Deep Learning: Tensorflow, CNTK

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Data Whisperer
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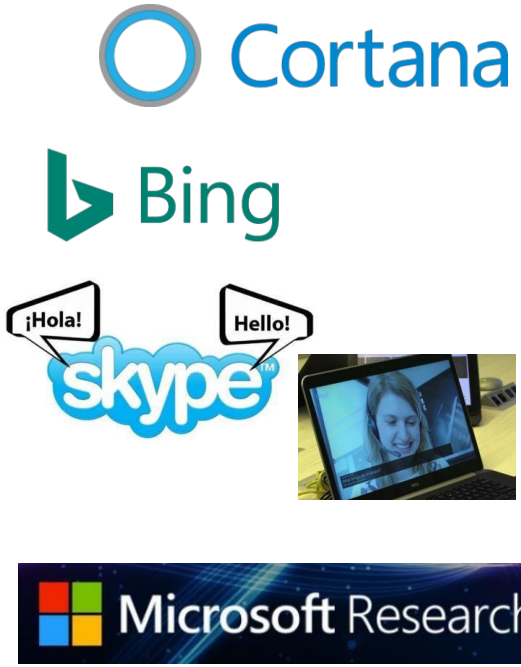
Level: Intermediate

Agenda

- What is deep learning?
- Tensorflow
- CNTK

Deep learning at Microsoft

- Microsoft Cognitive Services
- Skype Translator
- Cortana
- Bing
- HoloLens
- Microsoft Research



Uber to require selfie security check from drivers

Using Microsoft Cognitive Services, Uber hopes to make riders feel safer by verifying the ID of drivers before rides are given.

By Jake Smith for iGeneration | September 23, 2016 -- 19:59 GMT (03:59 GMT+08:00) | Topic: Innovation

Uber announced on Friday a new security feature called Real-Time ID Check that will require drivers to periodically take a selfie before starting their driving shift.

The feature, which begins rolling out to US cities on Friday, uses Microsoft Cognitive Services to reduce fraud and give riders an extra sense of security.

SHARING ECONOMY

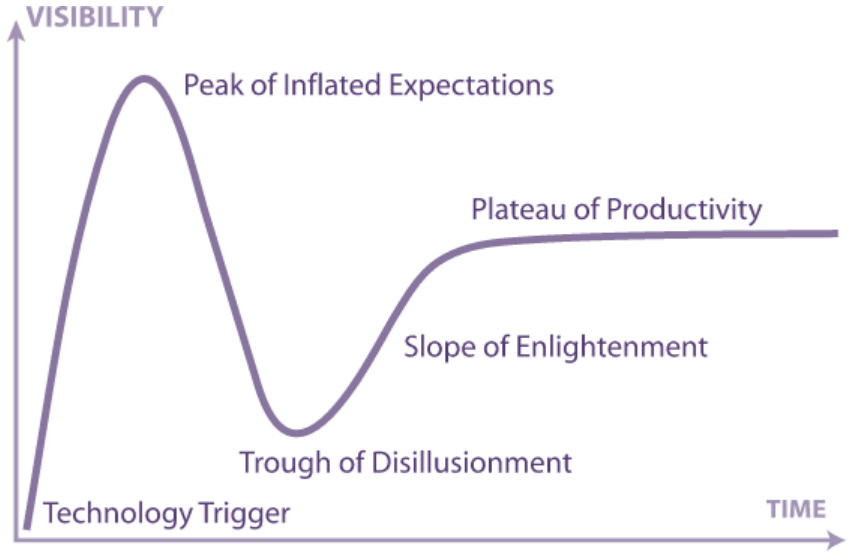
Uber says Microsoft's feature instantly compares the selfie to the one corresponding with the account on file. If the two

RELATED STORIES

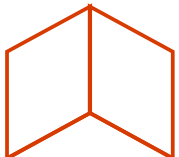
Innovation
Victoria partners with Bosch for self-driving vehicle development

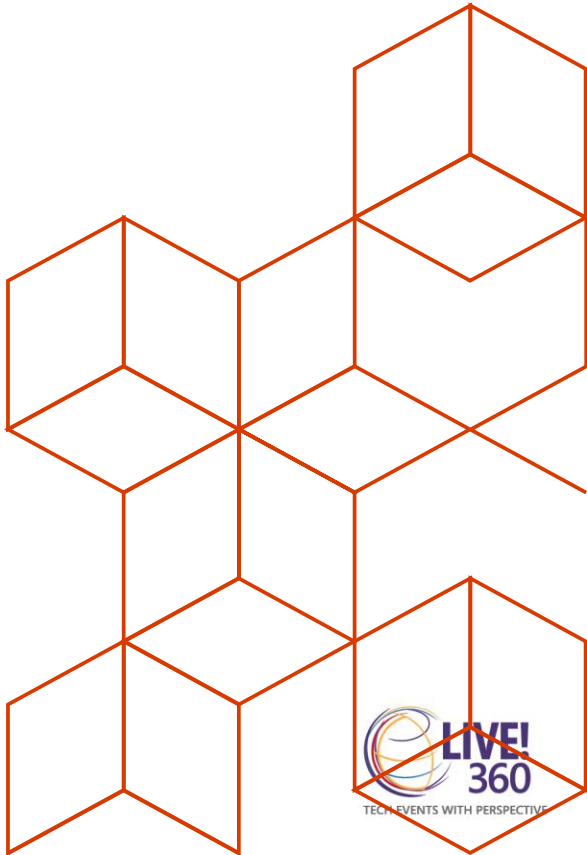
"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run"

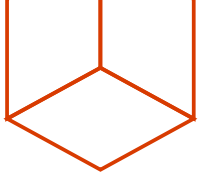
- Roy Amara



What is Deep Learning?

