

Develop Computer Vision Applications on Azure

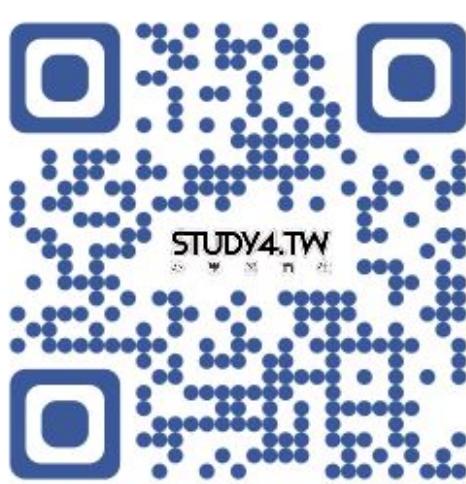
在Azure上開發電腦視覺相關應用
張懷文, Mia



Study4.TW



FB聊天社團



Study4.TW



FB粉絲專頁

特別感謝



關於我



Mia
Chang



Microsoft Data Platform MVP

Data Scientist

Linker Networks

Computer Vision/Algorithm Research

R-Ladies Taipei, Azure Taiwan

Co-organizer

mia5419@gmail.com

pymia @github



Study4Love
與大師對談

STUDY4.TW
為學習而生

#01 Smart Hotel

#02 Travel Agency

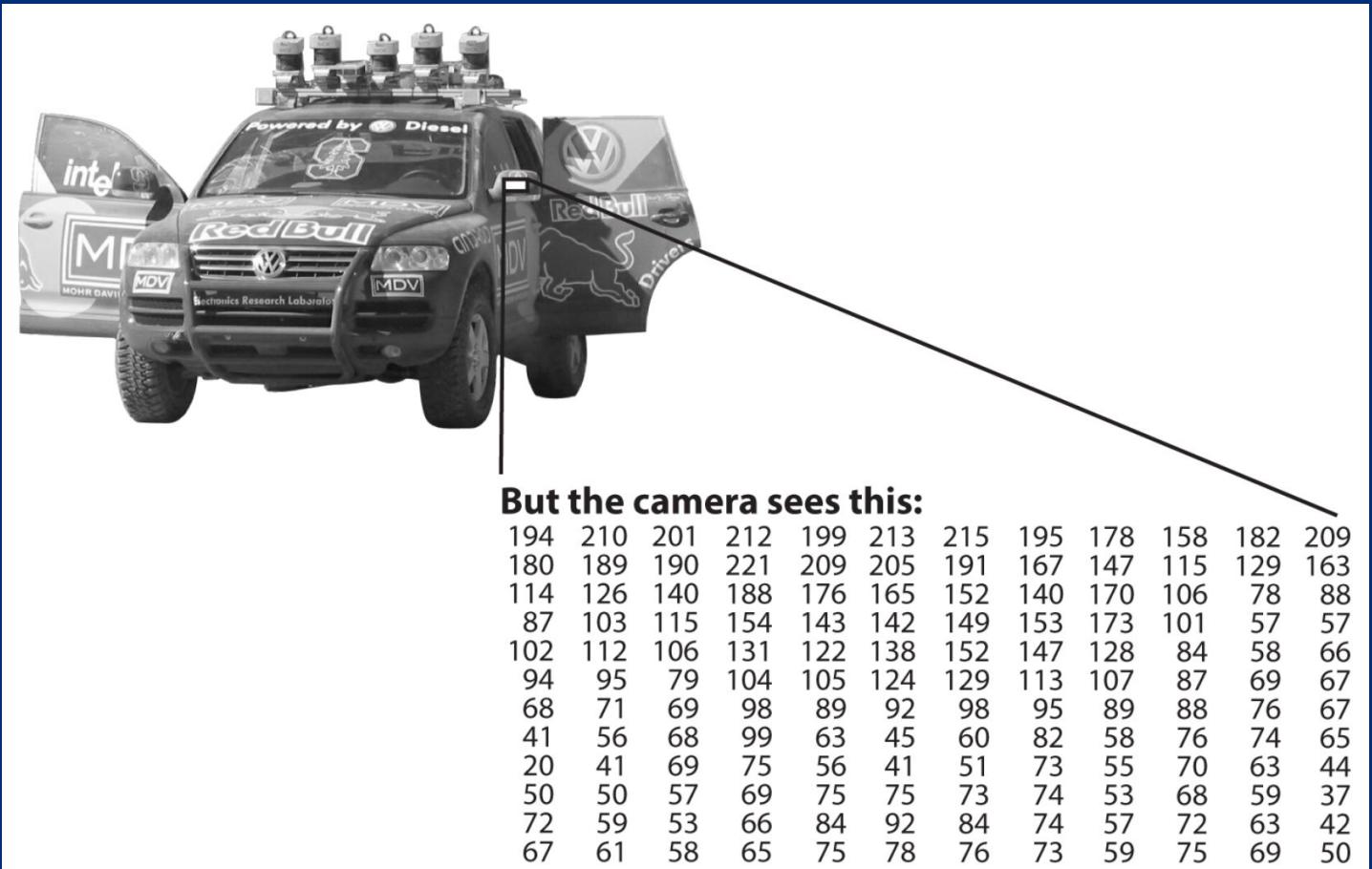
#03 Fish Recognition

#04
Face Recognition
Tracking
Smart Services

#05 Traffic Detection...



Let's Start...



For Each Pixel in Image {

 Red = Pixel.Red

 Green = Pixel.Green

 Blue = Pixel.Blue

 Gray = (Red + Green + Blue) / 3

 Pixel.Red = Gray

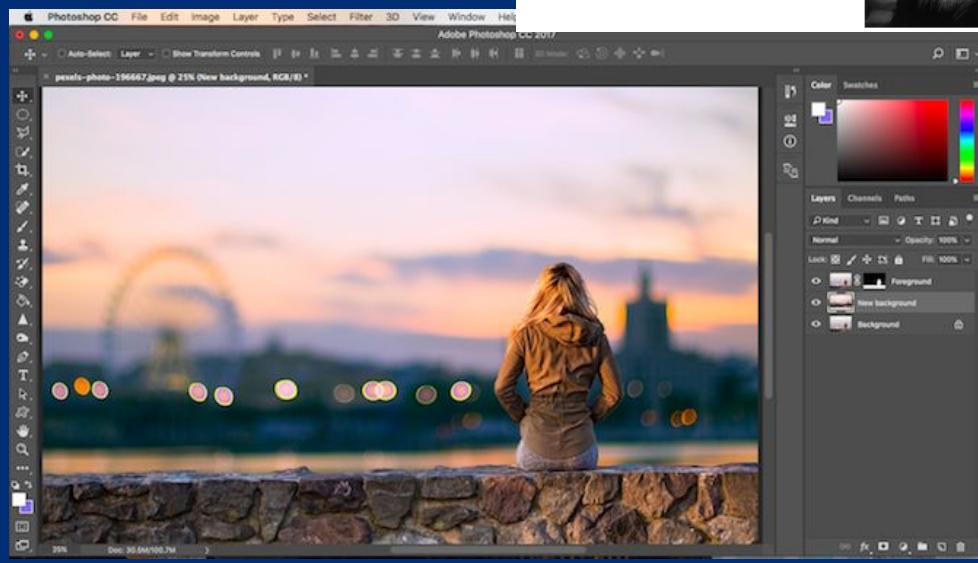
 Pixel.Green = Gray

 Pixel.Blue = Gray

}



Obama-Lisa



In 2016,

Traditional Datasets:

ImageNet

Common Objects in Context (COCO)
the CIFARs

MNIST



IMAGENET

www.image-net.org

22K categories and 14M images

- Animals
 - Bird
 - Fish
 - Mammal
 - Invertebrate
- Plants
 - Tree
 - Flower
 - Food
 - Materials
- Structures
 - Artifact
 - Tools
 - Appliances
 - Structures
- Person
- Scenes
 - Indoor
 - Geological Formations
- Sport Activities



