Machine learning


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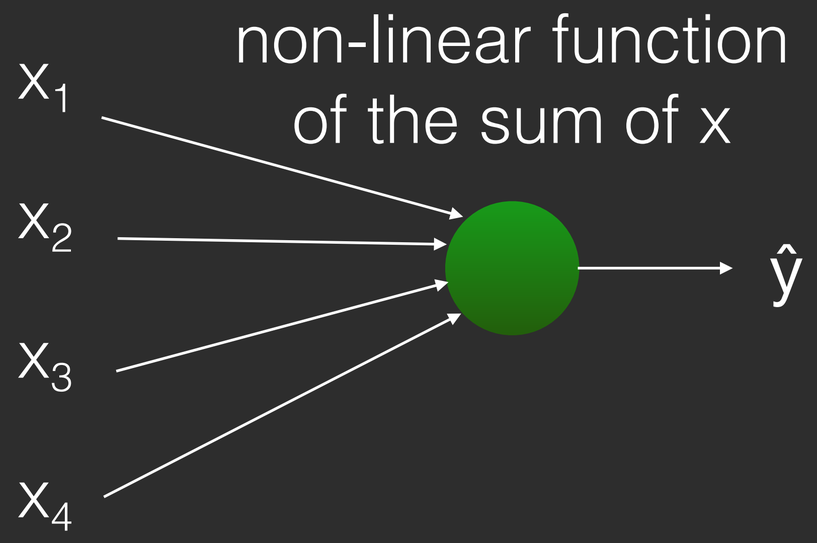
Machine learning gives computers the ability to learn without being explicitly programmed.

Neural networks

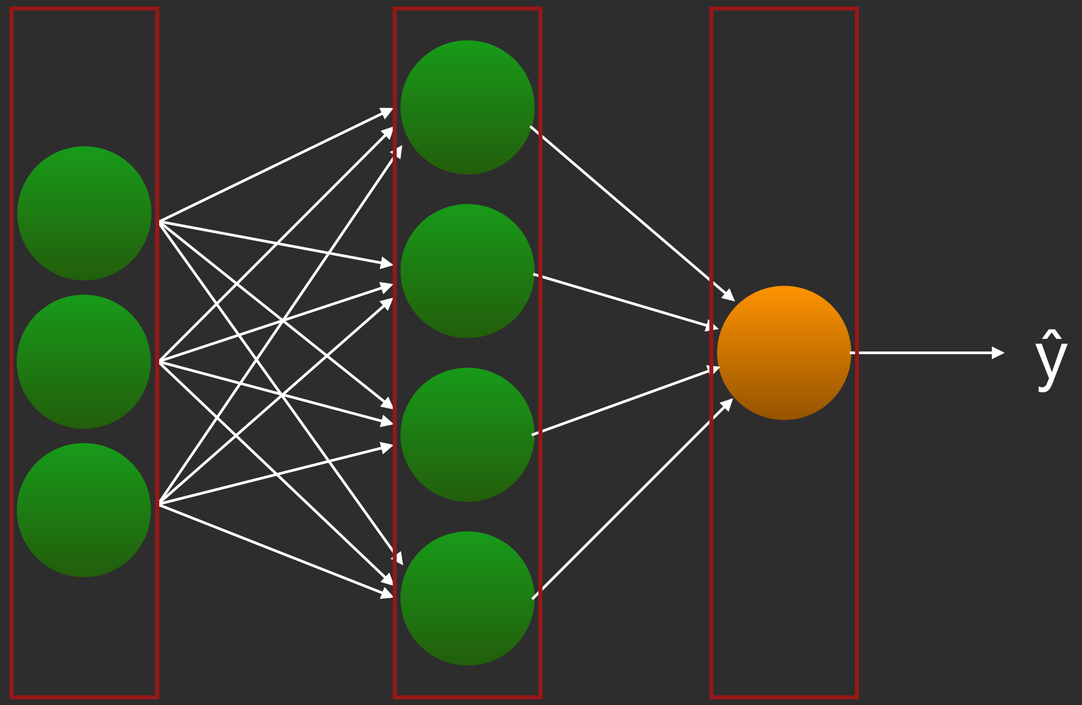
Computing systems inspired (loosely) by the brain