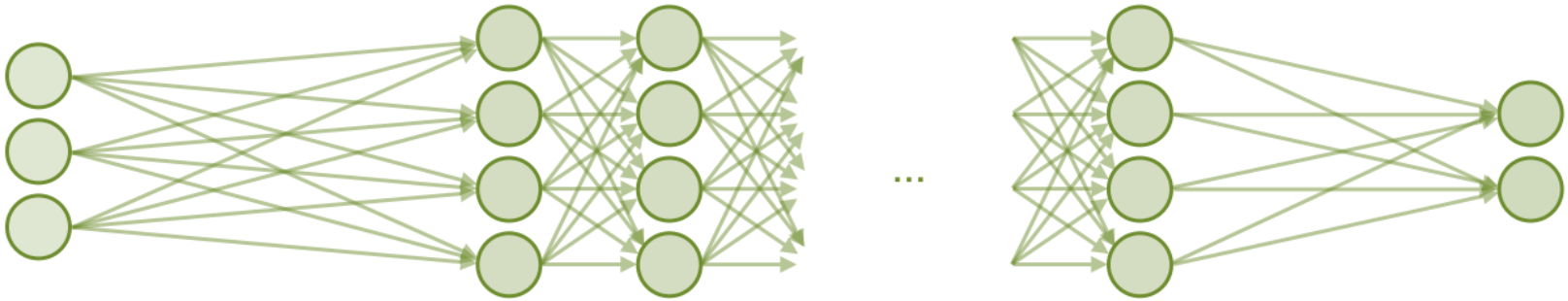




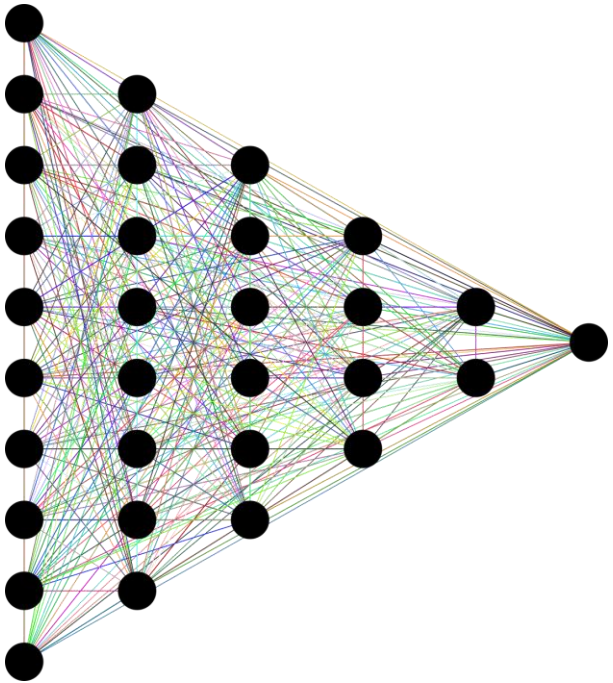


What is a Neural Network?

- Neural networks are a class of models that are built with layers.
- Commonly used types of neural networks include convolutional and recurrent neural networks.



Deep Learning and Big Data



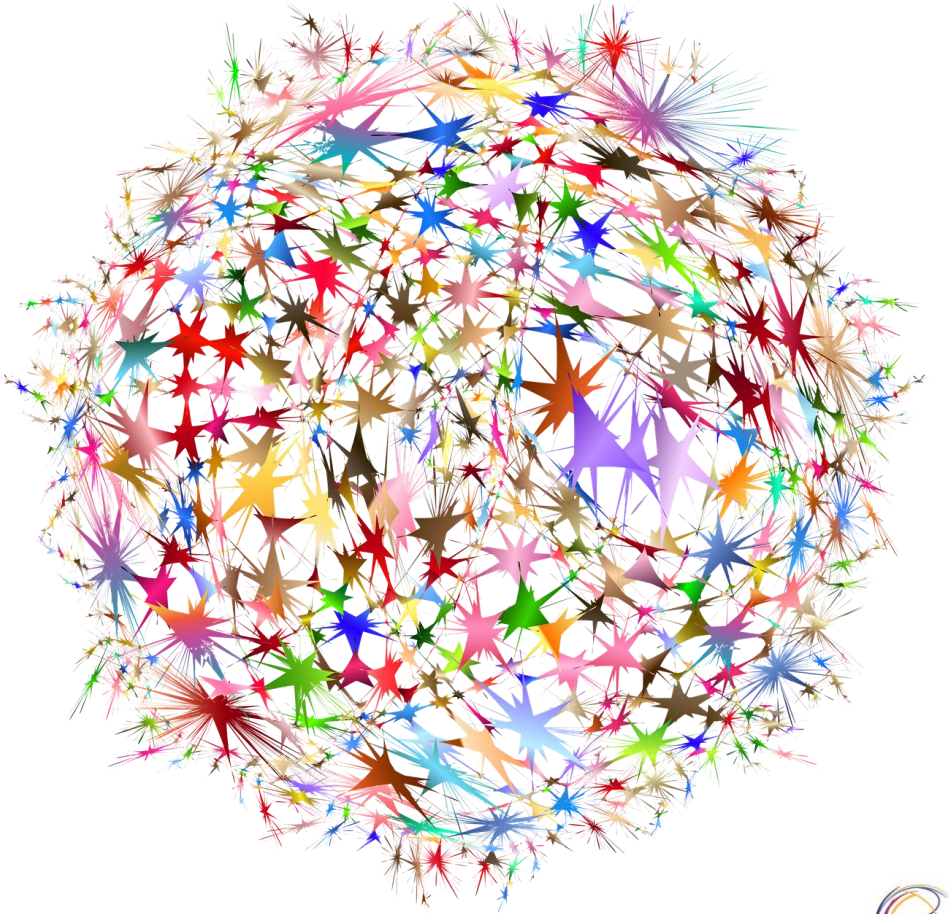
Size of Data?

How much data do you need for deep learning?

Why is it different?

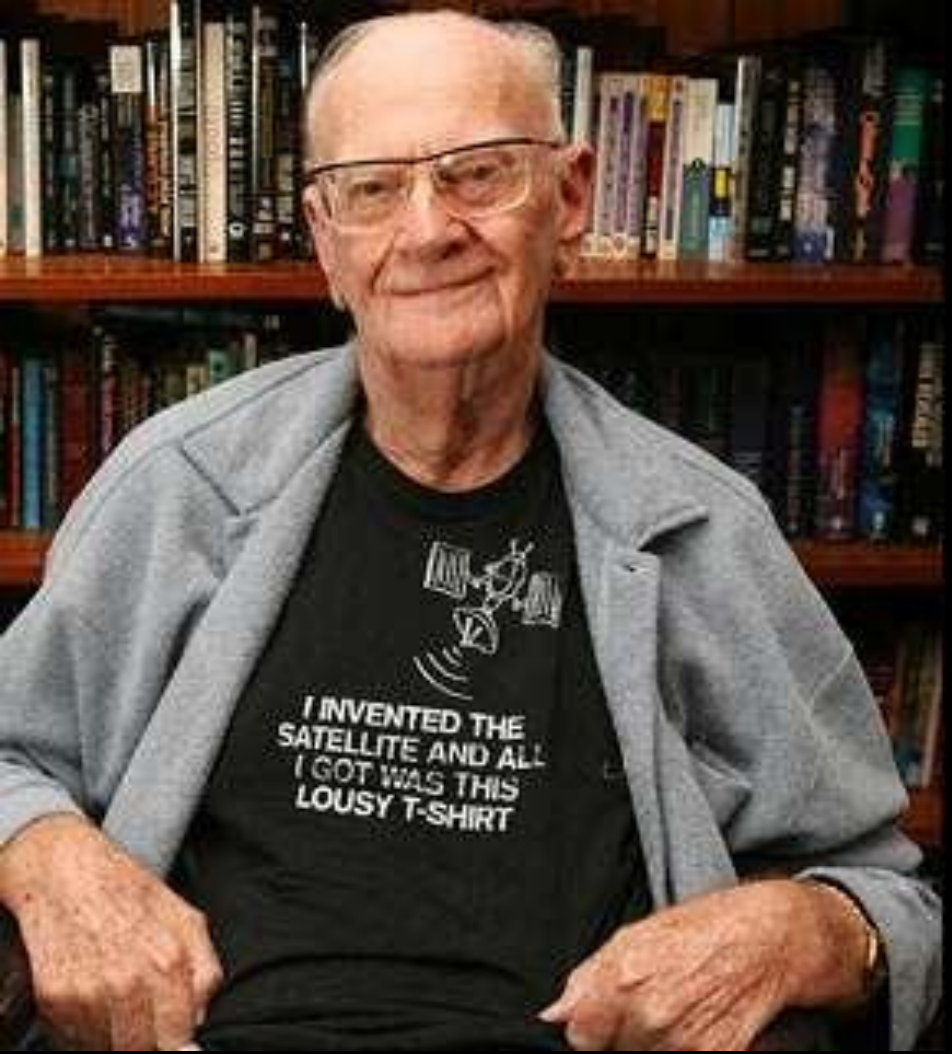
Interpreting text, images and video

Automate Object Detection



Deep Learning at Microsoft

Machine Learning?



