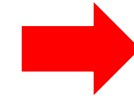


**Why
Deep Learning
is
Important ?**

Why Deep Learning is Important ?

- Everyone trains their neural net !
- DL seems to be a magic power !
- Full of successful stories using DL



**Solve Many
Real-World
Problems**

Why Deep Learning is Important ?

ImageNet Challenge

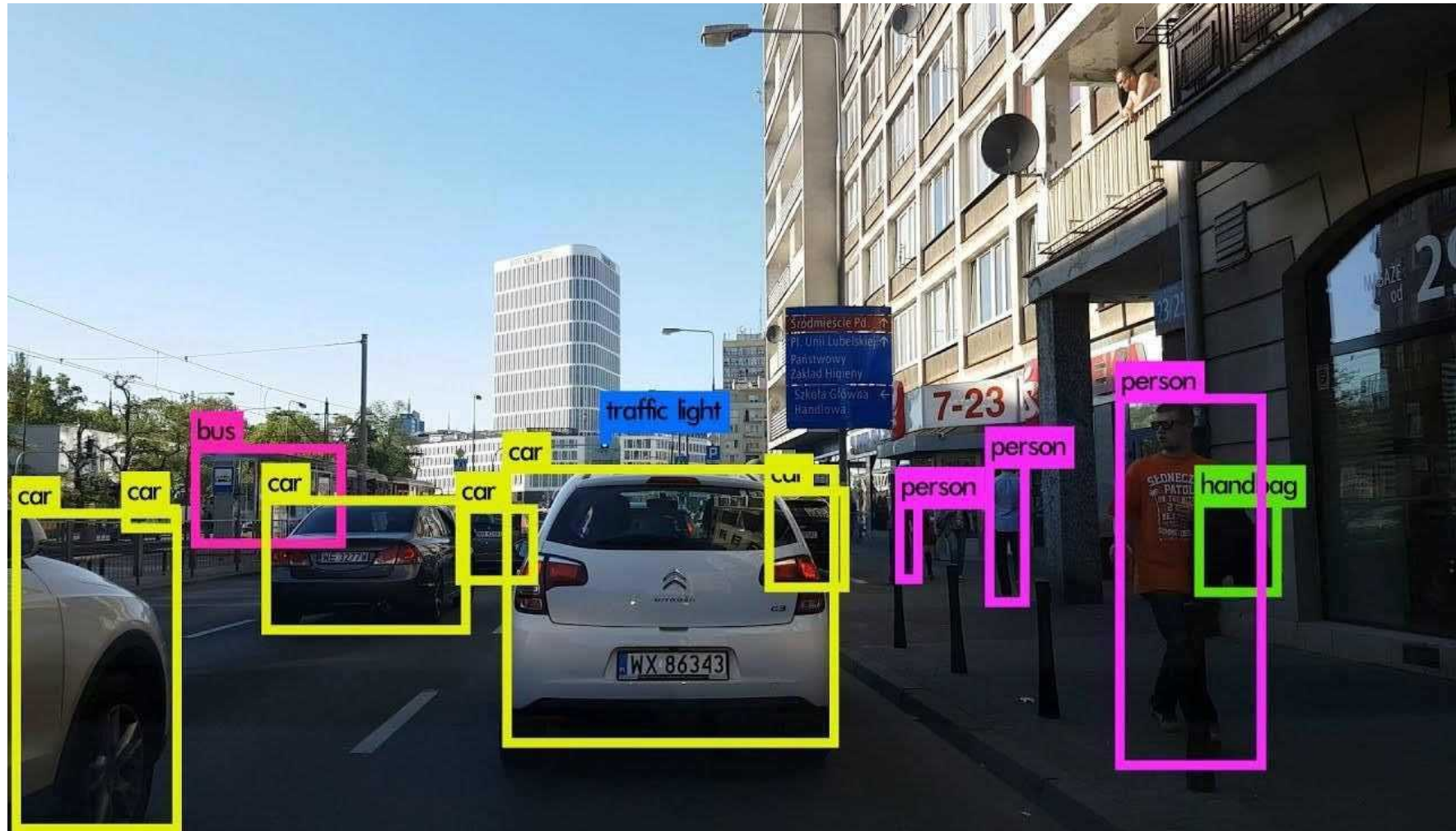
IMAGENET

- 1,000 object classes (categories).
- Images:
 - 1.2 M train
 - 100k test.



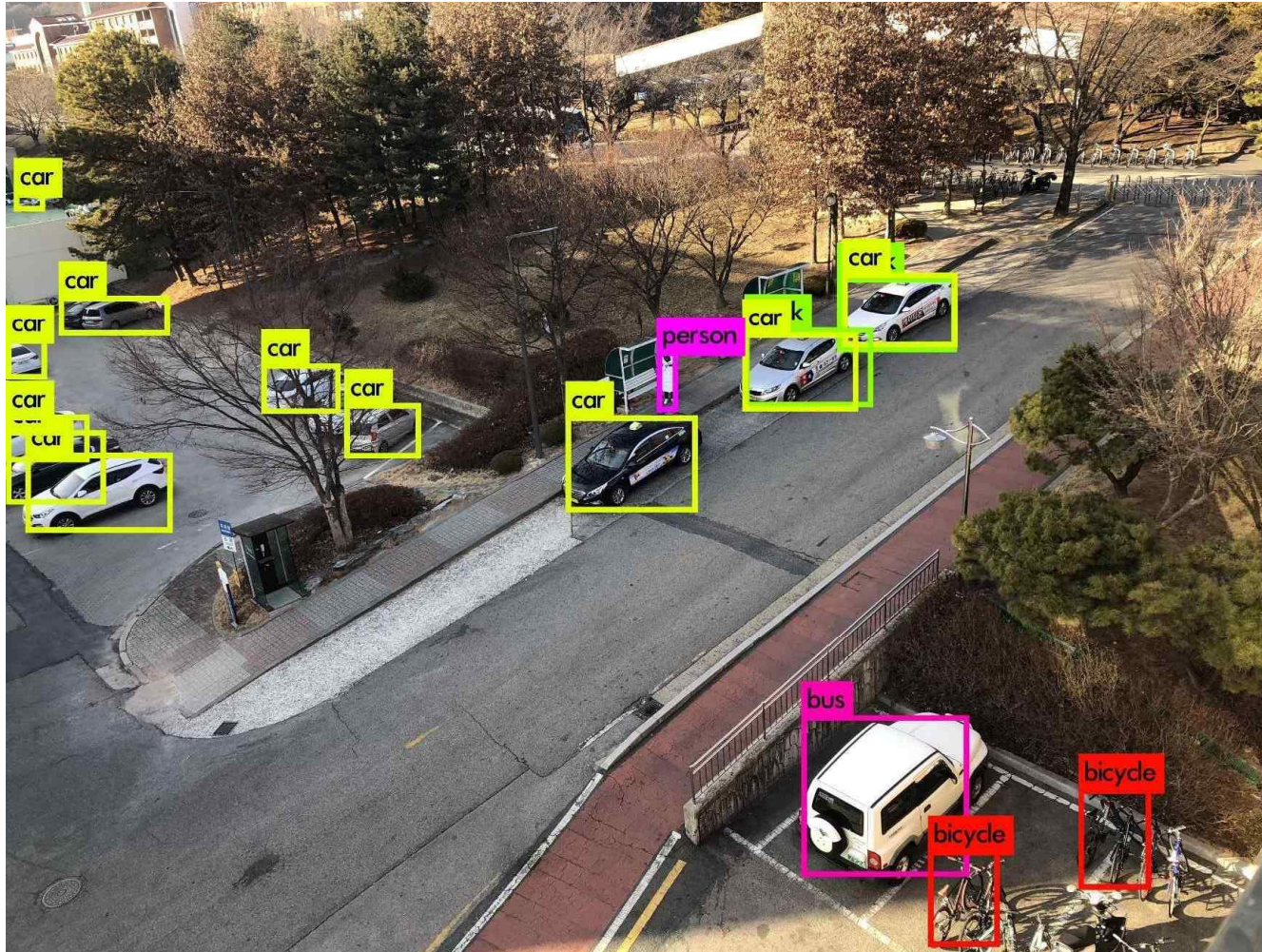
Image Classification [ResNet]

Why Deep Learning is Important ?



