Deep Learning

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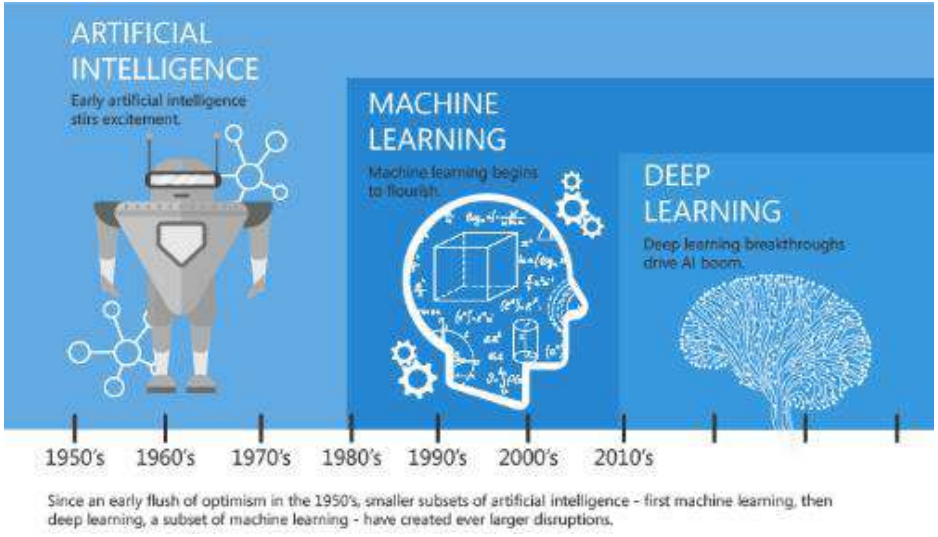
Outlines

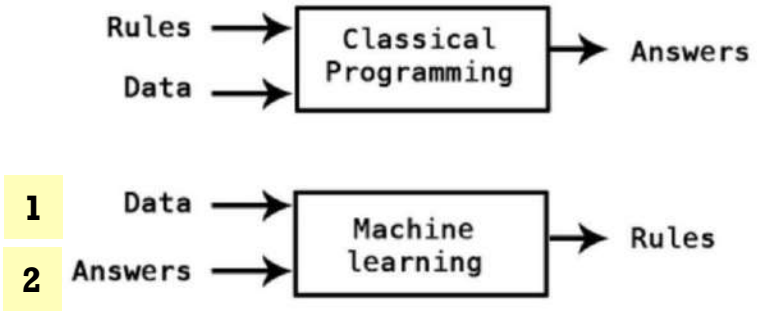
- What is Deep Learning (DL)?
- Why now?
- DL application
  - Computer Vision (CV), NLP, Automatic Speech Recognition (ASR)
- DL tools
- Conclusion

AI = Automation

- 1) Rule-based AI
- 2) Machine Learning (ML)



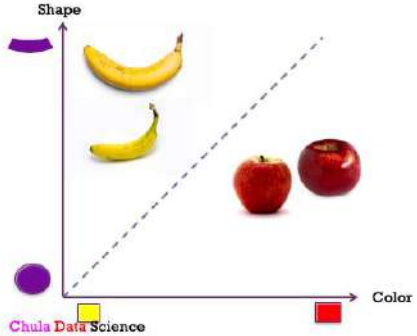
Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.



https://mc.ai/machine-learning-basics-artificial-intelligence-machine-learning-and-deep-learning/

Handcrafted features

Age	Income	Gender	Province	Corona
25	25,000	Female	Bangkok	Yes
35	50,000	Female	Nontaburi	Yes
32	35,000	Male	Bangkok	No

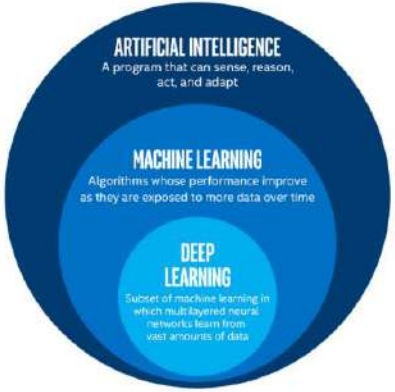


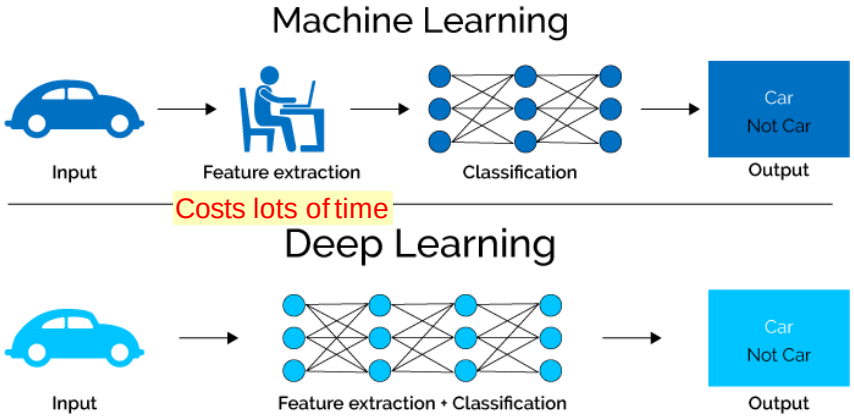
Can we still tell the features (columns)?

What is Deep Learning (DL)?

Part of the machine learning field of learning representations of data. Exceptional effective at learning patterns.

Utilizes learning algorithms that derive meaning out of data by using a hierarchy of multiple layers that mimic the neural networks of our brain.