Neuron - unit of computation



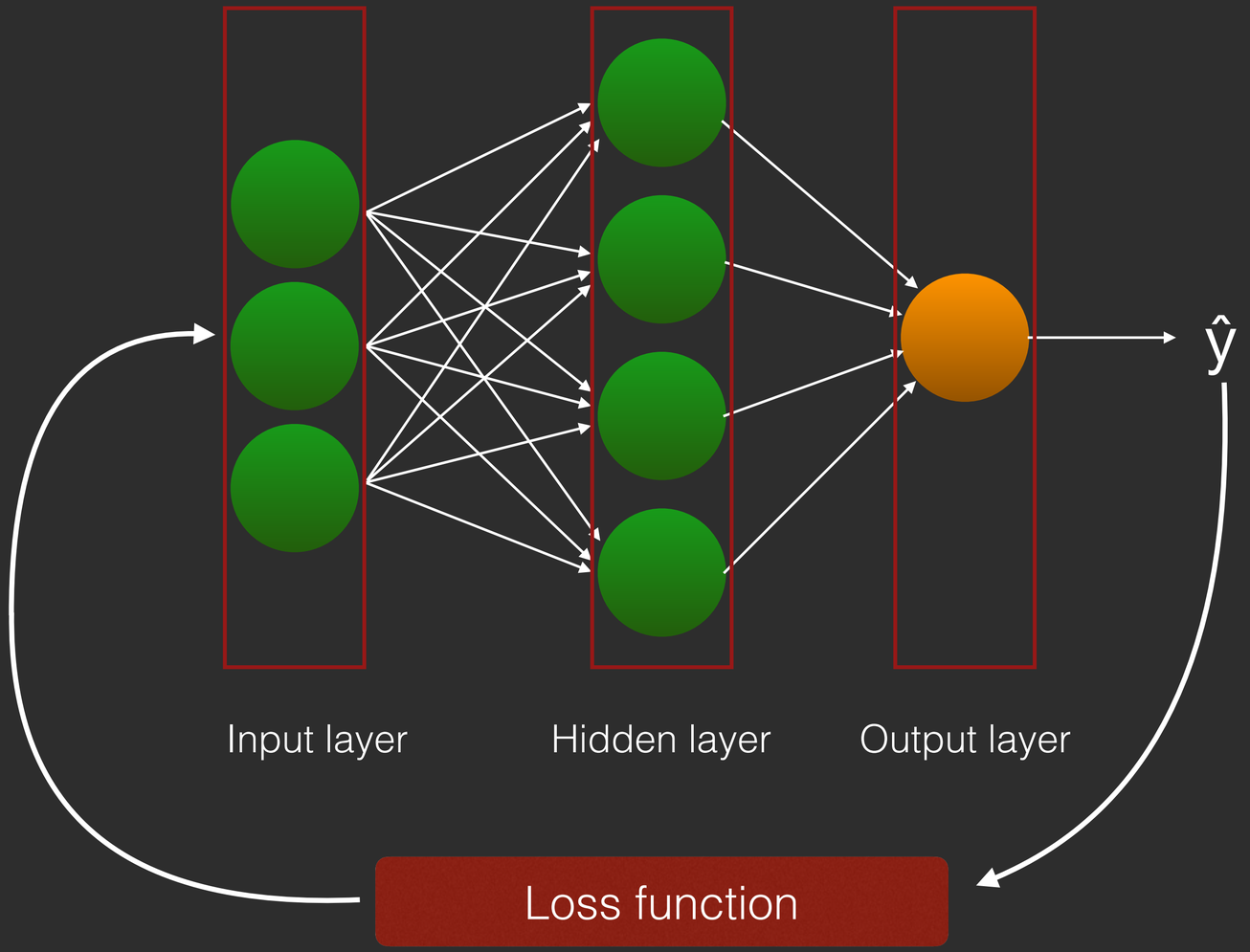
x - real number