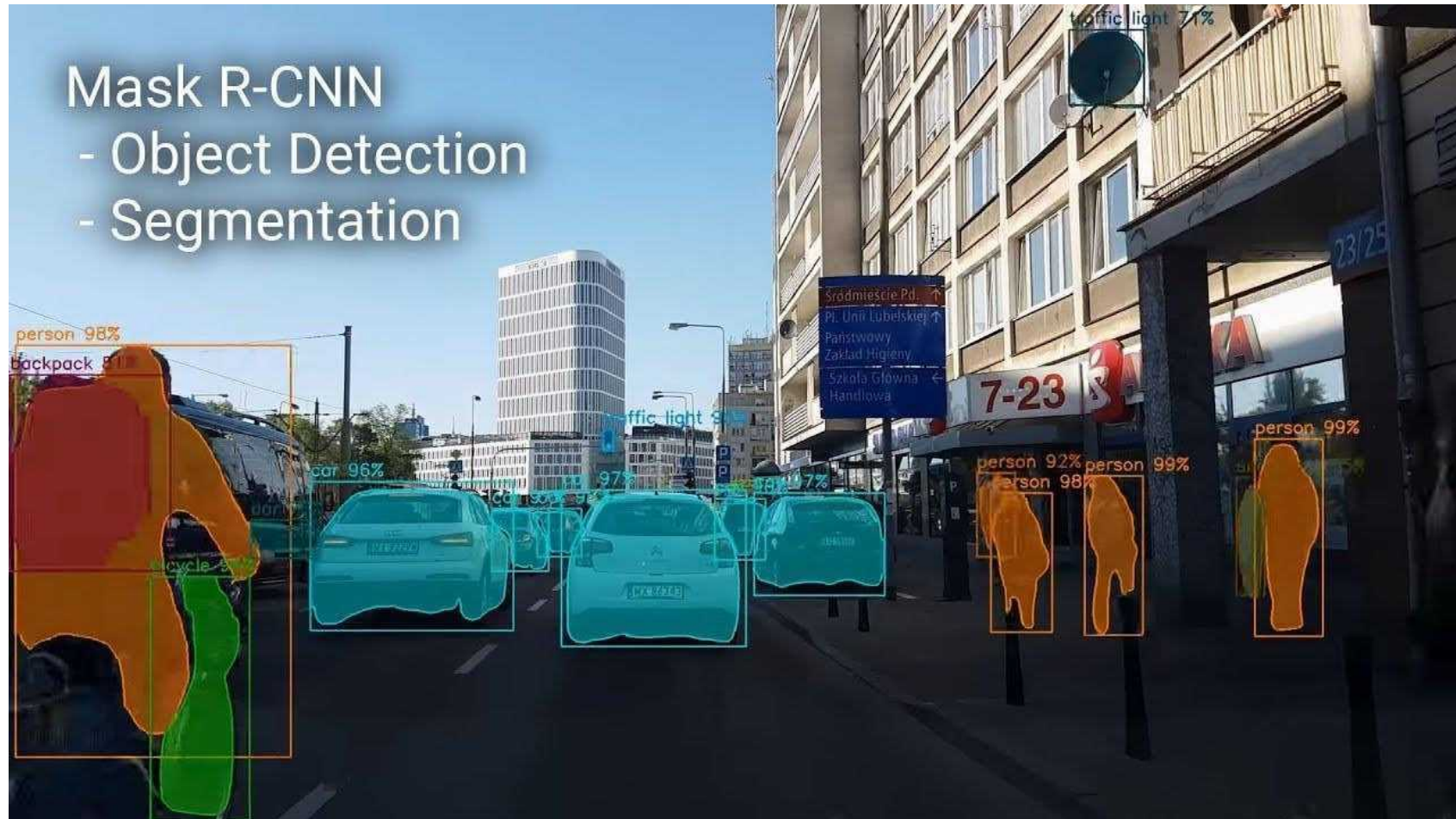
Object Detection [Yolo V3]

Why Deep Learning is Important ?



Object Detection [Yolo V3]

Why Deep Learning is Important ?



Object Detection + Segmentation [Mask R-CNN]

Why Deep Learning is Important ?

A



B



C



D



Image Generation [Style-Transfer]

Why Deep Learning is Important ?

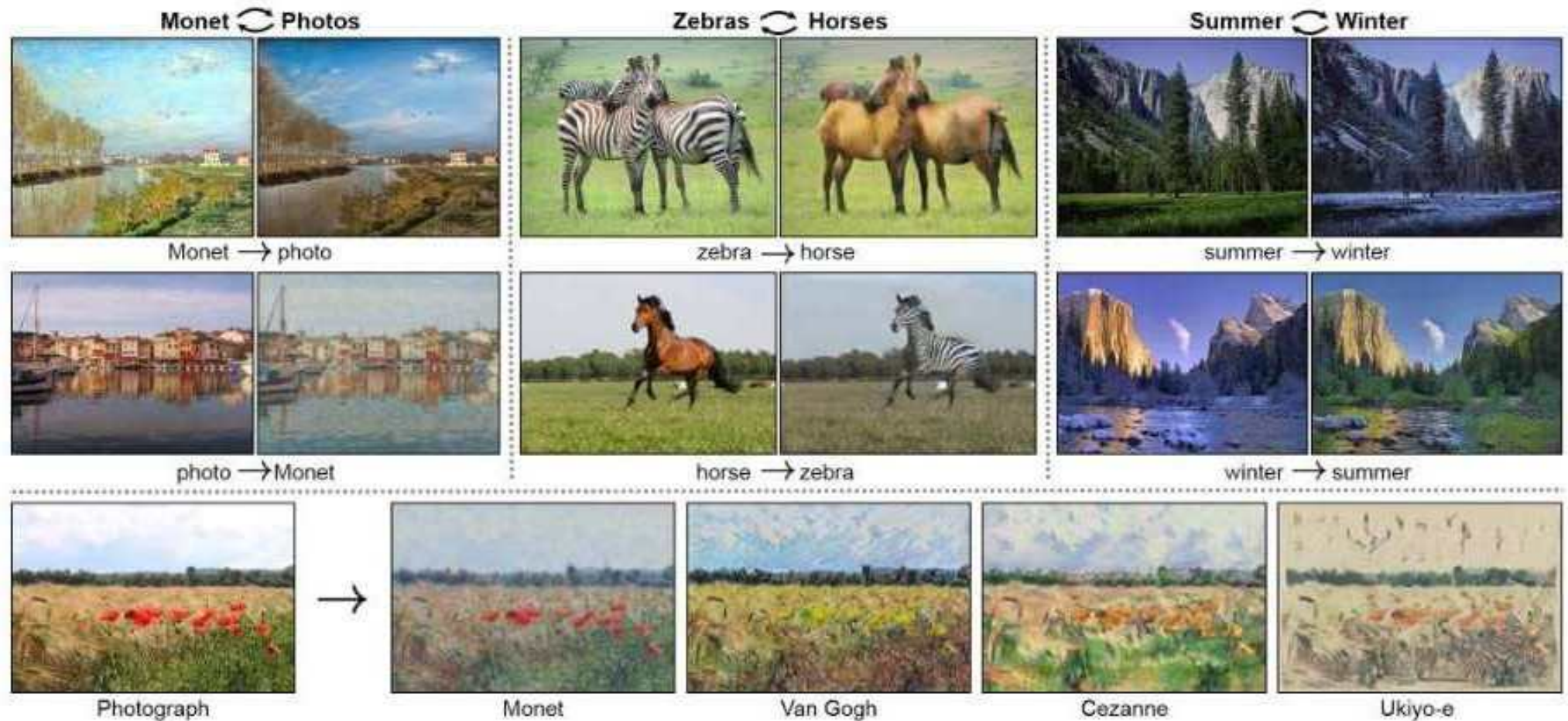


Image Generation [CycleGAN]

Why Deep Learning is Important ?

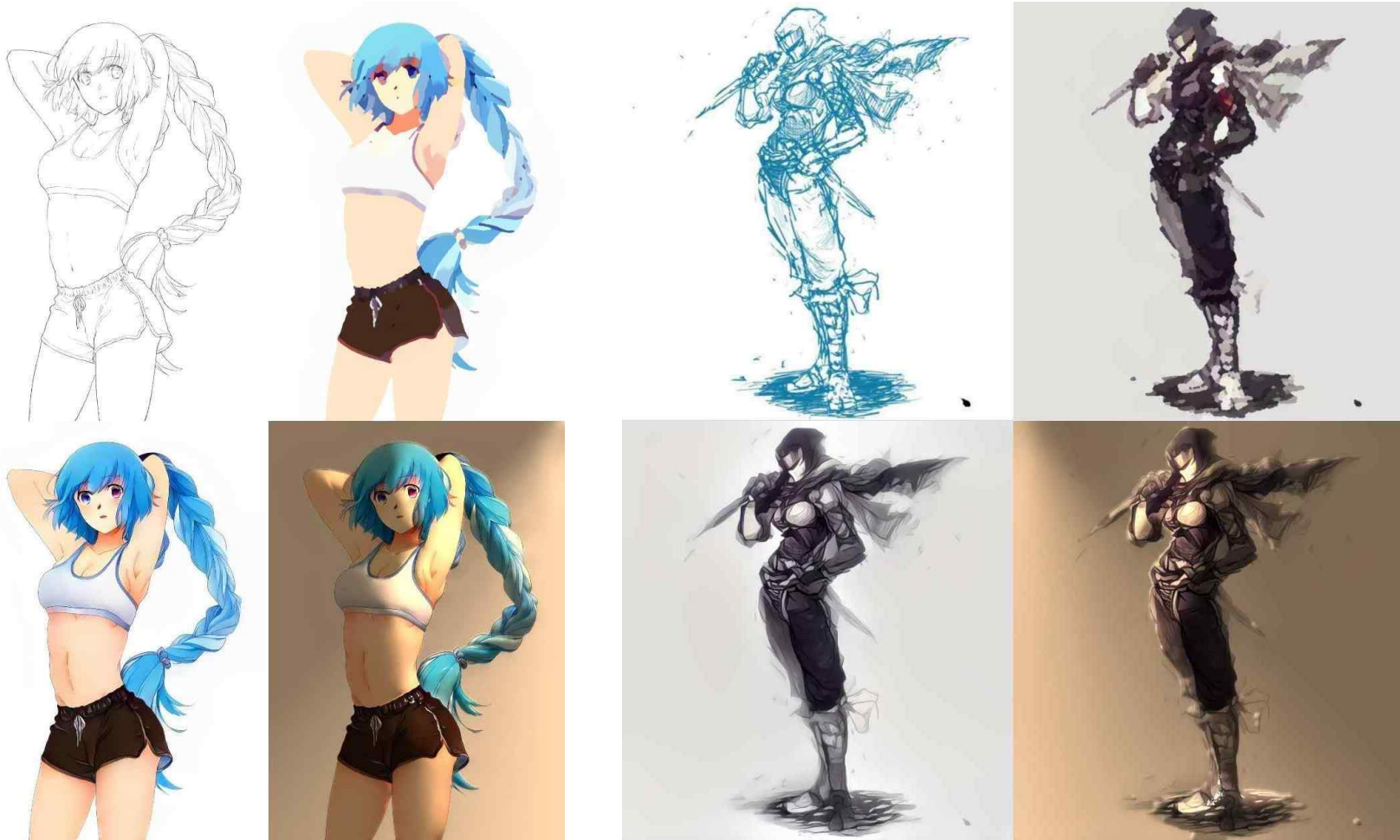
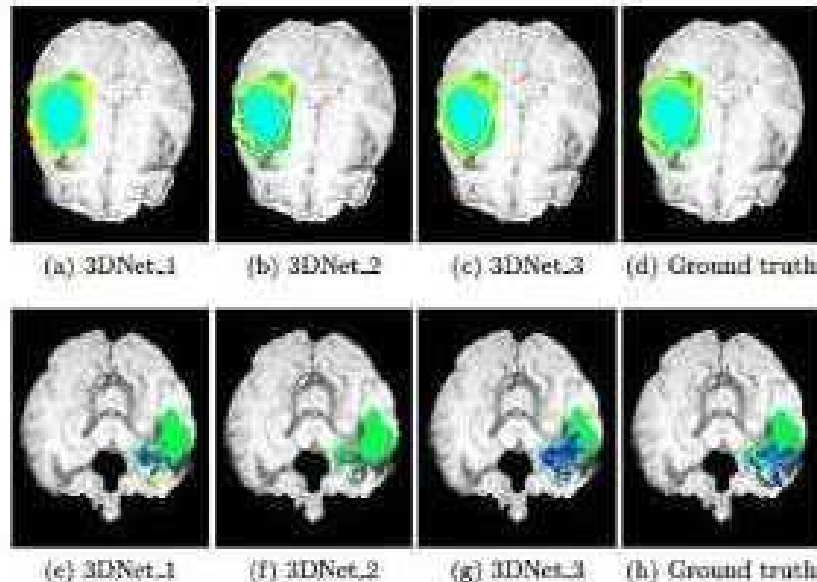


