

Introduction to Data

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Personal Demo Home Page:

<https://www.richieyyptutorialpage.com/>

* Open Source and Not-For-Profit Sharing / Demo

What will be covered?

- Introduction to Data Analytics
- CRISP-DM
- Practical Activities
- Structured vs Unstructured Data
- Turning Data into Actionable Insights
- Transforming Unstructured Data into Actionable Insights

I want to analyze the data...



What will NOT be covered?



- Advanced Coding Techniques
- Complex Equations
- Comprehensive Concepts

Before We continue:

Please make sure you have a
Google account

A: Introduction to Data

This image shows a screenshot of a Python-based web application interface. On the left, there is a dark sidebar with white text. At the top of the sidebar is a red 'X' icon. Below it, the text reads: "This is a python based web app - AI for FUN." followed by "For more info, please contact:" and a link "[Dr. Yong Poh Yu](#)". Below this, the text "Step 1: Select/Insert key" is displayed. At the bottom of the sidebar is a button labeled "Default" with a dropdown arrow, and a small question mark icon (circled with a question mark) is located above the "Default" button. The main area of the screen is black and contains the text "Demo: AI for Fun." in large white letters.

Myth!

Data science is a
field for
mathematical geeks



Myth!

Learning a tool is the equivalent of learning data science



Myth!

Data scientists will be
replaced by artificial
intelligence soon



What is ...

**Data Science?
Artificial Intelligence?
Machine Learning?**



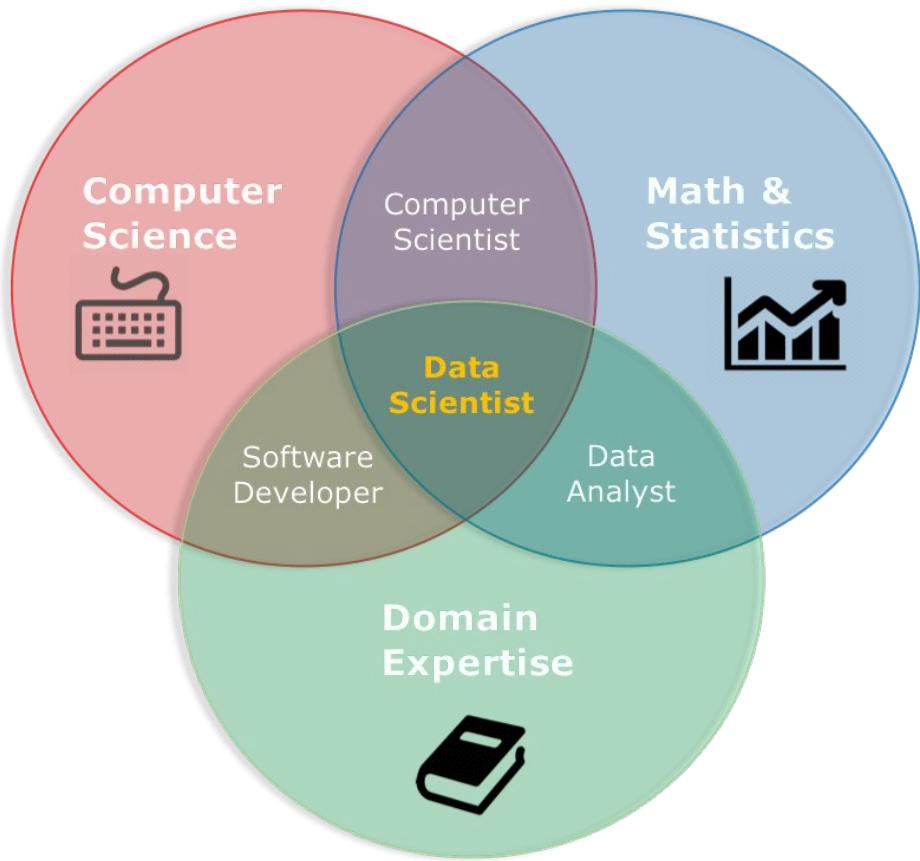


Image Credit: [HERE](#)



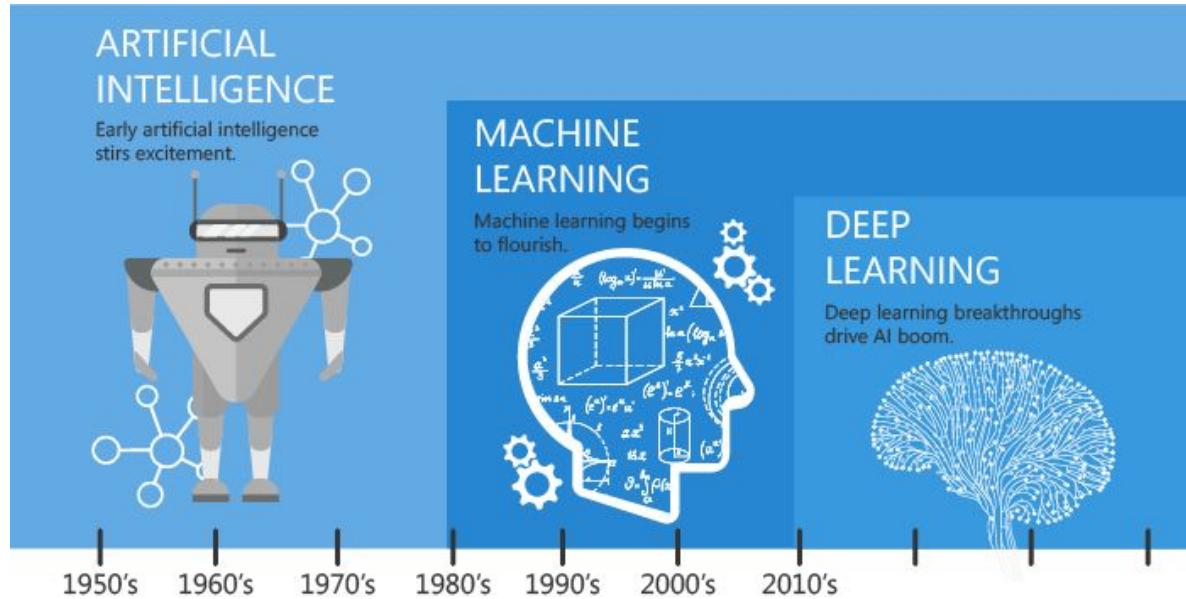


Image Credit: [HERE](#)

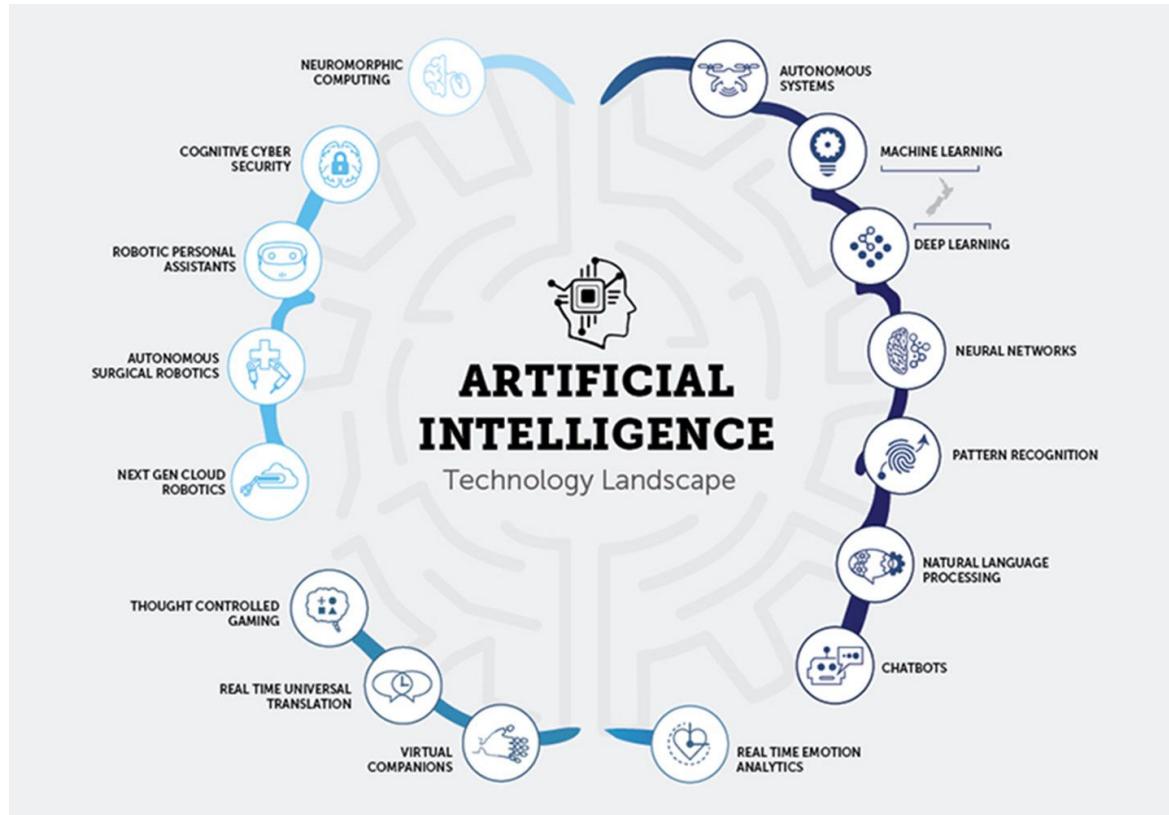


Image Credit: [HERE](#)

Data, AI, ML
Berpisah tiada

Trend: Job Opportunities



JobStreet by SEEK

Search Jobs

MyJobStreet

C

X
Salary Job type Date posted | Sort By **Relevance** ▾

1-30 of 2,406 jobs



Data Engineer

Trend: Job Opportunities



malaysianpaygap

Lead data science, manager,
industry data analytics

36/Malay/male

8years

Location KL

PhD in artificial intelligence

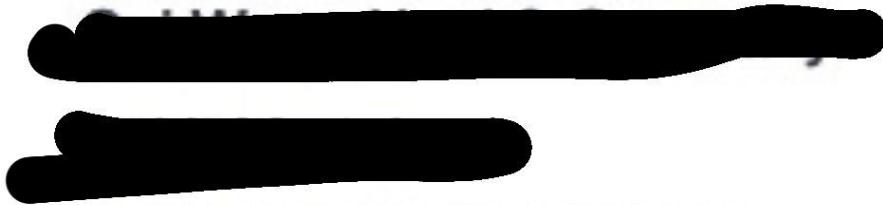
Current salary: 18,200 basic, 400
allowance

Data science is the new exciting trends. Salary pay is varied depending on qualifications and experience. MNC companies are willing to pay high if you have the right expertise and experience handling these complex projects. Many people claimed they are data scientists but come short in interview/real world applications. Ability to prove and understand your worth. You will always be in upper hands discussing salary with HR or recruiters



Trend: Job Opportunities

Data Scientist



MYR 1,500 - MYR 2,100

Posted on 24-Feb-22





“Let’s shrink Big Data into Small Data ...
and hope it magically becomes Great Data.”