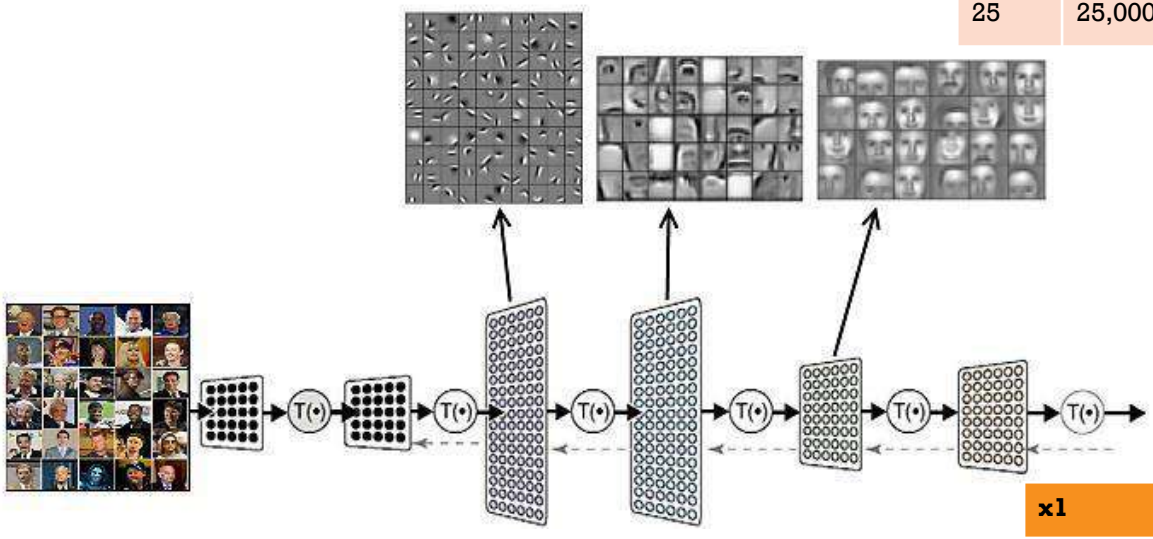


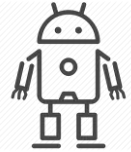
Deep Learning – Basics (cont.)

What did it learn?

A deep neural network consists of a hierarchy of layers, whereby each layer transforms the input data into more abstract representations (e.g., edge -> nose -> face). The output layer combines those features to make predictions.

Age	Income	Gender	Province	Corona
25	25,000	Female	Bangkok	Yes





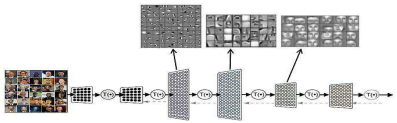
x1	x2	x3	x4	Corona
0.7	0.2	-0.5	-0.1	Yes

Deep Learning Application

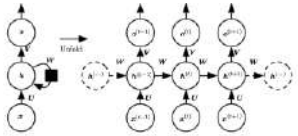
Speech Recognition

Computer Vision

Natural Language Processing



CNN



RNN (LSTM)

IMAGENET

The **ImageNet** project is a large visual database designed for use in visual object recognition software research. Over **14M** URLs of images have been hand-annotated by ImageNet to indicate what objects are pictured on **22K** categories.

IMAGENET **Large Scale Visual Recognition Challenge**

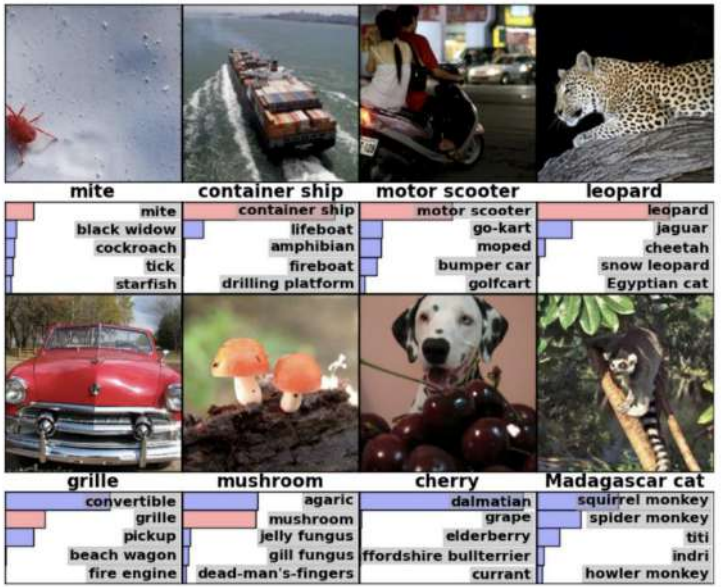
ILSVRC

The Image Classification Challenge:

1,000 object classes

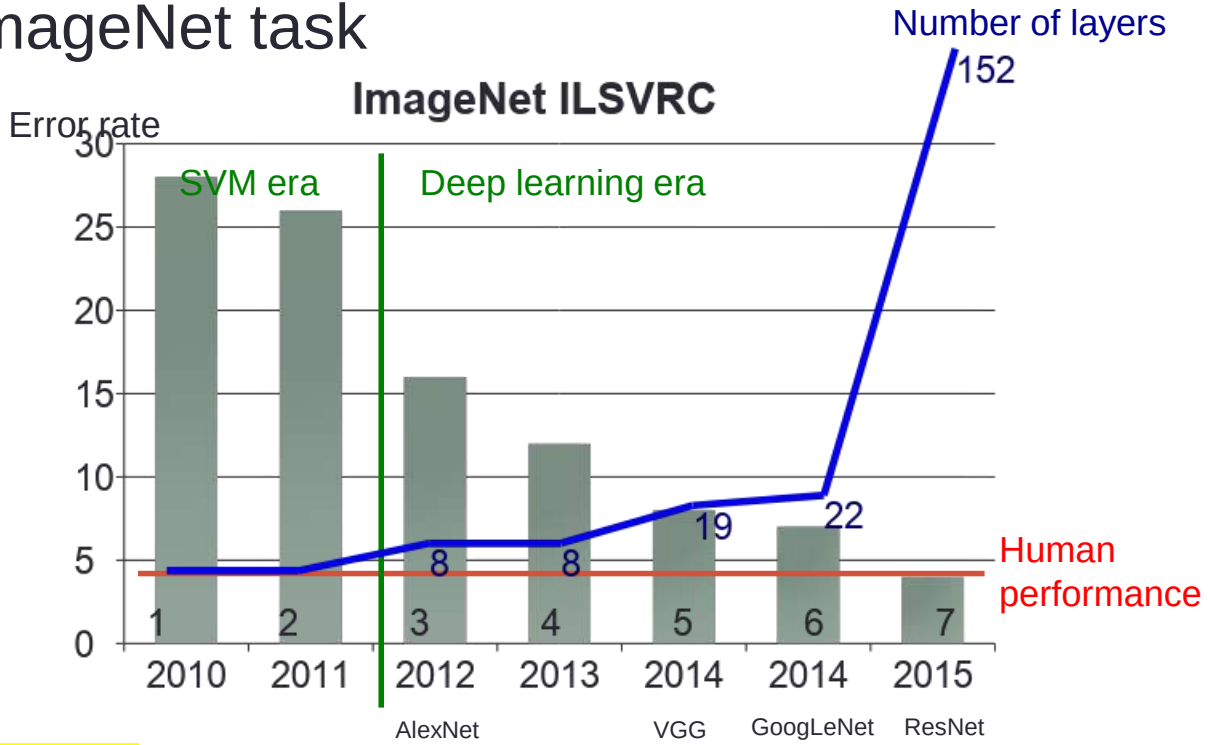
1,431,167 images

ImageNet 2017 is the last challenge.



Wider and deeper networks (Beyond Human)

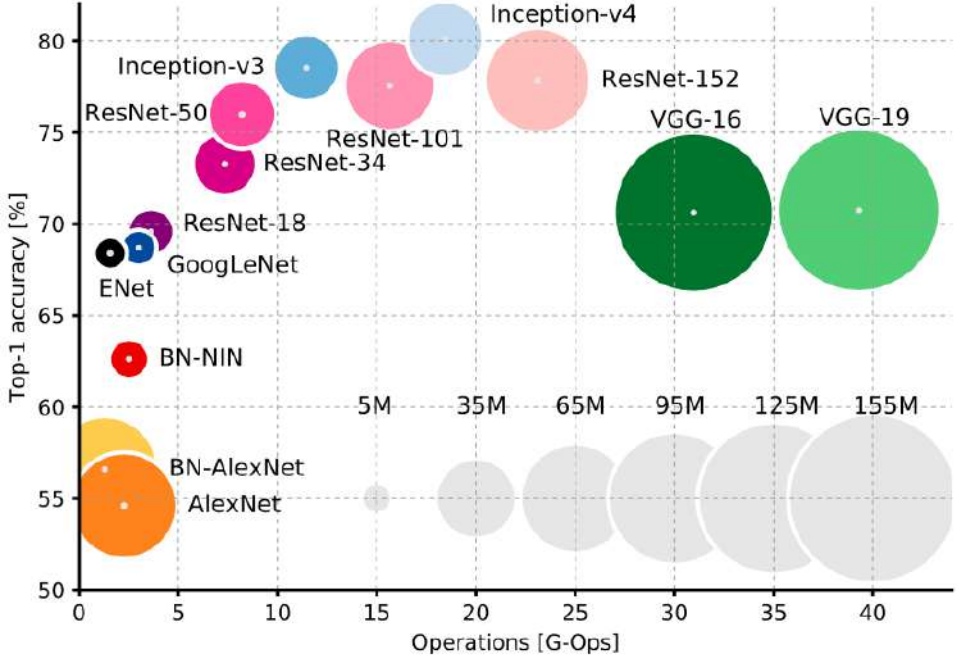
- ImageNet task

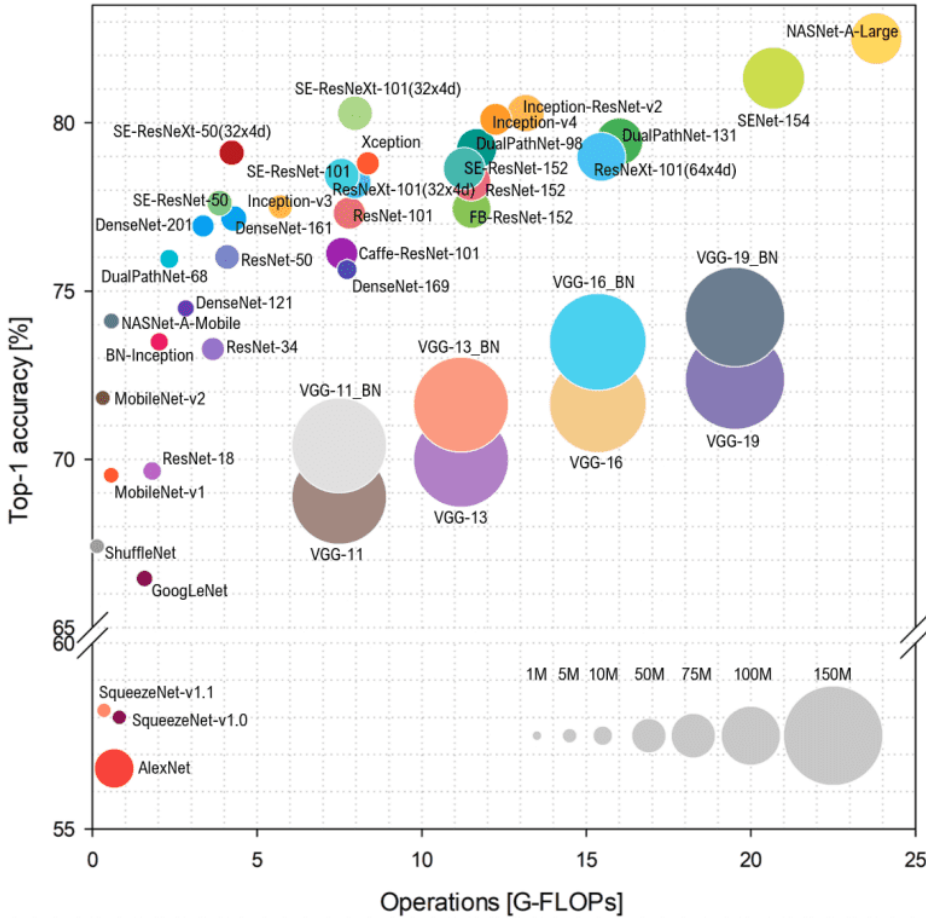


Based on the slide of Aj.Ekapol

Net Large Scale Visual Recognition Challenge, 2014 https://arxiv.org/abs/1409.0575