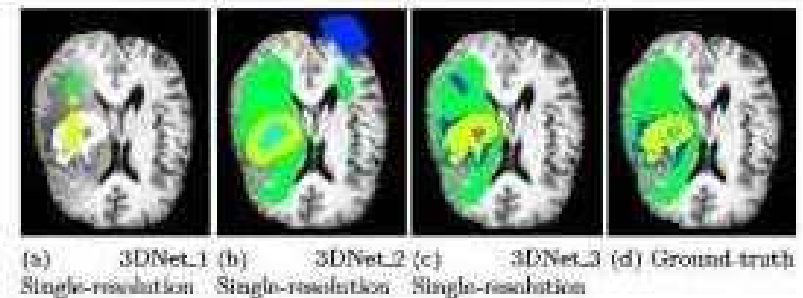
Image Generation [Style2Paints]

Why Deep Learning is Important ?

Segmentation: brain tumor segmentation



The importance of skip connections



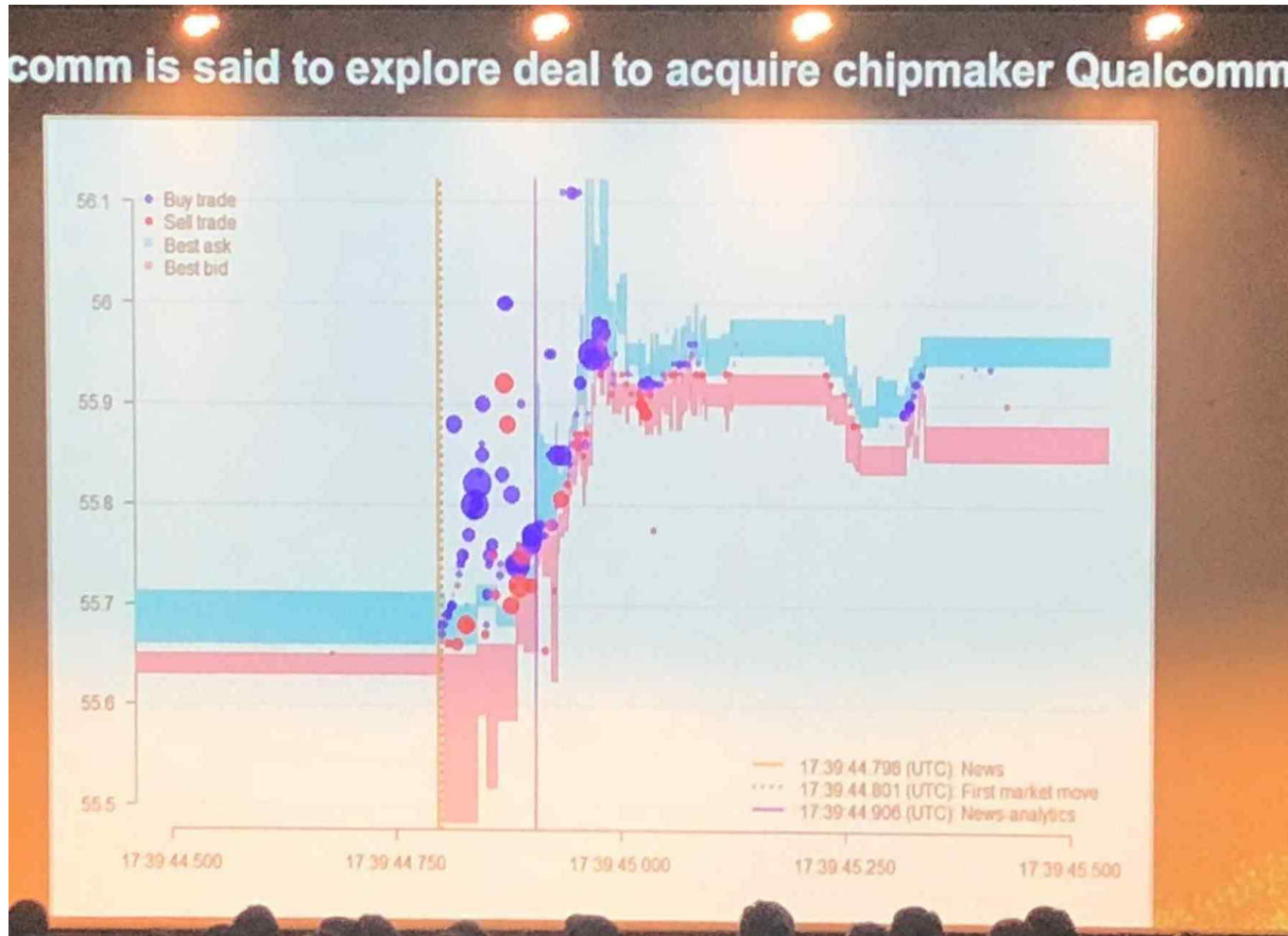
	Accuracy	Dice score		
		Whole	Core	Active
3DNet.1	99.69	89.64	76.87	63.12
3DNet.2	99.71	91.59	69.90	73.89
3DNet.3	99.71	91.74	83.61	76.82

	Precision					Recall				
	1-Nec	2-Edm	3-NEenh	4-Enh	0-Else	1-Nec	2-Edm	3-NEenh	4-Enh	0-Else
3DNet.1	65.33	81.49	28.40	66.94	99.95	44.71	74.09	28.40	66.94	99.95
3DNet.2	75.21	79.07	43.57	82.65	99.92	41.10	84.16	32.35	73.38	99.93
3DNet.3	67.45	85.06	49.44	74.06	99.90	51.29	77.50	37.61	87.29	99.95

Table 3: Results for our validation set from BRATS2015 training set.

Tumor Segmentation

Why Deep Learning is Important ?



News(Event) Based Trading Algorithm

Why Deep Learning is Important ?

The first recorded travels by Europeans to China and back date from this time. The most famous traveler of the period was the Venetian Marco Polo, whose account of his trip to "Cambaluc," the capital of the Great Khan, and of life there astounded the people of Europe. The account of his travels, *Il milione* (or, *The Million*, known in English as the *Travels of Marco Polo*), appeared about the year 1299. Some argue over the accuracy of Marco Polo's accounts due to the lack of mentioning the Great Wall of China, tea houses, which would have been a prominent sight since Europeans had yet to adopt a tea culture, as well the practice of foot binding by the women in capital of the Great Khan. Some suggest that Marco Polo acquired much of his knowledge **through contact with Persian traders** since many of the places he named were in Persian.