"Any sufficiently advanced technology is indistinguishable from magic."

-Arthur C. Clarke

Artificial Intelligence: The Clever Ways Video Games Are Used To Train AIs

Bernard Marr Contributor ⓘ

Training Robots with Games

Minecraft

Minecraft offers its users endless opportunities for simple and more complex tasks.

Building blocks of Intelligence

Grand Theft Auto

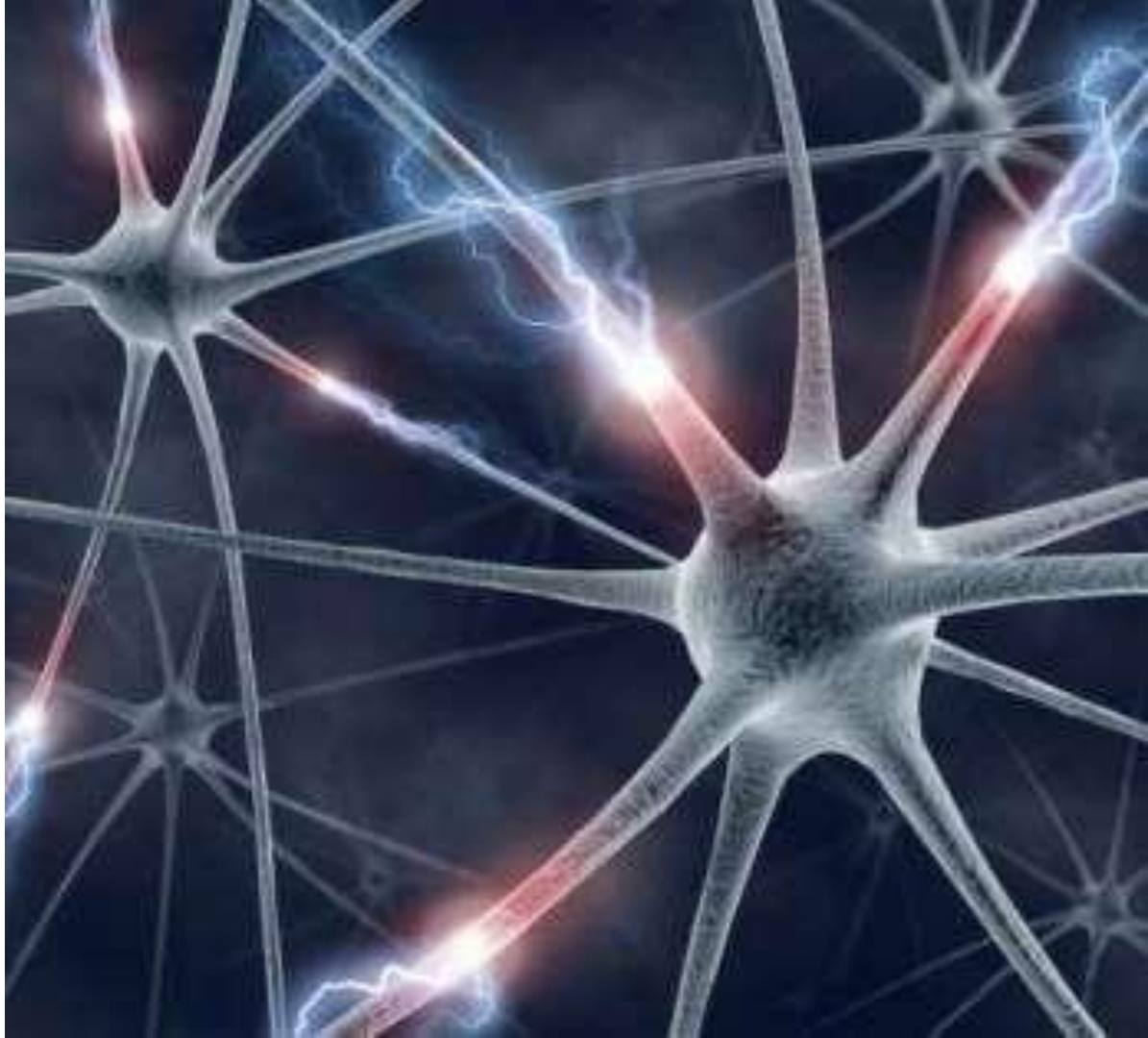
Autonomous Cars learn to drive using GTA

Assassin's Creed

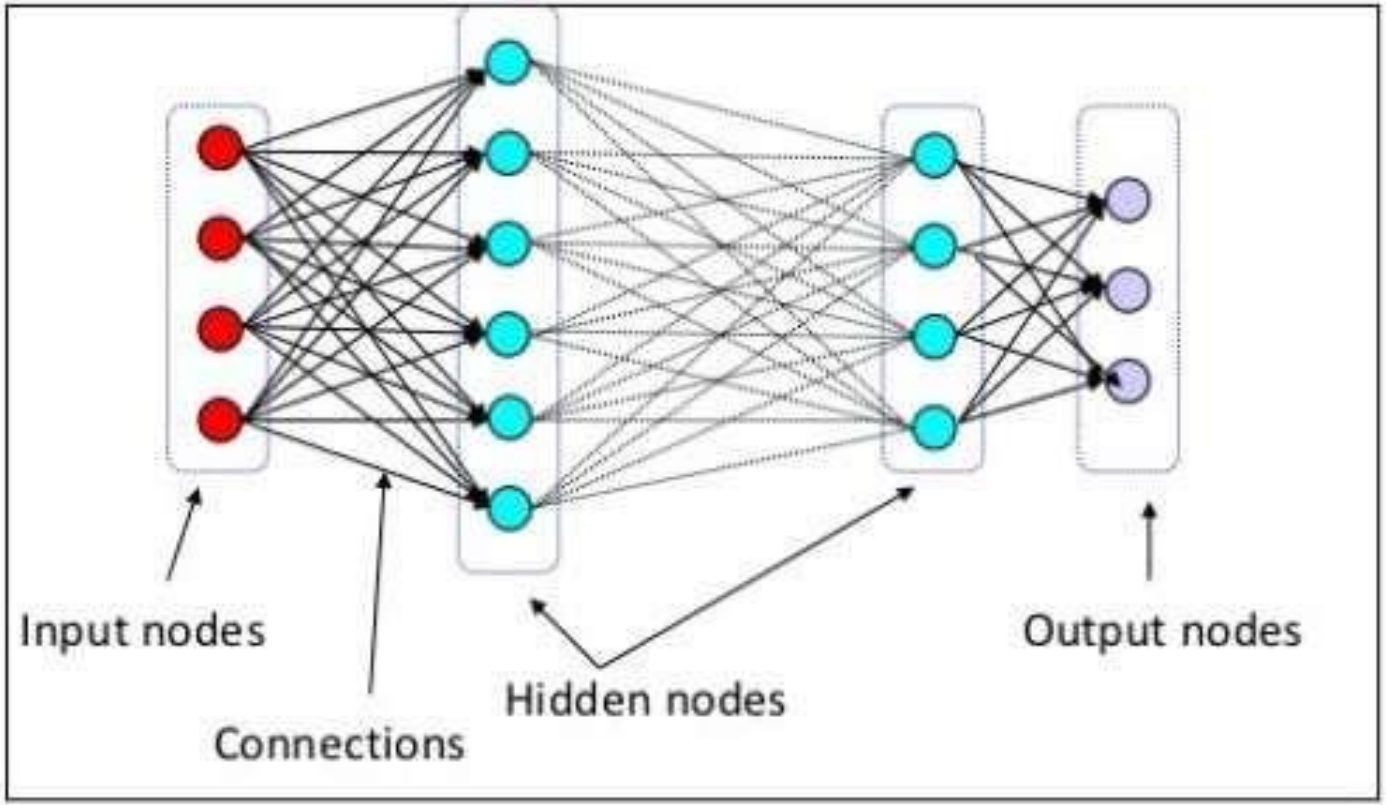
Used to train robots in synethetic environments