Deng, Dong, Socher, Li, Li, & Fei-Fei, 2009

Fei-Fei Li & Justin Johnson & Serena Yeung

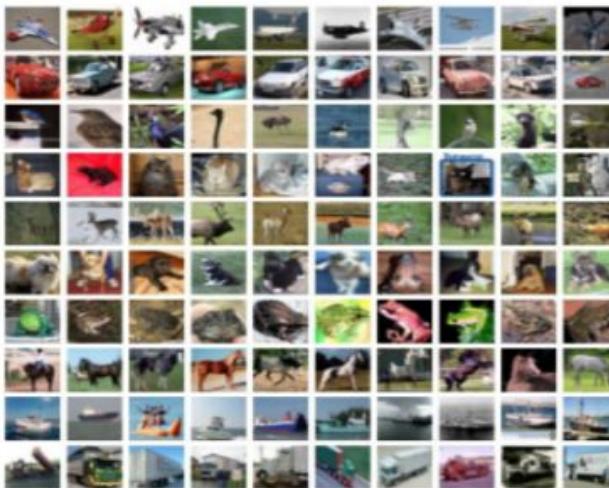
Lecture 1 - 22 4/4/2017

Example Dataset: CIFAR10

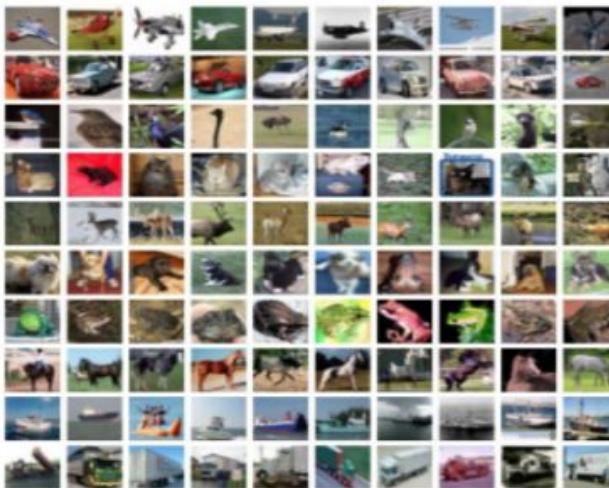
10 classes

50,000 training images
10,000 testing images

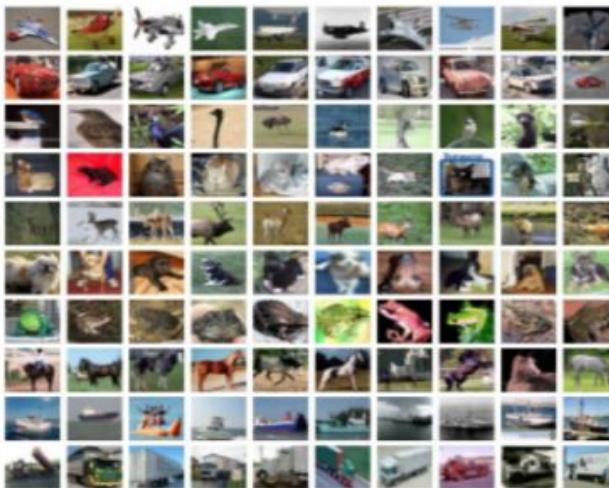
airplane



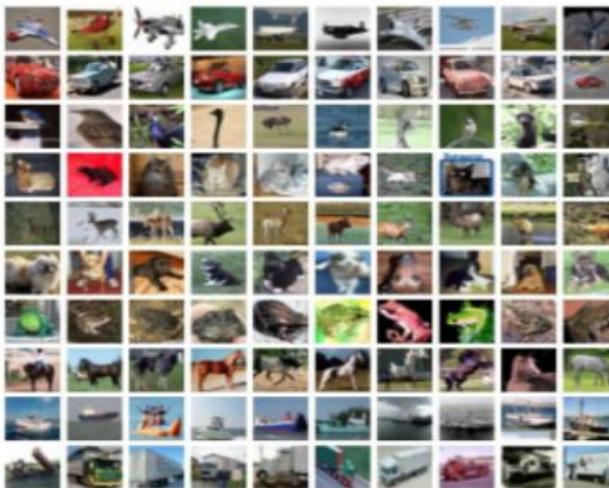
automobile



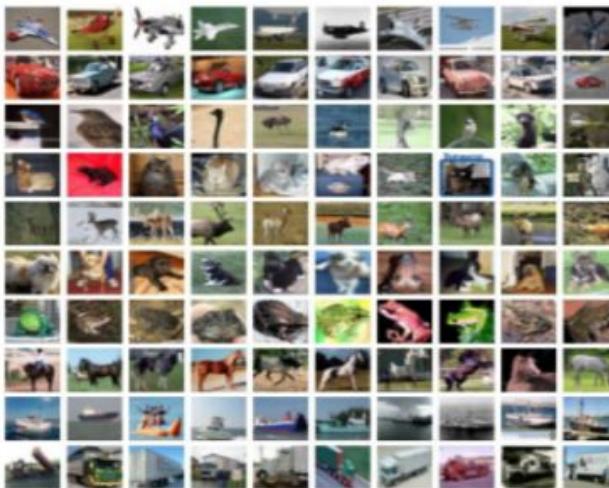
bird



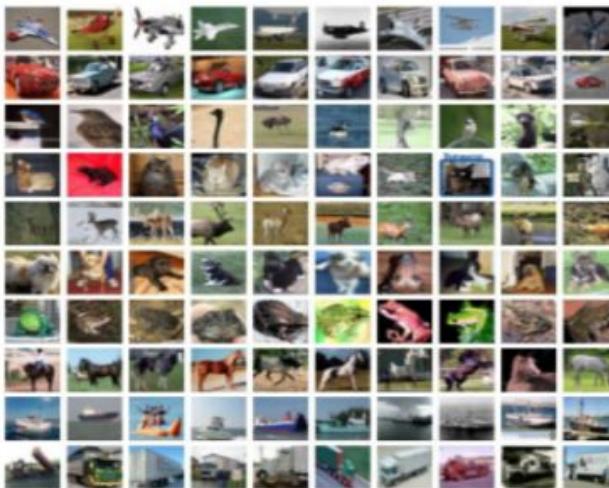
cat



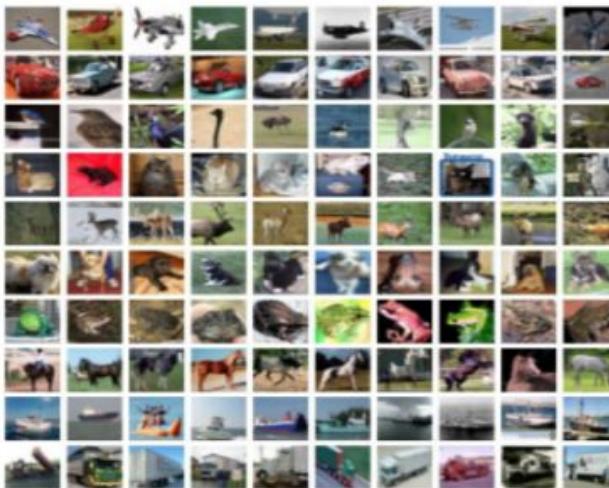
deer



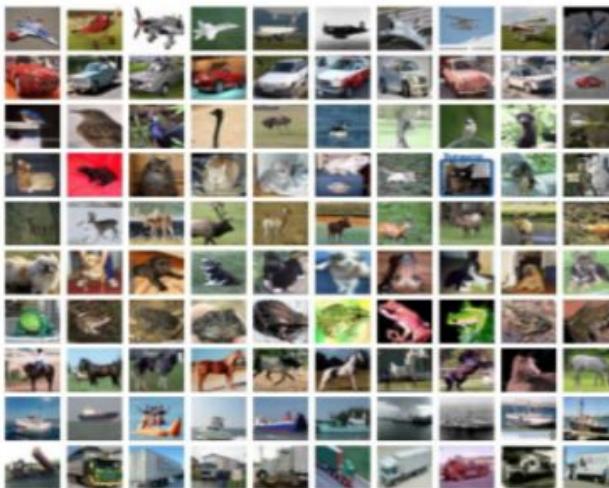
dog



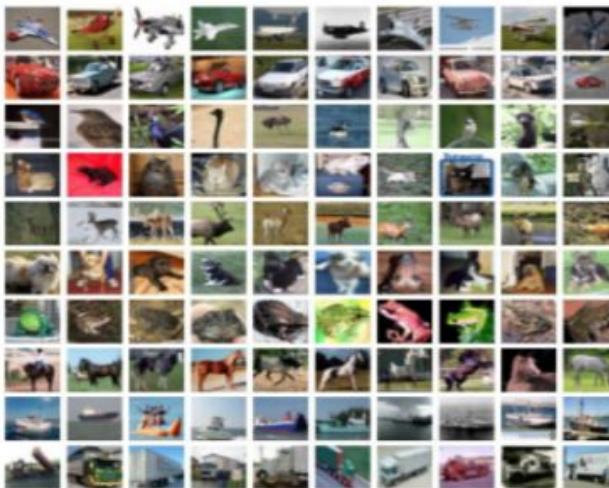
frog



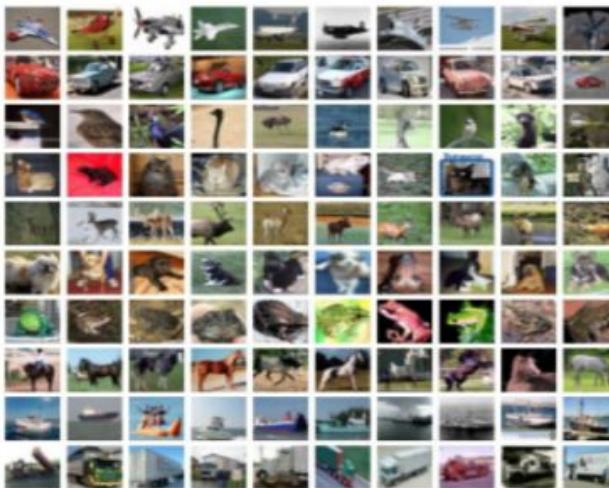
horse



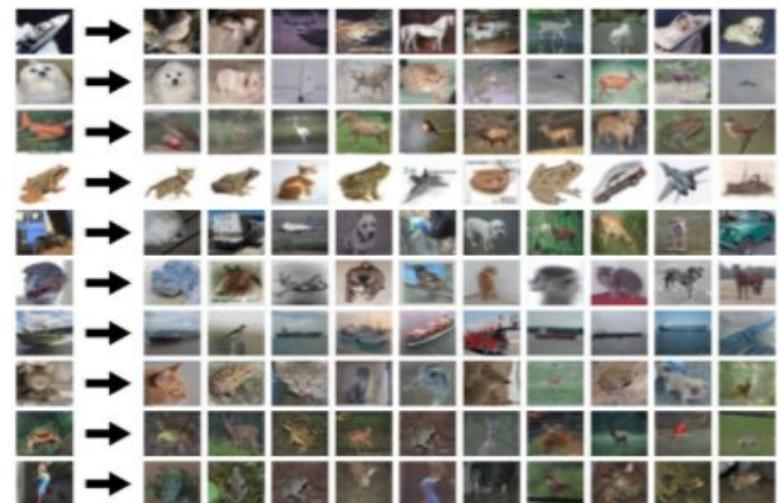
ship



truck



Test images and nearest neighbors

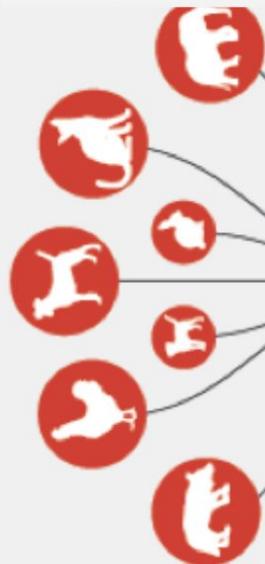


Alex Krizhevsky, "Learning Multiple Layers of Features from Tiny Images", Technical Report, 2009.

How NN Recognize a Dog in a Photo?