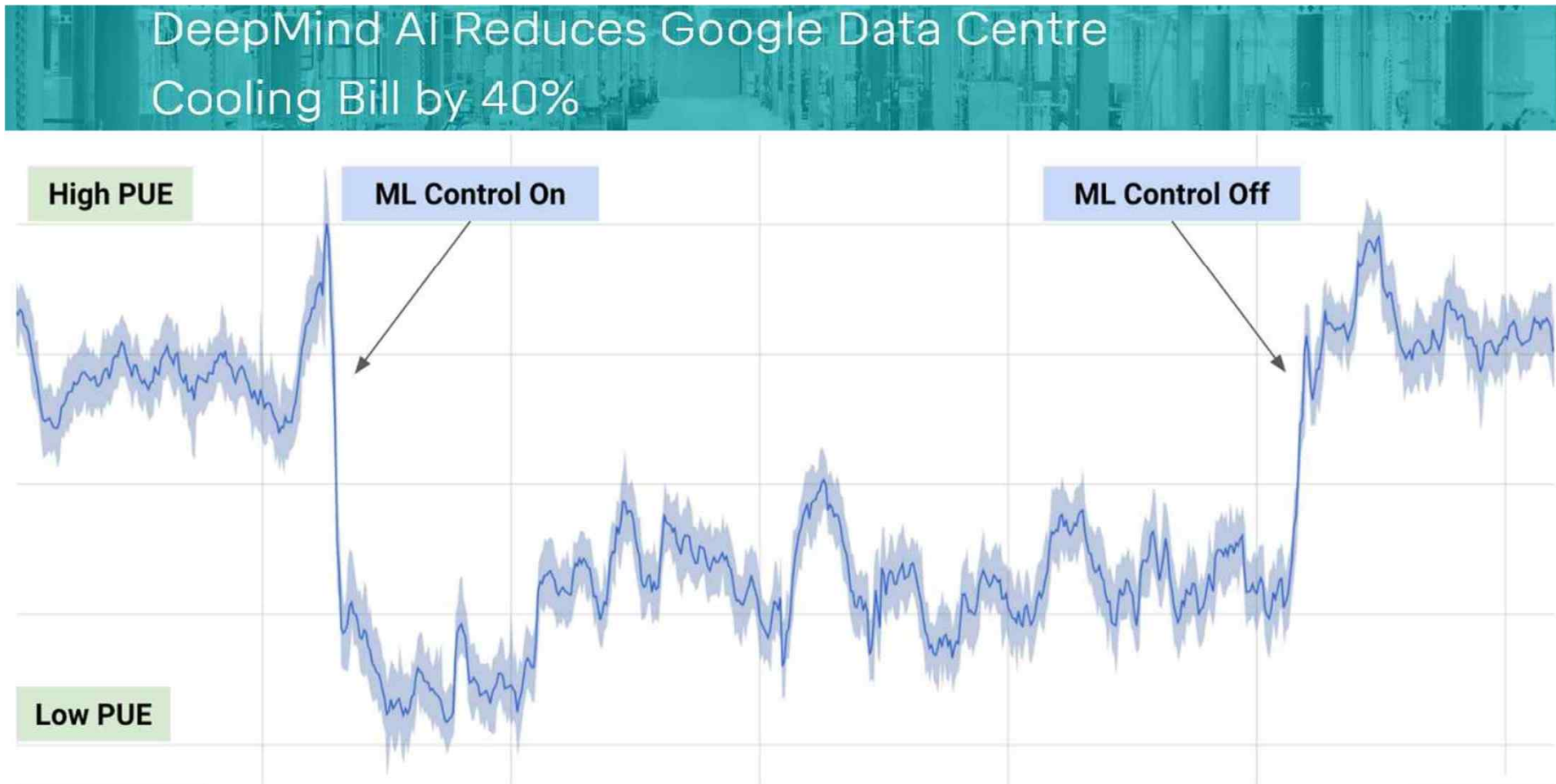
How did some suspect that Polo learned about China instead of by actually visiting it?

Answer: **through contact with Persian traders**

Rank	Model	EM	F1
	Human Performance <i>Stanford University</i> (Rajpurkar & Jia et al. '18)	86.831	89.452
1 Jan 10, 2019	BERT + Synthetic Self-Training (ensemble) <i>Google AI Language</i> https://github.com/google-research/bert	84.292	86.967
2 Dec 21, 2018	PAML+BERT (ensemble model) <i>PINGAN GammaLab</i>	83.457	86.122
2 Dec 16, 2018	Lunet + Verifier + BERT (ensemble) <i>Layer 6 AI NLP Team</i>	83.469	86.043

Question Answering [BERT]

Why Deep Learning is Important ?



Data Center Cooling Control [DeepMind]

Why Deep Learning is Important ?



Robot Hand Control [OpenAI]

Why Deep Learning is Important ?



How to learn move [DeepMind]

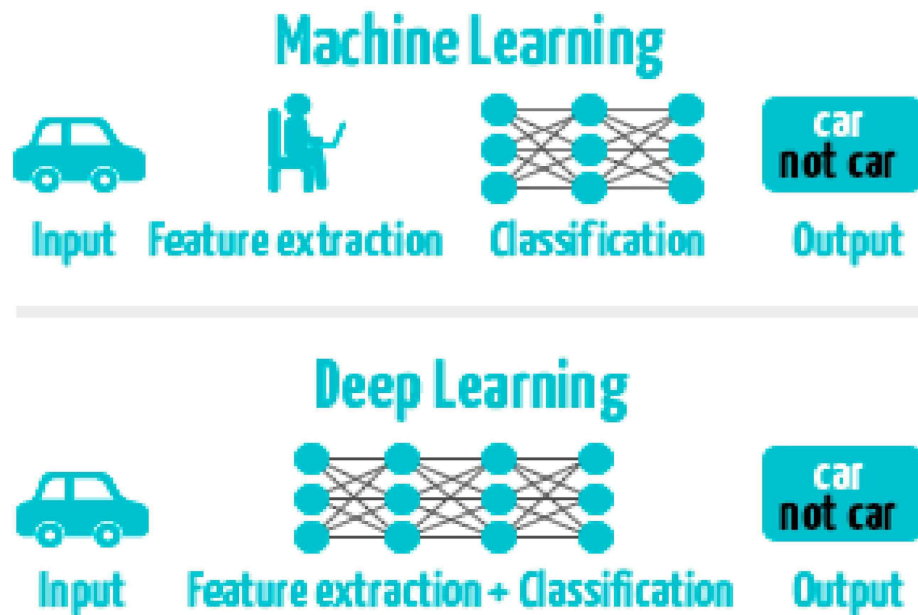
More project on ...

[30 Amazing MachineLearning Project](#)

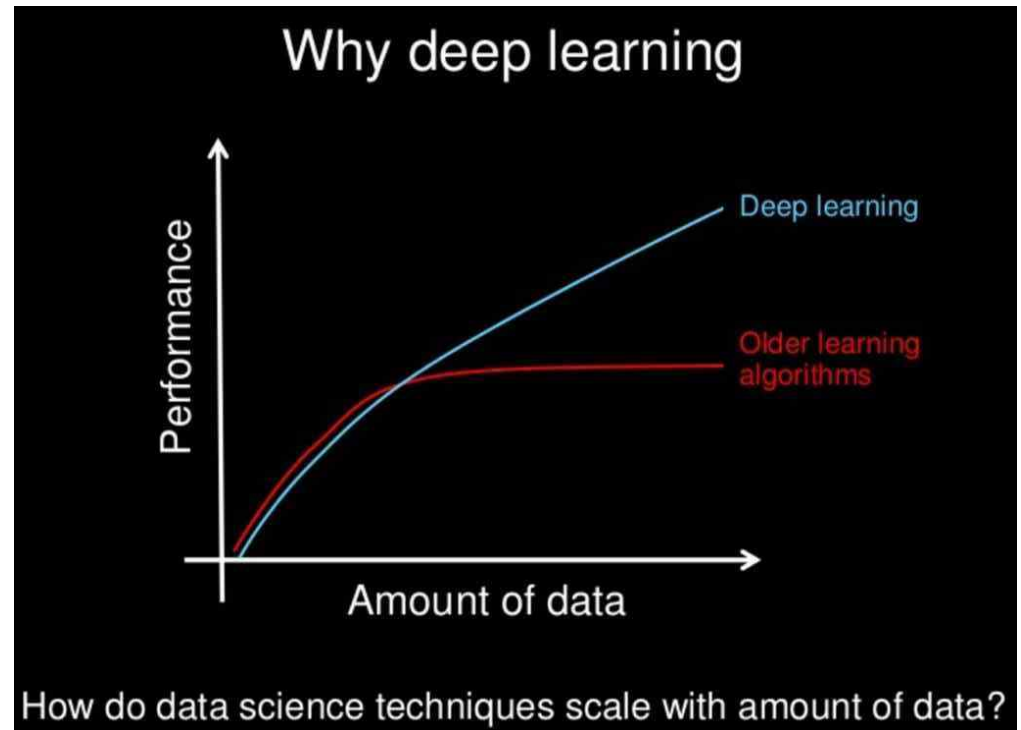
[Really Awesome GAN](#)

[Awesome DeepLearning](#)

Why Deep Learning is Important ?



Get rid of feature engineering



Limitless performance improvement

Why **Learning Deep Learning is Important ?**

Why **Learning** Deep Learning is Important ?

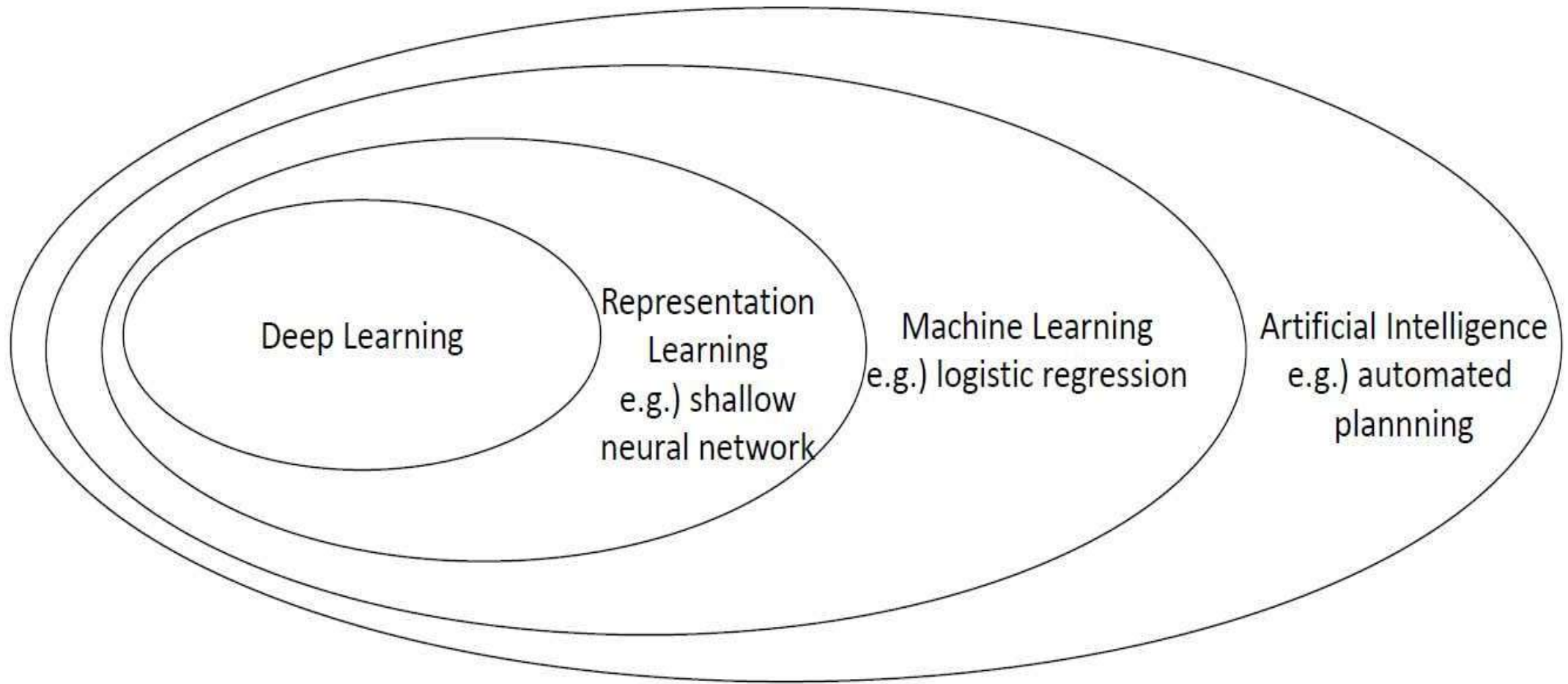
- Understanding how other solve the problems
- Survive from AI invasion
- Utilize available techniques or source code
- Solve your own problem with nice performance
- To get a job and make money

