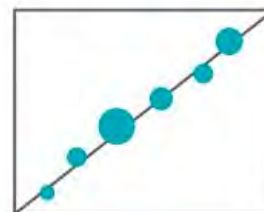


TYPES OF PROBLEMS TO WHICH IT'S SUITED



CLASSIFICATION

Sorting items into categories



REGRESSION

Identifying real values (dollars, weight, etc.)

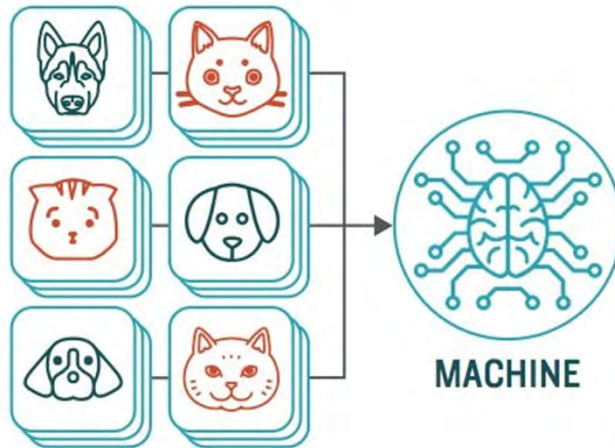


Unsupervised Learning

How **Unsupervised** Machine Learning Works

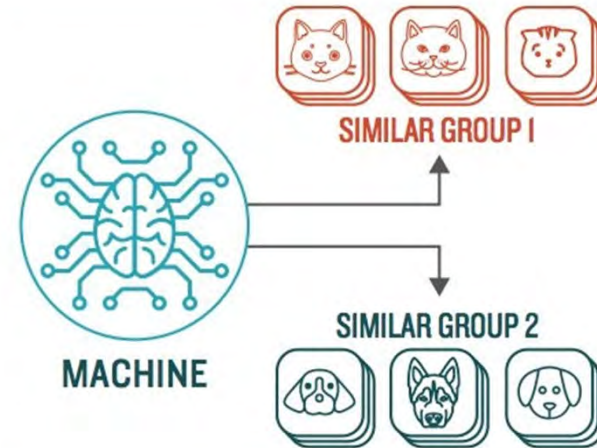
STEP 1

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

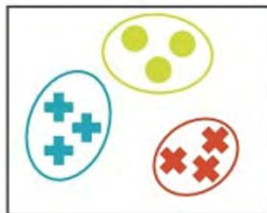


STEP 2

Observe and learn from the patterns the machine identifies



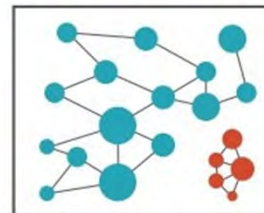
TYPES OF PROBLEMS TO WHICH IT'S SUITED



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

- **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

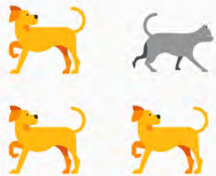
Social Networks

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)



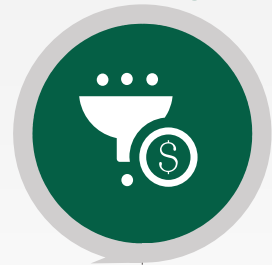
What will the temperature be next Tuesday?
What will my fourth quarter sales be?

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)