TRAINING

During the training phase, a neural network is fed thousands of labeled images of various animals, learning to classify them.

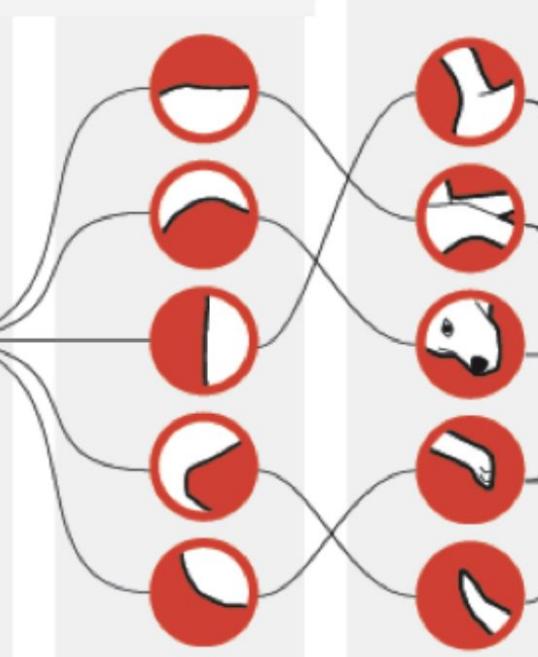


INPUT

An unlabeled image is shown to the pretrained network.

FIRST LAYER

The neurons respond to different simple shapes, like edges.



HIGHER LAYER

Neurons respond to more complex structures.

TOP LAYER

Neurons respond to highly complex, abstract concepts that we would identify as different animals.

OUTPUT

The network predicts what the object most likely is, based on its training.



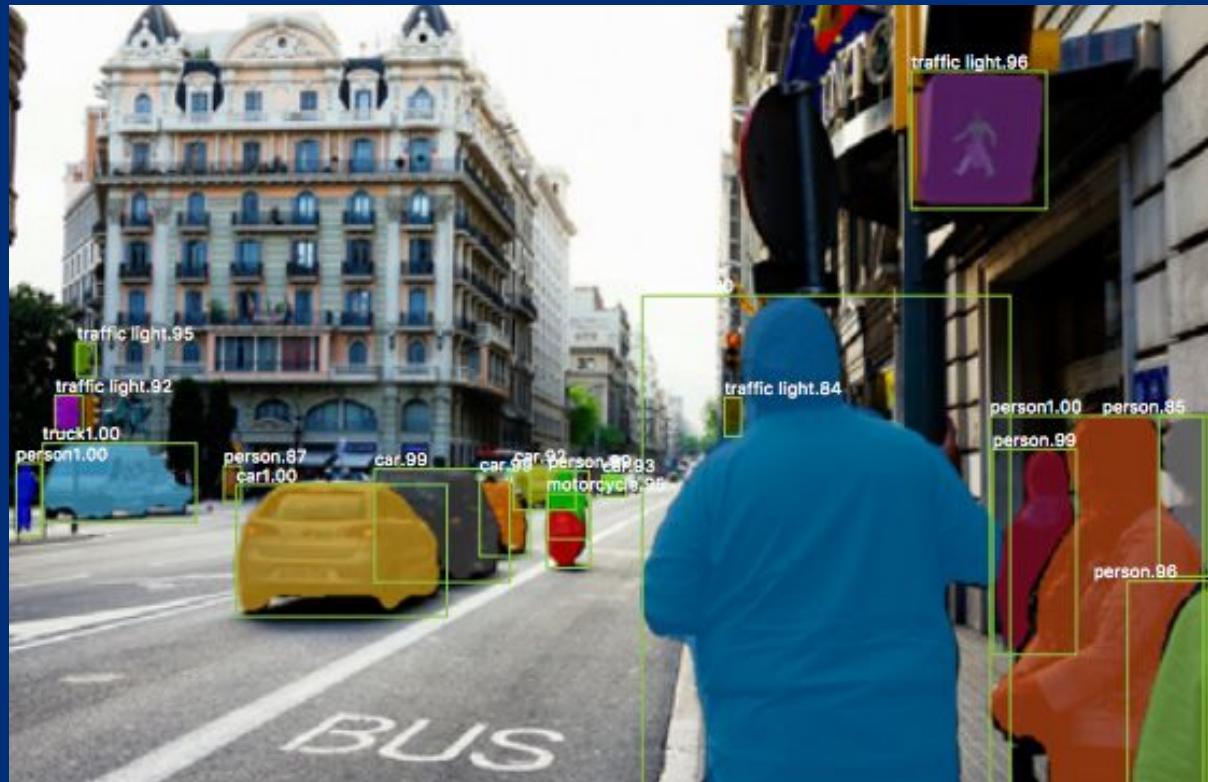
90% DOG



10% WOLF

Progress in 2017...

- # Classification
- # Segmentation
- # Style Transfer
- # Dataset



Computer Vision Tasks

Classification



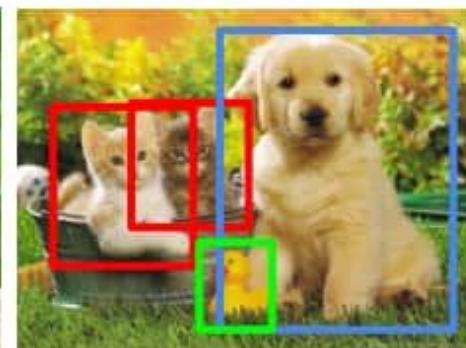
CAT

Classification + Localization



CAT

Object Detection



CAT, DOG, DUCK

Instance Segmentation

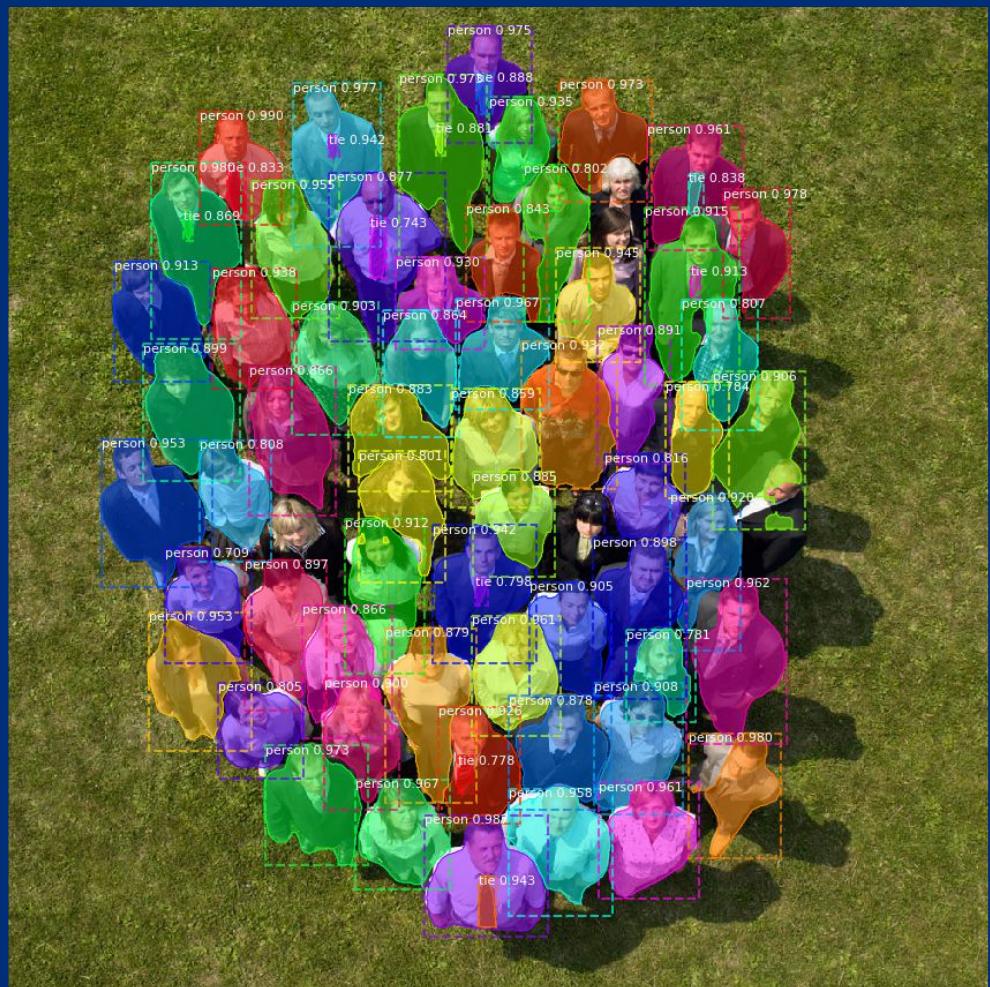
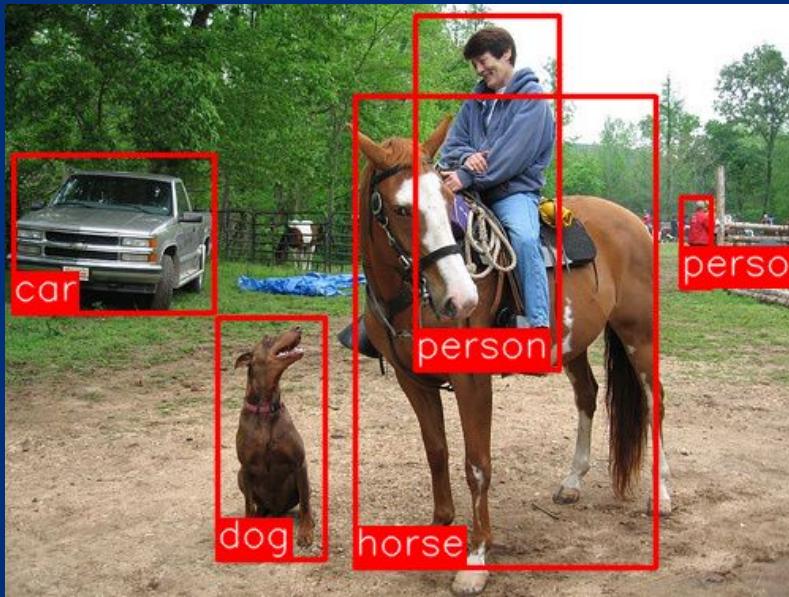


