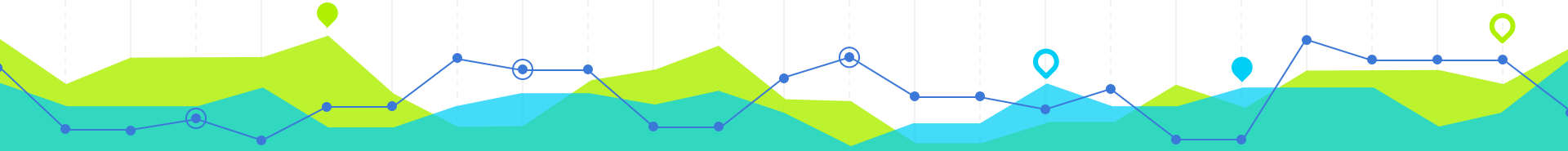

Image Classification in TensorFlow

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DOWNLOAD & INSTALL INSTRUCTIONS

Accel.AI

OFFICIAL DOCS

Python

https://docs.python.org/2.7/

Anaconda

https://www.anaconda.com/download/

TensorFlow

https://www.tensorflow.org/get_started/

Docker

https://docs.docker.com/

One Panel

https://help.onepanel.io/

GITHUB LINKS

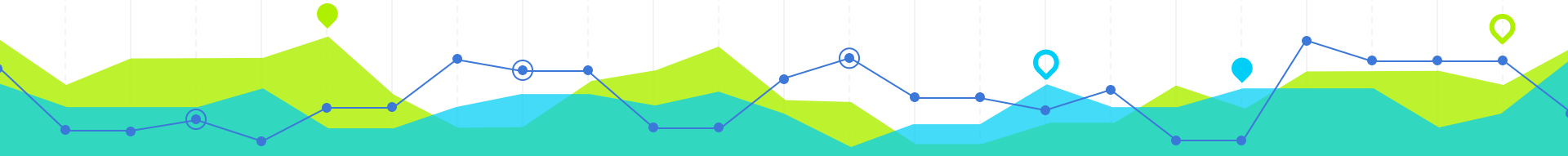
AI Workshop Installation Guides

https://github.com/AccelAI/AI-Workshop-Installation-Guides

Image Classification in TensorFlow
https://github.com/AccelAI/Image-Classification-TensorFlow

JS Google Image Scraper
https://github.com/quickresolve/img-scrapers

The applied AI lab is based on Google's Code Lab - TensorFlow for Poets
https://codelabs.developers.google.com/codelabs/tensorflow-for-poets/index.html



HEY!

I am Laura Montoya

I am a futurist, biologist, engineer, and social impact entrepreneur!

You can find me at...

@quickresolute

lauramontoya@accel.ai

Lauranmontoya.com

Accel.AI

LXAI

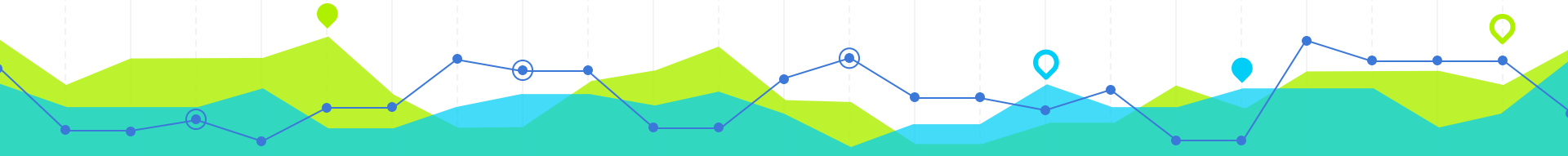
AGENDA

Main Concepts

1. What is computer vision?
2. How do we classify images?
3. What is a classifier?
4. How does a computer classify images?
5. 7 Steps in Machine Learning
6. CV Challenges
7. Models
8. Evaluation & Tuning

Applied AI Lab

1. Intro to TensorFlow
2. Image Classification in TensorFlow
3. Gender & Race Classifiers



Vision

1

An exponential evolution...