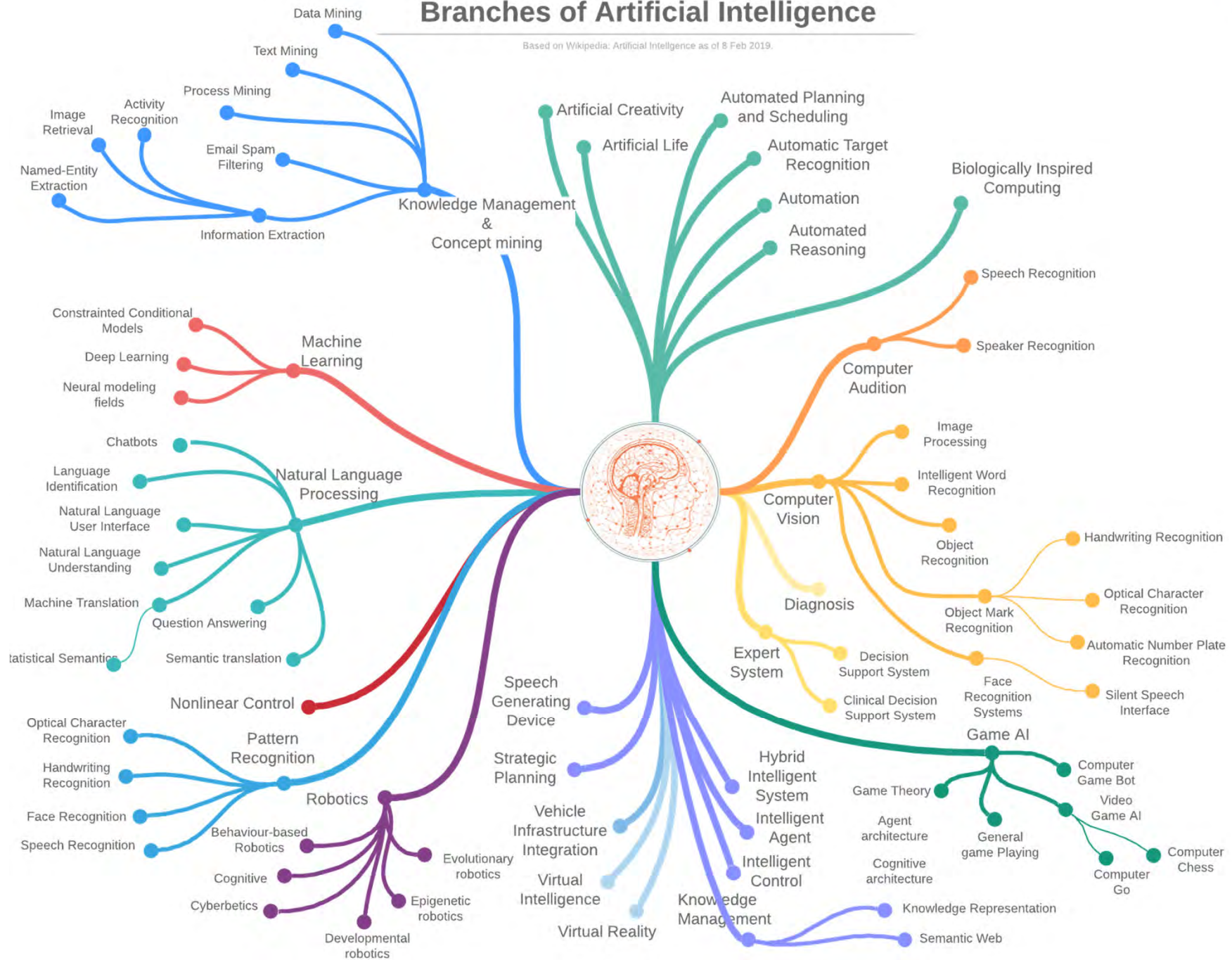


If I'm a self-driving car: At a yellow light, brake or accelerate?
For a robot vacuum: Keep vacuuming, or go back to the charging station?



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

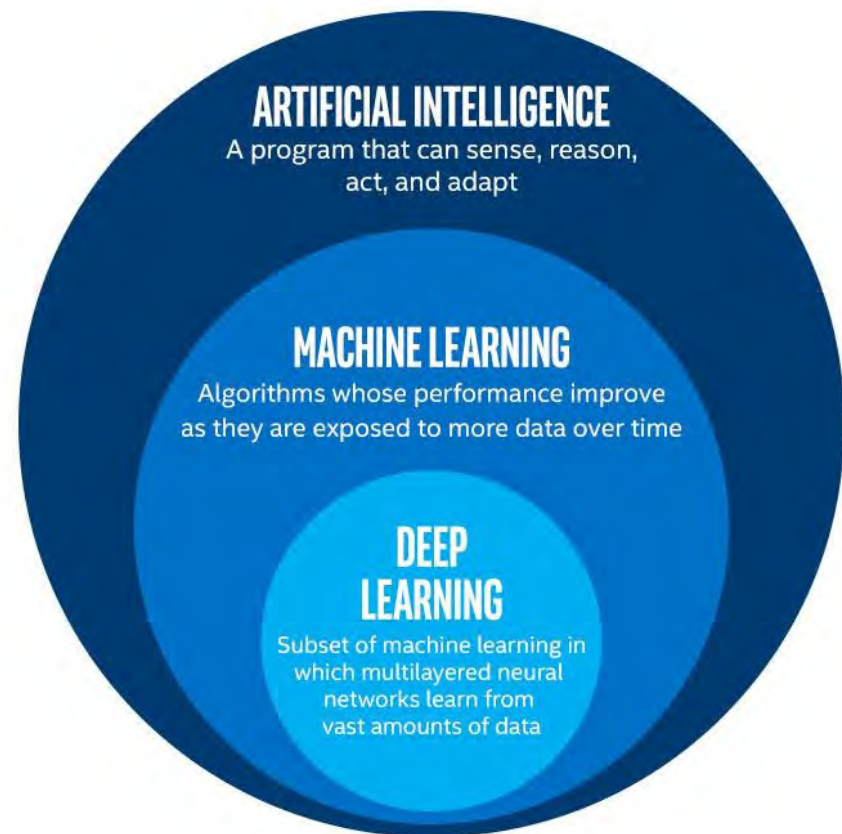


What is deep learning?

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.