Neuron network

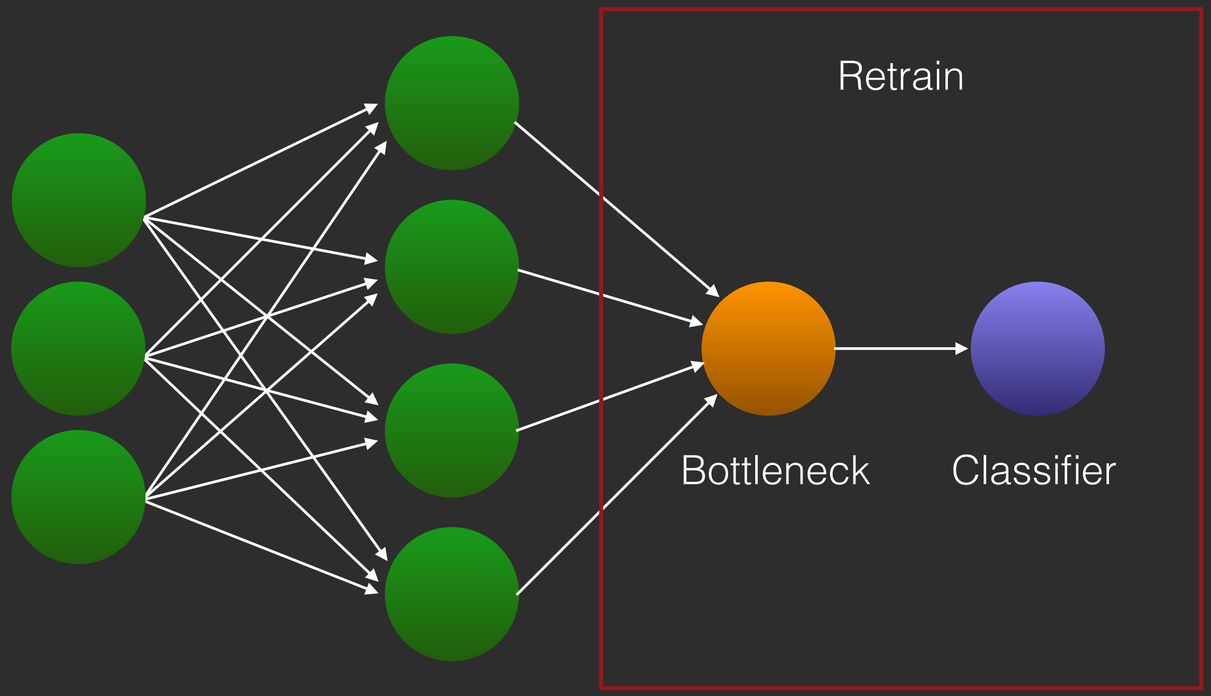


Training (deep learning)