Neural Networks

- Interconnected units (neurons)
- Activation signal(s)
- Information processing
- Learning involves adjustments to the synaptic connections



Artificial Neural Networks building blocks



Introduction to Tensorflow

TENSORFLOW

Introduction to TensorFlow

- Computational Graph
- Loss Function Optimisation
- Neural Network Architectures
- Deep Learning components
- Machine Learning APIs
- …

What is it?

An Open Source Machine Learning Library released by Google in 2015

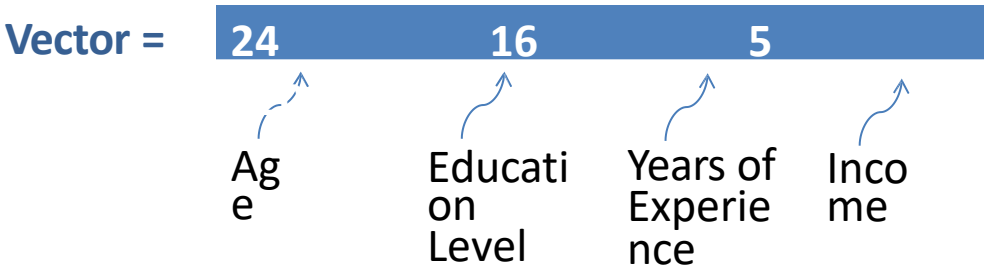
- Built on top of Google's Inception v3
- Google's most advanced image recognition system
- Convolution Neural Network (CNN)
- Available as a Python (or C++) Library

Basics – What is a Vector?

- A vector is an array of numbers.

Vector = [number, number, …]

- In machine learning, a vector holds the feature values (variables) for a sample.



Basics – What is a Matrix?

- A matrix is a 2-dimensional array of numbers.

Matrix = [n][m]

- In machine learning, a matrix holds the feature values [columns] for samples [rows] in a dataset.

Matrix =

24	16	5	
270000	12	8	
28000	18	2	
135000			

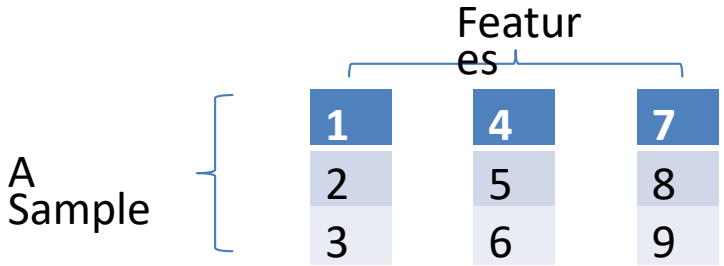
Age	Education Level	Years of Experience	Income

What is a Tensor?

- A tensor is a high dimensional array.

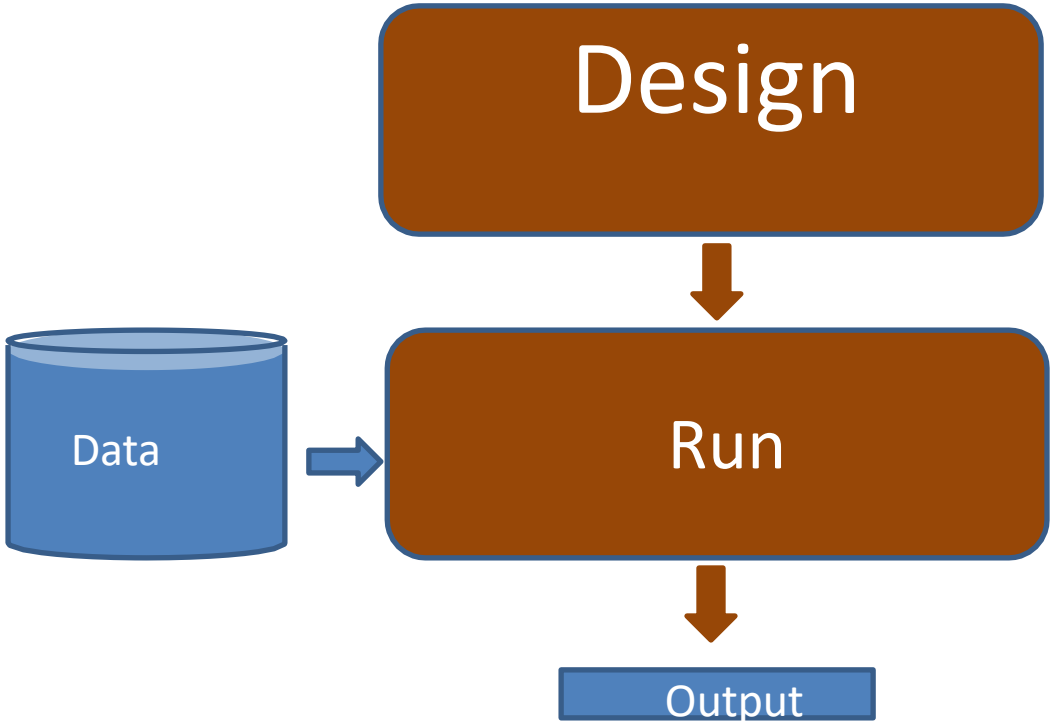
Tensor = [n1][n2] … [nx]

- A tensor consists of features, where each feature is a vector or multi-dimensional array (e.g., such as in embedding).



Design & Run

- TensorFlow uses a **Design & Run** methodology.