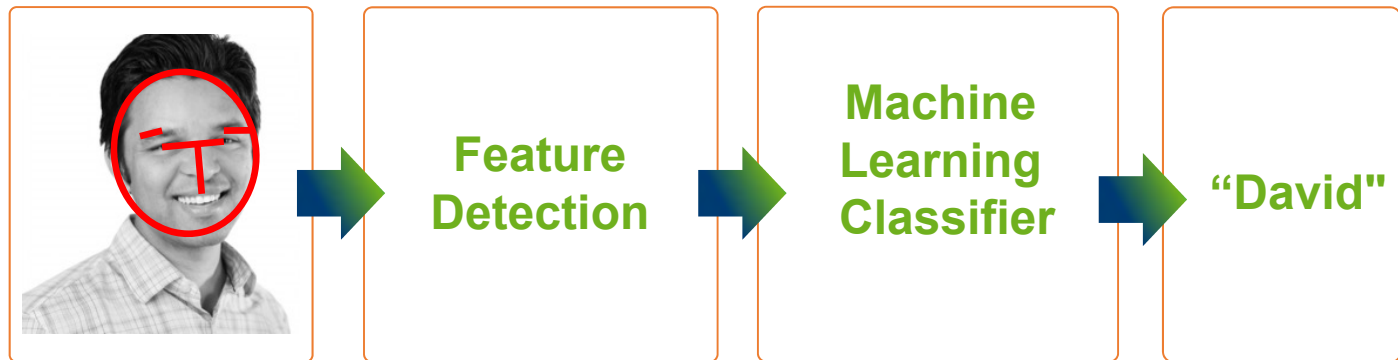




Deep Learning Example

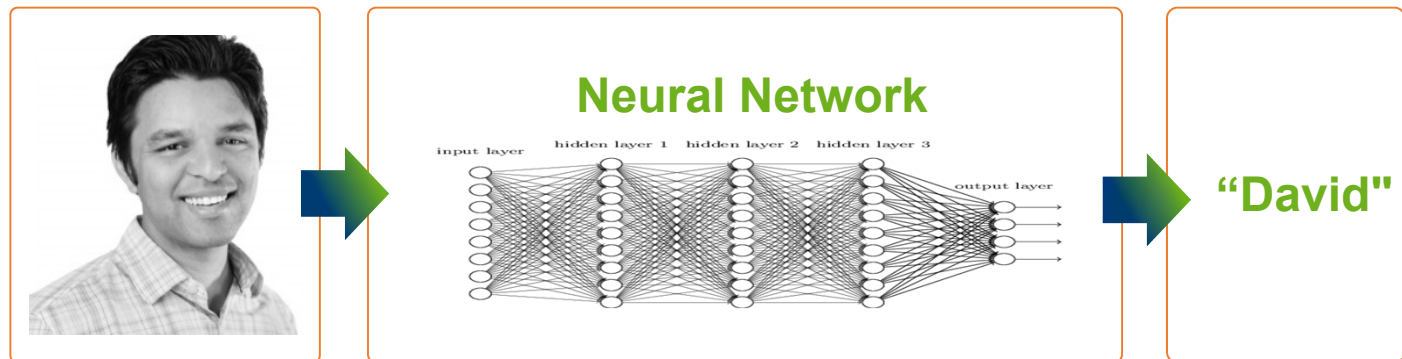
Classic Machine Learning

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



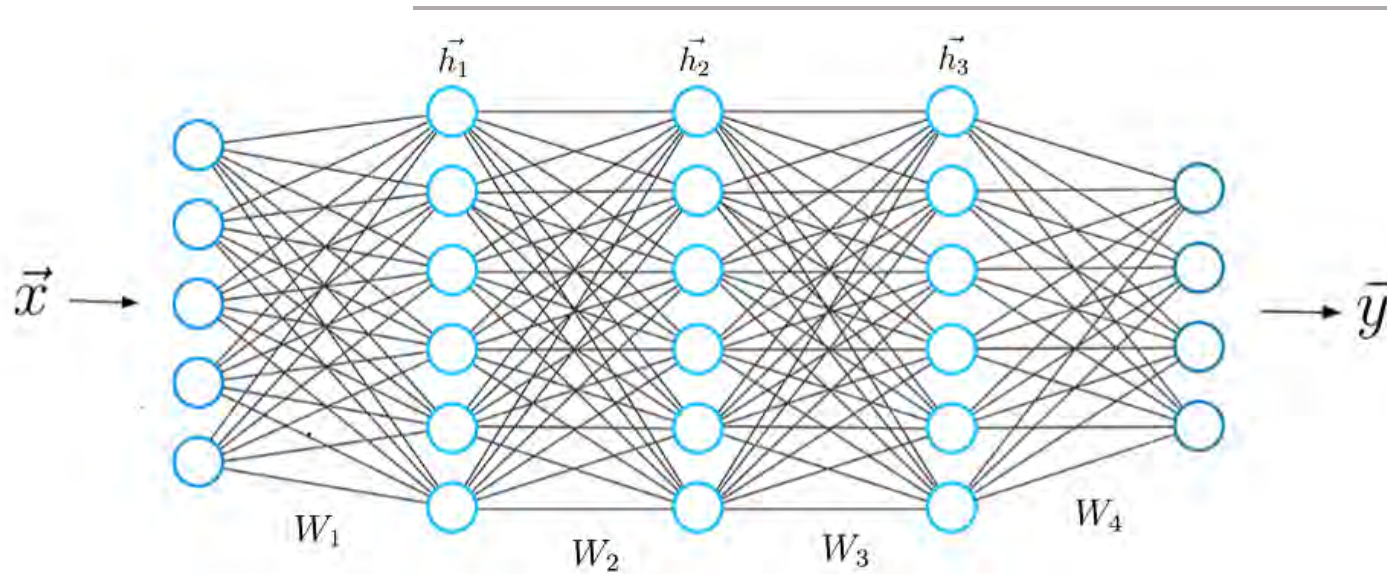
Deep Learning

Steps 1 and 2 are combined into 1 step.