What is Machine Learning ?

“ A Field of study that gives computer the ability to learn without being explicitly programmed”


– Arthur Samuel, 1959

Deep Learning, Machine Learning, Artificial Intelligence



Categories of ML Problems

	Supervised Learning	Unsupervised Learning	Reinforcement Learning
Discrete	Classification	Clustering	Discrete Action Space Agent
Continuous	Regression	Dimensionality Reduction	Continuous Action Space Agent



Semi-Supervised Learning

Categories of ML Problems

	Supervised Learning	Unsupervised Learning	Reinforcement Learning
Discrete	Classification	Clustering	Discrete Action Space Agent
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Semi-Supervised Learning

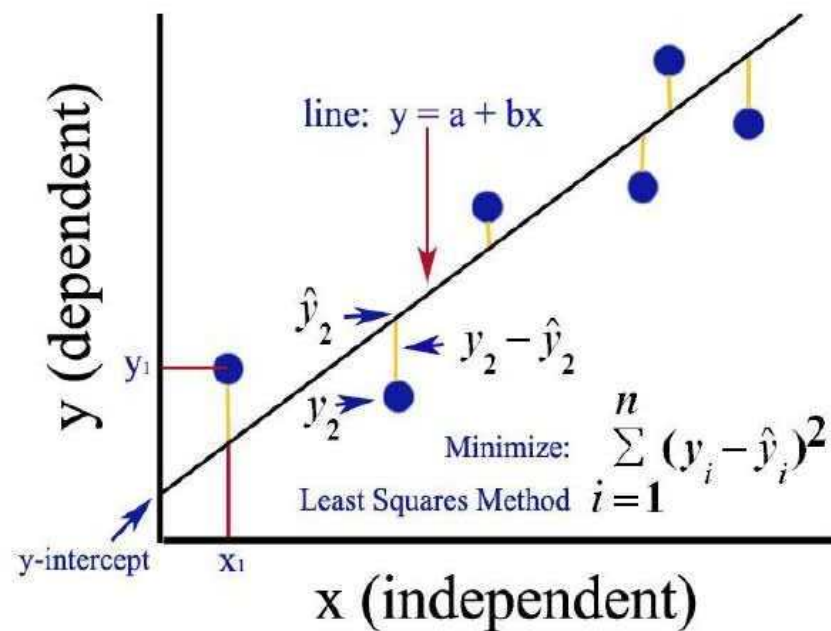
Regression Problem



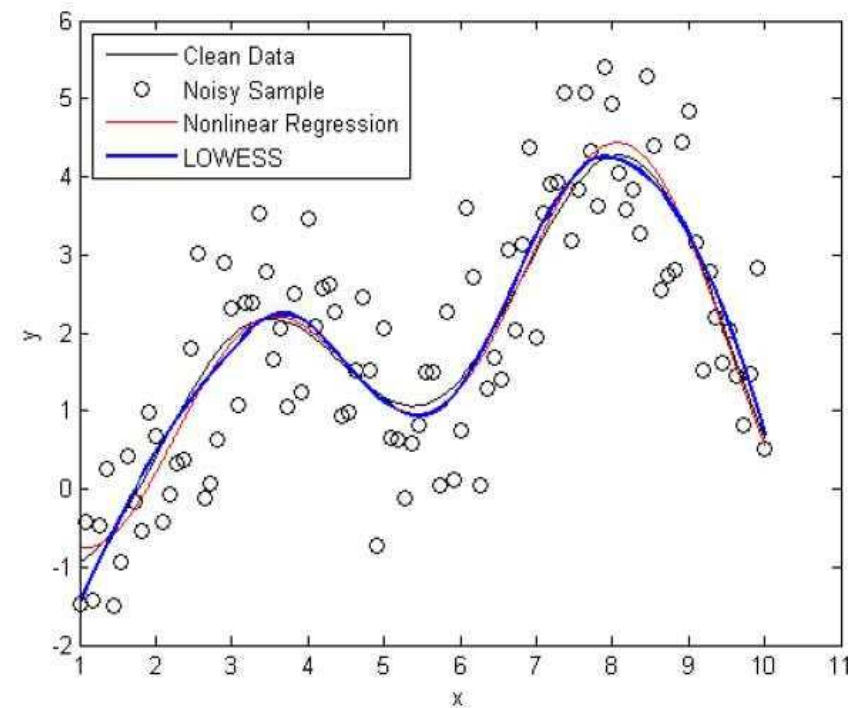
Price Prediction Based on Gi-Young Style Chart Analysis

Regression Problem

Fit the prediction function $f(x)$ to the training data, to predict continuous real value



Linear regression



Nonlinear regression

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Semi-Supervised Learning

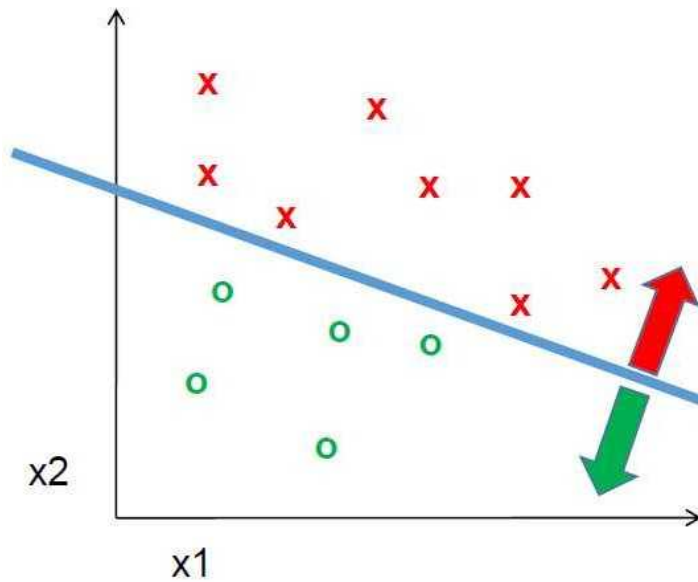
Classification Problem



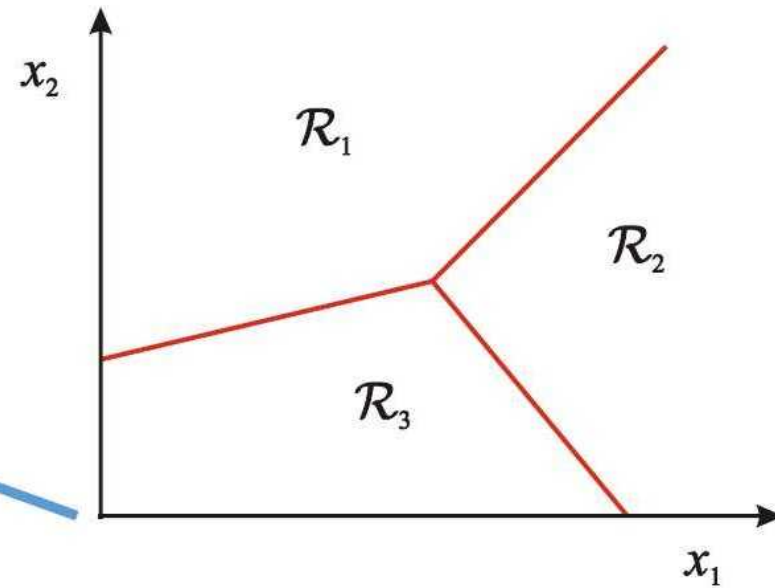
Chihuahua or Muffin?