CAT, DOG, DUCK

Single object

Multiple objects

Source: Fei-Fei Li, Andrej Karpathy & Justin Johnson (2016) cs231n, Lecture 8 - Slide 8, *Spatial Localization and Detection* (01/02/2016). Available: http://cs231n.stanford.edu/slides/2016/winter1516_lecture8.pdf

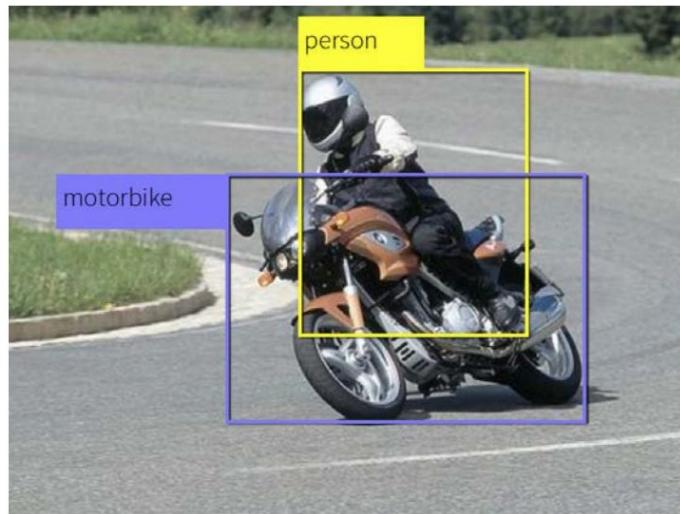


YOLO vs Mask R-CNN

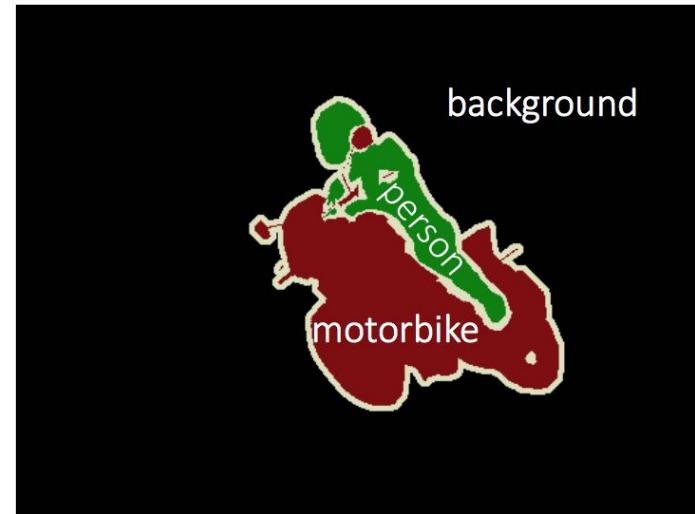
input image



object detection



segmentation