Tensorflow Hub

- What is Tensorflow?
- train a model with a smaller dataset
- improve generalization,
- significantly speed up training

Sample Code

```
import tensorflow as tf
import tensorflow_hub as hub

with tf.Graph().as_default():
  embed = hub.Module("https://tfhub.dev/google/nnlm-en-dim128-with-normalization/1")
  embeddings = embed(["A long sentence.", "single-word", "http://example.com"])

  with tf.Session() as sess:
    sess.run(tf.global_variables_initializer())
    sess.run(tf.tables_initializer())

    print(sess.run(embeddings))
```

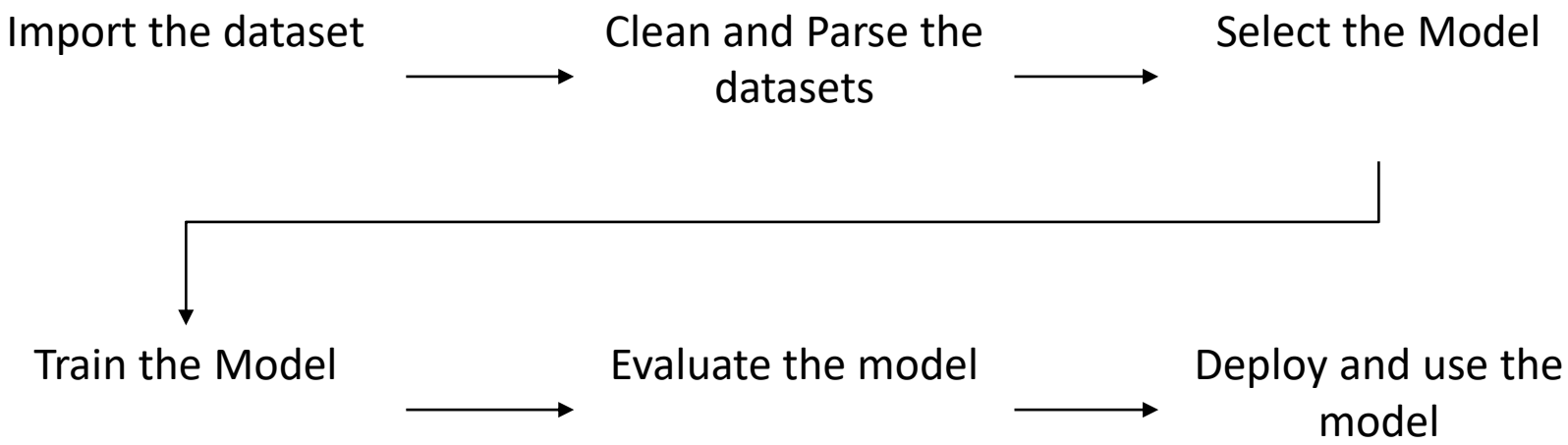
Getting Started With Tensorflow

- Enable Eager Execution dev environment

- Import Data with the Datasets API

- Build Models and Layers with Keras API

SEQUENCE

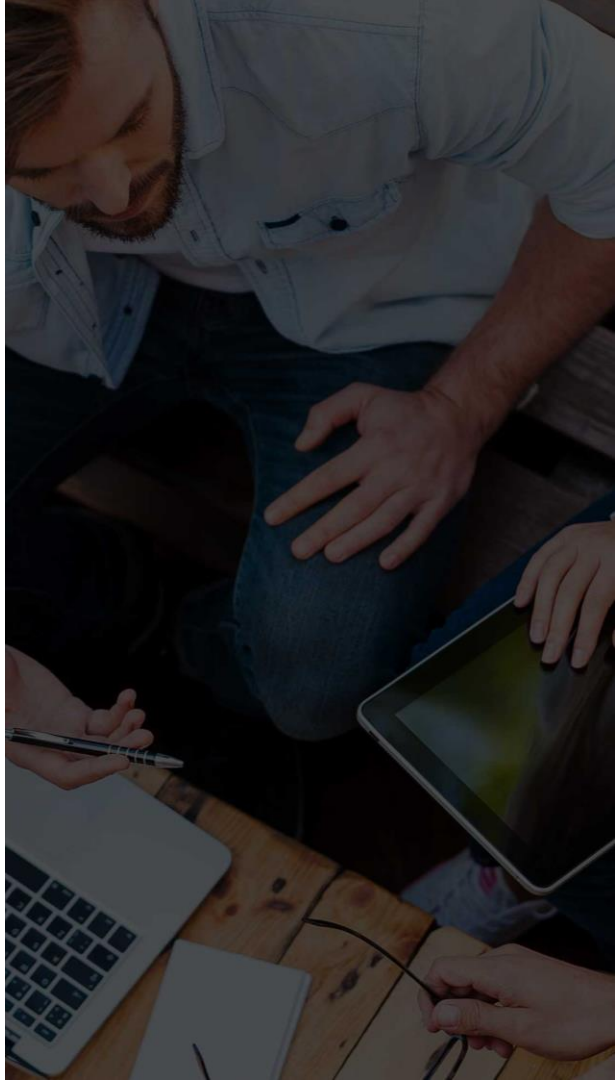