Classification Problem

Identifying which of a set of categories a new instance belongs



Binary Classification



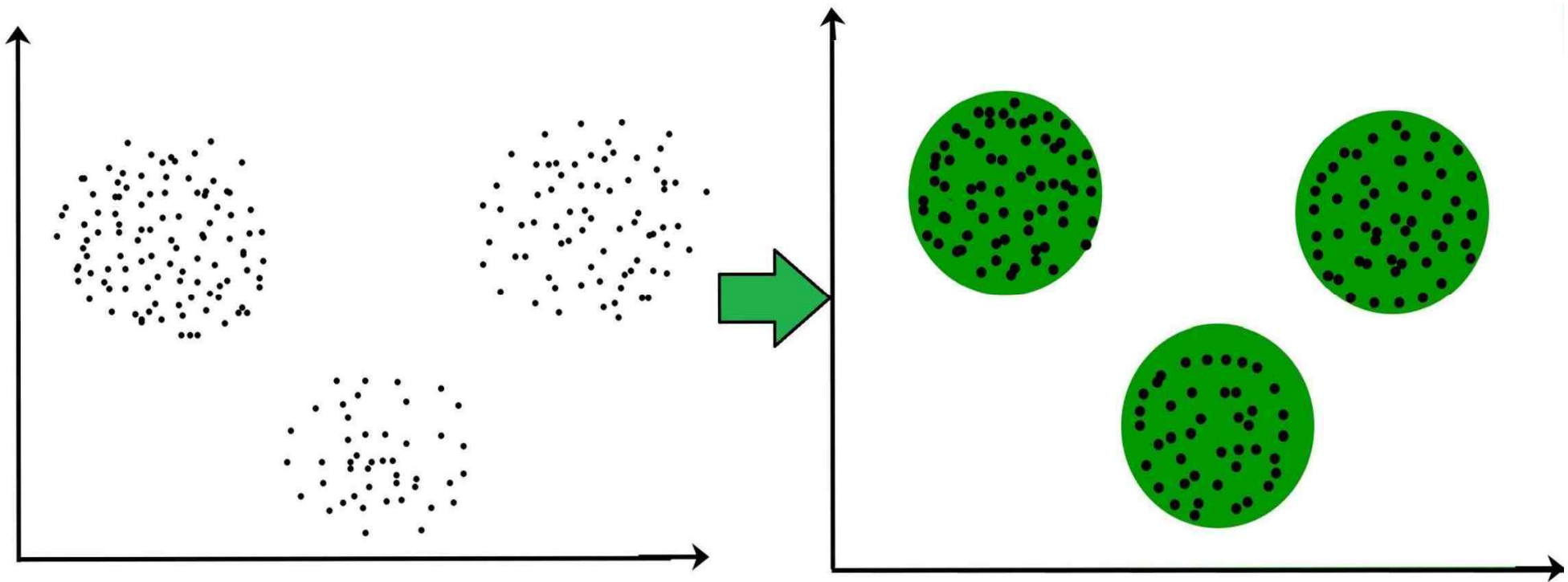
Multi-class Classification

Categories of ML Problems

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Discrete	Classification	Clustering	Discrete Action Space Agent
Continuous	Regression	Dimensionality Reduction	Continuous Action Space Agent

Semi-Supervised Learning

Clustering Problem



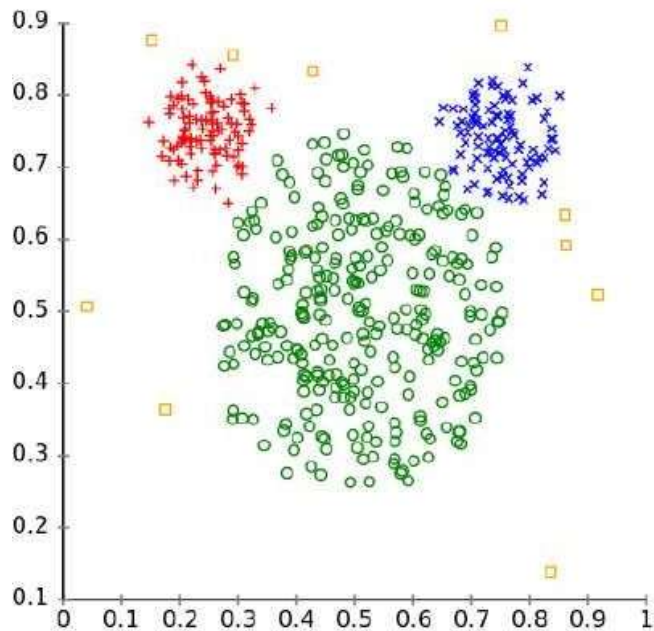
Grouping similar samples into K groups

Clustering Problem

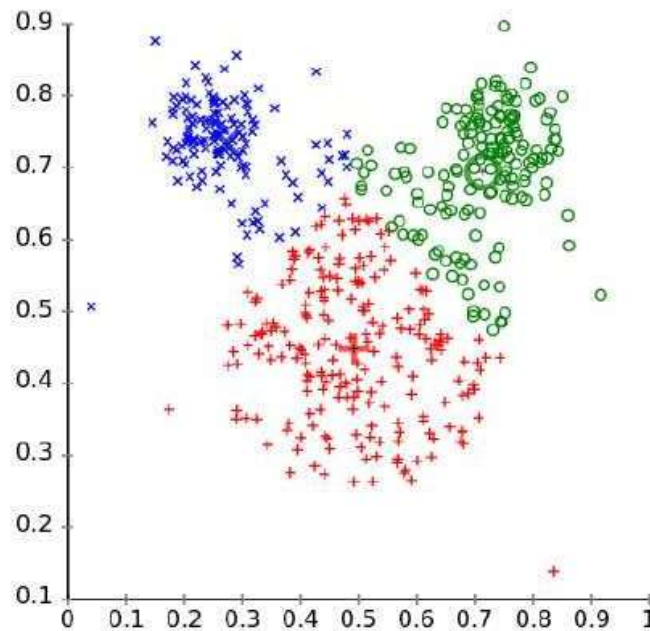
Automatic grouping of instances, such that the instances that belong to the same clusters are more similar to each other than to those in the other groups

Different cluster analysis results on "mouse" data set:

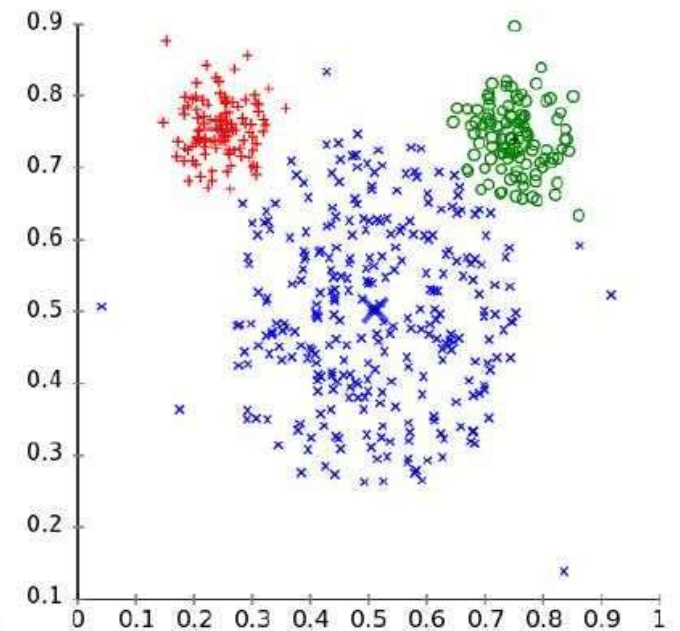
Original Data



k-Means Clustering



EM Clustering



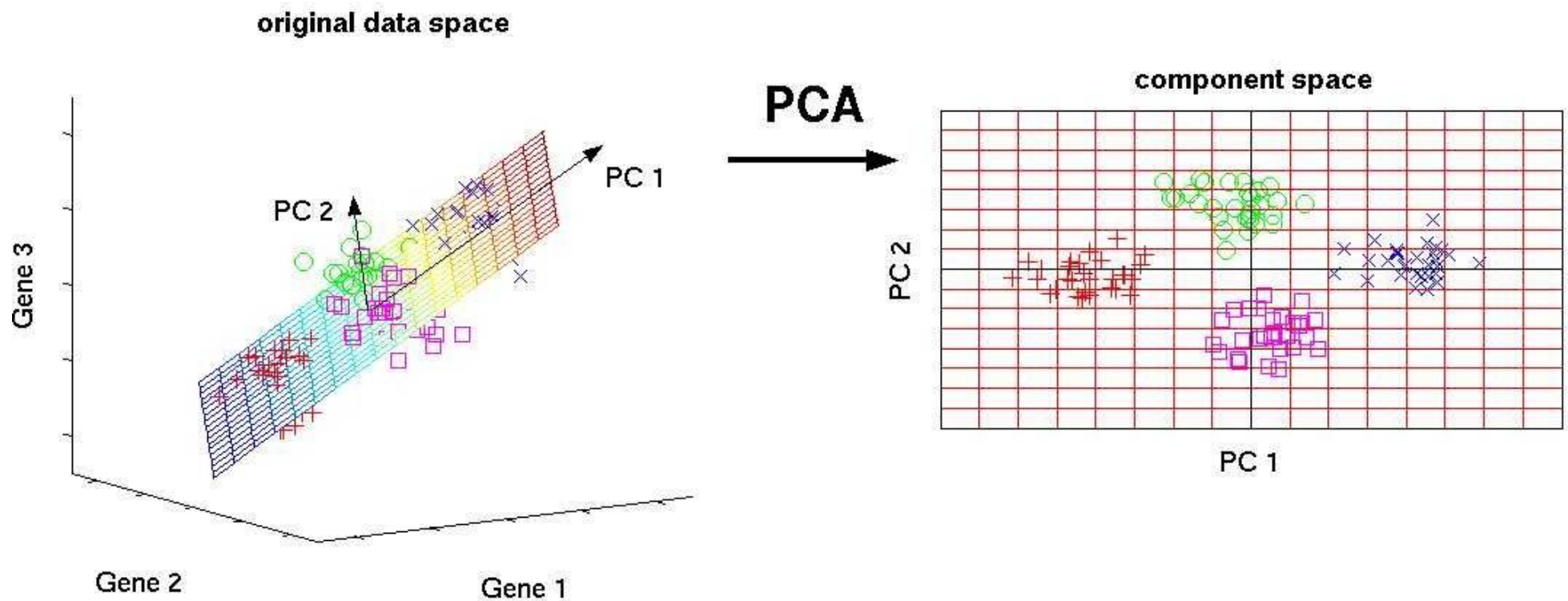
Categories of ML Problems

	Supervised Learning	Unsupervised Learning	Reinforcement Learning
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Semi-Supervised Learning