SOTA of Image Classification



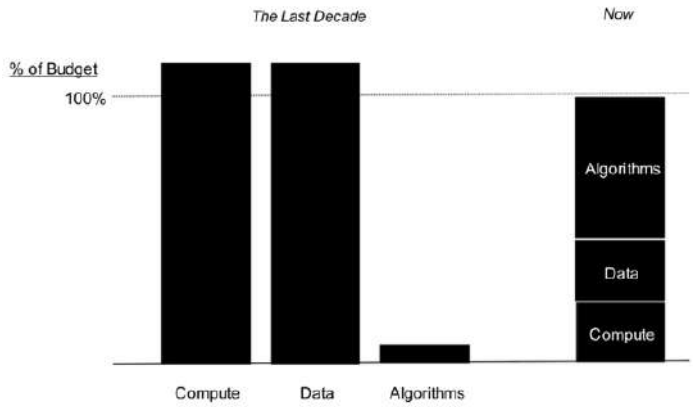


https://blog.csdn.net/qq_34216467/article/details/83061692

https://theaisummer.com/cnn-architectures/

Why now

- Neural Networks has been around since 1990s
- Big data – DNN can take advantage of large amounts of data better than other models
- GPU – Enable training bigger models possible
- Deep – Easier to avoid bad local minima when the model is large



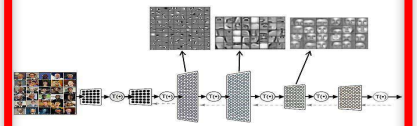
Based on the slide of Aj.Ekapol

www.kdnuggets.com/2017/06/practical-guide-machine-learning-understand-differentiate-apply.html

Deep Learning Application

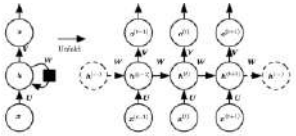
Speech Recognition

Computer Vision



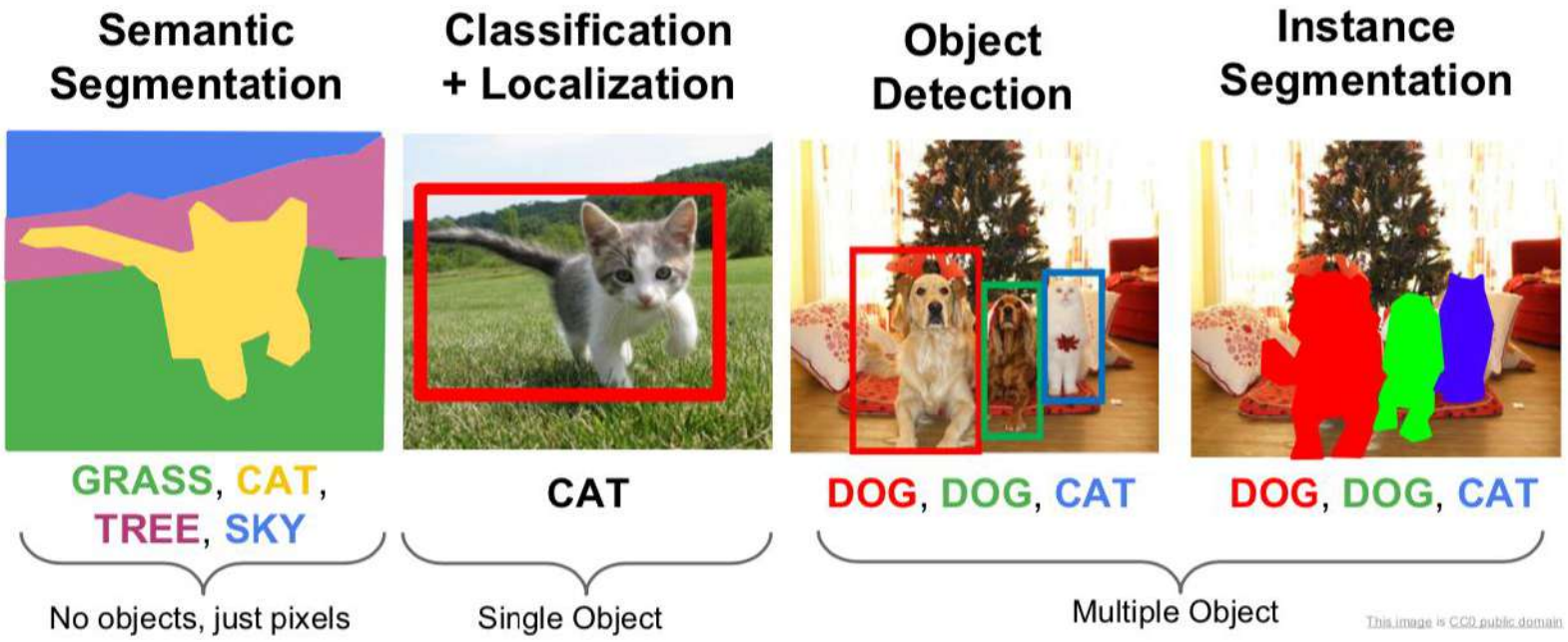
CNN

Natural Language Processing



RNN (LSTM)

Type of image tasks



https://www.hikvision.com/th/newsroom/latest-news/2019/people-counting-for-increased-retail-success/