Image Credit: [HERE](#)

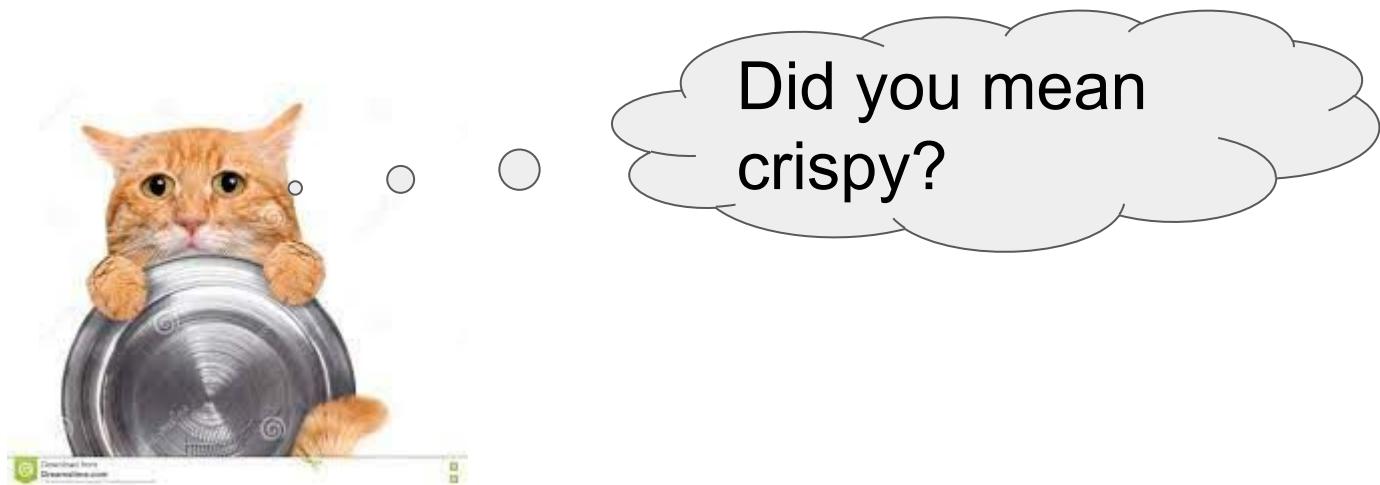
When you have mastered numbers, you will in fact no longer be reading numbers, any more than you read words when reading books. You will be reading meanings.

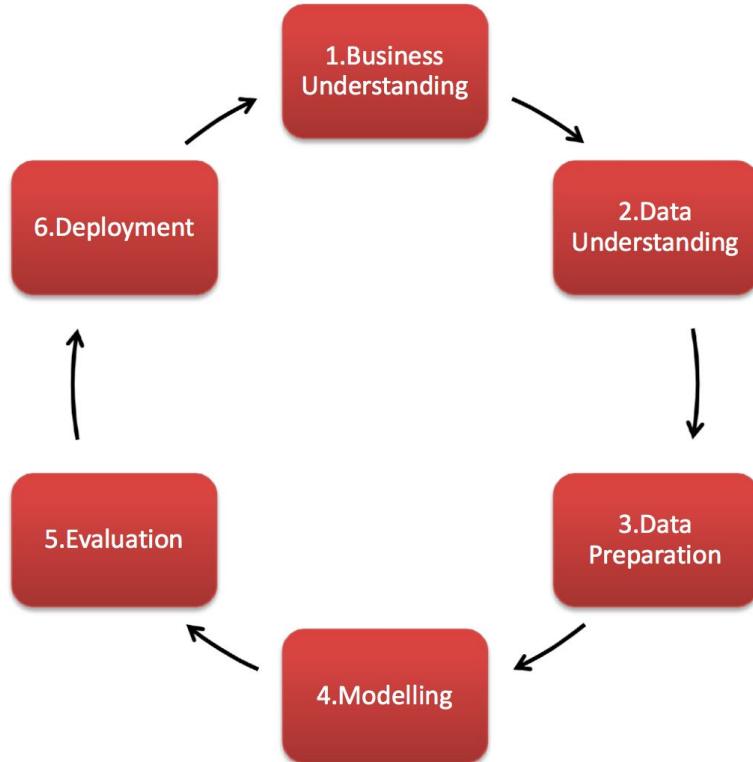
~ W.E.B. Du Bois

- 1. Measure the right things**
2. Ask the right questions to stakeholders
3. Use segmentation to drive action
4. Use clear visualizations to convey your message
5. Discover the context of your data set
- 6. Build a solid optimization plan**
7. Construct a great hypothesis
8. Integrate data sources
9. Break down organizational silos
- 10. Don't forget to hire smart people**

Source: [HERE](#)

B: CRISP-DM





Business
Data

A vertical double-headed arrow icon, consisting of a thick grey vertical line with a small gap in the center, indicating a bidirectional relationship between Business and Data.

Image Credit: [HERE](#)

1) Business Understanding



What are the leading factors?

Automate a data-drive solution

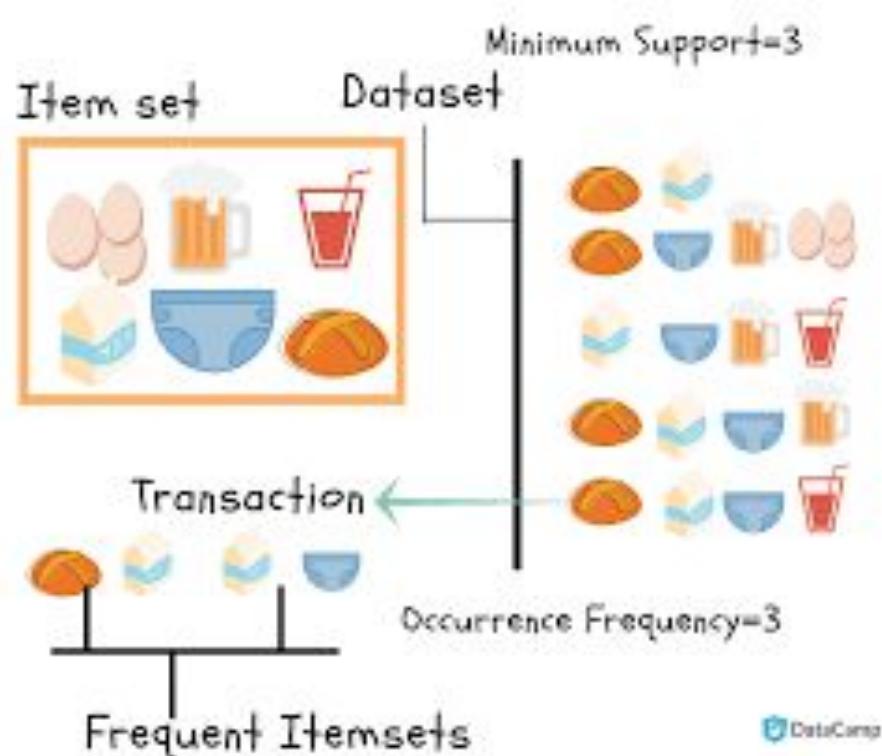
Use Case: Stock Price Forecasting



High Risk,
High Return



Use Case: Market Basket Analysis

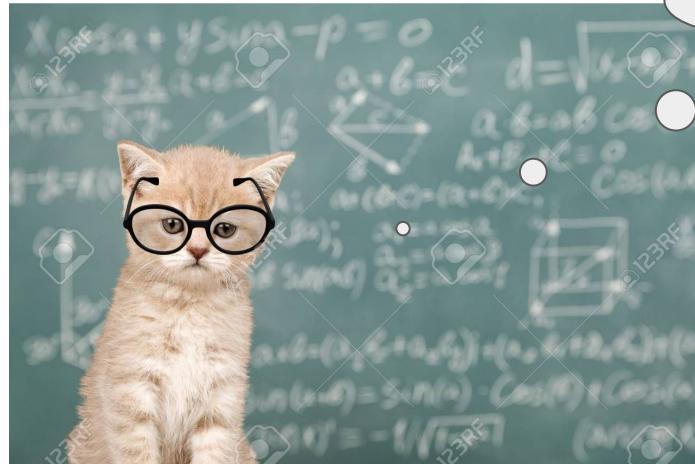


Use Case : Customer Segmentation



[https://www.richieyyptutorialpage.com/demo-r-series/
customer-segmentation-using-k-means](https://www.richieyyptutorialpage.com/demo-r-series/customer-segmentation-using-k-means)

What is the problem with the previous dashboard?