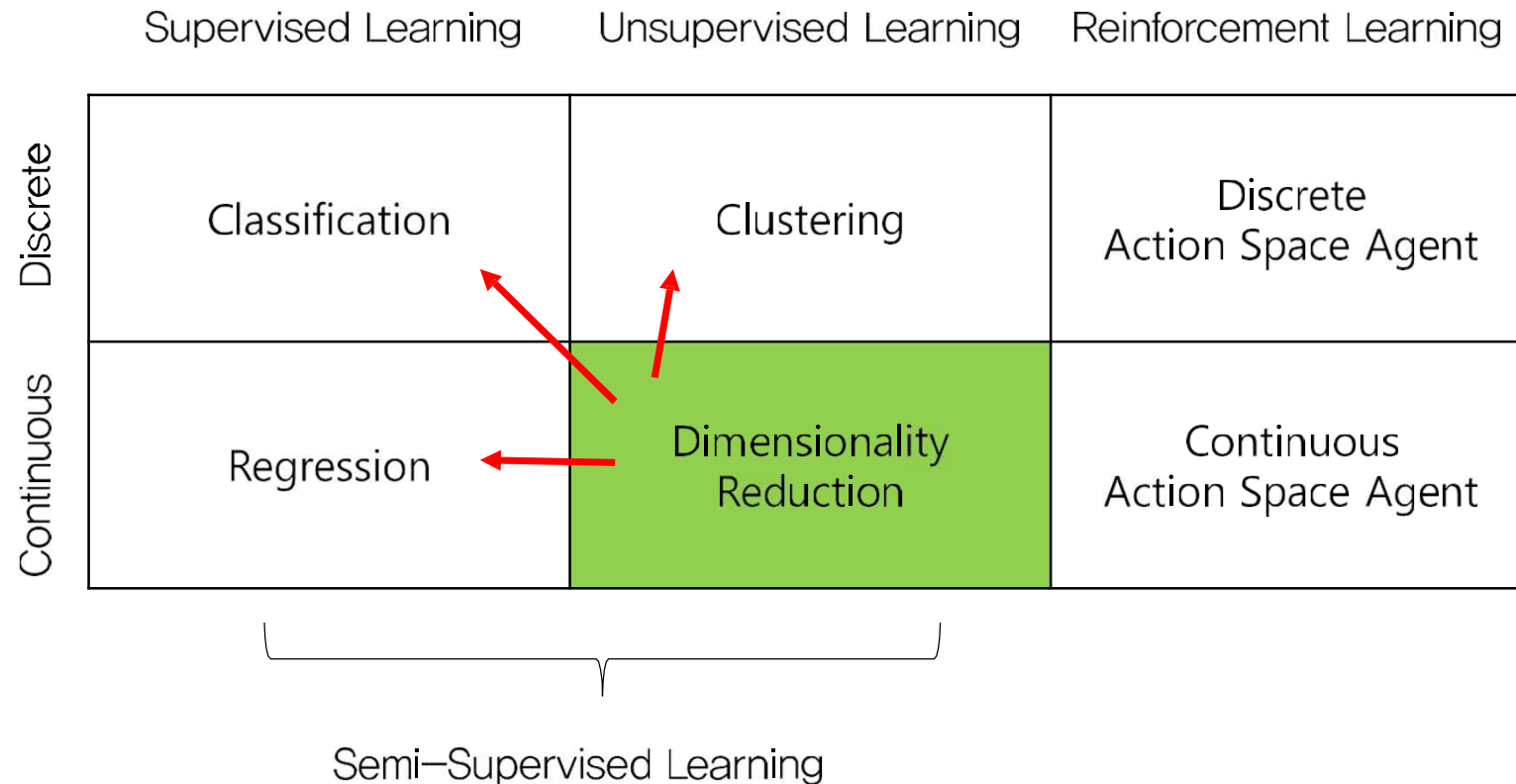
Dimensionality Reduction Problem

Reduce the dimension of input data, to avoid the effect of the curse of dimensionality