Loss function adjusts connections weights as learning proceeds

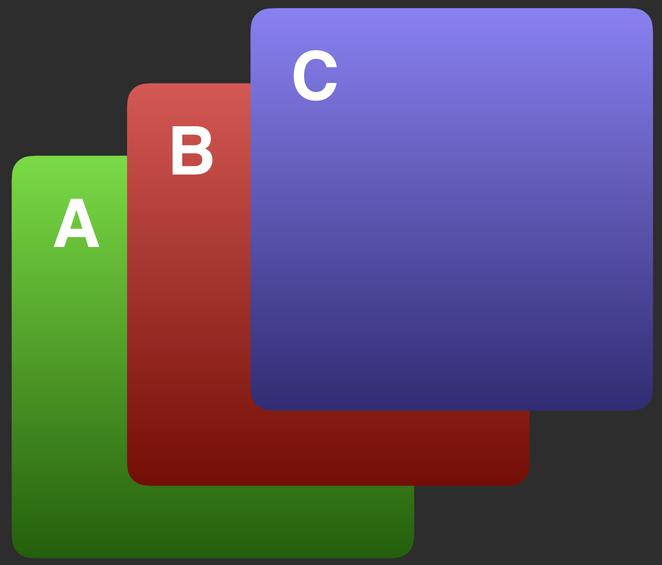


Transfer learning

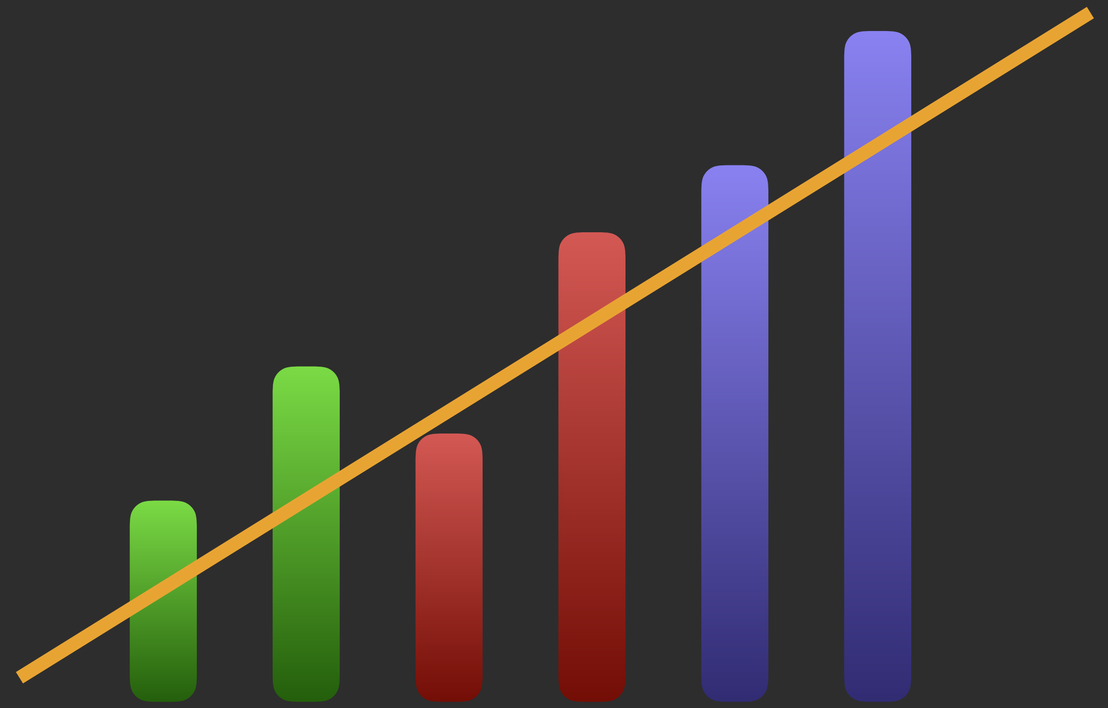


Supervised learning

Classification

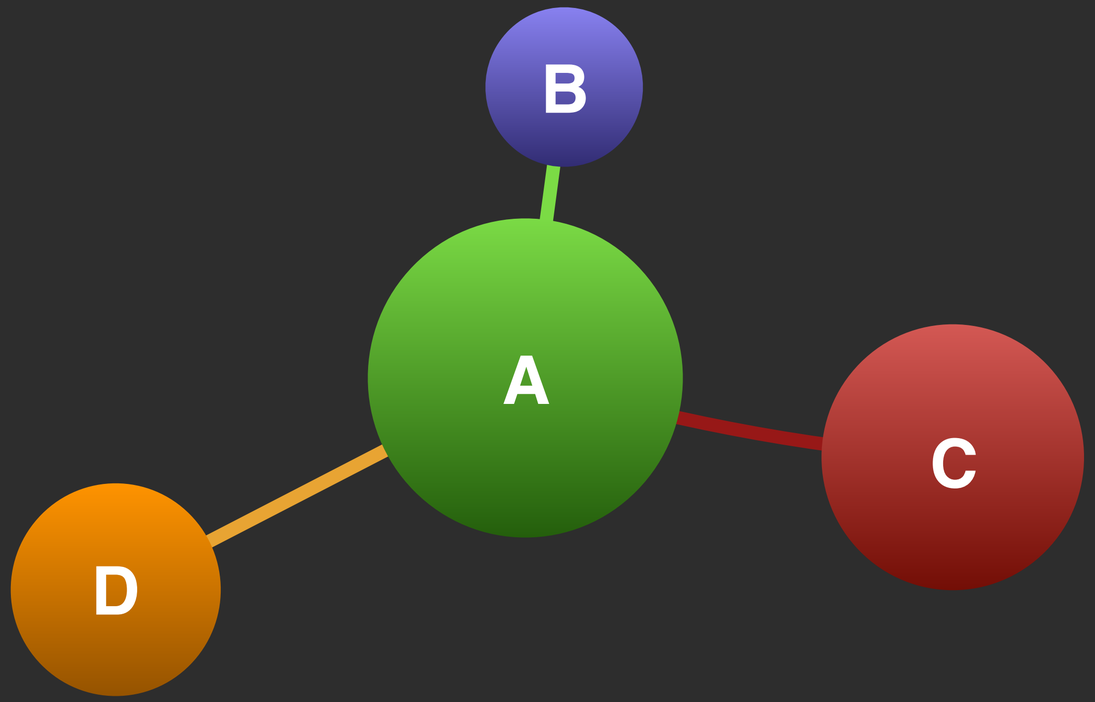


Regression



Unsupervised learning

Clustering



Frameworks


TensorFlow ™


K
Keras


turi


GLUON


Microsoft
Cognitive
Toolkit
aka.ms/CognitiveToolkit
Microsoft


Caffe2


PYTORCH

Manchester United	Not Manchester United
	

Model creation

Images Show Less


a0.jpg


a1.jpg


a2.jpg


a3.jpg


a4.png


a5.jpg


a6.jpg


a7.jpg


a8.jpg


a9.jpg


b10.jpg


b11.jpg

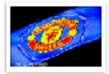