Data
Storytelling is
important

Customer Segmentation - Background

- Clustering
- k-means
- Spending behaviors, demographic Information etc

Use Case: Household Income and Food Expenditure



<https://www.richieyyptutorialpage.com/demo-r-series/household-income-and-food-expenditure>

What is the problem with the previous dashboard?



When data is
extraordinary ...

Background

- Data Visualization
- Storytelling
- Domain Knowledge

Use Case 3: Customer Churn Activity



What are the leading factors?

Can you give a list of potential churners?



Background

- Classification
- Random Forest (Machine Learning)
- Garbage in, Garbage out

And MANY MANY MORE:

Marketing	Risk Management	Government	Web	Logistics	Other
Response modeling	Credit risk modeling	Tax avoidance	Web analytics	Demand forecasting	Text analytics
Net lift modeling	Market risk modeling	Social security fraud	Social media analytics	Supply chain analytics	Business process analytics
Retention modeling	Operational risk modeling	Money laundering	Multivariate testing		
Market basket analysis	Fraud detection	Terrorism detection			
Recommender systems					
Customer segmentation					

2) Data Understanding



What are the X?

What is the y?

Missing value?

Outliers?

Get Your Hands Dirty



Yu Yong Poh, [GNU General Public License v3.0](#)

Activity 1

Get the Dataset at [HERE](#). Make a copy.

How many observations (rows)
do we have? _____

How many columns (variables)
do we have? _____

A	B	C	D	E	F	G	H	I	J	K	L	M	N
PostalCode	HashCode	Age	Gender	Payment Method	rowNumber	LastTransaction	ChurnDate						
49278	BOl2gvxC	64	male	credit card	1	2012-04-17 02:05:40	2014-01-24 18:27:13						
39982	UC8cDTW	35	male	cheque	2	2011-11-25 06:58:03	2012-08-09 13:01:39						
87213	tKlbadnh	25	female	credit card	3	2012-02-15 17:29:26							
38548	RcW2Pb3w	39	female	credit card	4	2010-10-09 11:22:28	2013-11-07 10:27:31						
38794	z9twAAJ4	39	male	credit card	5	2012-06-13 10:13:08							
44573	akWNQl4e	28	female	cheque	6	2010-07-16 09:39:10	2011-06-23 07:08:53						
70936	gIrpDLzY	21	female	credit card	7	2012-03-15 22:17:03							
71302	Pn6fkbuL	48	male	credit card	8	2011-06-16 21:46:18							
49705	3rGPBX98	70	female	credit card	9	2011-03-30 14:17:44	2012-07-05 02:34:33						
36049	9Eng7yIO	36	male	credit card	10	2013-04-17 18:06:59							
26323	uP7dRmDK	22	male	credit card	11	2013-03-11 17:37:27							
42376	XlxhOIu	53	female	cash	12	2010-08-31 17:39:06	2013-08-31 17:21:18						
42215	KYmSR2vE	27	male	cash	13	2011-07-15 07:16:15							
80059	EOGj6tDH	234	männlich	credit card	14	2014-02-26 18:22:25							
57984	yTDIEBxc	22	male	cash	15	2011-05-09 06:30:35							
52245	3ANQ9shn	49	female	credit card	16	2011-02-18 10:22:00	2012-04-03 06:13:43						
56625	BDEPLKmG	24	female	cash	17	2011-01-22 03:19:03	2013-02-28 23:50:54						
50003	8vB4xOrN	45	männlich	credit card	18	2013-02-11 21:16:18							
37852	1SDIHCF7	45	male	credit card	19	2011-02-06 11:31:19							
66713	gQBQD28Lw	66	female	cash	20	2011-03-09 23:04:48	2013-04-19 04:27:33						
70052	G1c0kZqQ	82	female	cash	21	2010-10-10 10:29:03	2013-12-17 15:21:46						
44272	UC8cDTW	35	female	credit card	22	2010-10-14 07:48:11							
71962	n5YVLU7v	17	female	credit card	23	2011-08-14 16:40:26							

Activity 1

No	Dimension	Data Type	Comment
1	PostalCode	Integer	Whole number, therefore use integer
2	HashCode	Polynomial	Different strings, so polynomial is fine.
3	Age	Integer	Whole number, therefore use integer
4	Gender	Polynomial	Should be binomial, but inconsistent data type
5	PaymentMethod	Polynomial	3 payment methods: what are they?
6	rowNumber	Integer	Integer
7	LastTransaction	Date_time	Contains date
8	ChurnDate	Date_time	Contains date

3) Data Preparation



Missing value?

Outliers?

New Column/Variable/Feature?

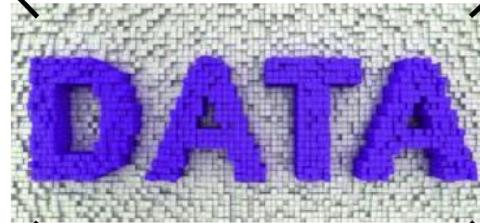
I heard that ...

Garbage in,
garbage out
(GIGO)

Key Ingredient

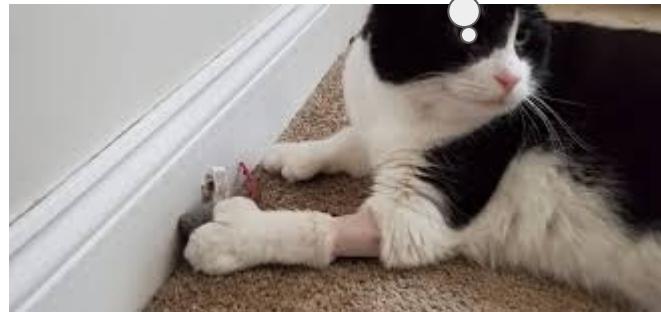
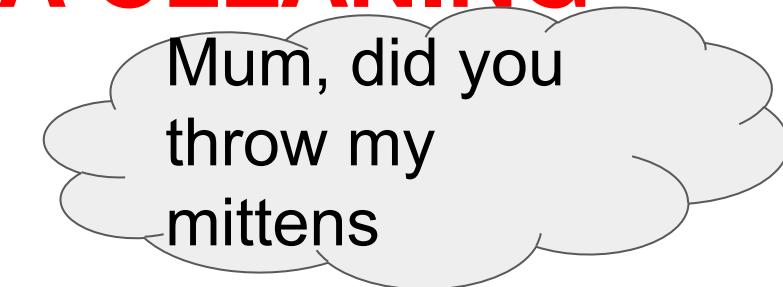
Messy

The more the
better



I heard that ...

DATA SCIENCE = DATA CLEANING



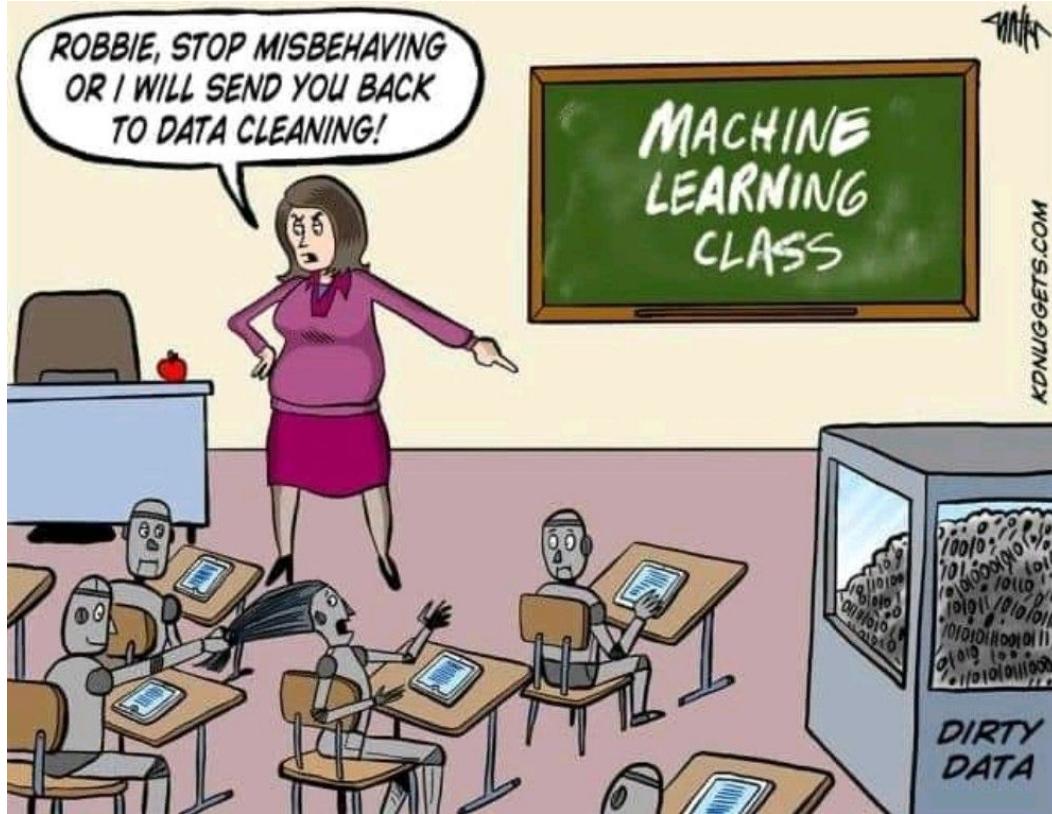


Image Credit: [HERE](#)