Further Examples of Style Transfer



**Realtime
Multi-Person
2D Pose Estimation**

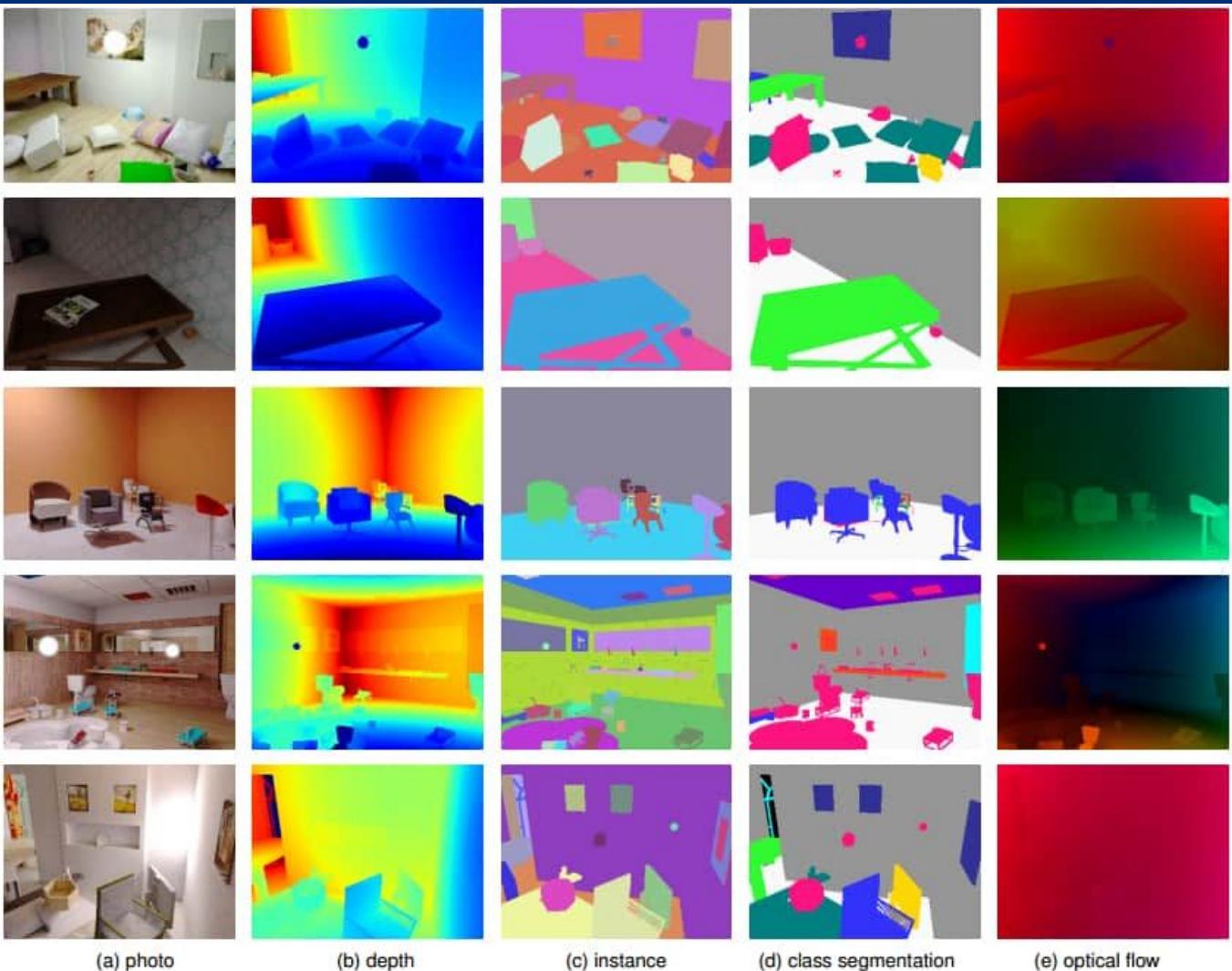
using Part Affinity Fields



Source: <https://www.youtube.com/watch?v=YgQ2lwAgng>

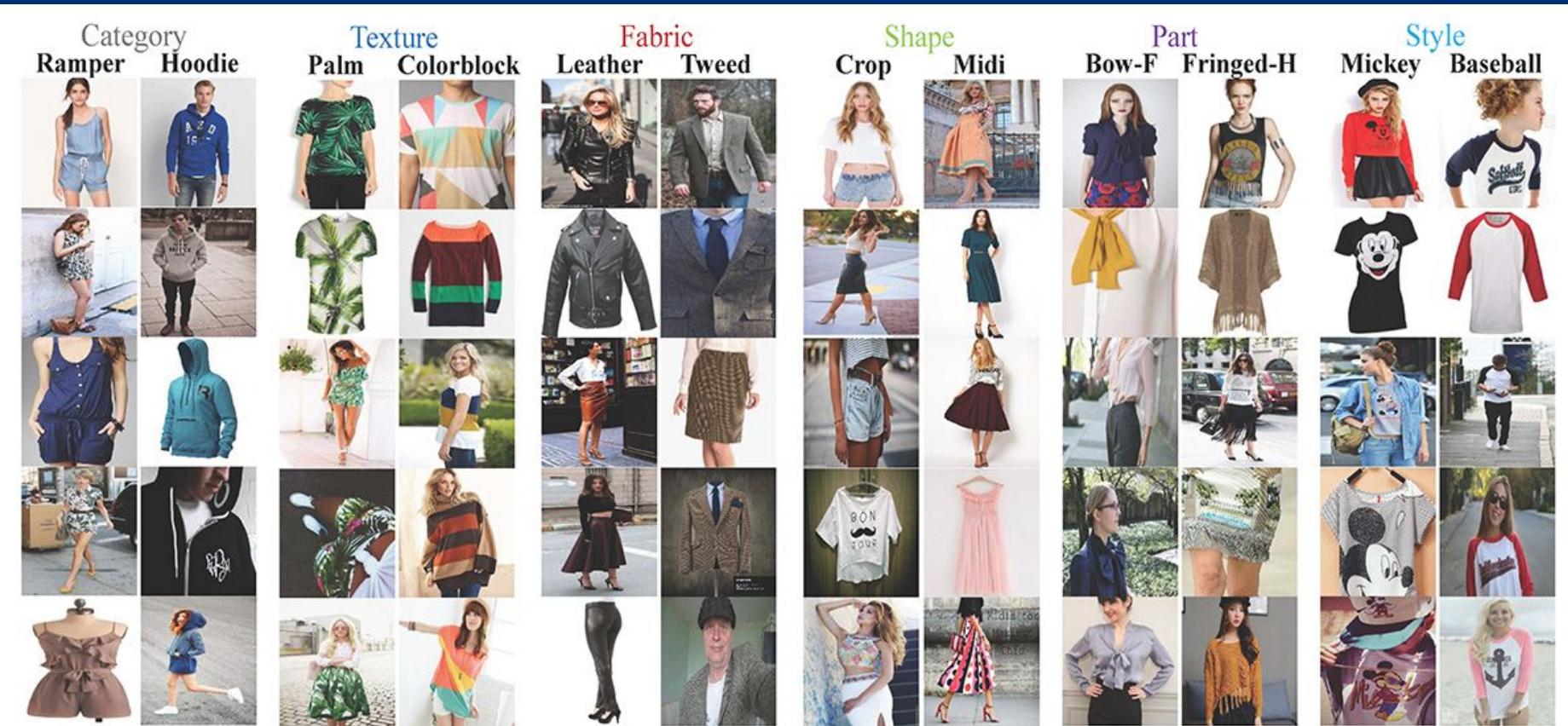
Datasets

SceneNet RGB-D



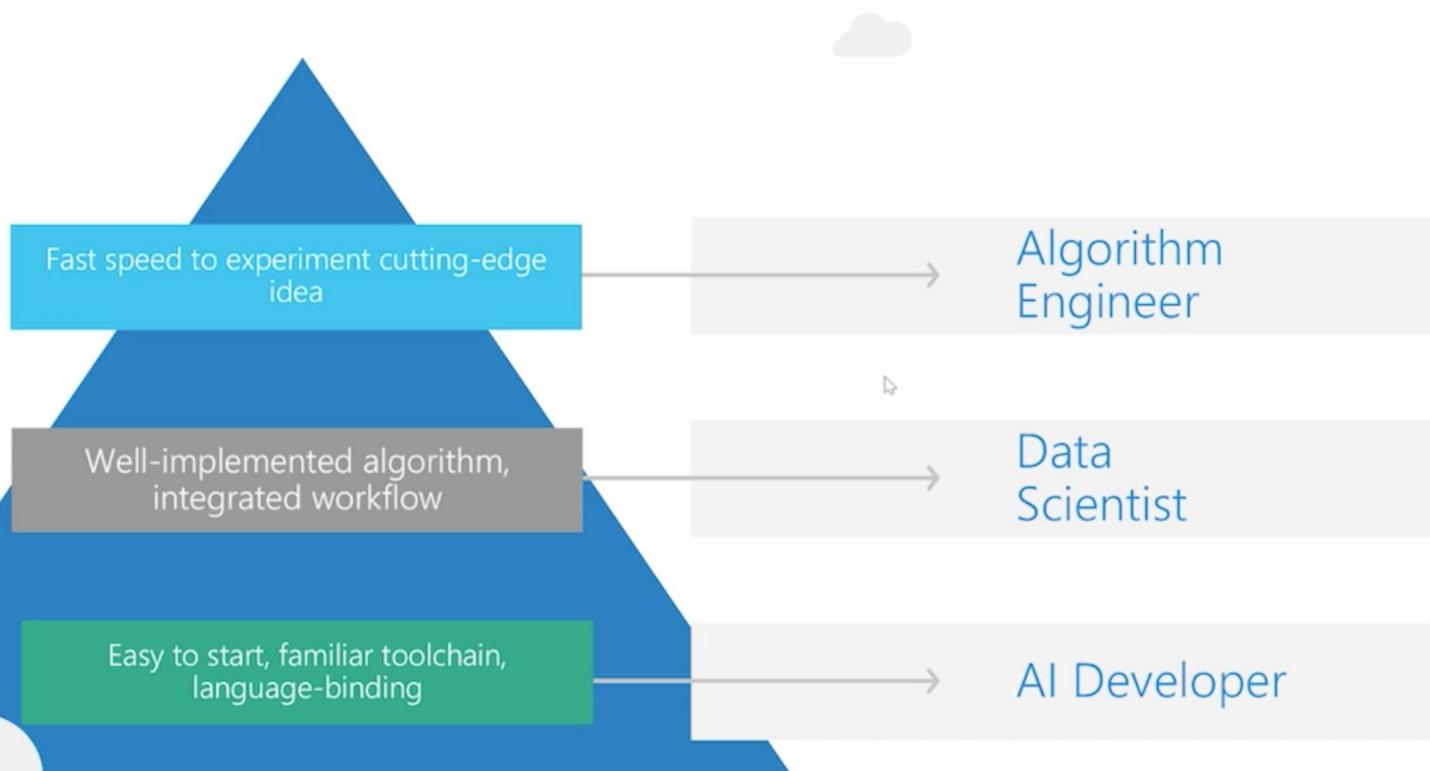
Datasets

DeepFashion

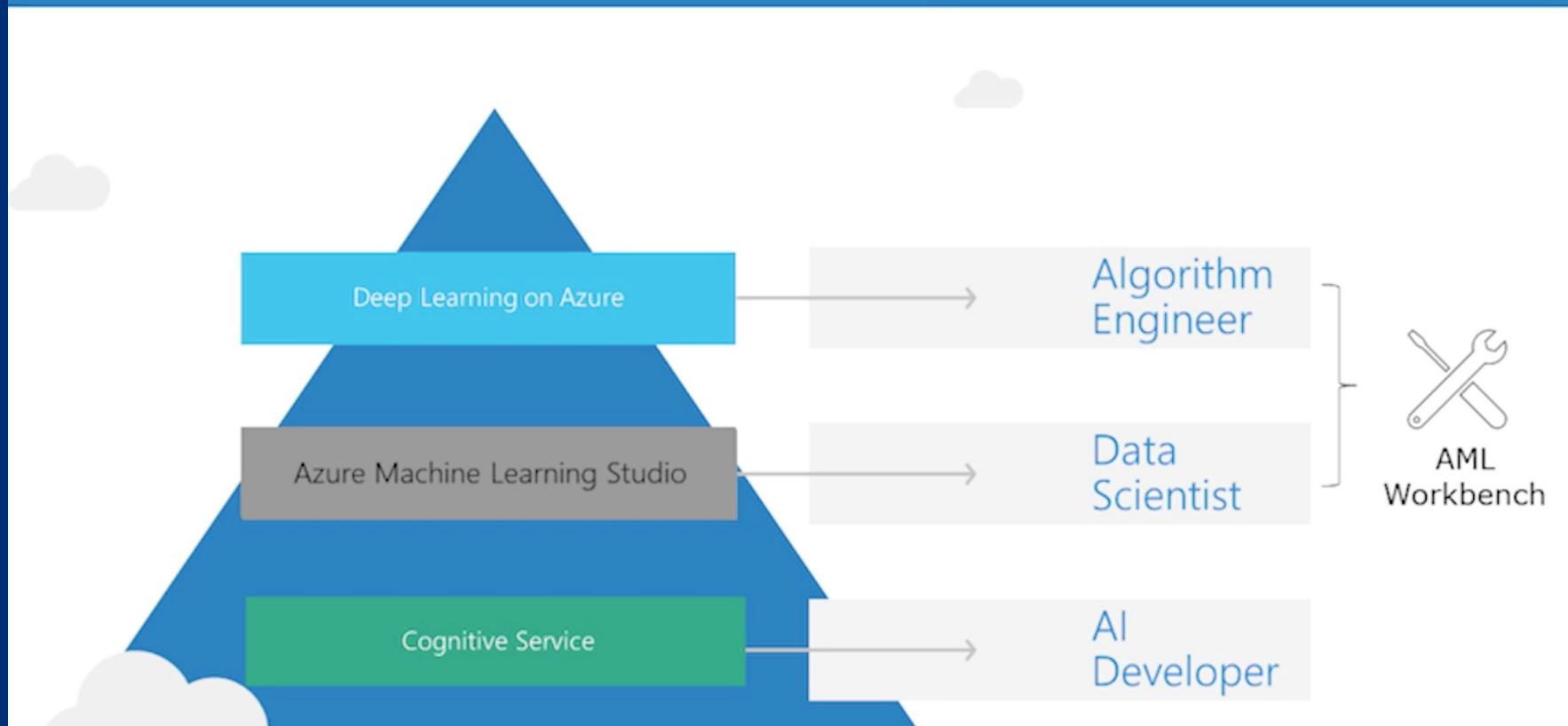


Azure ML Workbench...