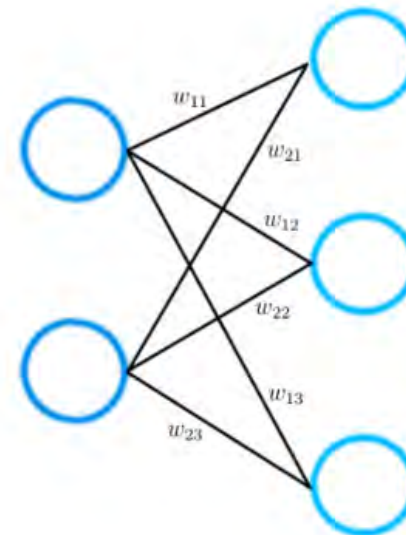




Neural Networks

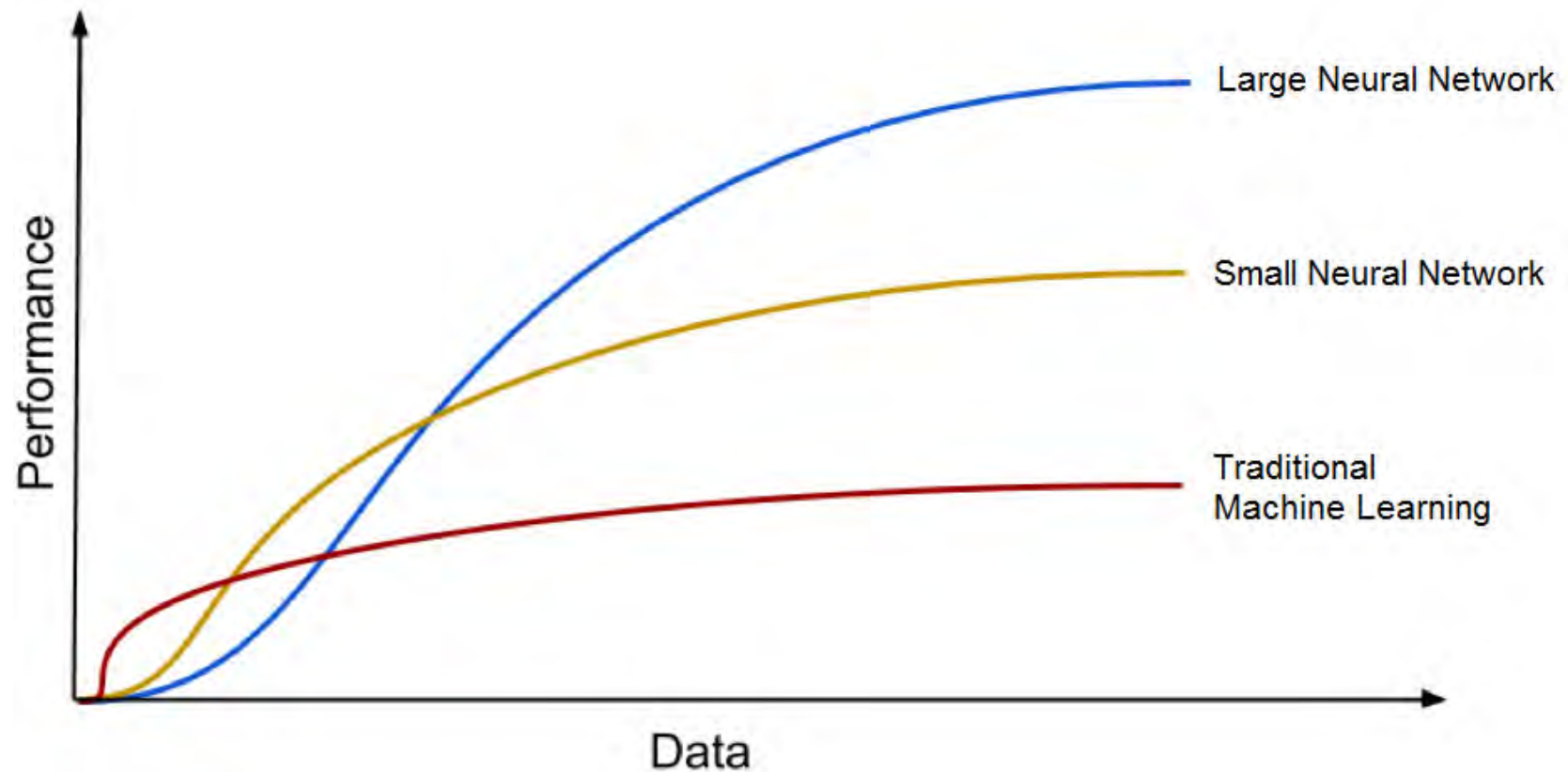


The challenge in training a neural network is finding a set of weights that give the most accurate output.





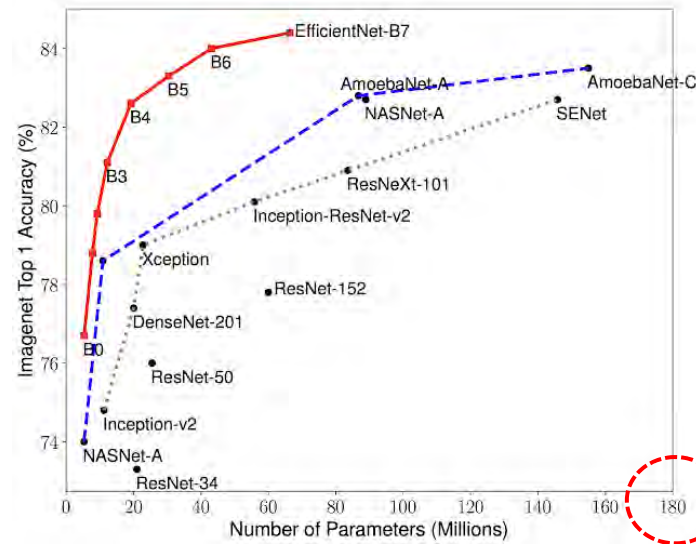
Performance



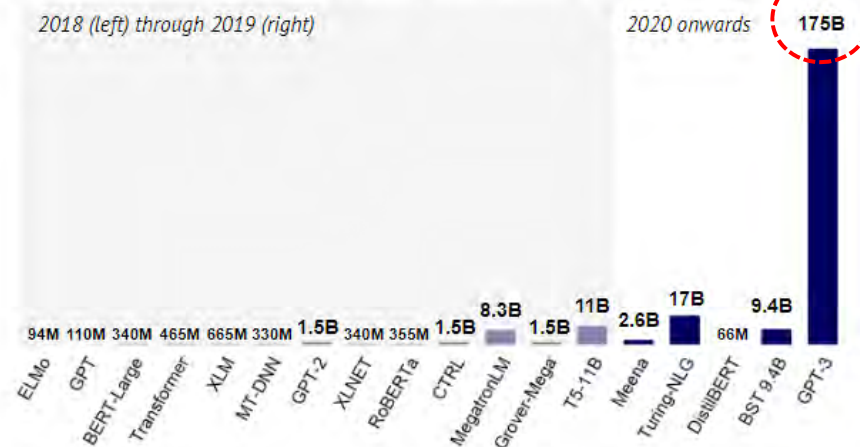
Deep Learning Algorithms get better with the increasing amount of data.



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.