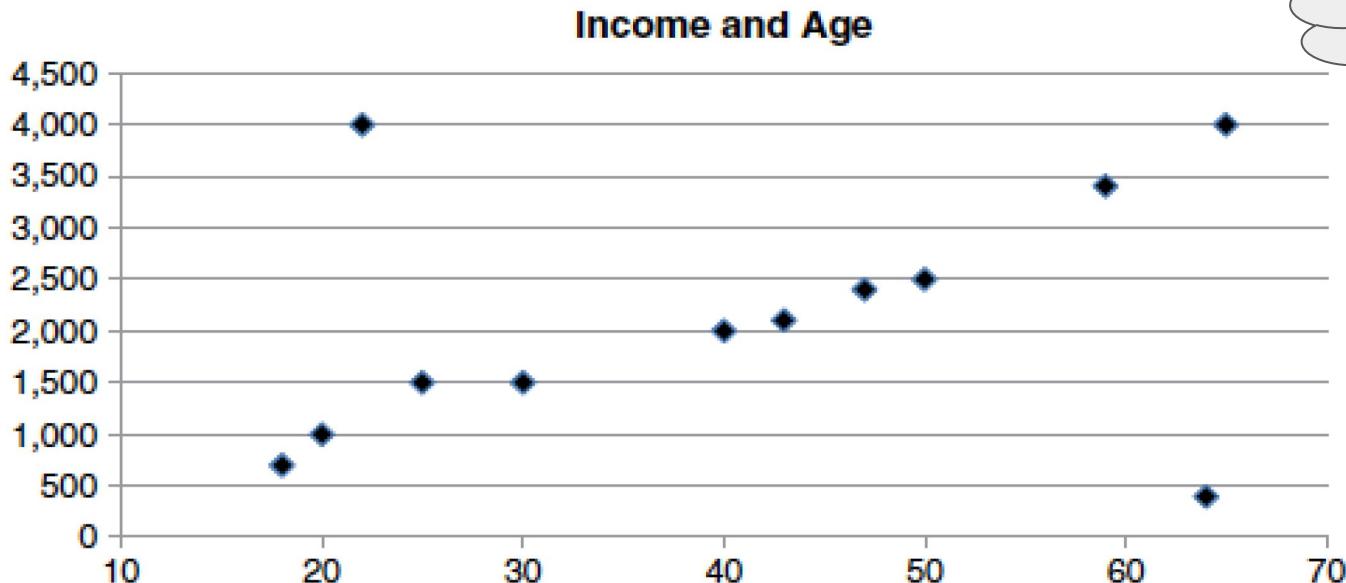
Data, AI, ML
Berpisah tiada

I heard that data is incomplete...

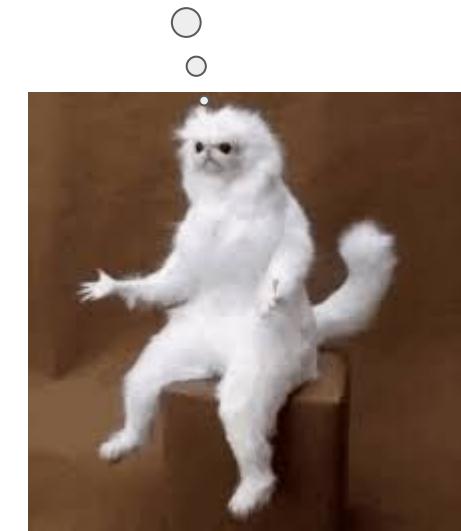
ID	Age	Income	Marital Status	Credit Bureau Score	Class
1	34	1,800		620	Churner
2	28	1,200	Single		Nonchurner
3	22	1,000	Single	?	Nonchurner
4	60	2,200	Widowed	700	Churner
5	58	2,000	Married		Nonchurner
6	44				Nonchurner
7	22	1,200	Single		Nonchurner
8	26	1,500	Married	350	Nonchurner
9	34		Single		Churner
10	50	2,100	Divorced		Nonchurner



I heard that data always surprises us...



Win liao
lo



I heard that data quality is important...



Activity 2: Dealing with Missing Values

4 factors to consider when dealing with missing data:

- i. If an attribute contains too many missing data, consider discarding it.
 - ii. In a categorical (ChurnDate) attribute with missing values, consider introducing a new category eg. “*unknown*”. (“*unknown*” means something very different from missing)
 - iii. If only few rows contain missing values, consider removing those rows.
 - iv. If we cannot afford to discard data, consider imputing values into the missing values.
- Analyze your data. Which attributes possess missing values?

Activity 2: Dealing with Missing Values

For *Age* and *Gender*, only 1 missing value. Doesn't make much difference to remove (filter) them.

	A	B	C	D	H
1	PostalCode	HashCode	Age	Gender	ChurnDate
2	49278	BOI2gvcX	64	male	05:40 2014-01-24 18:27:13
3	39982	IJC8cDTW	35	male	58:03 2012-08-09 13:01:39
4	87213	tKlbadnh	25	female	29:26
5	38548	RcW2Pb3w	39	female	22:28 2013-11-07 10:27:31
6	38794	z9twA4AJ	39	male	13:08
7	44573	akWNQl4e	28	female	39:10 2011-06-23 07:08:53
8	70936	glrPDLzY	21	female	17:03
9	71302	Pn6FkbuL	48	male	46:18
10	49705	3rGPBX98	70	female	17:44 2012-07-05 02:34:33
11	36049	9Eng7ylo	36	male	06:59
12	26323	uP7dRmDK	22	male	37:27
13	42376	XlxhfOlo	53	female	39:06 2013-08-31 17:21:18
14	42215	KYmSR2vE	27	male	16:15
15	80059	EOGj6tDH	234	männlich	22:25
16	57984	yTDIEBXc	22	male	30:35
17	52245	3ANQ9shn	49	female	22:00 2012-04-03 06:13:43
18	56625	BDEPLKmG	24	female	19:03 2013-02-28 23:50:54
19	50003	8vB4XorN	45	männlich	16:18
20	37852	1SDtHcf7	45	male	credit card

Activity 2: Dealing with Missing Values

Copy of Customer Data **XLSX**

File Edit View Insert Format Data Tools Help Last edit was seconds ago

100% \$.00 123 Calibri 11 B I S A

C1 | fx | Age

	A	B	C	D	E	F	G	H	I
1	PostalCo	HashCode	Age	Gender	Payment Method	rowNumber	LastTransaction	ChurnDate	
2	49278	BOI2gvcX	64			Sort ↗ A			
3	39982	IJC8cDTW	35			Sort by color			
4	87213	tKibadnh	25			Filter by color			
5	38548	RcW2Pb3w	39			Filter by condition			
6	38794	z9twA4AJ	39			Is not empty			
7	44573	akWNQl4e	28			Filter by values			
8	70936	glrPDLzY	21			Select all - Clear			
9	71302	Pn6FkbuL	48						
10	49705	3rGPBX98	70						
11	36049	9Eng7yl0	36						
12	26323	uP7dRmDK	22						
13	42376	XlxhfOlo	53						
14	42215	KYmSR2vE	27						
15	80059	EOGj6tDH	234						
16	57984	yTDIEBXc	22						
17	52245	3ANQ9shn	49						
18	56625	BDEPLKmG	24						
19	50003	8vB4xOrN	45						
20	37852	1SDtHCF7	45						
21	66713	gQBDZ8Lw	66						
22	70052	G1c0kZqQ	82						
23	44272	IJC8cDTW	35						
24	71962	n5YVLJ7v	17						

Activity 3: Creating a new Column

1. For ChurnDate, it involves semantics and has meaning, hence removing them is NOT an option. (But we know, that if the ChurnDate is missing, the customer is still loyal)
2. So let's generate a “*Churn*” attribute that will tell us whether a customer is ‘loyal’ or ‘churn’.

Activity 3: Creating a new Column

A screenshot of a Google Sheets spreadsheet. The top menu bar shows various icons and settings like 100% zoom, currency, and font size. The formula bar contains the formula `=ArrayFormula(if(H2:H999="", "loyal", "false"))`. The main table has columns labeled A through K. Column A is 'PostalCo', B is 'HashCode', C is 'Age', D is 'Gender', E is 'Payment Method', F is 'rowNumber', G is 'LastTransaction', H is 'ChurnDate', and I is 'Churn'. The 'Churn' column contains values 'false', 'false', 'loyal', 'false', 'loyal', 'false', 'loyal', 'loyal', 'false', 'loyal', and 'loyal'. The last row, row 12, has a partially visible 'HashCode' value starting with 'uP7dRmDK'.

	A	B	C	D	E	F	G	H	I	J	K
	PostalCo	HashCode	Age	Gender	Payment Method	rowNumber	LastTransaction	ChurnDate	Churn		
1	49278	BOI2gvcX	64	male	credit card	1	2012-04-17 02:05:40	2014-01-24 18:27:13	false		
2	39982	IJC8cDTW	35	male	cheque	2	2011-11-25 06:58:03	2012-08-09 13:01:39	false		
3	87213	tKlbadnh	25	female	credit card	3	2012-02-15 17:29:26		loyal		
4	38548	RcW2Pb3w	39	female	credit card	4	2010-10-09 11:22:28	2013-11-07 10:27:31	false		
5	38794	z9twA4AJ	39	male	credit card	5	2012-06-13 10:13:08		loyal		
6	44573	akWNQl4e	28	female	cheque	6	2010-07-16 09:39:10	2011-06-23 07:08:53	false		
7	70936	glrPDLzY	21	female	credit card	7	2012-03-15 22:17:03		loyal		
8	71302	Pn6FkbuL	48	male	credit card	8	2011-06-16 21:46:18		loyal		
9	49705	3rGPBX98	70	female	credit card	9	2011-03-30 14:17:44	2012-07-05 02:34:33	false		
10	36049	9Eng7yl0	36	male	credit card	10	2013-04-17 18:06:59		loyal		
11	26323	uP7dRmDK	22	male	credit card	11	2013-03-11 17:37:27		loyal		

Activity 4: Removing Outliers/Extraordinary Values

Let us assume that in this case, the term and condition states that the minimum age is more than 16 years old. Hence, there are invalid age values (2 years old and 234 years old!)

Challenge: Multiple filters in one column....??