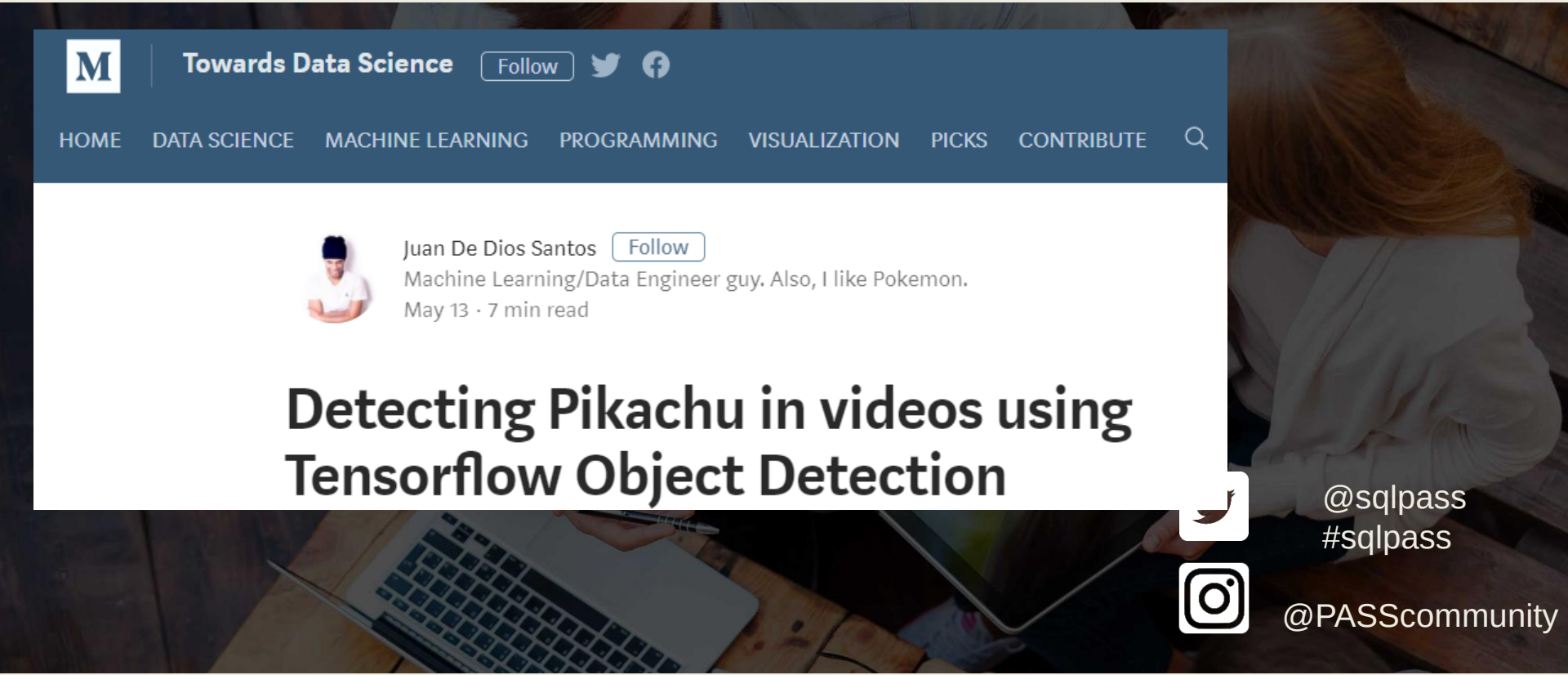
TensorFlow

TensorFlow Object Detection API

This is a package which trains a neural network capable of recognizing objects in a frame, for example, an image.

Pikachu

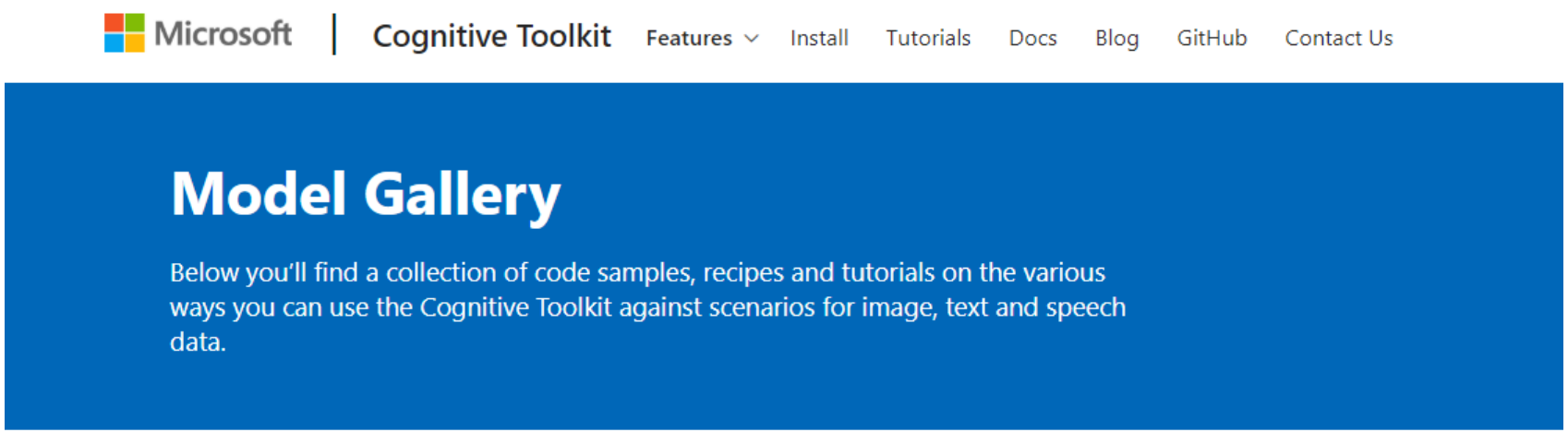




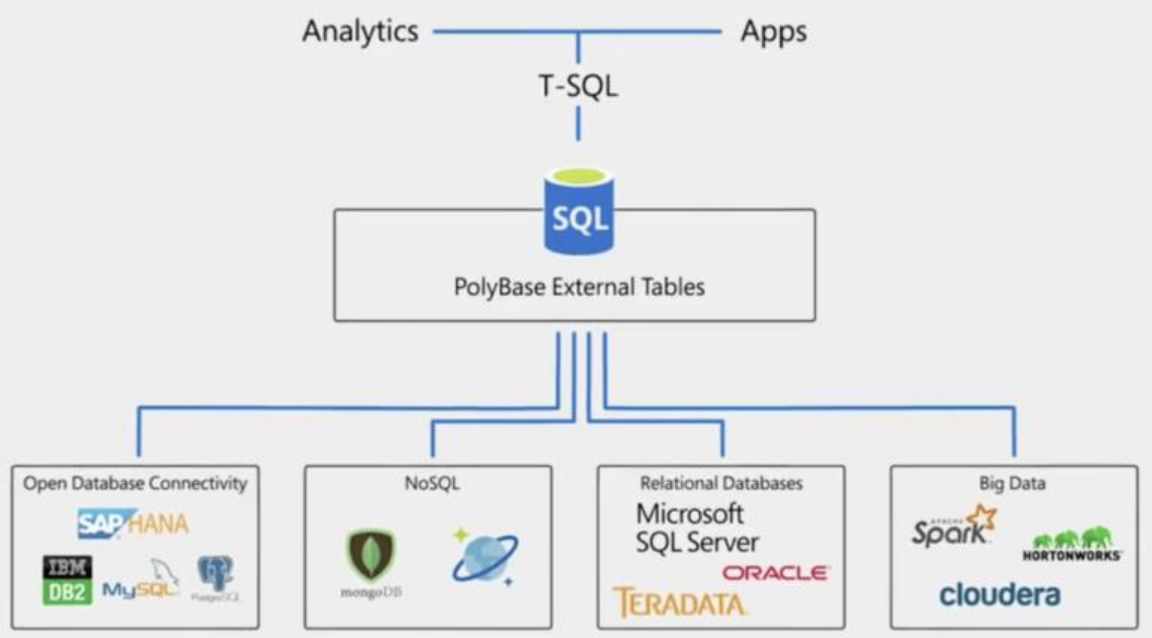
@sqlpass
#sqlpass

@PASSCommunity

Deep Learning at Microsoft



Deep Learning at Microsoft



Computational Network Toolkit

- CNTK is Microsoft's open-source, cross-platform toolkit for learning and evaluating deep neural networks.
- CNTK expresses (nearly) arbitrary neural networks by composing simple building blocks into complex computational networks, supporting relevant network types and applications.
- CNTK is production-ready: State-of-the-art accuracy, efficient, and scales to multi-GPU/multi-server.