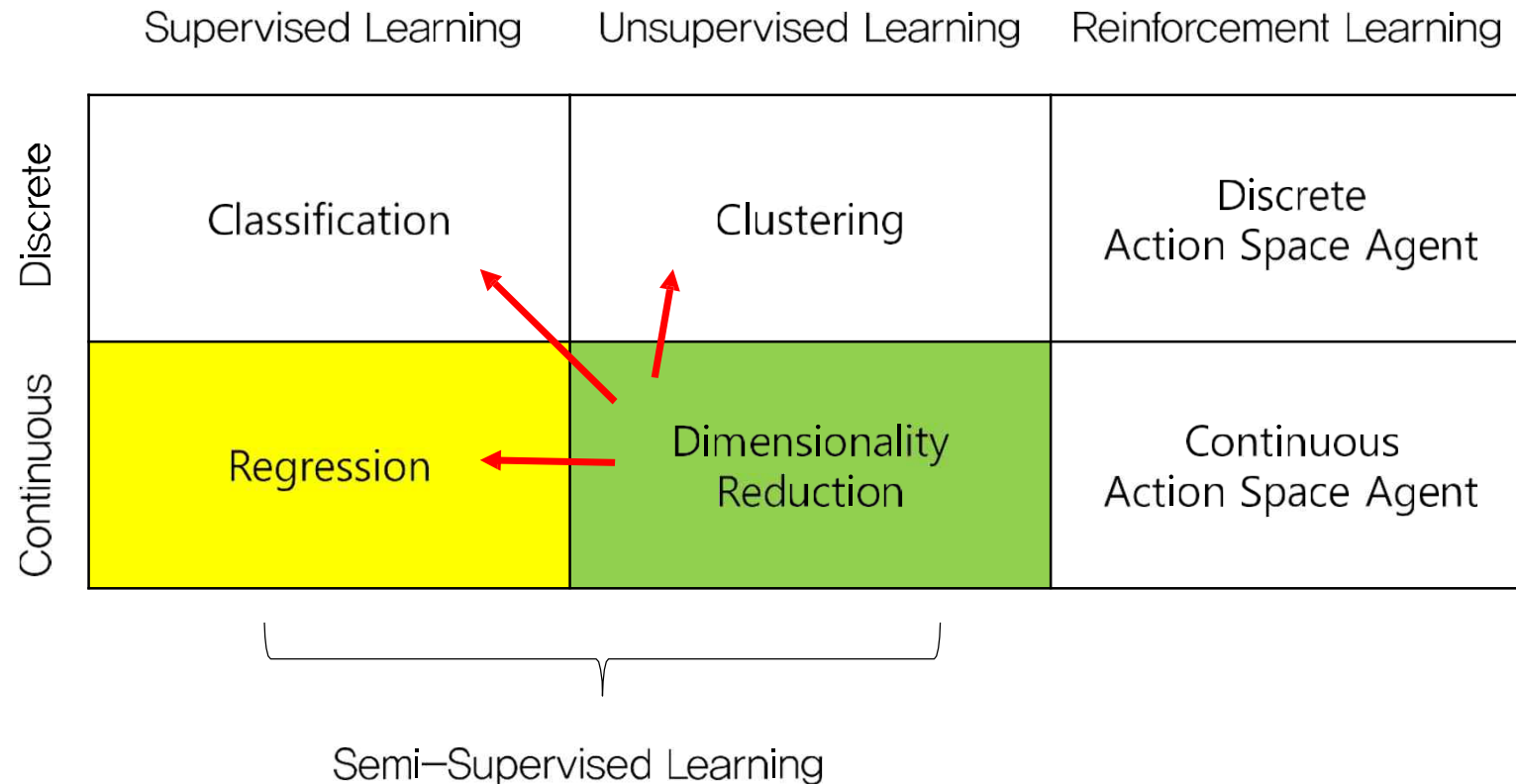


Reduce unnecessary representation axis

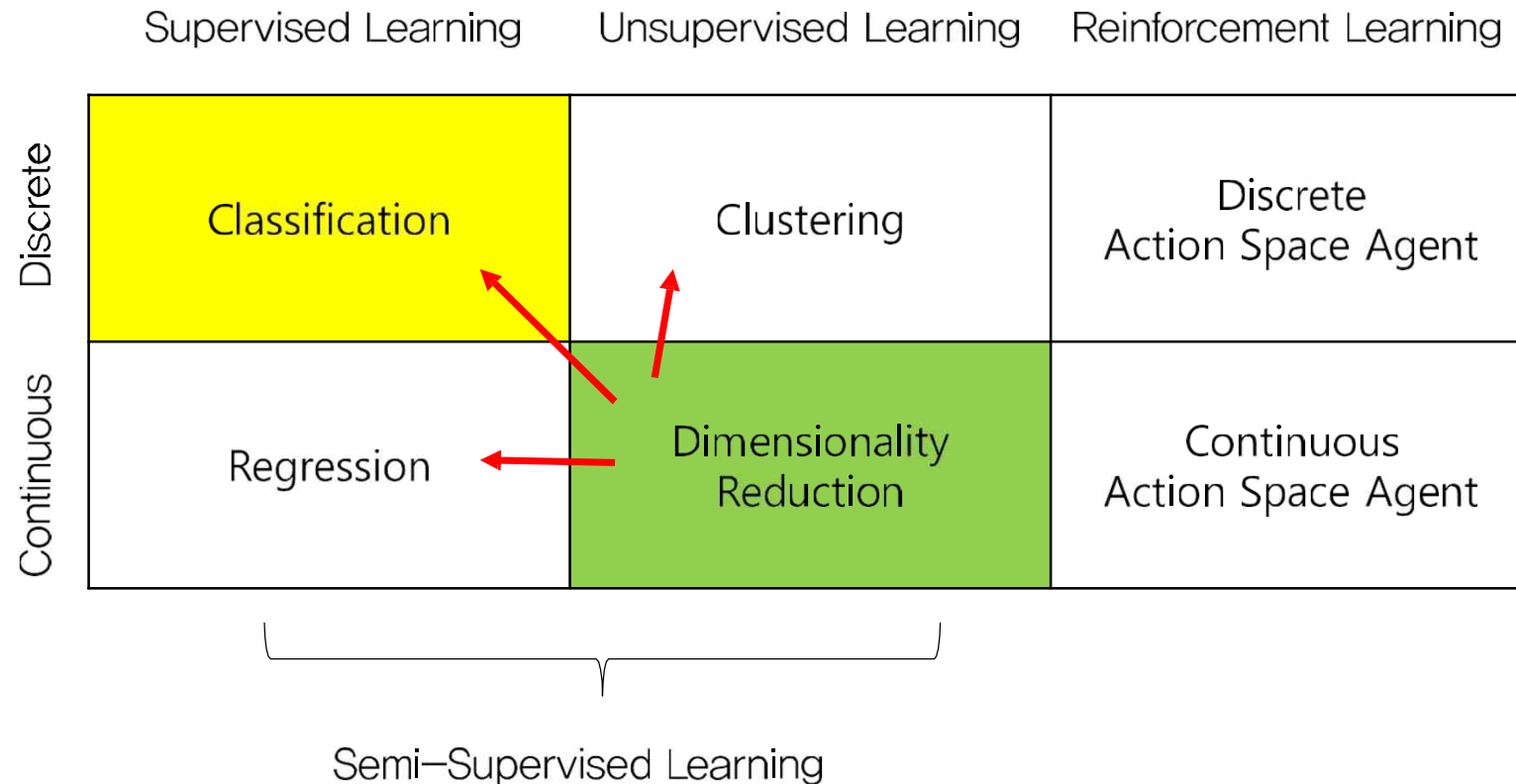
Categories of ML Problems



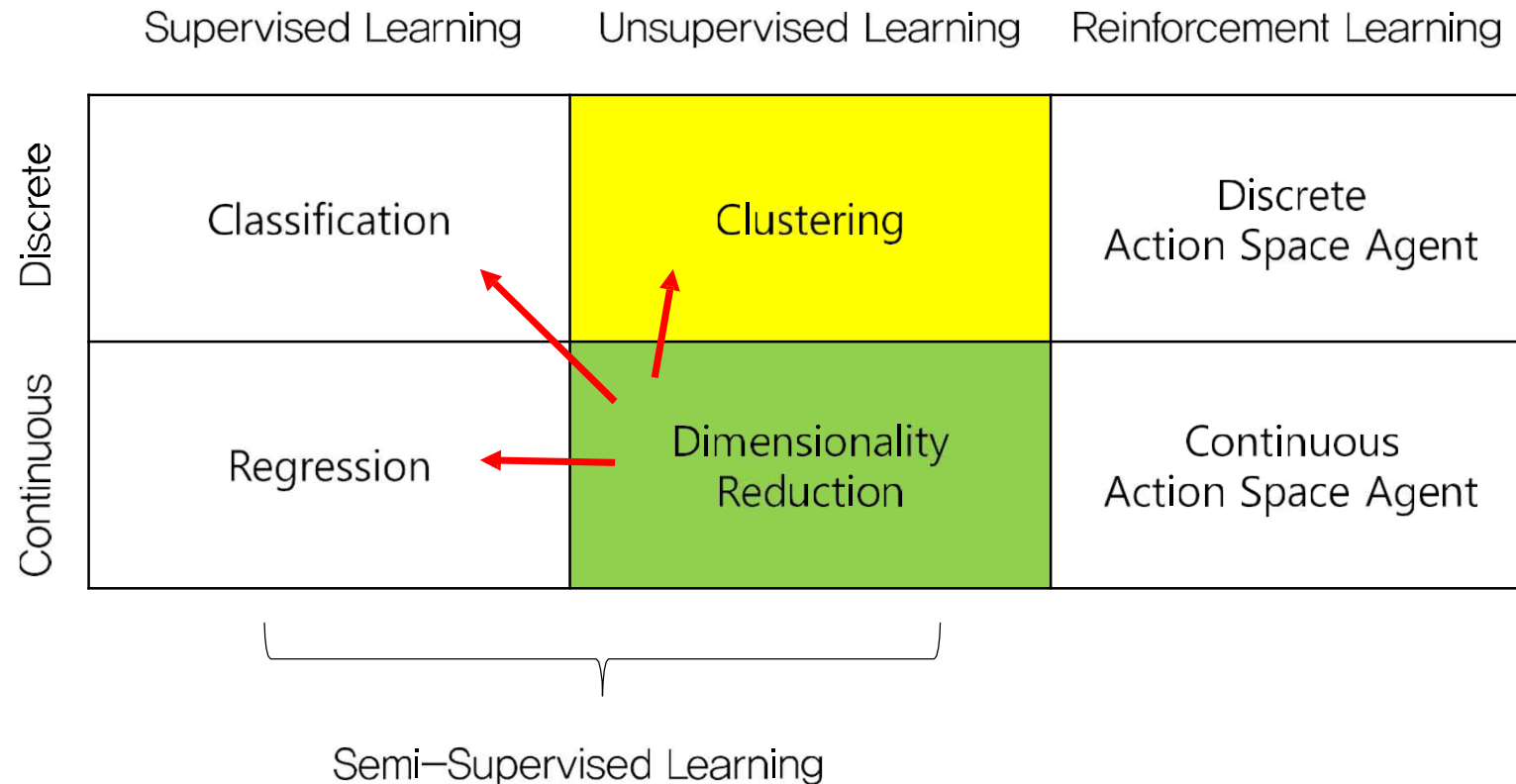
Categories of ML Problems



Categories of ML Problems



Categories of ML Problems



Feature & Data Representation

Case 1

X

ML

Y

x1 : quiz 1 score
x2 : quiz 2 score
x3 : study hour



y1 : final exam score
y2 : grade

Feature & Data Representation

Case 2

X

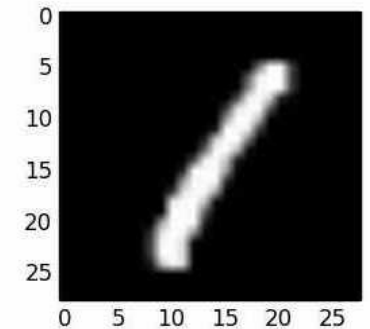
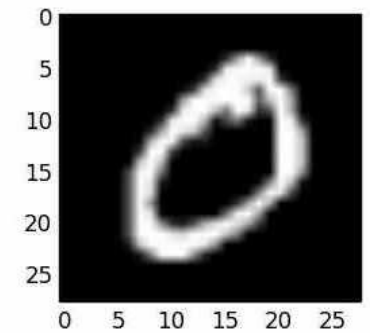
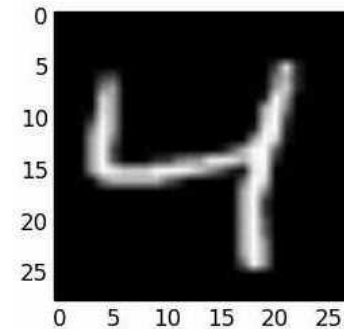
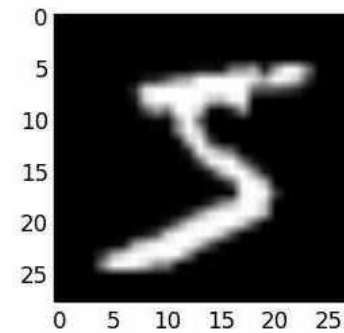
ML

Y

x1 : first pixel value
x2 : second pixel value
x3 : third pixel value
...
x784 : 784th pixel value



y1 : digit



Feature & Data Representation

Case 2

X

DL

h

ML

Y

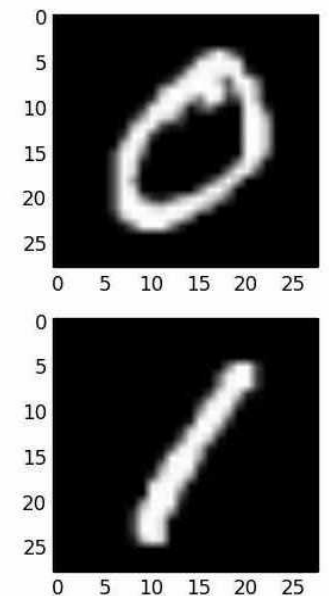
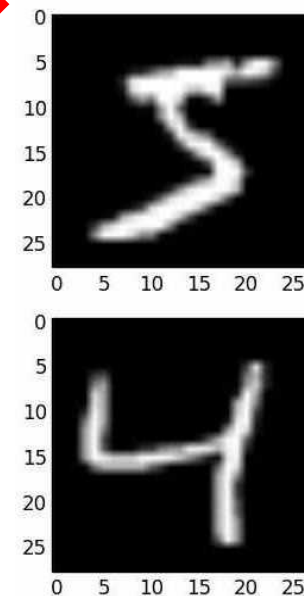
x1 : first pixel value
x2 : second pixel value
x3 : third pixel value
...
x784 : 784th pixel value



h1 : feature1
h2 : feature2
h3 : feature3



y1 : digit



Summary