Different AI Experts need different skillset



Position of Azure Machine Learning Workbench

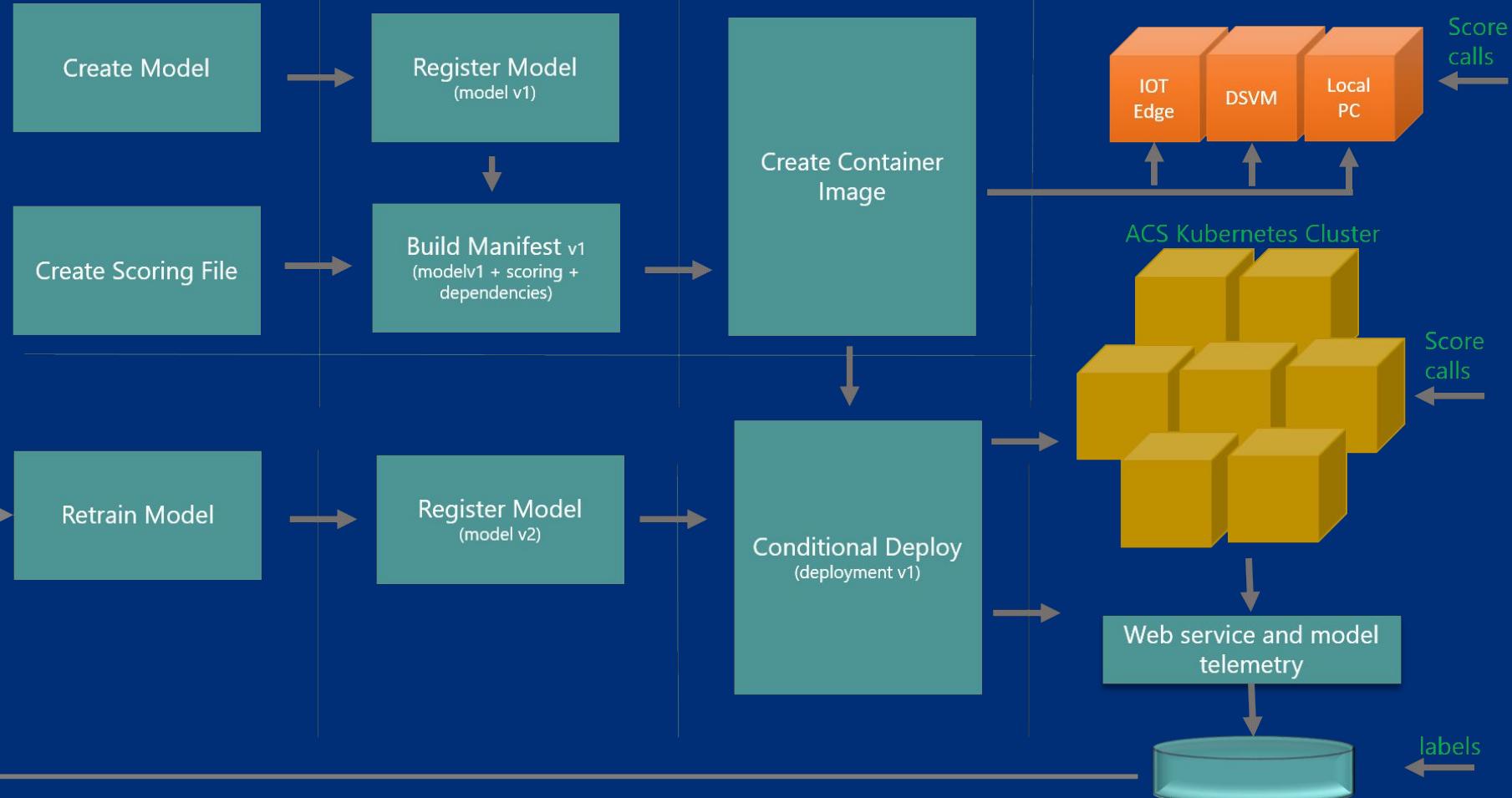


AUTHOR

PREPARE TO SERVE

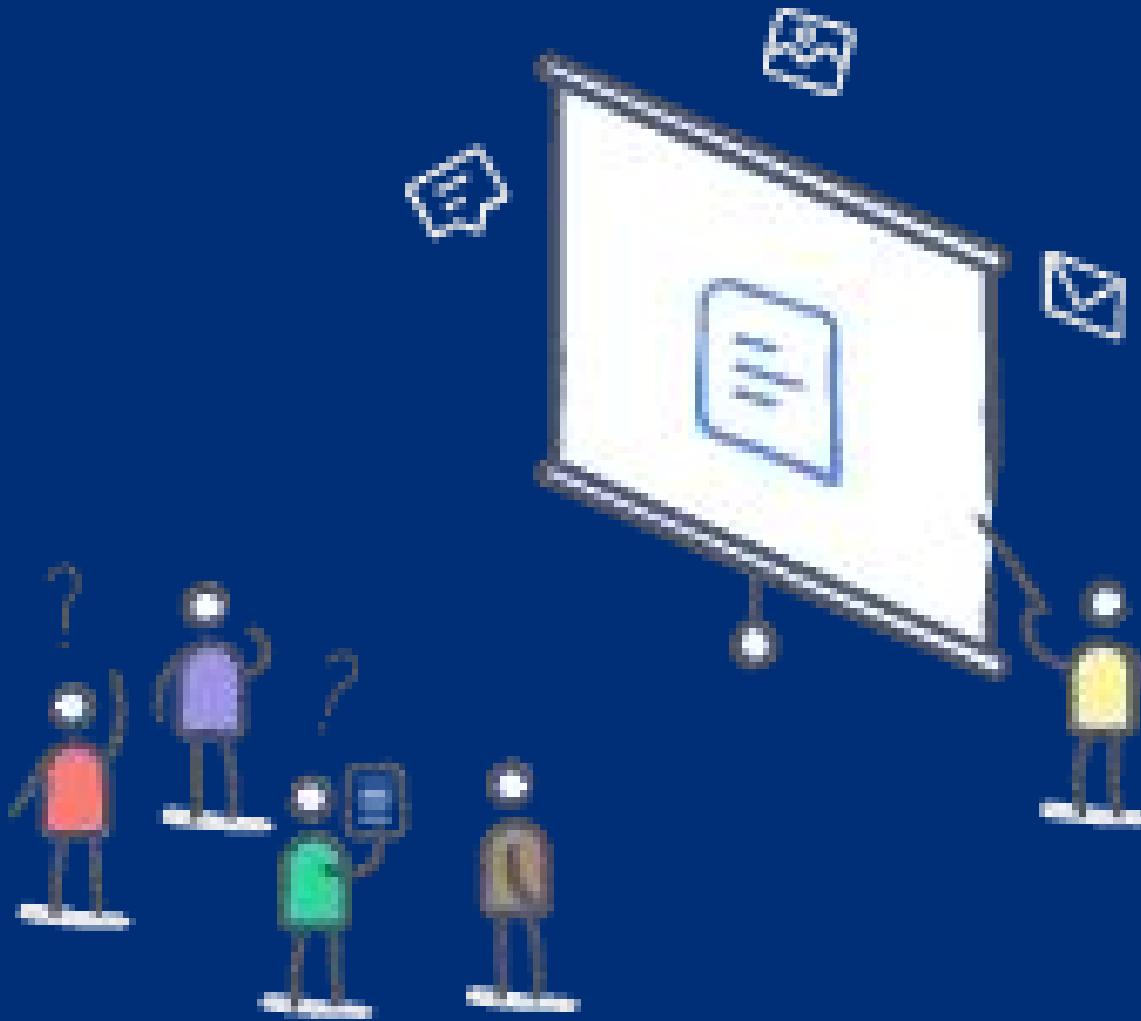
SERVE

SERVING ENVIRONMENT



Data scientists have major pain points

- ✓ ~70% of a data scientist's time is spent on acquiring, understanding, prepping, and feature engineering data
- ✓ Explaining results to business stakeholders is difficult and time-consuming
- ✓ Lack of collaboration, knowledge management tools, and lack of reproducibility and trackability lead to loss of productivity
- ✓ Model deployment and management is slow and error prone with no insight into deployed models or audit trail



Project “Vienna” – A Modern Platform for Machine Learning & Data Science



Intelligent Data Prep

- Discover and solve data problems in one place
- Easy, fast understanding of any data source
- Iterative, intuitive workflow
- Integrated enterprise orchestration
- Develop locally & scale to the cloud



Agile Experimentation

- Local execution
- Scale into the cloud
- Rapid rate of experimentation
- Big data and big compute
- Meet users where they are.
- Deep Learning & Spark made easy
- Experimentation-as-a-Service
- Collaboration over Git and Gallery



Data Science Provenance

- Model metrics
- Model lineage tracking
- Run history
- Version control through Git
- Run artifacts management
- E2e model lifecycle management
- Auditable
- Explainable
- Reproducible



Operationalization at Scale

- Create and manage model packages
- Low-latency real time APIs
- High-throughput batch APIs
- Docker-based deployment
- Performance monitoring
- Model retraining
- Consumption with user's choice.

Microsoft Magic Sauce

PROSE, TLC, RevoScaleR Framework, Microsoft ML Libraries for Spark...

Open Source ML Toolkits

CNTK, TensorFlow, scikit-learn, Spark ML, 10k+ CRAN-R/Python packages...

Open Platform & IDEs

Docker, Spark, Kubernetes, VS Code, RStudio, PyCharm...

Cloud infra. + Advanced Hardware

Azure VM, Azure Batch, GPU, FPGA...

Intelligent Data Preparation

Project Dashboard iris-1 iris-1

» iris

DATAFLOWS

#	Sepal Leng..	# Sepal Wid...	# Petal Leng...	# Petal Width	abc Species
1		5.1	3.5	1.4	0.2 Iris-set
2		4.9	3	1.4	0.2 Iris-set
3		4.7	3.2	1.3	0.2 Iris-set
4		4.6	3.1	1.5	0.2 Iris-set
5		5	3.6	1.4	0.2 Iris-set
6		5.4	3.9	1.7	0.4 Iris-set
7		4.6	3.4	1.4	0.3 Iris-set
8		5	3.4	1.5	0.2 Iris-set
9		4.4	2.9	1.4	0.2 Iris-set
10		4.9	3.1	1.5	0.1 Iris-set
11		5.4	3.7	1.5	0.2 Iris-set
12		4.8	3.4	1.6	0.2 Iris-set
13		4.8	3	1.4	0.1 Iris-set

INSPECTORS

Top 6 values of "Species"

Iris-virginica Iris-virginica: 50

STEPS

- Reference dataflow
- Rename Column1 to Sepal Length
- Rename Column2 to Sepal Width
- Rename Column3 to Petal Length
- Rename Column4 to Petal Width
- Rename Column5 to Species
- Filter Species

Jobs

- iris_score.py [8] Completed Today at 1:31 PM
- run.py [7] Completed Today at 1:26 PM
- iris_sklearn.py [6] Failed Today at 1:23 PM
- iris_sklearn.py [5] Completed Today at 1:18 PM
- iris_sklearn.py [4] Completed Today at 1:18 PM
- iris_sklearn.py [3] Completed Today at 1:17 PM
- iris_sklearn.py [2] Completed



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Agile Experimentation

Project Dashboard × local.compute ×

docker-py ↗ iris_sklear ↗ Arguments:

Arguments

```
type: "local"
pythonLocation: "python"
sparkSubmitLocation: "spark-submit"
nativeSharedDirectory: "~/.azureml/share/"
```

```
1 FROM tensorflow/tensorflow:latest-py3
2
3 MAINTAINER mia
4
5 WORKDIR /batch
6
7 VOLUME /batch
8
9 ENV LC_ALL=C.UTF-8
10
11 ENV LANG=C.UTF-8
12
13 RUN pip install --no-cache-dir click
14
15 COPY trainer.py /
16
17 ENTRYPOINT ["python", "/trainer.py"]
```