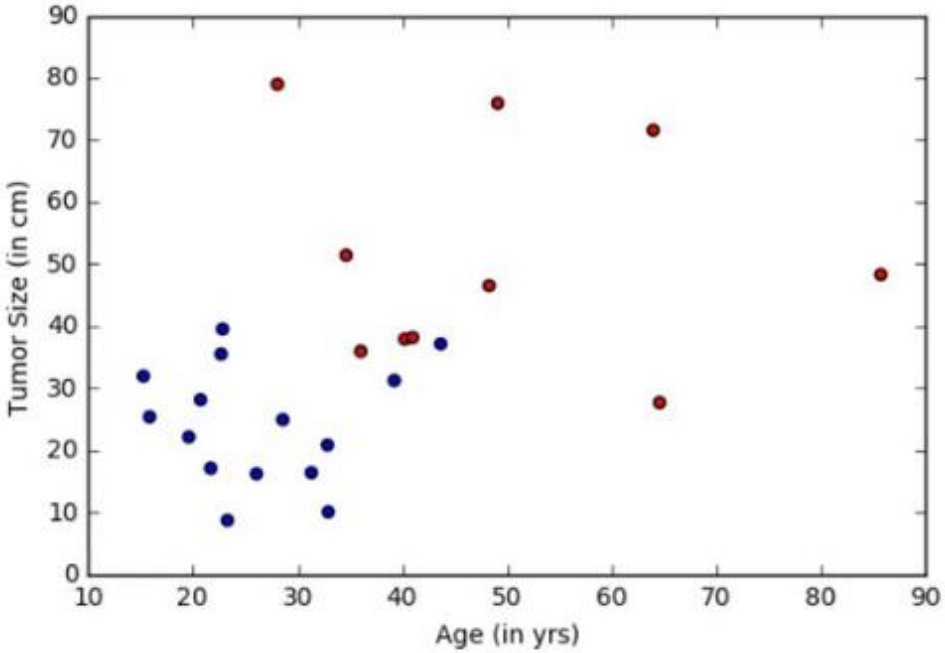
Computational Network Toolkit

- open-source model inside and outside the company
- used by Speech, Windows (Hololens), Bing (relevance, ads), MSR
- external contributions e.g. from MIT and Stanford

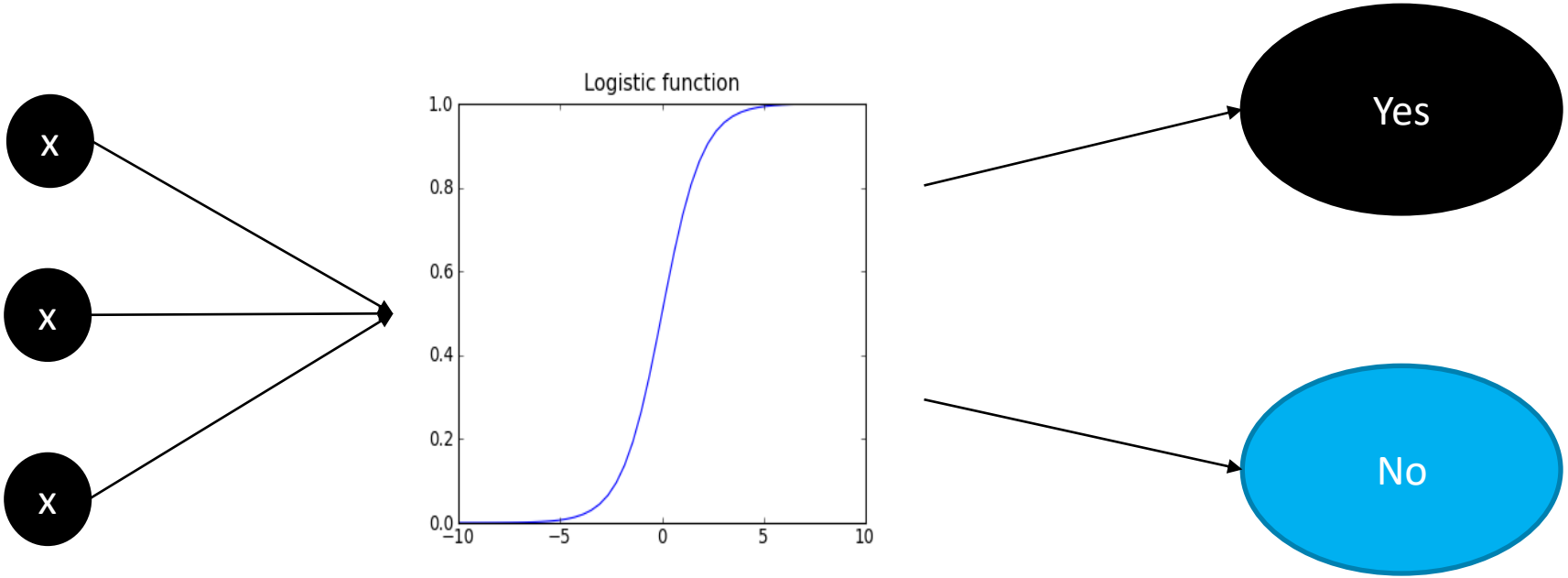
Demo

Classification Problem

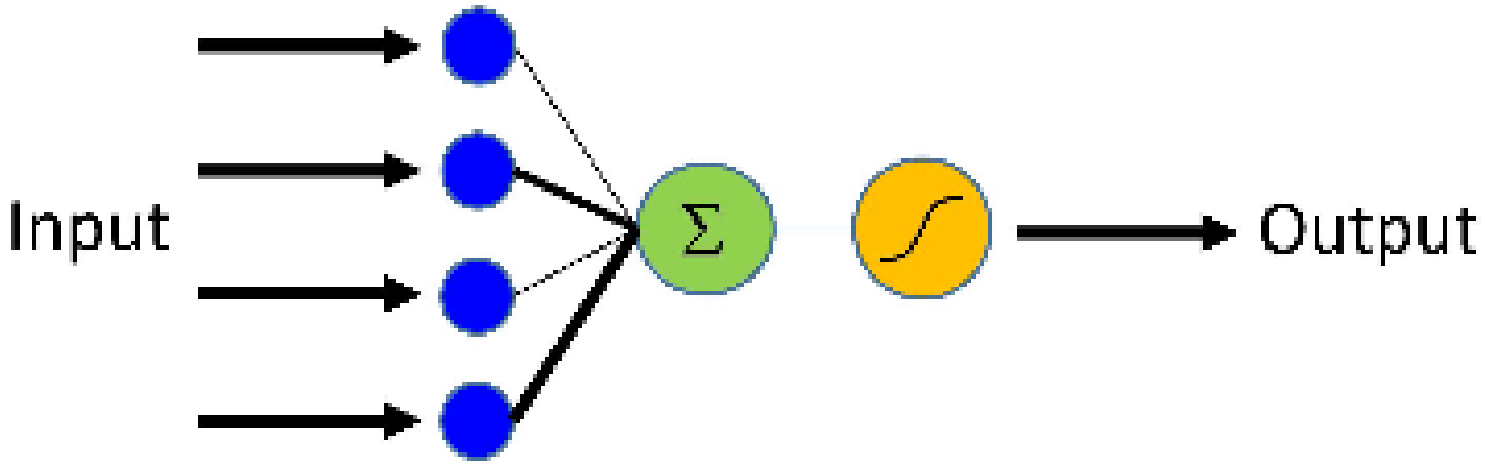
- Classification Problem
- Cancer cells
  - Demo data



Logistic Regression



The output from the hypothesis is the estimated probability.