stateof.ai 2020



Deep Learning in Action



10 mins

bit.ly/google_teachable

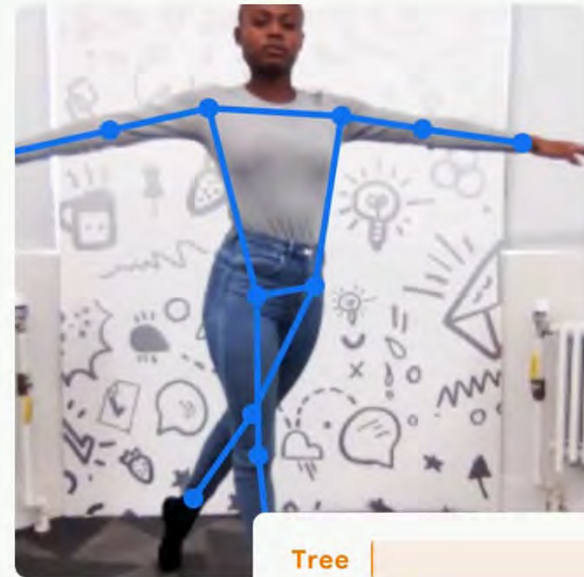


Teachable Machine

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



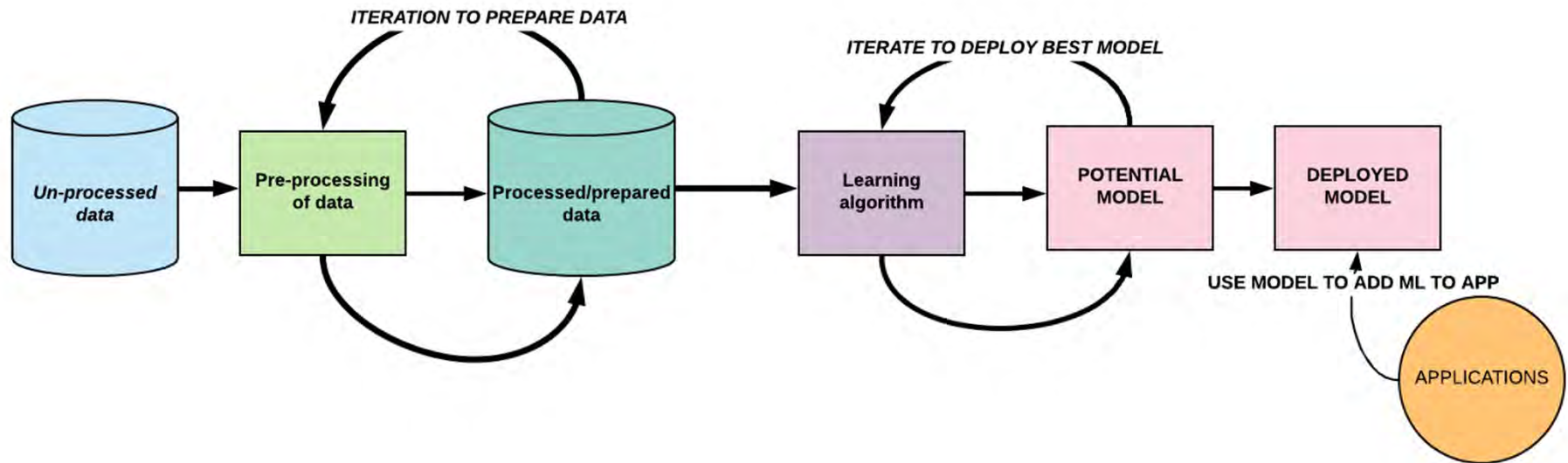
15 Mins Break

bit.ly/top10_2020





Machine Learning workflow



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

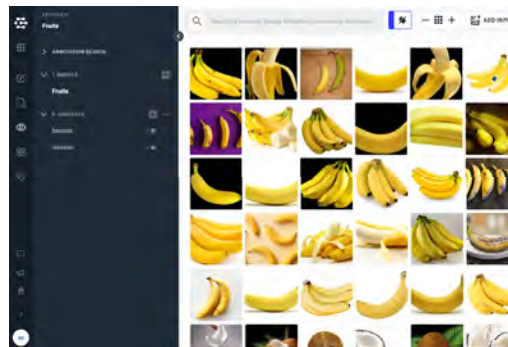


Code-Free Machine Learning tools

Microsoft Azure
Machine Learning Studio
(Classic)



Clarifai



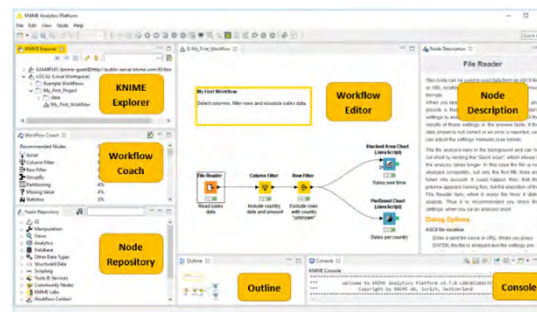
Peltarion



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-bas	length	width	height	curb-wgt	engine-type	num-of-cyl	engine-stk	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
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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
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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



45 mins 30

Individual Activity



60 mins Lunch Break

Some interesting videos

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

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											

Azure Machine Learning

My First Experiment [Predictive Exp.]

1. VIEW SCHEMA

2. PREDICT

Input: input1

Sheet1!A1:Z6

☒ My data has headers

Use sample data

Output: output1

Sheet1!A10

☒ Include headers

Predicting will override existing values. This can't be undone. [Got it!](#)

Predict ☐ Auto-predict

3. ERRORS

Step 1:

Watch and listen to the instructor's demonstration



15 mins

Step 2:

Work through the activities



45 mins

Individual Activity



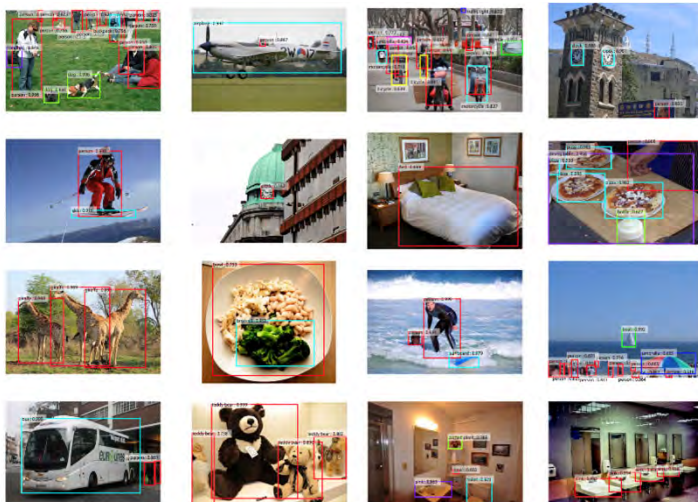
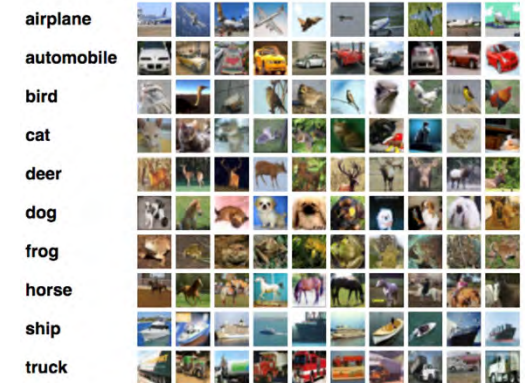
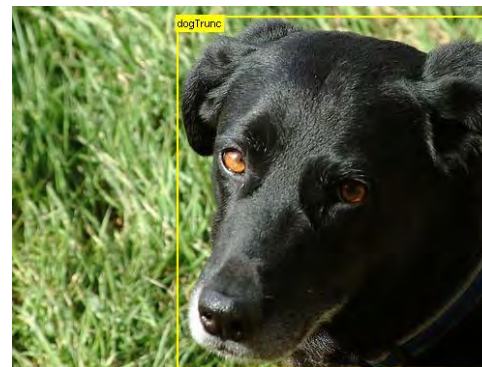
Optional Activities

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



Applications of Computer Vision

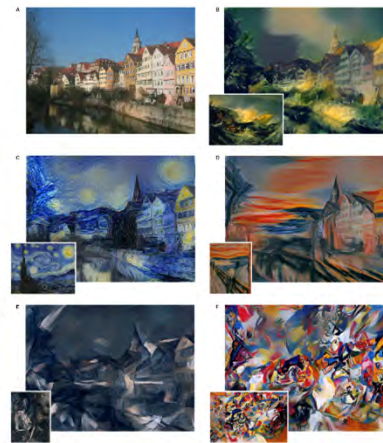
- Image Classification
- Image Classification With Localization
- Object Detection
- Object Segmentation