b12.jpg


b13.jpeg


b14.jpg


b15.jpg


b16.jpg


b17.jpg


b18.jpeg


b19.jpg


c20.jpg


c21


c22.jpg


c23.jpg


c24.jpg


c25.jpg


c26.jpg


c27.jpg


c28.jpg


c29.jpg

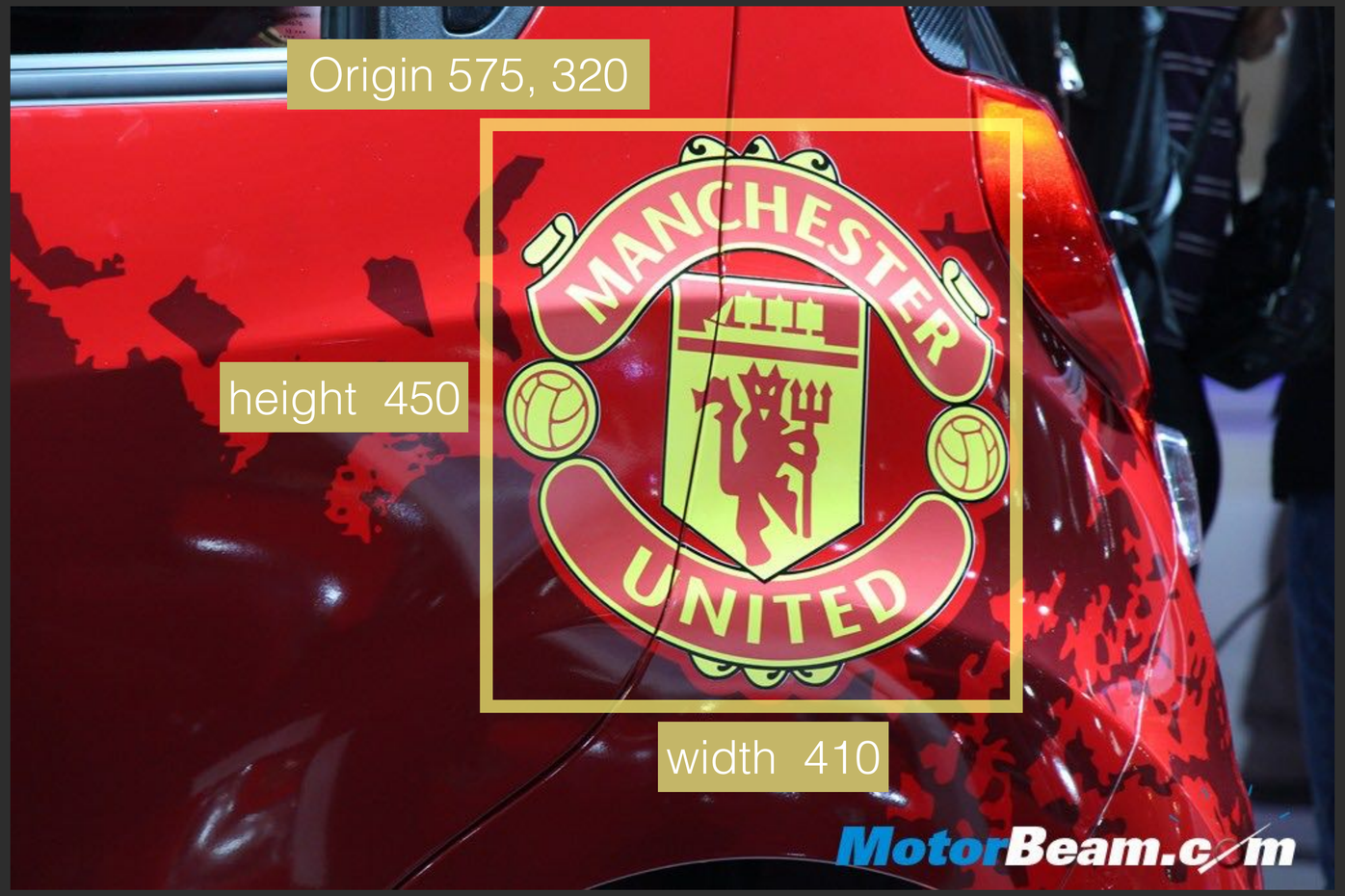

d30.jpeg


d31.jpg


d32.jpg


d33.jpg

Bounding boxes



Turi Create

```
import turicreate as tc

data = tc.image_analysis.load_images('train', with_path=True)
data = data.sort(['path'])

data['annotations'] = [
    [{'coordinates': {'height': 450, 'width': 410, 'x': 575, 'y': 320}, 'label': 'manch'}], #0
    [{'coordinates': {'height': 271, 'width': 261, 'x': 280, 'y': 176}, 'label': 'manch'}], #1
    [{'coordinates': {'height': 177, 'width': 177, 'x': 254, 'y': 250}, 'label': 'manch'}], #2
    …
    [{'coordinates': {'height': 400, 'width': 380, 'x': 360, 'y': 235}, 'label': 'manch'}], #31
    [{'coordinates': {'height': 190, 'width': 190, 'x': 250, 'y': 205}, 'label': 'manch'}], #32
    [{'coordinates': {'height': 170, 'width': 170, 'x': 350, 'y': 620}, 'label': 'manch'}]  #33
]

model = tc.object_detector.create(data)

model.export_coreml('manchester.mlmodel')
```

Core ML framework

Machine Learning Model

Name	manchester
Type	Neural Network
Size	63.4 MB
Author	unknown
Description	Object detector (darknet-yolo) created by Turi Create (version 4.0)
License	unknown