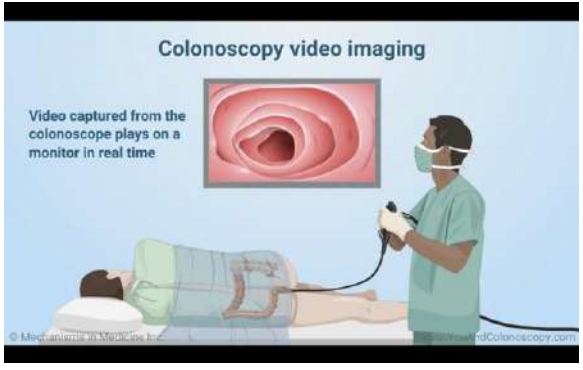

boat 0.55
boat 0.40


In Frame: 3
Identified: 3
workpoint
ID: Orn
DB: 88 (img)
ID: Cherprang
DB: 176 (img)
ID: Pun
DB: 48 (img)
ตัวอย่างความสนุกวันนี้
www.youtube.com/workpointofficial

Smart Medical Diagnosis

CHULA ENGINEERING
Foundation toward Innovation

King Chulalongkorn Memorial Hospital
The Thai Red Cross Society



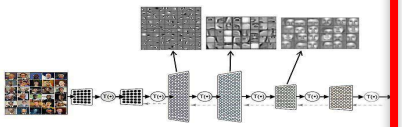

car 0.96
traffic cone 0.85
traffic cone 0.89

Deep Learning Application

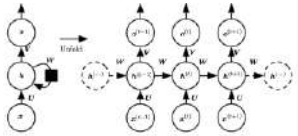
Speech Recognition

Computer Vision

Natural Language Processing



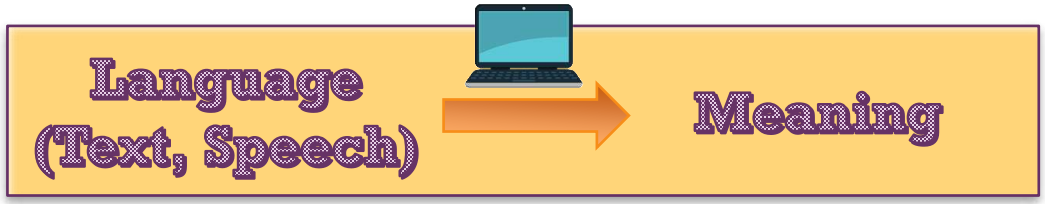
CNN



RNN (LSTM)

Introduction: Natural Language Processing (NLP)

- Subfield of AI
- GOAL:
  - Bridge the gap between how people **communicate** and what machines **understand** in order to perform useful tasks, e.g.
    - Making appointments, buying things, question answering, etc.



Goal: intelligent processing of human languages
- Not just string matching

Intro (cont.): NLP Pipeline Example (English)

1 Tokenization
- Input: Mr.Smith goes to Washington
- Output: [Mr.Smith, goes, to, Washington]

2 Part of Speech tagging
- Input: [Mr.Smith,goes,to,Washington]
- Output:[(Mr.Smith,**NNP**), (goes,**VBZ**), (to,**TO**), (Washington,**NNP**)]

3 NER
- Input:[(Mr.Smith,**NNP**), (goes,**VBZ**), (to,**TO**), (Washington,**NNP**)]
- Output:[(Mr.Smith,NNP,**PER**), (goes,VBZ,**O**), (to,TO,**O**), (Washington,NNP,**LOC**)]

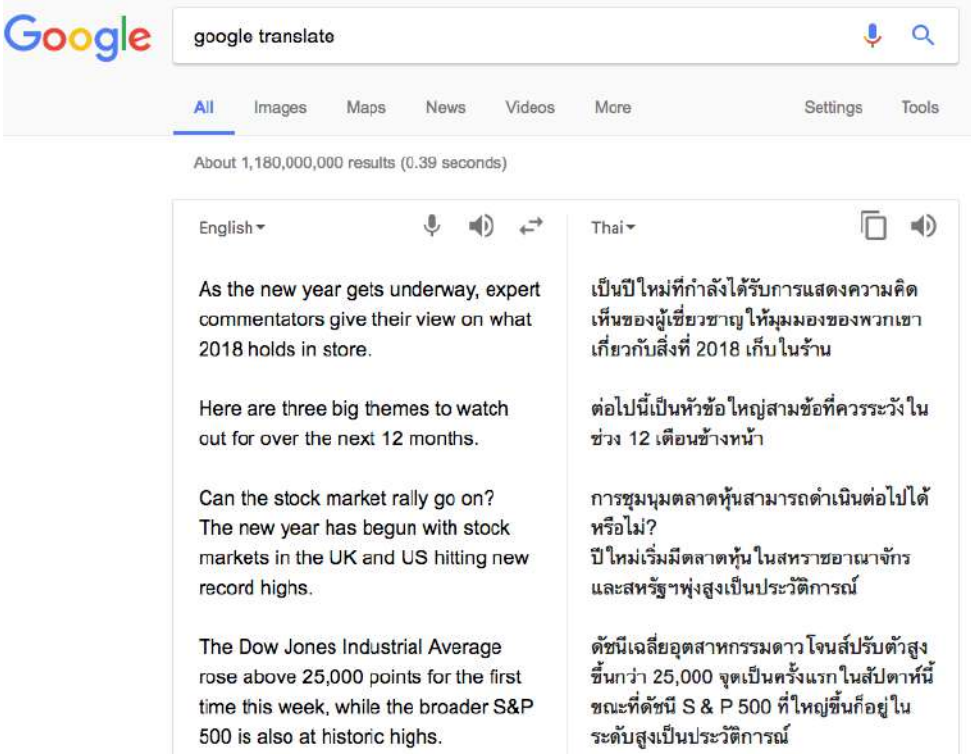
4 Application
- e.g., Word Cloud (Named Entity Only), Question Answering (QA)

PENN Part Of Speech Tags
- NNP – proper noun
- VBZ - Verb, 3rd person singular present
- TO – to

Ref: https://www.ling.upenn.edu/courses/Fall_2003/ling001/penn_treebank_pos.html

Named Entity Tags
- PER –Person
- LOC – Location
- ORG – Organization
- O – Other

NLP today: Machine Translation (MT)



http://www.bbc.com/news/business-42581934

NLP today: Question Answering (QA)

IBM Watson wowed the tech industry and a corner of U.S. pop culture with its 2011 win against two of Jeopardy's greatest champions. Here's how IBM pulled it off and a look at what Watson's real career is going to be.