Applications of Computer Vision

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

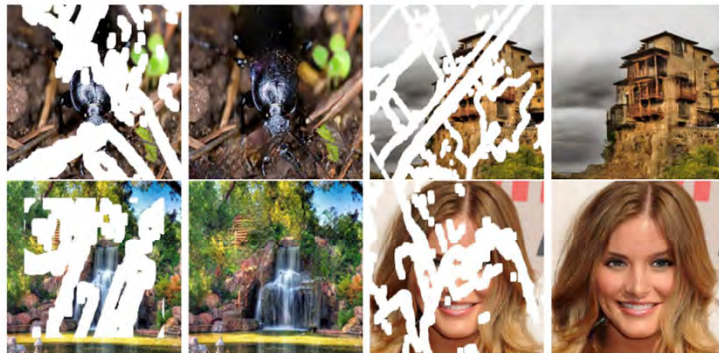


bicubic
(21.59dB/0.6423)

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



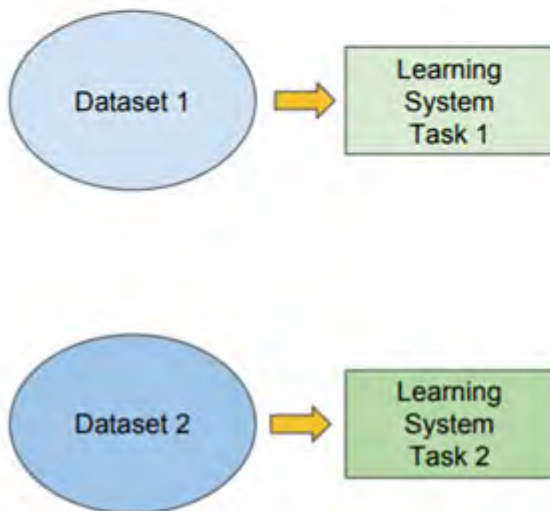
Transfer Learning

Traditional ML

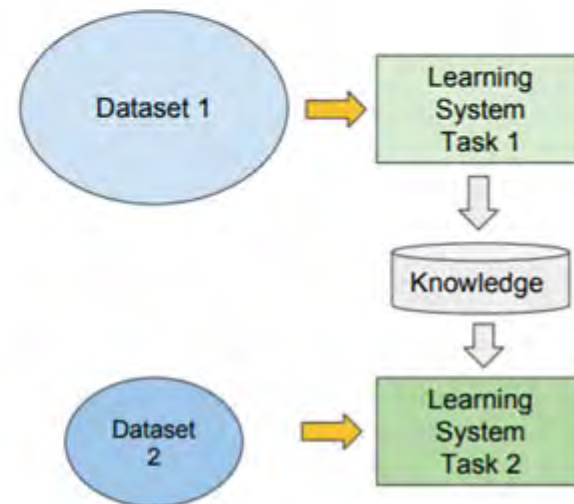
vs

Transfer Learning

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

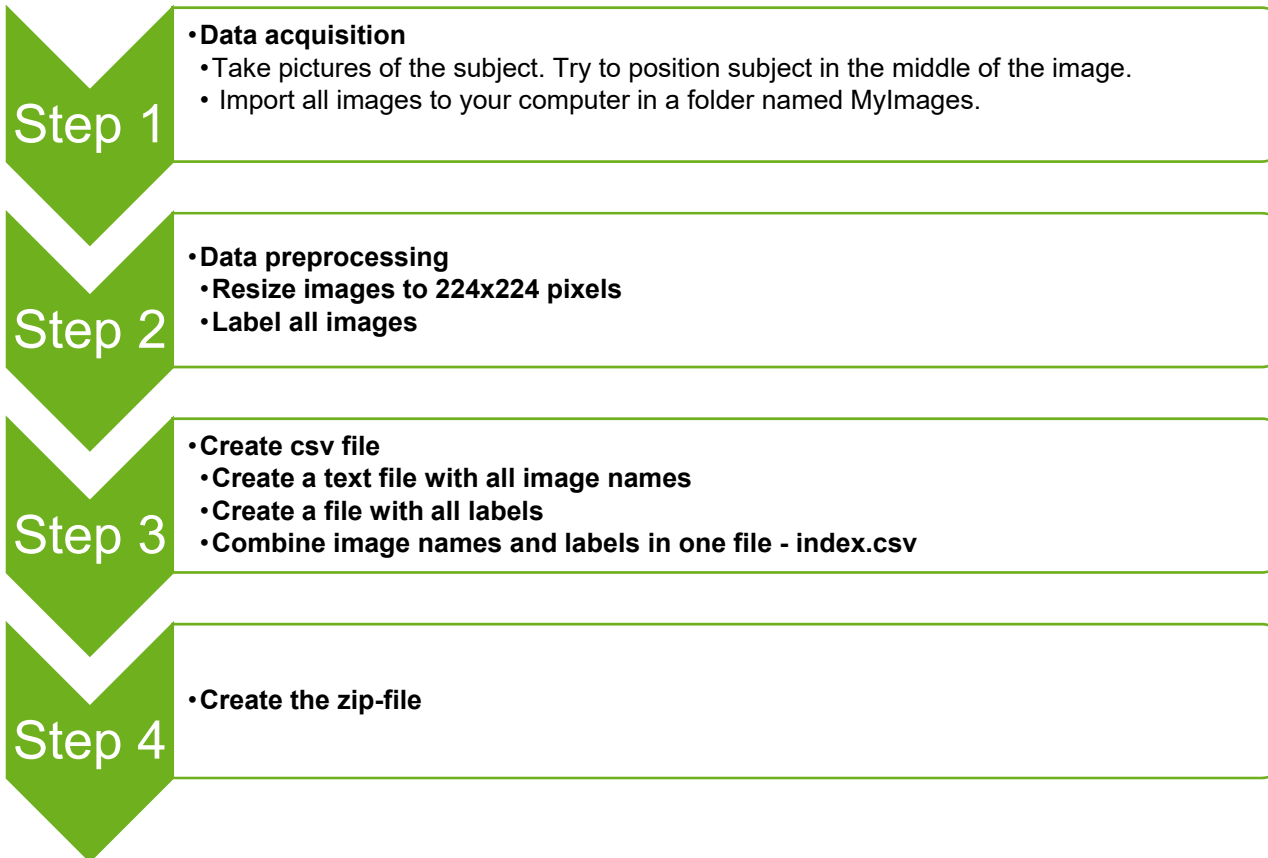


- Learning of a new task relies on the previous learned tasks:
 - Learning process can be faster, more accurate and/or need less training data





Creating a new dataset





Example

Dataset Explorer: Car damage dataset

- image
- test_images
- index.csv
- metadata.json

Dataset Explorer: Car damage dataset > image

Search 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

Image thumbnails (0.jpeg to 17.jpeg) showing various car damage examples.