Agile Experimentation

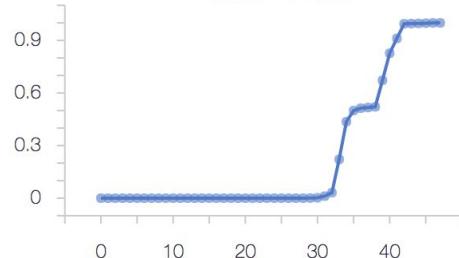


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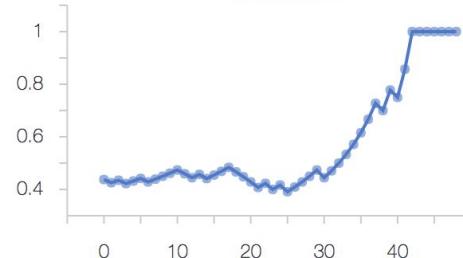
Data Science Provenance

Metrics

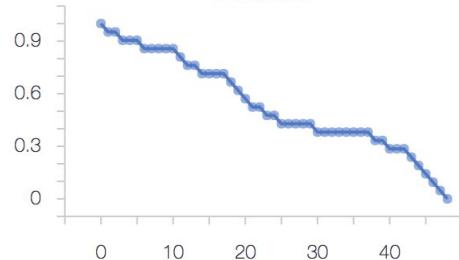
Thresholds



Precision



Recall



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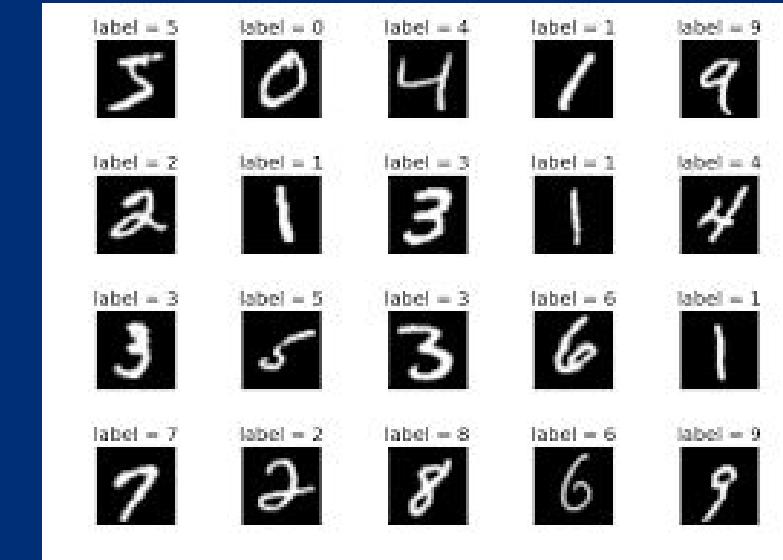
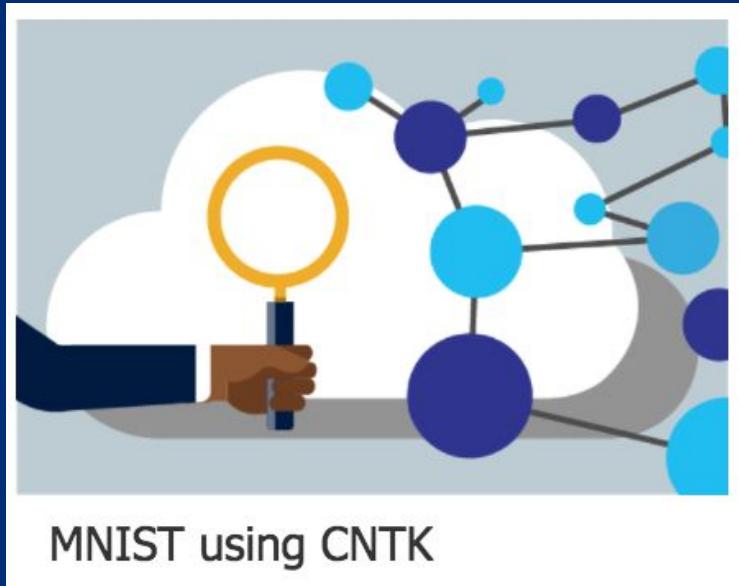
Demo



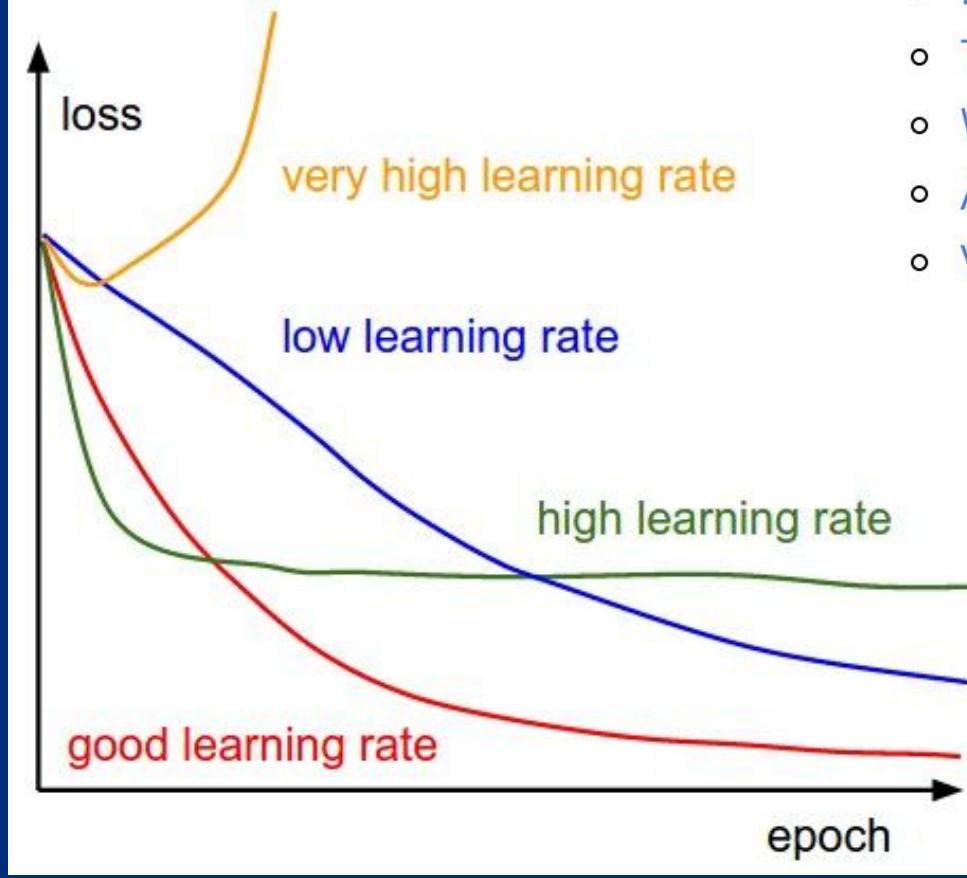
Classifying Iris

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5.0	3.4	1.5	0.2	setosa

Demo



- Babysitting the learning process
 - Loss function
 - Train/val accuracy
 - Weights:Updates ratio
 - Activation/Gradient distributions per layer
 - Visualization



For AI Developers

The Emotion Detection Automation



Reference The Big Bang Theory 10x14 Promo "The Emotion Detection Automation" (HD)
<https://www.youtube.com/watch?v=9WIsTRZCUkk>



| Basic information

App icon



+ Under 3MB; JPEG/PNG/GIF/BMP

App name

emotion.ai

App description

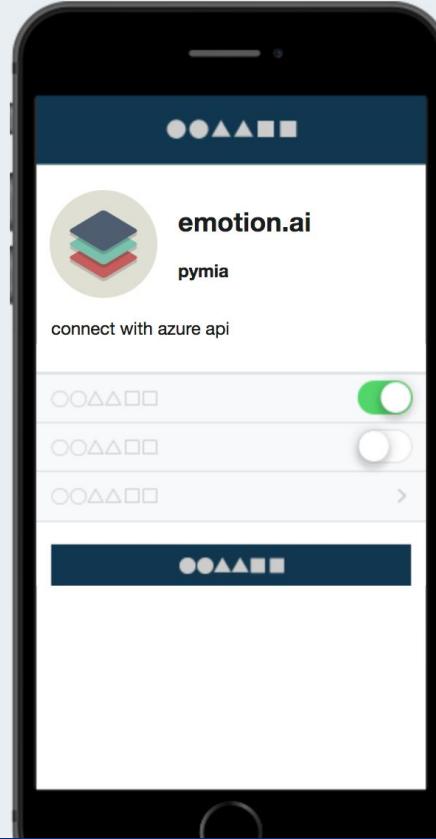
connect with azure api

Channel ID ?

1555393800

Channel secret ?

ISSUE





emotion.ai

1. 4 (Thu)

⋮

Read
2:19 PM

Hi

Read
2:23 PM

Hi

Read
3:16 PM

Hi

Read
3:18 PM

Hike

Read
3:31 PM

Hi

Read
3:32 PM

酷



emotion.ai

1.4 (Thu)

⋮

Read
2:19 PM

Hi

Read
2:23 PM

Hi

Read
3:16 PM

Hi

Read
3:18 PM

Hike

Read
3:31 PM

Hi

Read
3:32 PM

酷



emotion.ai

Read
3:31 PM

Hi

Read
3:32 PM

酷

Read
3:34 PM

沒東西

Read
3:50 PM

是

Read
3:51 PM

來阿

Read
3:58 PM

怕不



Read
4:00 PM

Read
4:00 PM

沒事找事



load image to <https://i.imgur.com/9pw6bX4.jpg>

emotion.ai

9:38 PM

⋮

Read
10:08 PM

測字

Read
10:09 PM

恩測字

Read
10:09 PM

Sorry

Sorry

10:09 PM



emotion.ai

10:16 PM

⋮



Read
10:16 PM

Forward | Save



10:16 PM



{"sadness":9.804495E-10,"surprise":1.09095408E-08}}]

emotion.ai

10:20 PM



Read
10:23 PM

Forward | Save

```
[{"faceRectangle":  
 {"height":230,"left":419,"top":241,"width":230}, "scores":  
 {"anger":0.000109505461, "contempt":4.199349E-  
 05, "disgust":5.93012146E-06, "fear":1.55778969E-  
 06, "happiness":8.823994E-  
 07, "neutral":0.9993072, "sadness":0.00013771368, "surprise":  
 0.000395204232}]}]
```

10:23 PM

Check Some Code

```
99  @handler.add(MessageEvent, message=ImageMessage)
100 def handle_image_message(event):
101     local_img_path = save_image_local(event)
102     uploaded_image = upload_imgur(local_img_path)
103     text = ask_azure_emotion_api(uploaded_image.link)
104     line_bot_api.reply_message(
105         event.reply_token,
106         TextSendMessage(text=text))
```



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Infuse your apps, websites and bots with intelligent algorithms to see, hear, speak, understand and interpret your user needs through natural methods of communication. Transform your business with AI today

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Use AI to solve business problems



Vision

Image-processing algorithms to smartly identify, caption and moderate your pictures.