Activity 4: Removing Outliers/Extraordinary Values

Solution - Customer Data [XLSX](#)

File Edit View Insert Format Data Tools Help Last edit was seconds ago

100% \$.0 .00 123 Calibri 11 B I A fx Age

PostalCo	HashCode	Age	Gender	Payment Method	rowNumber	Last Transaction	Churn Date	Churn
49278	BOl2gvcX	64				2012-04-17 02:05:40	2014-01-24 18:27:13	churn
39982	IJC8cDTW	35				2011-11-25 06:58:03	2012-08-09 13:01:39	churn
87213	tKlbadnh	25				2012-02-15 17:29:26		loyal
38548	RcW2Pb3w	39				2010-10-09 11:22:28	2013-11-07 10:27:31	churn
38794	z9twA4AJ	39				2012-06-13 10:13:08		loyal
44573	akWNQl4e	28				2010-07-16 09:39:10	2011-06-23 07:08:53	churn
70936	glrPDLzY	21				2012-03-15 22:17:03		loyal
71302	Pn6FkbuL	48				2011-06-16 21:46:18		loyal
49705	3rGPBX98	70				2011-03-30 14:17:44	2012-07-05 02:34:33	churn
36049	9Eng7yI0	36				2013-04-17 18:06:59		loyal
26323	uP7dRmDK	22				2013-03-11 17:37:27		loyal
42376	XlxhfOlo	53				2010-08-31 17:39:06	2013-08-31 17:21:18	churn
42215	KYmsR2vE	27				2011-07-15 07:16:15		loyal
57984	yTDIEBxc	22				2011-05-09 06:30:35		loyal
52245	3ANQ9shn	49				2011-02-18 10:22:00	2012-04-03 06:13:43	churn
56625	BDEPLKmG	24				2011-01-22 03:19:03	2013-02-28 23:50:54	churn
50003	8vB4xOrN	45				2013-02-11 21:16:18		loyal
37852	1SDtHcf7	45				2011-02-06 11:31:19		loyal
66713	gQBDZ8lw	66				2011-03-09 23:04:48	2013-04-19 04:27:33	churn
70052	G1c0kZqQ	82				2010-10-10 10:29:03	2013-12-17 15:21:46	churn
44272	IJC8cDTW	35				2010-10-14 07:48:11		loyal
71962	nSYVLJ7v	17				2011-08-14 16:40:26		loyal
30942	tldMRZzN	52				2010-06-23 03:58:56	2013-05-06 15:12:32	churn

Is not empty

Filter by values

Select all · Clear

✓ 90

✓ 91

2

234

Cancel OK

RapidMiner Data

Activity 5: Cleaning Gender Column

- Gender attribute contains male, female, *manlich* and *weiblich* (German terms for male and female).

Activity 5: Cleaning Gender Column

```
=ArrayFormula(if(D2:D1001="männlich","male",D2:D1001))
```

B	C	D	E	F	G	H	I	J
ashCode	Age	Gender	Payment Method	rowNumber	LastTransaction	ChurnDate	Churn	Gender
OI2gvcX	64	male	credit card	1	2012-04-17 02:05:40	2014-01-24 18:27:13	churn	male
C8cDTW	35	male	cheque	2	2011-11-25 06:58:03	2012-08-09 13:01:39	churn	male
Qibadnh	25	female	credit card	3	2012-02-15 17:29:26		loyal	female
W9PQZ	28	female	bank transfer	4	2012-10-20 11:22:20	2012-11-07 10:27:21	loyal	female

Activity 5: Cleaning Gender Column

A screenshot of a Google Sheets spreadsheet. The formula bar at the top contains the formula: =ArrayFormula(if(J2:J1001="weiblich", "female", J2:J1001)). The spreadsheet has a header row with columns labeled B through L. The data starts from row 2, with columns A through I. The 'Gender' column (I) contains mixed values ('male' and 'female'). The 'Gender' column (L) contains the cleaned values, where 'weiblich' has been replaced by 'female'. The 'Gender' column (K) also contains the cleaned values.

Col	B	C	D	E	F	G	H	I	J	K	L
HashCode	Age	Genre	Payment Meth	rowNumber	LastTransaction	ChurnDate	Churn	Gender	Gender	Gender	Gender
BOl2gvcX	64	male	credit card	1	2012-04-17 02:05:40	2014-01-24 18:27:13	churn	male	male	male	male
IJC8cDTW	35	male	cheque	2	2011-11-25 06:58:03	2012-08-09 13:01:39	churn	male	male	male	male
tKlbardnh	25	female	credit card	3	2012-02-15 17:29:26		loyal	female	female	female	female
RcW2Pb3w	39	female	credit card	4	2010-10-09 11:22:28	2013-11-07 10:27:31	churn	female	female	female	female
z9twA4AJ	39	male	credit card	5	2012-06-13 10:13:08		loyal	male	male	male	male
akWNQl4e	28	female	cheque	6	2010-07-16 09:39:10	2011-06-23 07:08:53	churn	female	female	female	female
glrPDLzY	21	female	credit card	7	2012-03-15 22:17:03		loyal	female	female	female	female

Activity 6: Getting the First Character of texts in the PostalCode Column

A screenshot of a Google Sheets spreadsheet. The formula `=ArrayFormula(LEFT(A2:A1001))` is entered in cell A2. The spreadsheet contains 10 rows of data, starting with row 2. The columns are labeled B through M. The data includes columns for customer ID (shCode), age, gender, payment method, row number, last transaction date, churn date, churn status, gender, and postal code. The postal code column (M) shows the result of the formula applied to each row, where the first character of the postal code is highlighted in blue.

B	C	D	E	F	G	H	I	J	K	L	M
shCode	Age	Gender	Payment Method	rowNumber	LastTransaction	ChurnDate	Churn	Gender	Gender	PostalCode	
0I2gvcX	64	male	credit card	1	2012-04-17 02:05:40	2014-01-24 18:27:13	churn	male	male	4	
8cDTW	35	male	cheque	2	2011-11-25 06:58:03	2012-08-09 13:01:39	churn	male	male	3	
badnh	25	female	credit card	3	2012-02-15 17:29:26		loyal	female	female	8	
W2Pb3w	39	female	credit card	4	2010-10-09 11:22:28	2013-11-07 10:27:31	churn	female	female	3	
twA4AJ	39	male	credit card	5	2012-06-13 10:13:08		loyal	male	male	3	
WNQI4e	28	female	cheque	6	2010-07-16 09:39:10	2011-06-23 07:08:53	churn	female	female	4	
PDLzY	21	female	credit card	7	2012-03-15 22:17:03		loyal	female	female	7	

4) Modelling

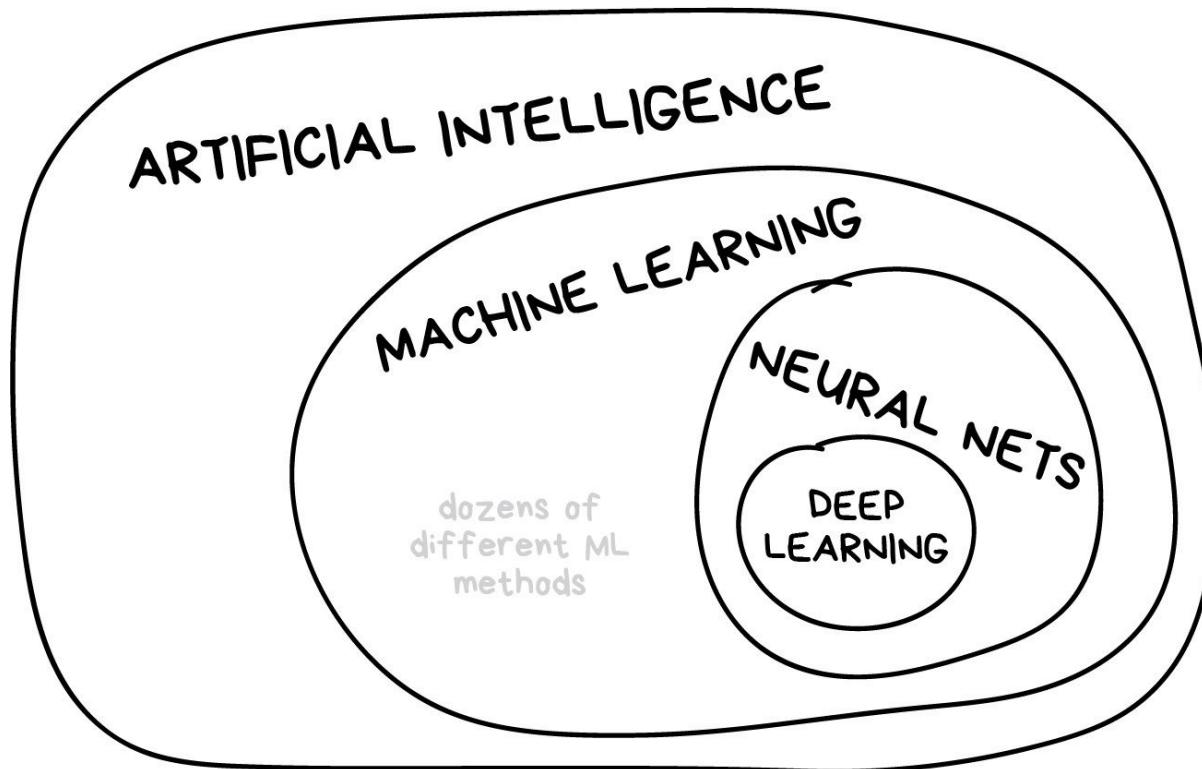
Are you looking for a model?