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



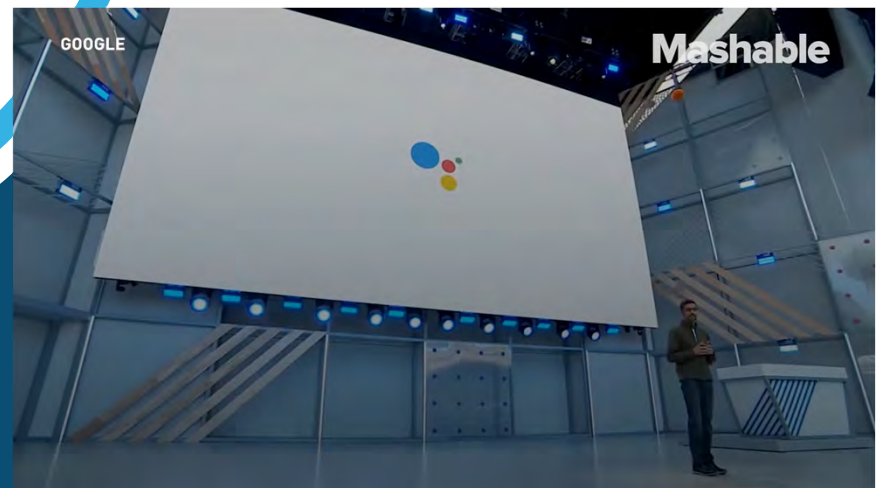
40 mins

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





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

sci-fi-or-not.csv - Excel

	A	B	C
1	Summary	Science Fiction	
2	Old Major, the old boar on the Manor Farm, calls the animals on t	0	
3	Alex, a teenager living in near-future England, leads his gang on n	1	
4	The text of The Plague is divided into five parts. In the town of Or	0	
5	The novel posits that space around the Milky Way is divided into c	1	
6	The book tells the story of Paul Bäumer, a German soldier wh	0	
7	Ged is a young boy on Gont, one of the larger islands in the north	0	
8	Living on Mars, Deckard is acting as a consultant to a movie crew f	1	
9	Beginning several months after the events in Blade Runner, Deck	1	
10	The book of Job tells the story of an extremely righteous man nar	0	
11	The story is told through the eyes of narrator James Ballard, name	0	
12	Nine years after Emperor Paul Muad'dib walked into the desert, b	1	
13	Candide contains thirty episodic chapters, which may be grouped	0	
14	The situation is desperate for the Bene Gesserit as they find them	1	
15	The story is presented by Le Fanu as part of the casebook of Dr He	0	
16	Homer Wells grows up in an orphanage where he spends his child	0	
17	The novel is told in epistolary format, as a series of letters, diary e	1	
18	The First Sally Alonso Quijano, the protagonist of the novel, is a re	0	
19	Twelve years after the events described in Dune (1965), Paul "Mu	1	
20	"Starting in the Middle", Part I of Darwin's Dangerous Idea, gets it	0	
21	Death of a Hero is the story of a young English artist named Georg	0	
22	Egypt's Pharaoh, fearful of the Israelites' numbers, orders that all	0	
23	On his thirtieth birthday, the chief financial officer of a bank, José	0	

sci-fi-or-not



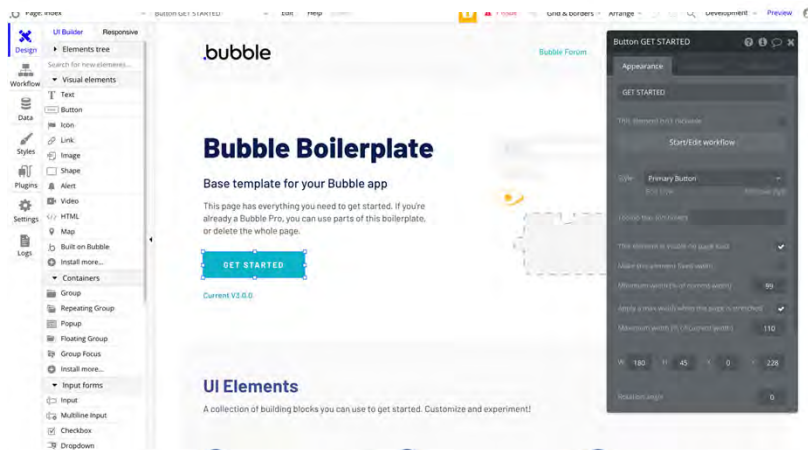
Linking Them Together

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.

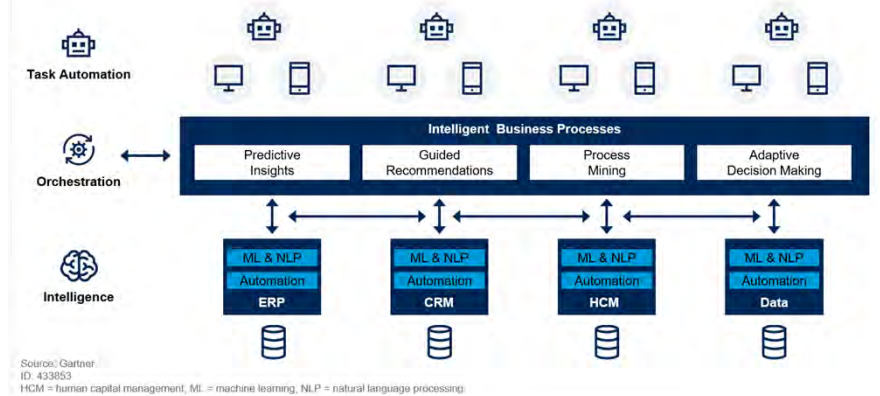
Discover the 5 most powerful Bubble alternatives in the comparison table below to decide which one fits you best. Find more detailed information about the other Bubble.io alternatives after the table.