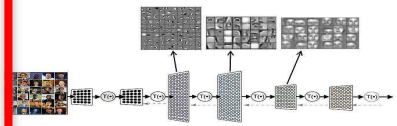
https://www.techrepublic.com/article/ibm-watson-the-inside-story-of-how-the-jeopardy-winning-supercomputer-was-born-and-what-it-wants-to-do-next/

Ref: Prof. Regina Barzilay, NLP @MIT

Deep Learning Application

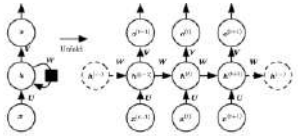
Speech Recognition

Computer Vision

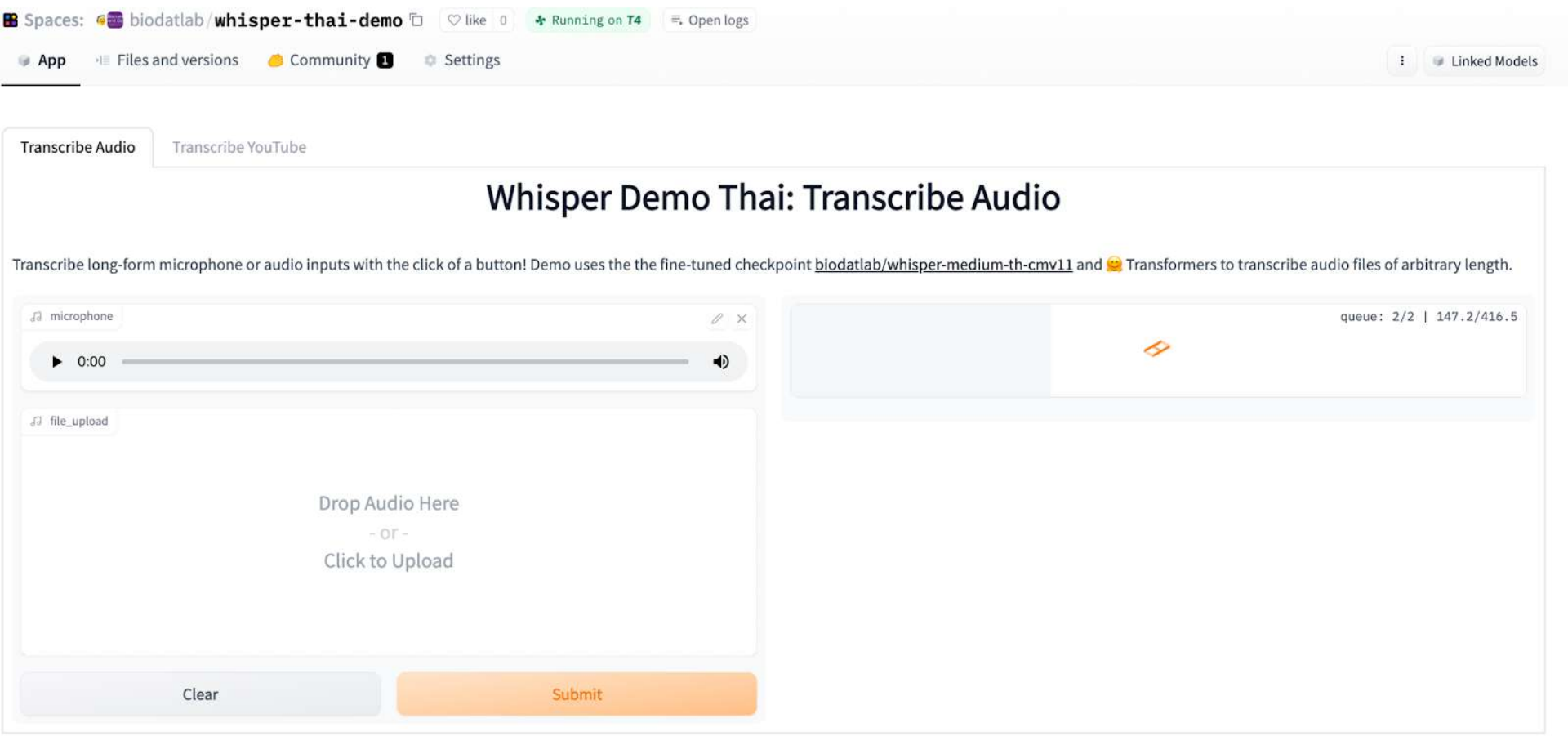


CNN

Natural Language Processing

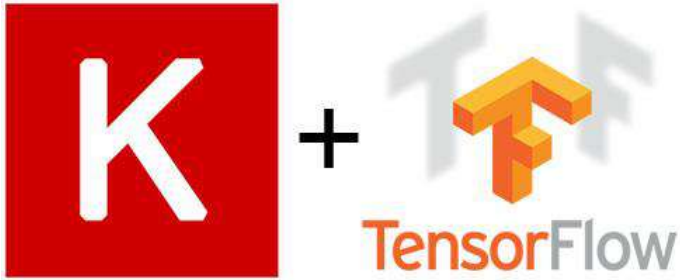


RNN (LSTM)