Speech

Convert spoken audio into text, use voice for verification, or add speaker recognition to your app.



Knowledge



Search



Emotion API

PREVIEW

Personalize user experiences
with emotion recognition

30,000 transactions, 20 per
minute.

Get API Key >

Log in



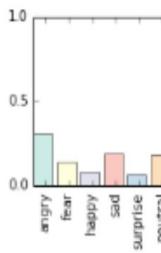
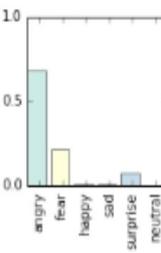
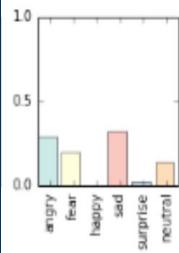
Sad



Angry



Angry



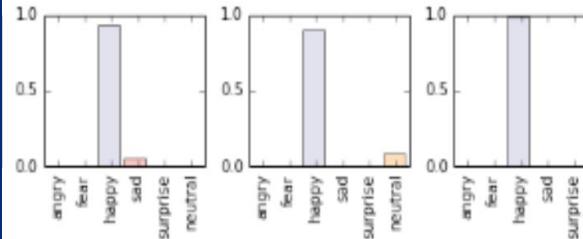
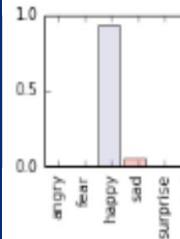
Happy



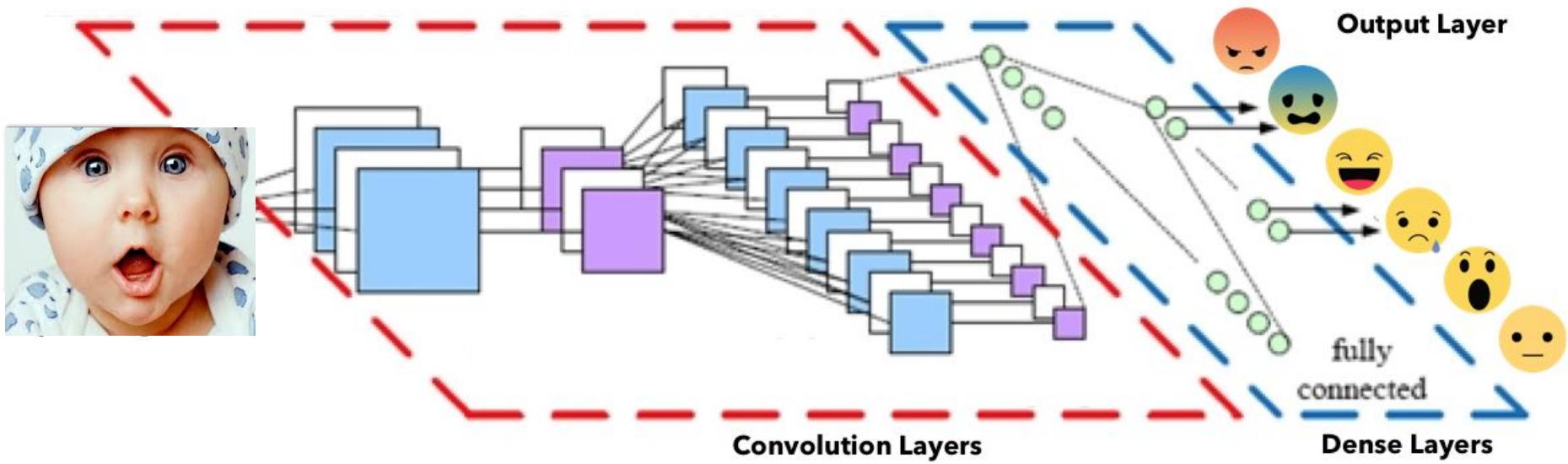
Happy

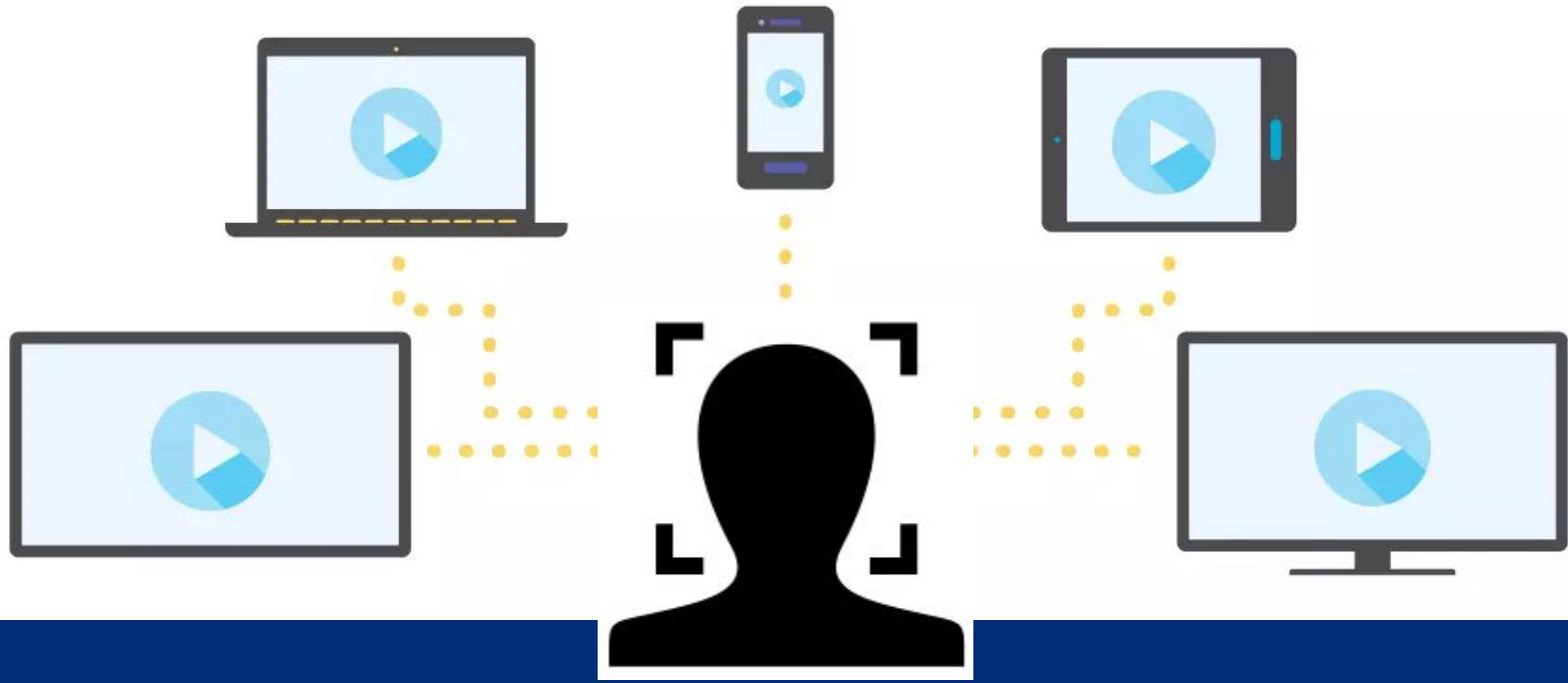


Happy

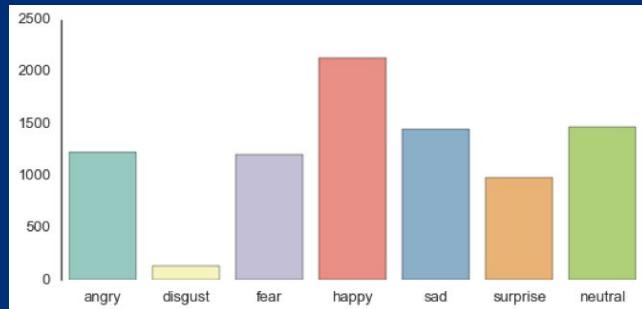


Recognized Emotions:





1. Video Streaming
2. Face Detection
3. Face Alignment
4. Emotion Recognition



This screenshot shows a GitHub repository page for the Microsoft Cognitive-Emotion-Python project. The repository has 73 stars and 46 forks. The 'Code' tab is selected, showing a Jupyter Notebook titled 'Emotion Analysis Example.ipynb'. The notebook content is visible in a code editor window.

Project Oxford: Emotion analysis example

This Jupyter notebook shows you how to get started with the Project Oxford Emotion API in Python, and how to visualize your results.

To use this notebook, you will need to get keys to Emotion API. Visit www.projectoxford.ai/emotion, and then the "Try for free" button. On the "Sign in" page, use your Microsoft account to sign in and you will be able to subscribe to Emotion API and get free keys (Code of Conduct and TOS). After completing the sign-up process, paste your key into the variables section below. (Either the primary or the secondary key works.)

```
In [1]: import time
import requests
import cv2
import operator
import numpy as np
from __future__ import print_function

# Import library to display results
import matplotlib.pyplot as plt
%matplotlib inline
# Display images within Jupyter
```

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Azure Taiwan

Location

Taipei, Taiwan

Members

476



Organizers

Robert Weaver and 4 others

Schedule

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R-Ladies Taipei

Location
Taipei, Taiwan

Members
818



Organizers
Ju-Yin Tang and 11 others

Schedule

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