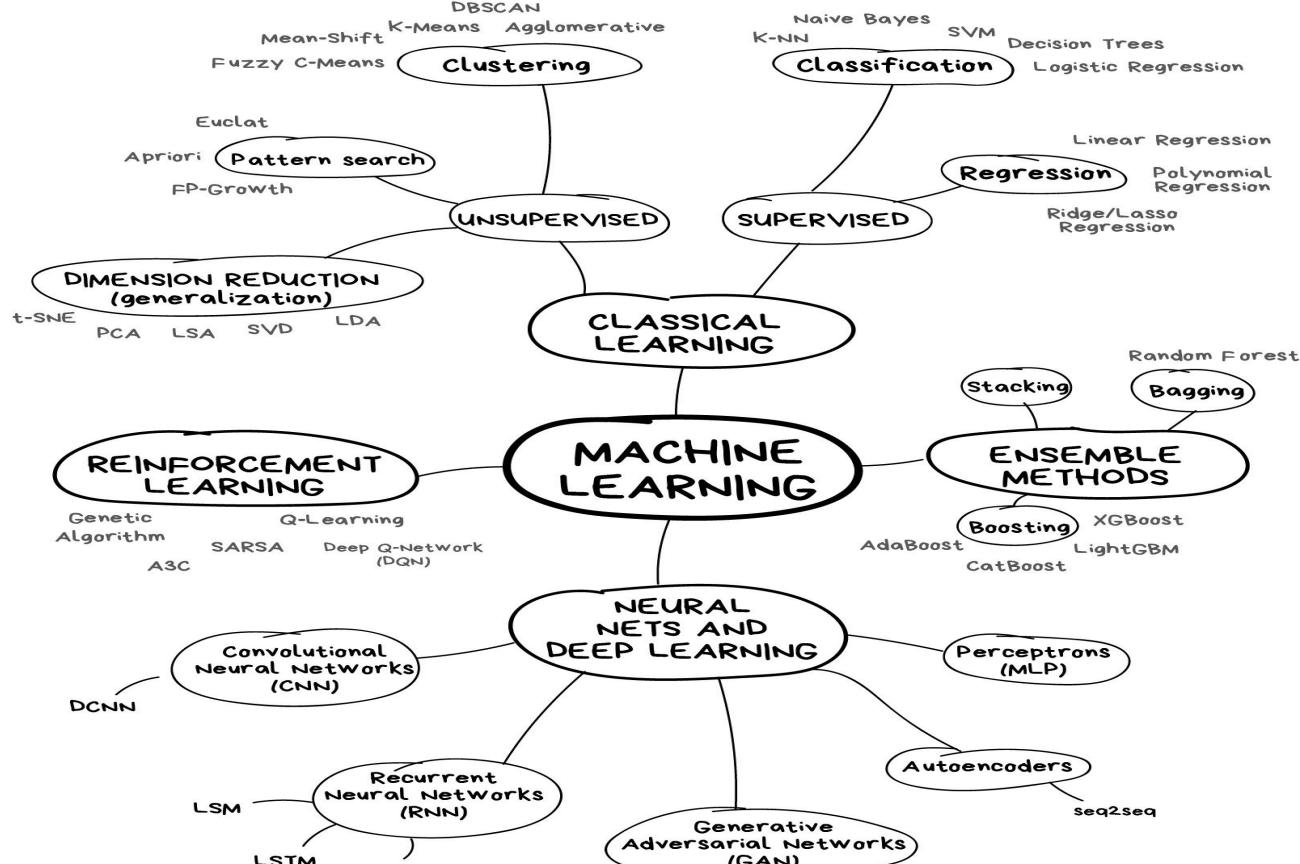
What is ...

Data Science?
Artificial Intelligence?
Machine Learning?



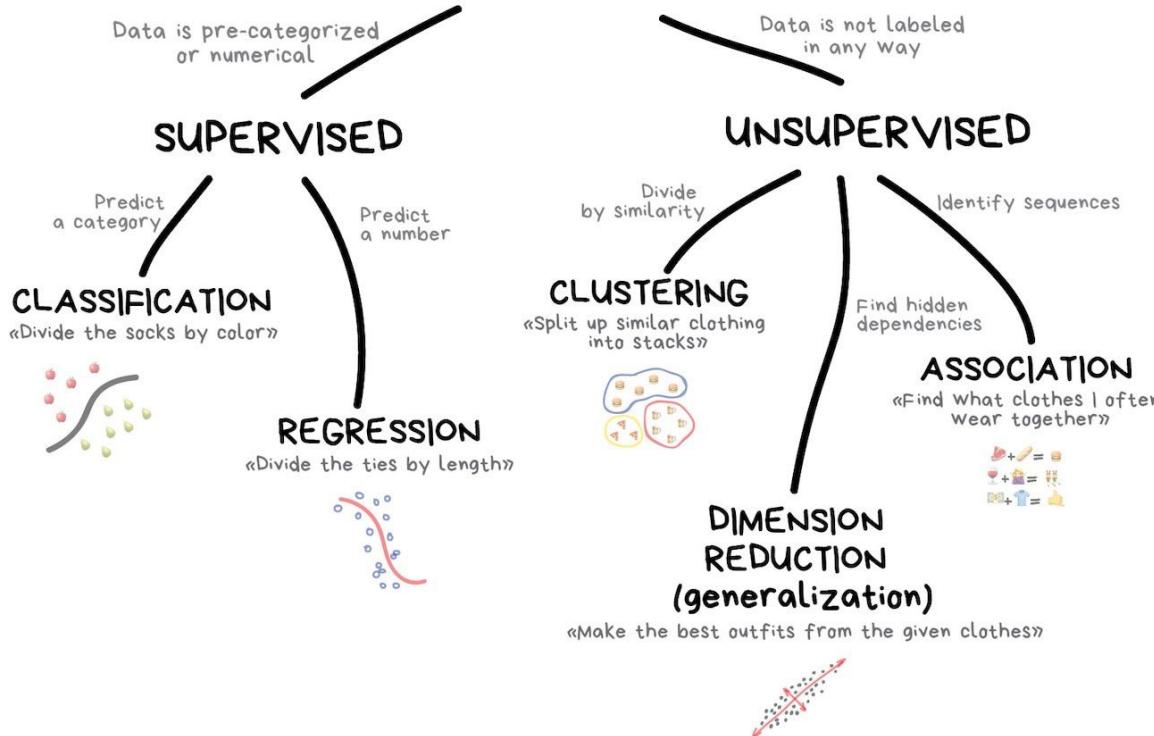


Reference: [here](#)

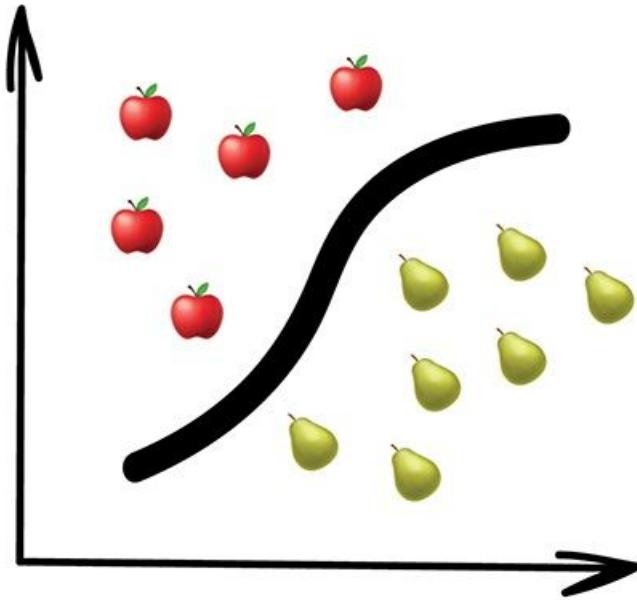


Reference: [here](#)

CLASSICAL MACHINE LEARNING



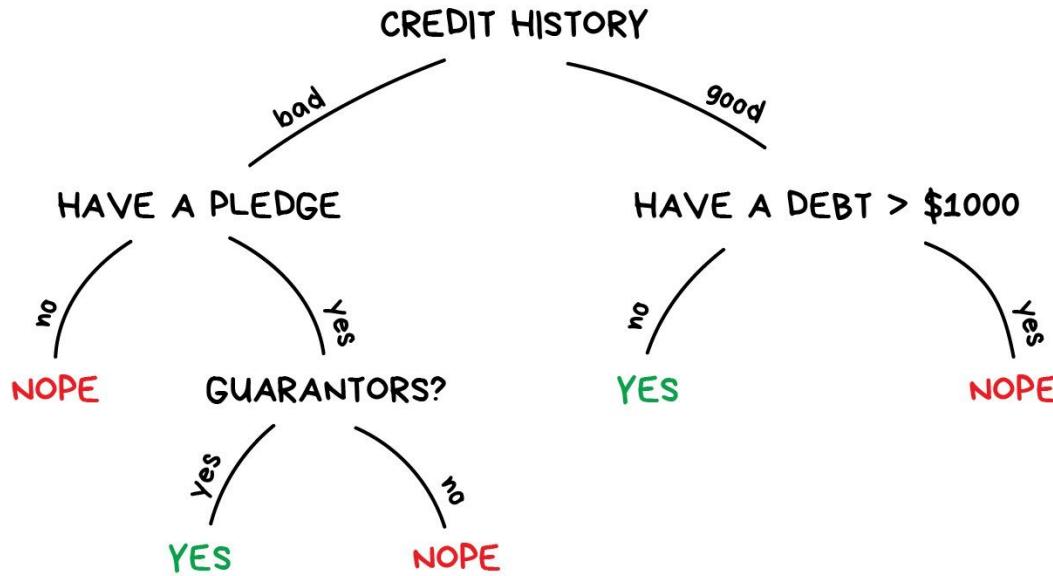
Reference: [here](#)



Classification

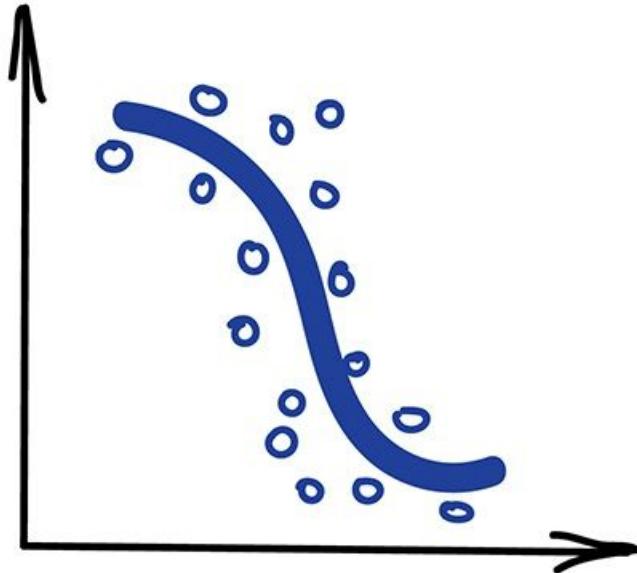
Reference: [here](#)

GIVE A LOAN?