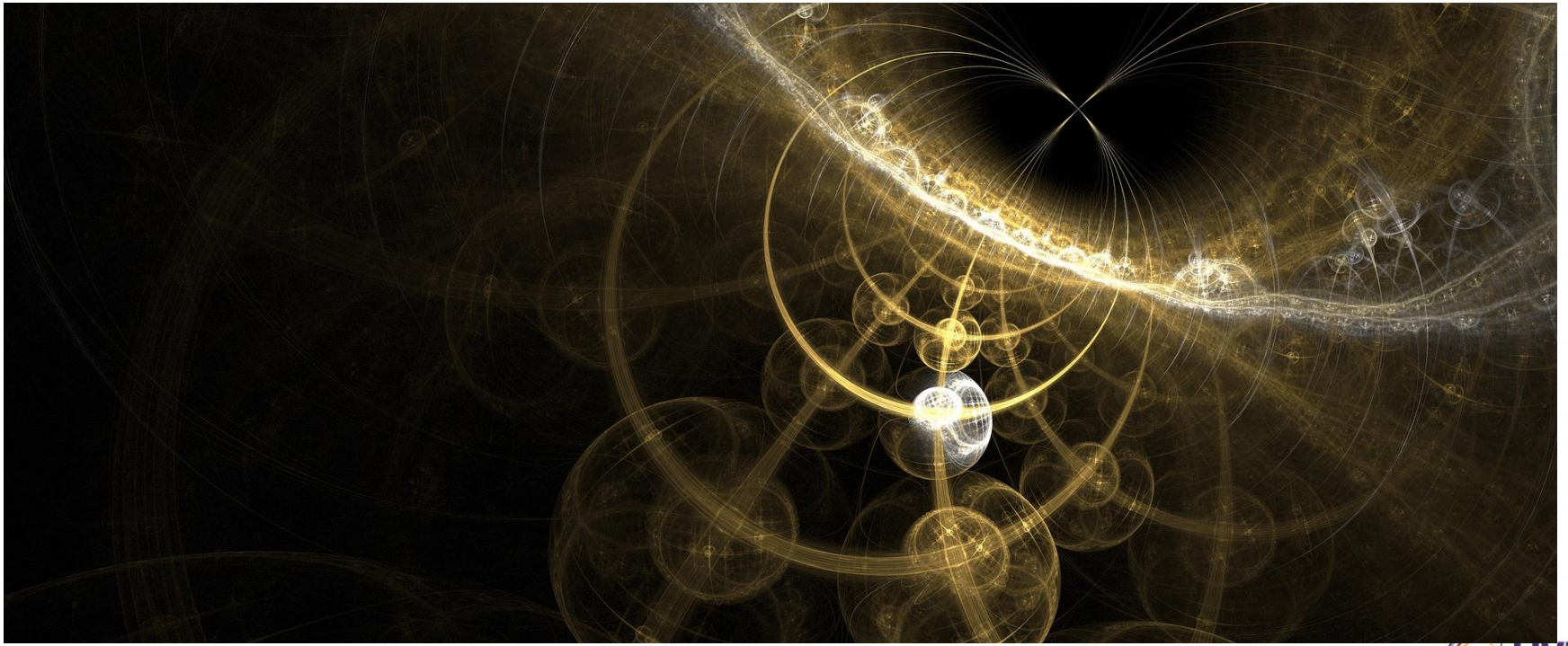


Because we have two output labels, we call this a binary classification task: blue or red.

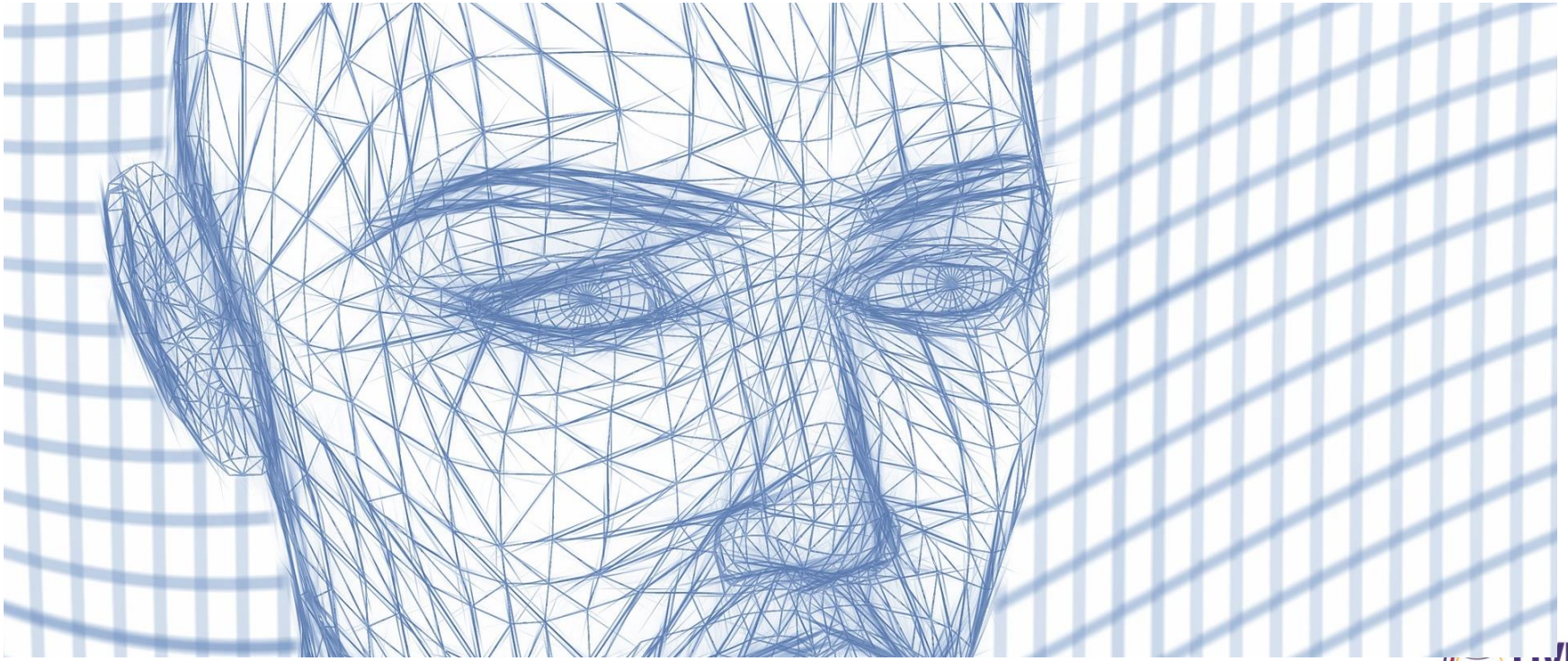
Numpy

- NumPy is the fundamental package for scientific computing with Python.
- A powerful N-dimensional array object
- NumPy can also be used as an efficient multi-dimensional container of generic data.

Deep Learning Futures



Summary



References

- Channel 9 –Microsoft Cognitive Toolkit CNTK for Deep Learning
- Microsoft Ignite Orlando 2017 videos
- Tensorflow.org