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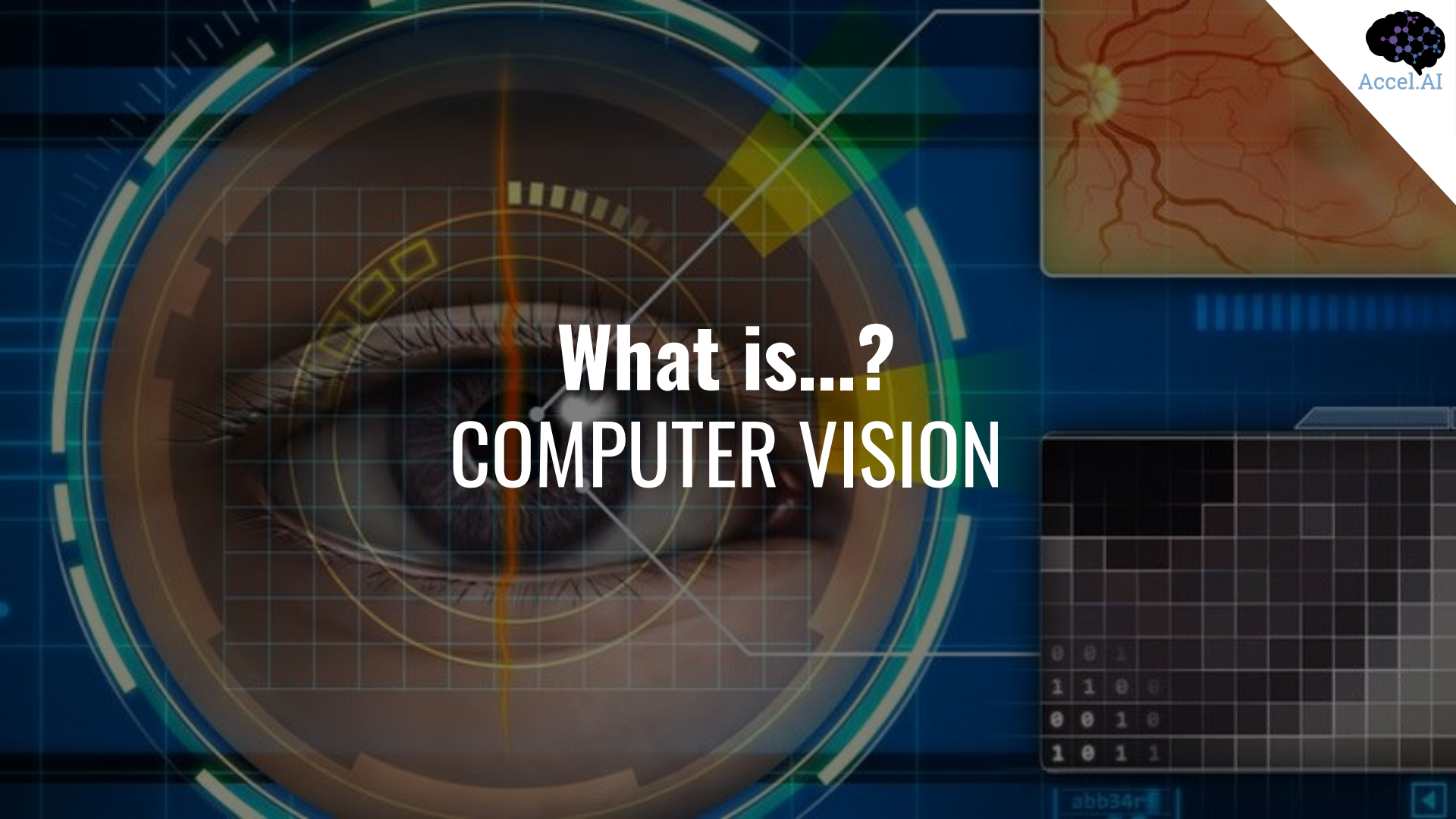
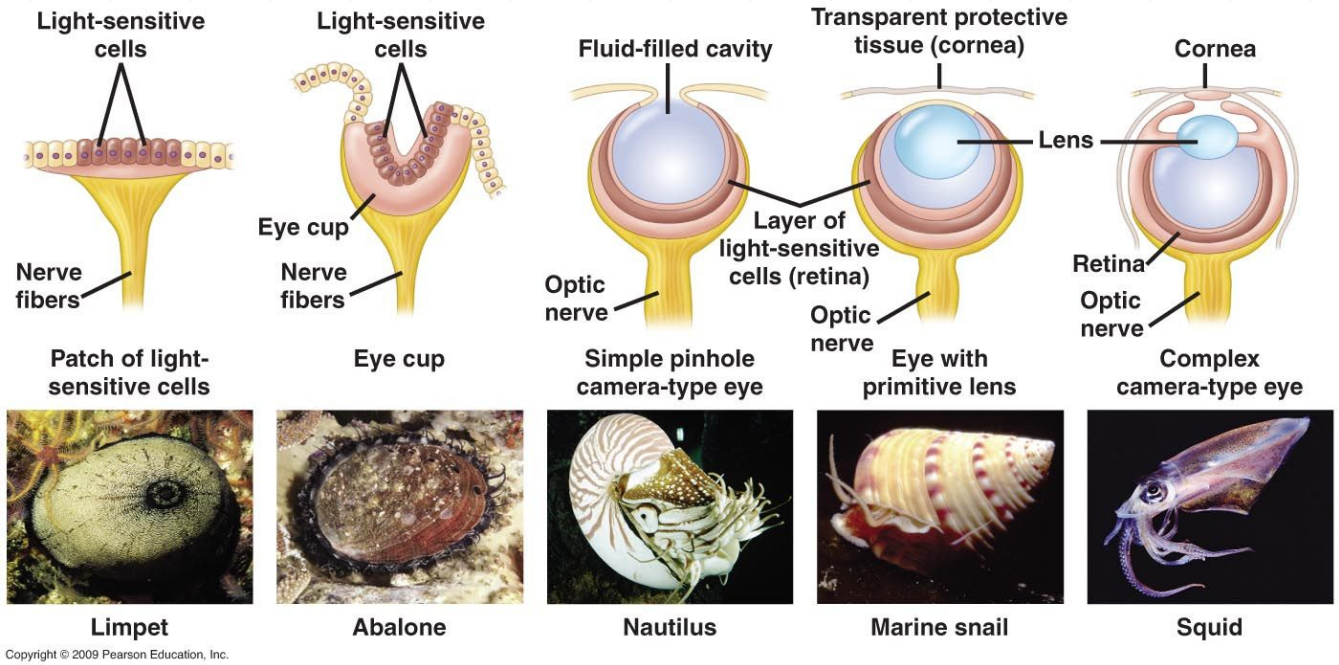