DECISION TREE

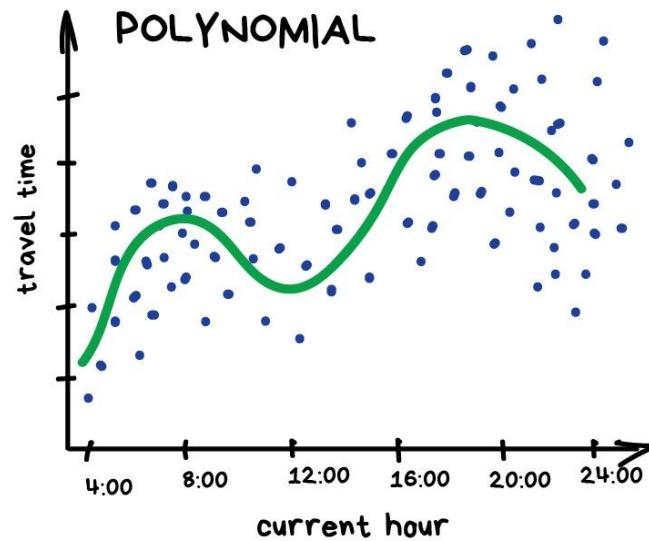
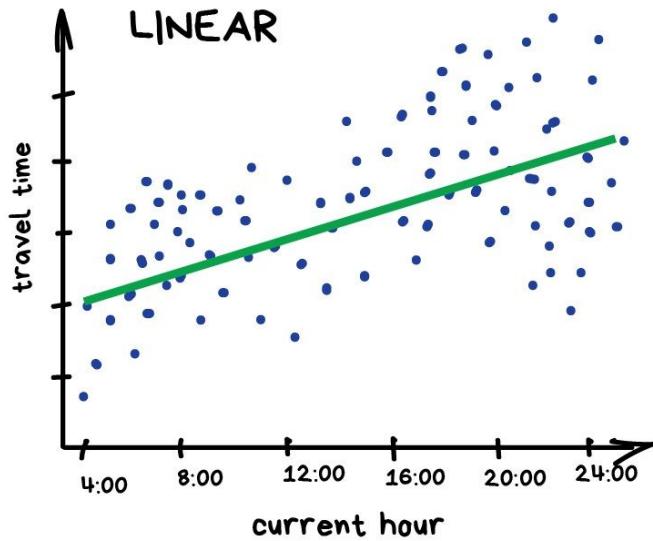
Reference: [here](#)



Regression

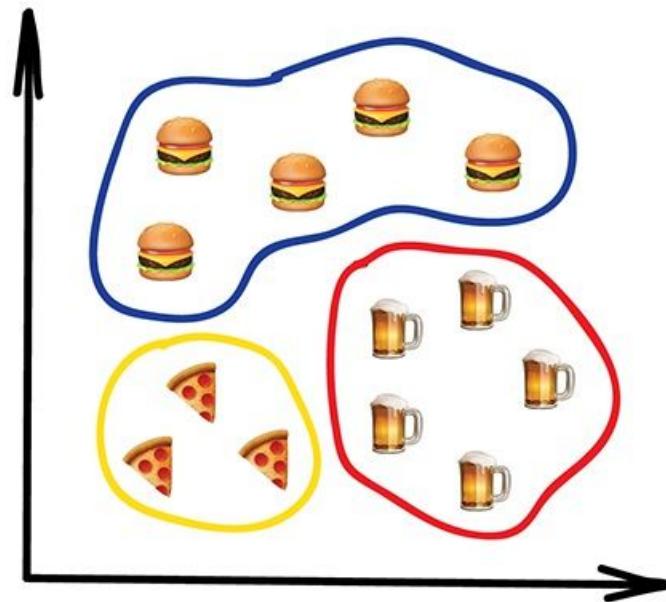
Reference: [here](#)

PREDICT TRAFFIC JAMS



REGRESSION

Reference: [here](#)



Reference: [here](#)

5) Evaluation



Classification: Confusion Matrix



Reference: [here](#)

		ACTUAL VALUES	
		Positive	Negative
PREDICTED VALUES	Positive	TP	FP
	Negative	FN	TN

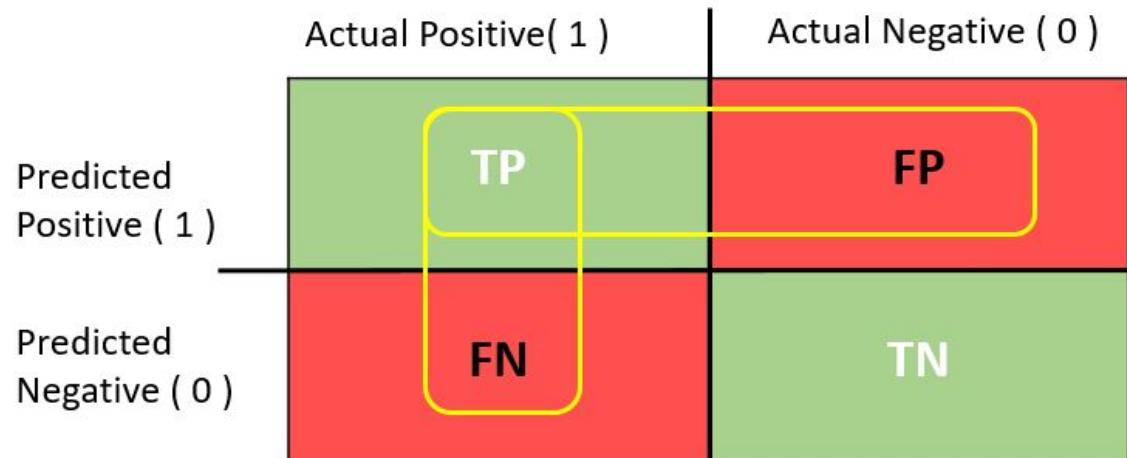
The predicted value is positive and its positive

Type I error : The predicted value is positive but it False

Type II error : The predicted value is negative but its positive

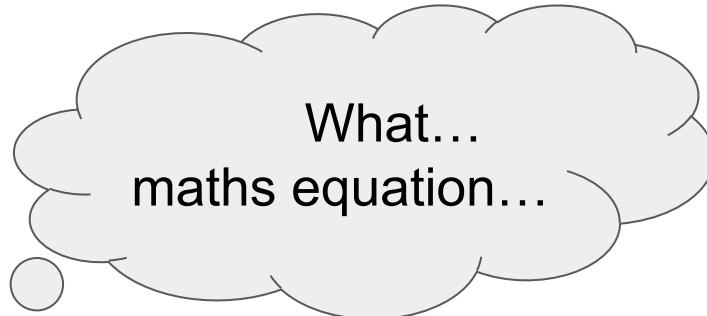
The predicted value is Negative and its Negative

Classification: Precision & Recall



Reference: [here](#)

Regression: RMSE & Rsquare



$$MAE = \frac{1}{N} \sum_{i=1}^N |y_i - \hat{y}|$$

$$MSE = \frac{1}{N} \sum_{i=1}^N (y_i - \hat{y})^2$$

$$RMSE = \sqrt{MSE} = \sqrt{\frac{1}{N} \sum_{i=1}^N (y_i - \hat{y})^2}$$

$$R^2 = 1 - \frac{\sum(y_i - \hat{y})^2}{\sum(y_i - \bar{y})^2}$$

Where,

\hat{y} – predicted value of y

\bar{y} – mean value of y

Reference: [here](#)

Activity 7: Use Case - Discussion

By using a use case/case study in your profession/domain/discipline, discuss which evaluation metric is more suitable.



6) Deployment



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6) Cloud



C: Turning Data into Actionable Insights

By using a use case/case study in your profession/domain/discipline, discuss which evaluation metric is more suitable.





G2.com

Structured Data



Structured data is **quantitative** data in the form of numbers and values.

Unstructured Data



Unstructured data is **qualitative** data in the form of text files, audio files, video files.

Image Credit: [HERE](#)

Structured Data vs. Unstructured Data

Key Differences



Structured data is often stored in databases, while unstructured data is stored in data lakes.



Structured data is easy to access and work with, while unstructured data requires more work to process and understand.



Structured data is organized and exists in predefined formats, while unstructured data exists in different formats.



Structured data is quantitative, while unstructured data is qualitative data that cannot be processed using conventional tools.



Image Credit: [HERE](#)

Use cases for structured data

- **Customer relationship management (CRM):** CRM software runs structured data through analytical tools to create datasets that reveal customer behavior patterns and trends.
- **Online booking:** Hotel and ticket reservation data (e.g., dates, prices, destinations, etc.) fits the “rows and columns” format indicative of the pre-defined data model.
- **Accounting:** Accounting firms or departments use structured data to process and record financial transactions.