Model Class

manchester

Automatically generated Swift model class

Model Evaluation Parameters

Name	Type	Description
Inputs		
image	Image (Color 416 x 416)	Input image
Outputs		
confidence	MultiArray (Double 2535 x 1)	Boxes × Class confidence (see user-defined metadata "classes")
coordinates	MultiArray (Double 2535 x 4)	Boxes × [x, y, width, height] (relative to image size)

Core ML request

```
private var requests = [VNCoreMLRequest]()
```

```
let mlmodel = Manchester().model
let model = try VNCoreMLModel(for: mlmodel)
```

```
let request = VNCoreMLRequest(model: model, completionHandler: { [weak self] request, error in
    self?.processClassifications(for: request, error: error)
})
```

```
request.imageCropAndScaleOption = .scaleFill
requests.append(request)
```

Core ML request handler

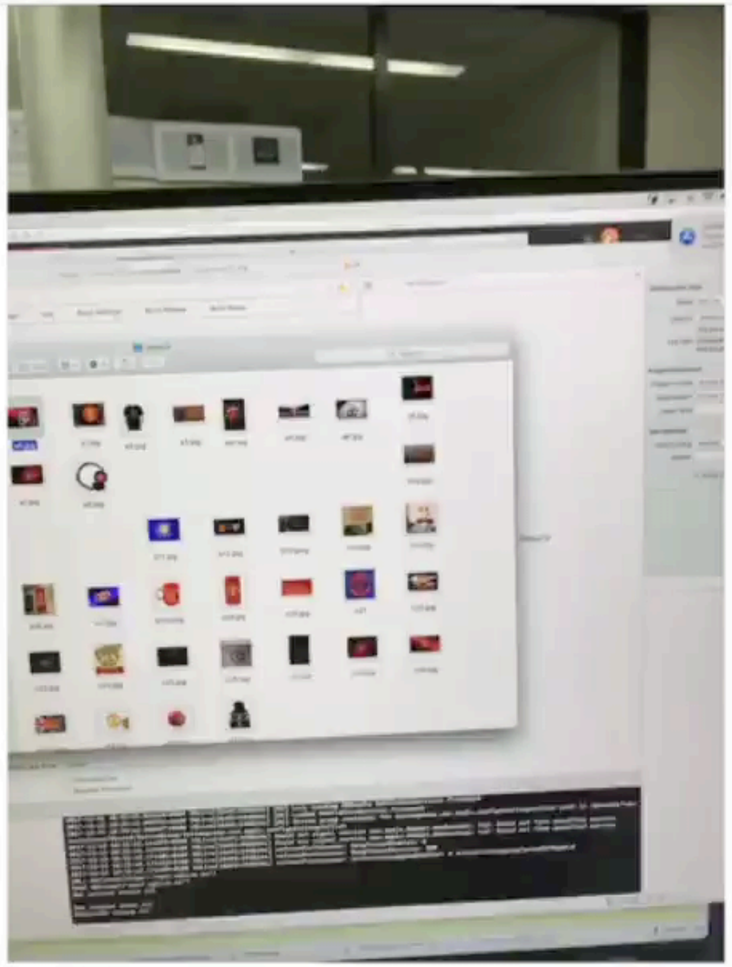
```
guard let pixelBuffer = CMSampleBufferGetImageBuffer(sampleBuffer) else { return }
```

```
let handler = VNImageRequestHandler(cvPixelBuffer: pixelBuffer,
                                    orientation: CGImagePropertyOrientation(rawValue: UInt32(ex))!,
                                    options: requestOptions)
```

```
handler.perform(requests)
```

09:41

Live



Stop

Resources

- course.fast.ai
- coursera.org/learn/machine-learning with Andrew Ng
- Swift by Sundell 22: "A path for learning”
- lynda.com iOS App Development: Core ML
- github.com/blob8129/MUnotMU