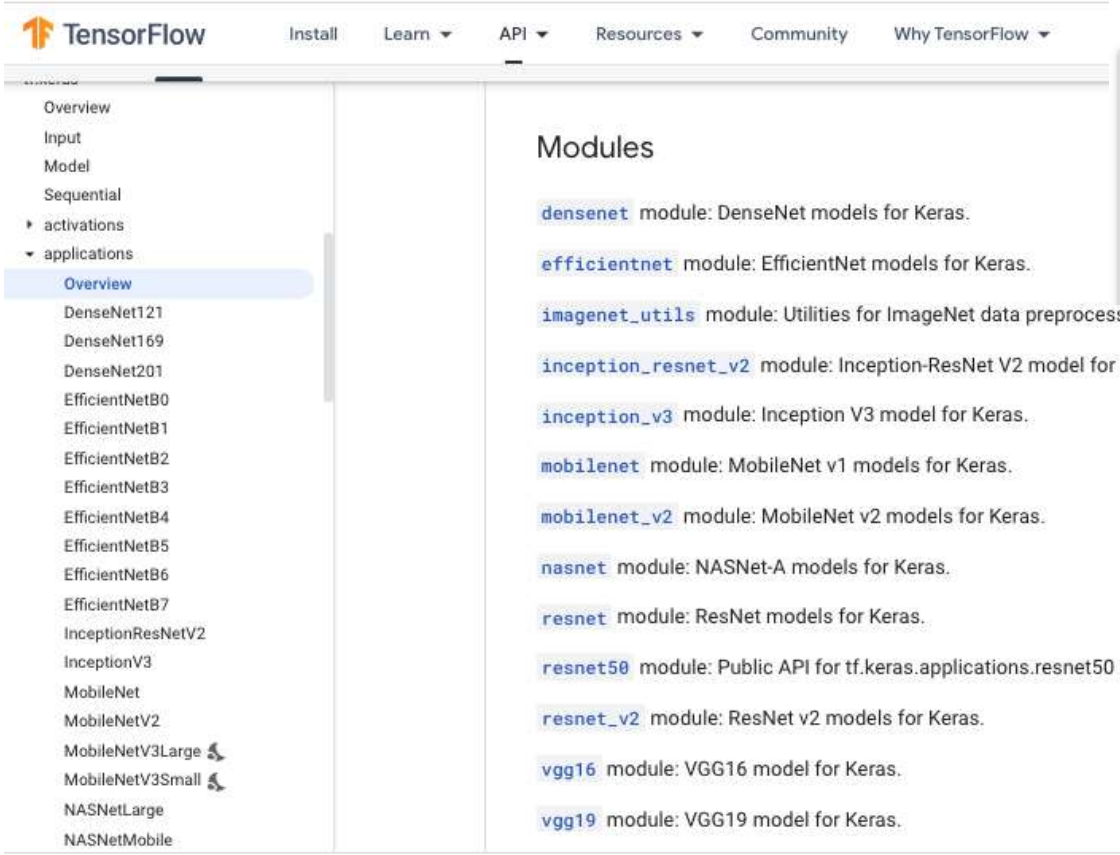


https://huggingface.co/spaces/biodatlab/whisper-thai-demo

Deep Learning tools



Tools for Computer Vision



Model 1

- VGG19 (random initialized weights) + 2 Dense layers + Output layer

```
base_model = VGG19(weights=None, include_top=False, input_shape=(224, 224, 3))

for layer in base_model.layers:
    layer.trainable = True

x = base_model.output
x = Flatten()(x)
x = Dense(1024)(x)
x = Dropout(0.5)(x)
x = Dense(512)(x)
x = Dropout(0.5)(x)
output = Dense(num_class, activation='softmax')(x)
```

https://www.tensorflow.org/api_docs/python/tf/keras/applications

Tools for Thai NLP

PyThaiNLP

python 3.6 | pypi v2.1.2 | downloads/month 15k | License Apache 2.0 | license scan passing | build passing | build passing
code quality A | coverage 91% | Launch Quick Start Guide on Google Colab | DOI 10.5281/zenodo.3595968

Thai Natural Language Processing in Python.

PyThaiNLP is a Python package for text processing and linguistic analysis, similar to `nltk` but with focus on Thai language.

News

> We are conducting a 2-minute survey to know more about your experience using the library and your expectations regarding what the library should be able to do. Take part in this survey: https://forms.gle/aLdSHnvkNuK5CFyt9

This is a document for development branch (post 2.1). Things will break.