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

RPA

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



Adobe Acrobat
Document

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

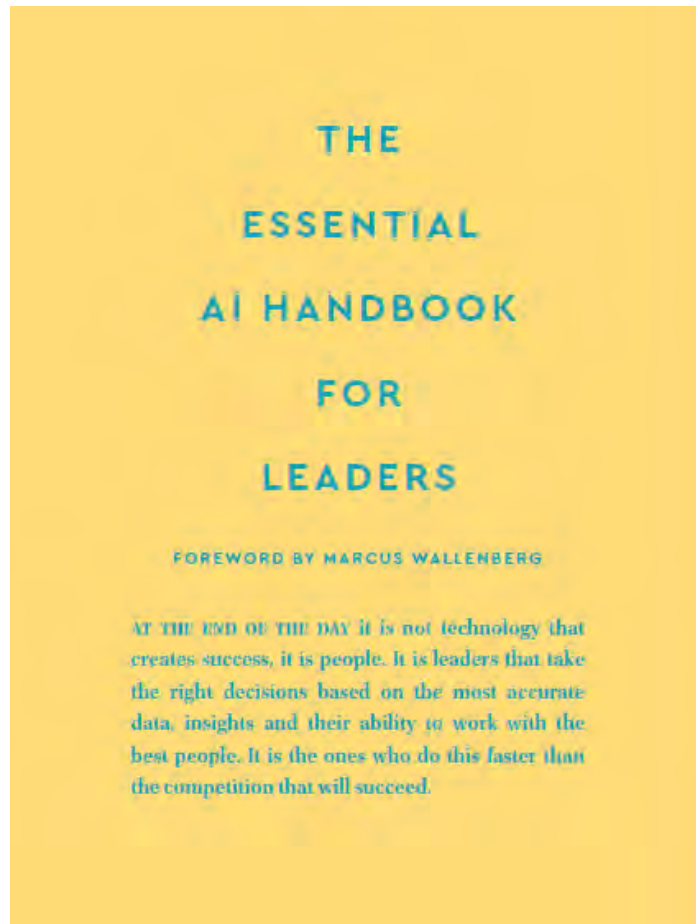


When to use Machine Learning

- **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.

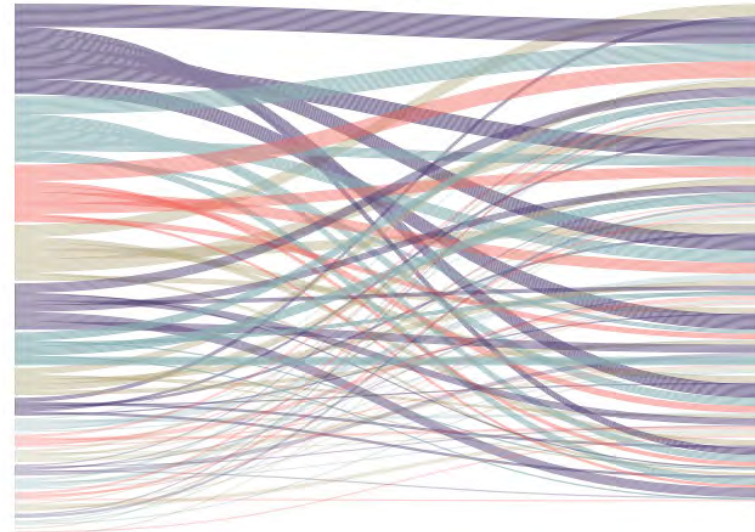


Some easy readings



ALGORITHMIA

2020 state of enterprise machine learning





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



Debrief

Step 1: Go to the following url

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



SCAN ME

OFFICIAL (CLOSED) \ NON-SENSITIVE



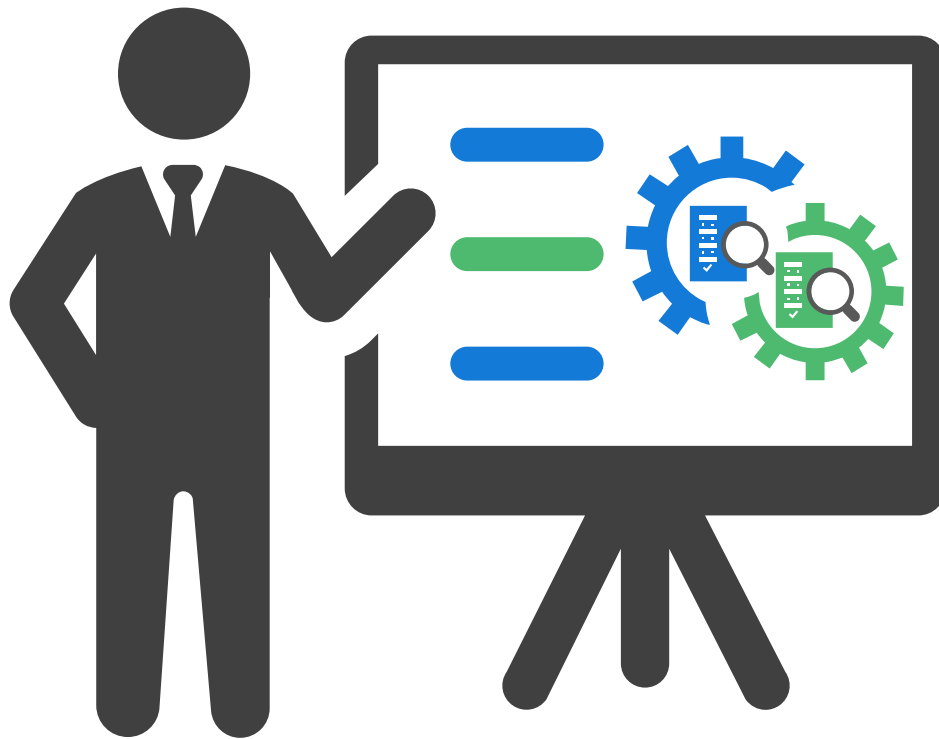
Survey

<https://bit.ly/2GRIT2P>





Summary



Email
seow_khee_wei@rp.edu.sg

Telegram
@kwseow

Source code:



Thank you