Source: [HERE](#)

Use cases for unstructured data

- **Data mining:** Enables businesses to use unstructured data to identify consumer behavior, product sentiment, and purchasing patterns to better accommodate their customer base.
- **Predictive data analytics:** Alert businesses of important activity ahead of time so they can properly plan and accordingly adjust to significant market shifts.
- **Chatbots:** Perform text analysis to route customer questions to the appropriate answer sources.

Source: [HERE](#)

And many
more.....



80% of global data will be unstructured by 2025



Source: [HERE](#)

Unstructured Data: Image

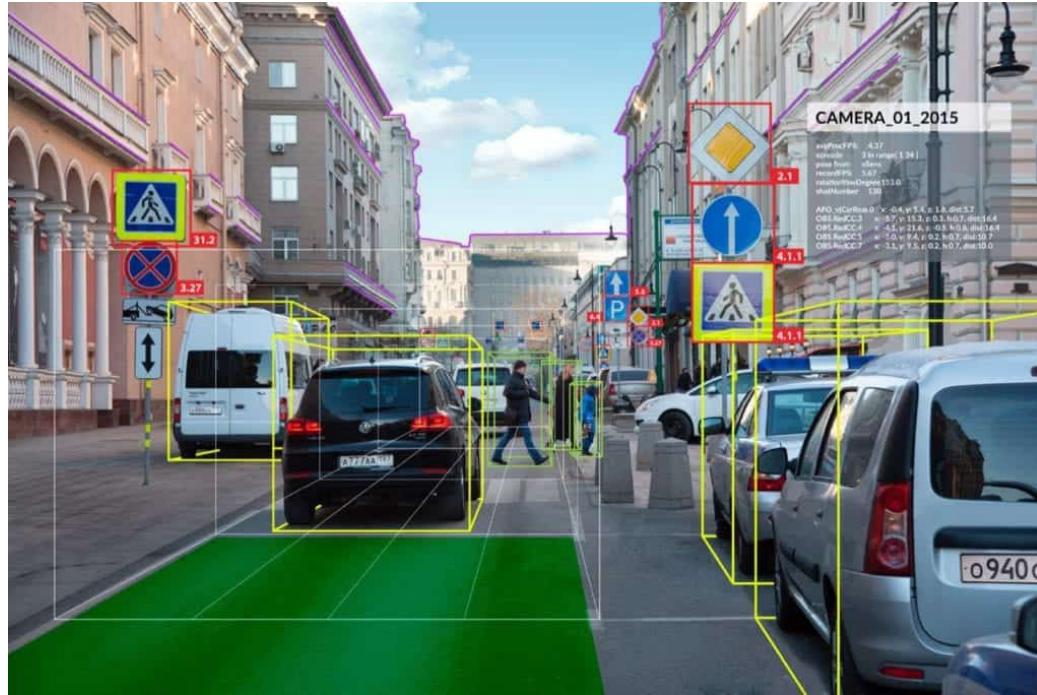
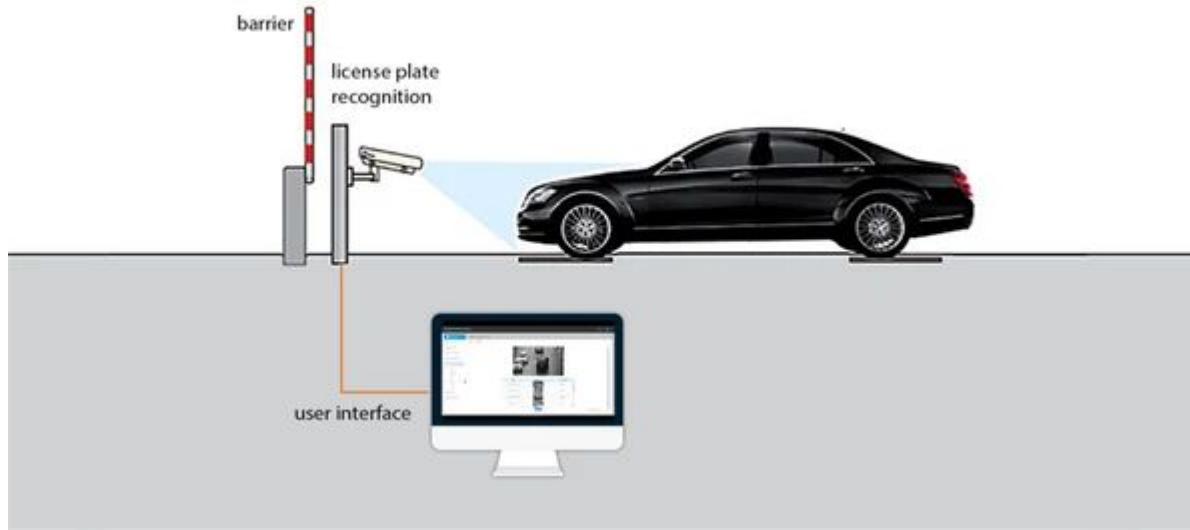


Image Credit: [HERE](#)

Image - Background

- **Image Processing & Analytics (Domain)**
- **CNN/YOLO and many more (Deep Learning)**
- **Image (Data)**

Example 1: Smart Parking System



Example 2: Manufacturing Defect Detection

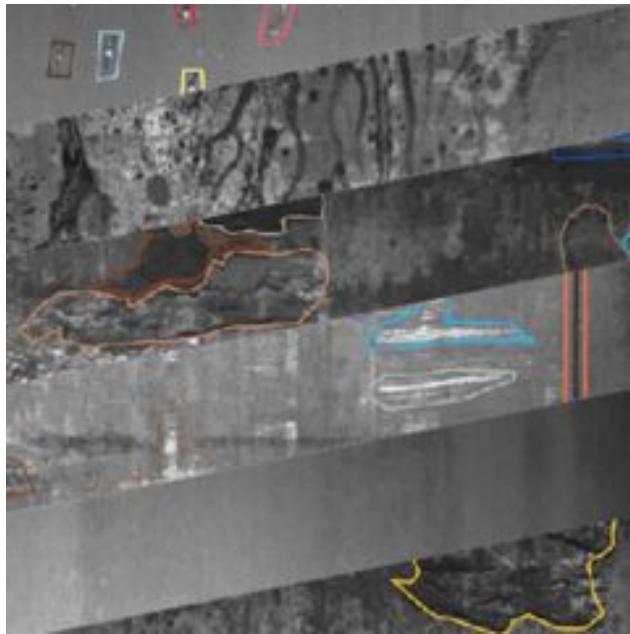


Image Credit: [HERE](#)

Example 3: Face Recognition Attendance System

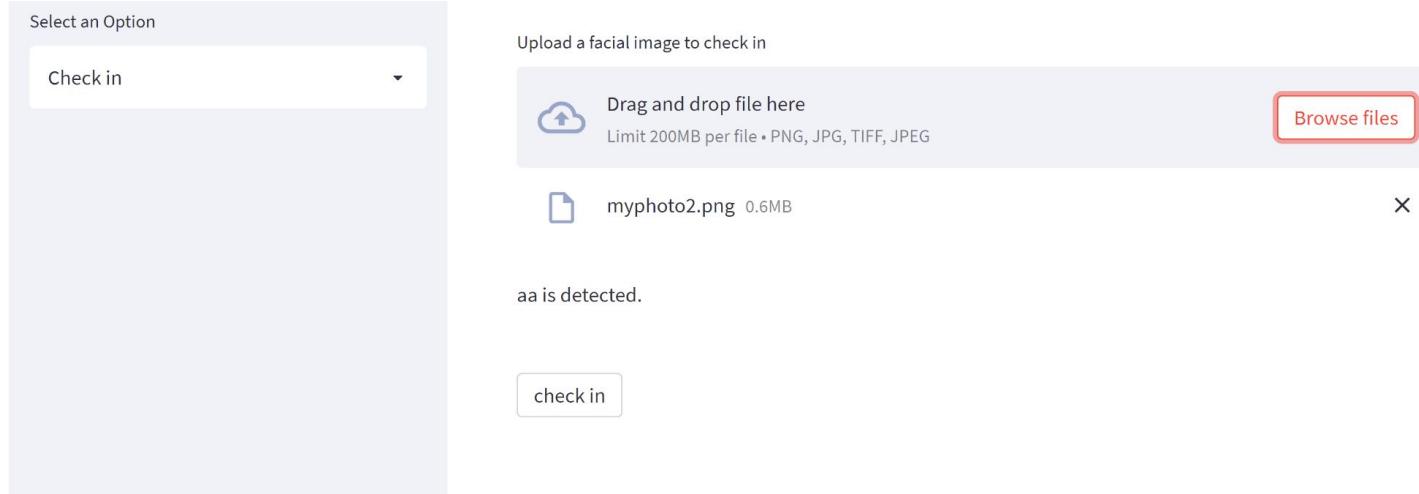


Image Credit: [HERE](#)

Demo: Face Recognition Attendance System

<https://www.richieyyptutorialpage.com/demo-python-series/face-recognition-attendance-check-in-system>

Yu Yong Poh, [GNU General Public License v3.0](#)

Unstructured Data: Text

Chat With Me Now

readme first

You:



fourier transform

Dr Librarian:

In mathematics, a Fourier transform (FT) is a mathematical transform that decomposes functions depending on space or time into functions depending on spatial or temporal frequency, such as the expression of a musical chord in terms of the volumes and frequencies of its constituent notes. The term Fourier transform refers to both the frequency domain representation and the mathematical operation that associates the frequency domain representation to a function of space or time.

Text - Background

- **Text Analytics (Domain)**
- **Transformer/BERT/GPT3 etc (Deep Learning)**
- **Text (Data)**

Example 1: Chatbot



Example 2: Sentimental Analytics



Demo: Chatting with Dr. Librarian

<https://www.richieyyptutorialpage.com/demo-python-series/ai-chatbot-chat-with-me-now>