WangchanBERTa โมเดลประมวลผลภาษาไทยที่ใหญ่และก้าวหน้าที่สุดในขณะนี้

VISTEC-depa AI Research Institute of Thailand Follow
Jan 24 · 5 min read

> *เปิดให้ทุกคนใช้ฟรีโดย AIResearch.in.th และ VISTEC ภายใต้สัญญาอนุญาต CC-BY-SA 4.0*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บริษัท ลูลู่ เทคโนโลยี ร่วมกับ มหาวิทยาลัยมหิดล
BD Biomedical and Data Lab Mahidol University
ปล่อยโมเดล
Thonburian Whisper
Automatic Speech Recognition in Thai
ถอดความจากเสียงพูดภาษาไทยที่พัฒนาต่อจากโมเดลของ OpenAI
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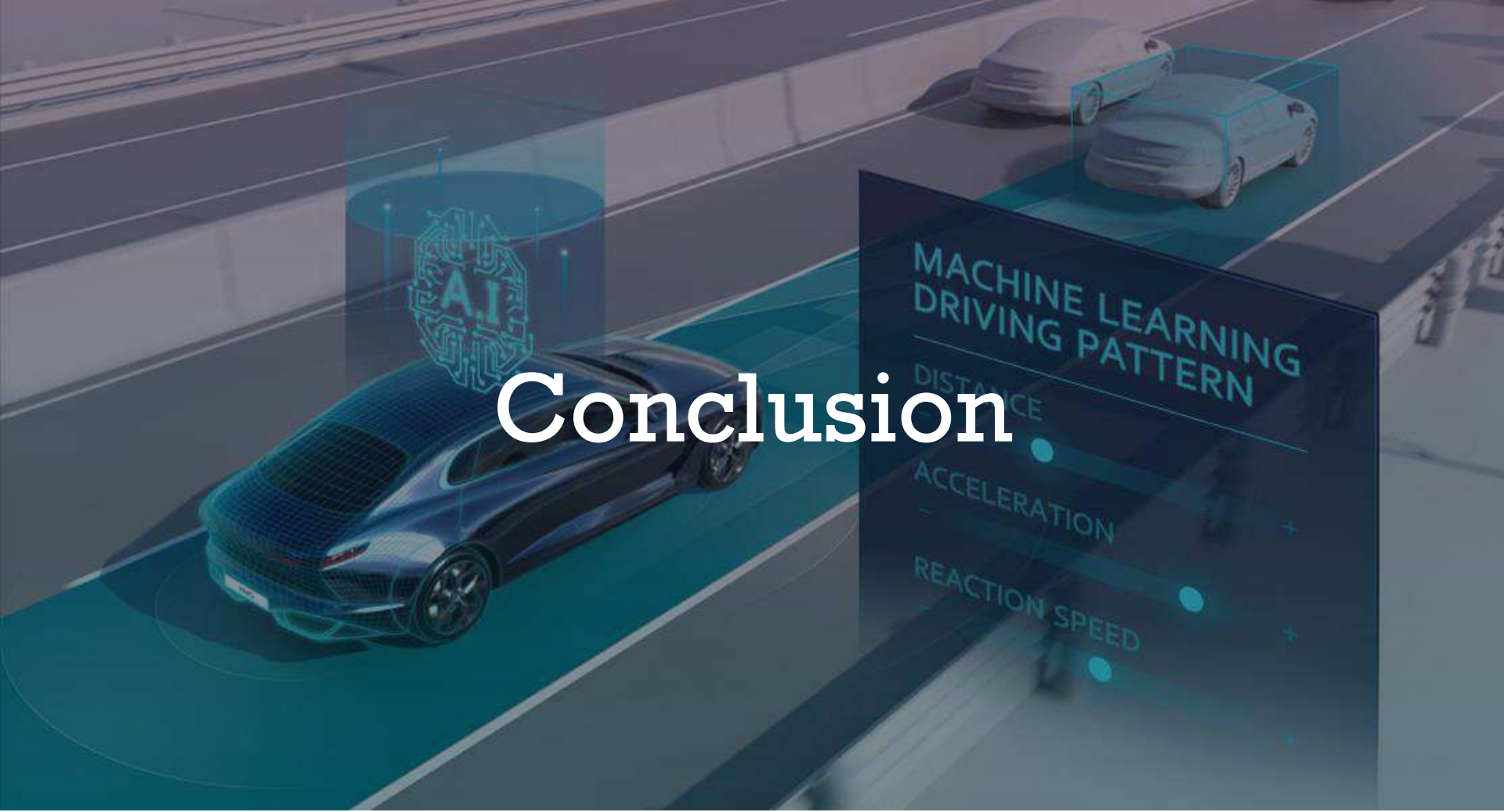
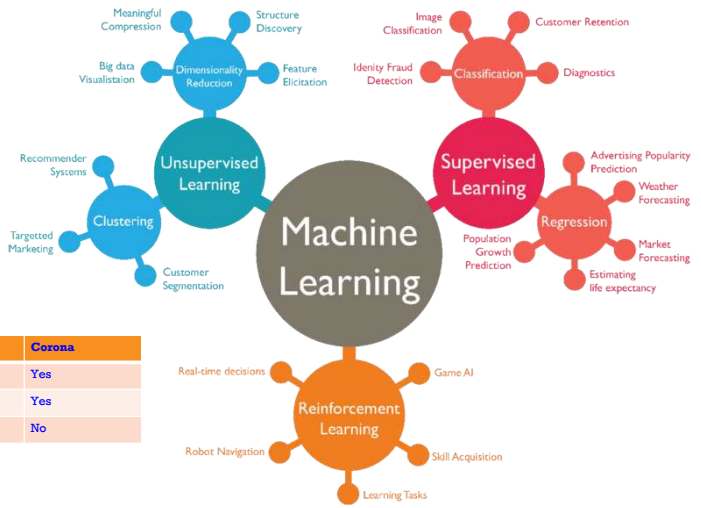
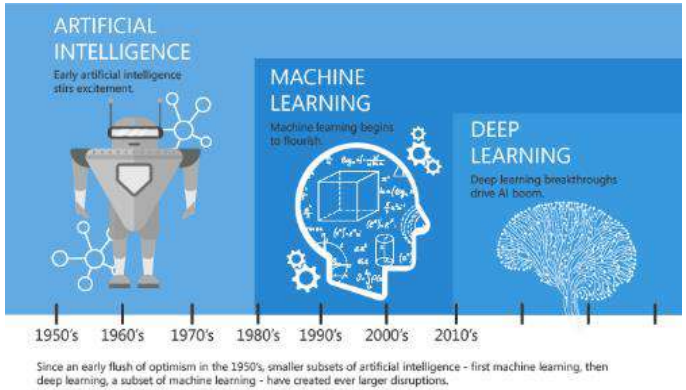

A.I
MACHINE LEARNING
DRIVING PATTERN
DISTANCE
ACCELERATION
REACTION SPEED

Conclusion

Conclusion





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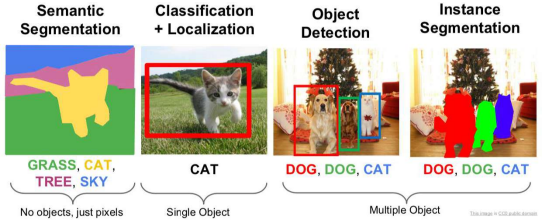

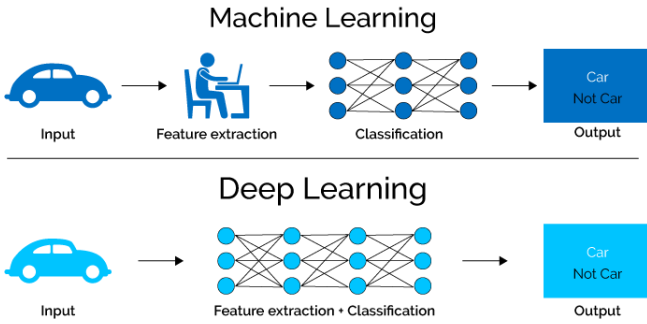


THANK YOU
FOR YOUR
ATTENTION