What is...?
COMPUTER VISION
Accel.AI



Human Vision

2

How do we see the world?

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MIT neuroscientists find the brain can identify images seen for as little as 13 milliseconds

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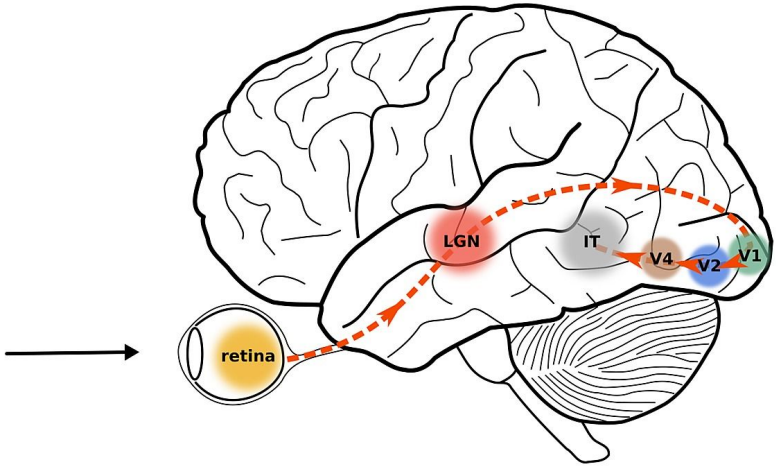
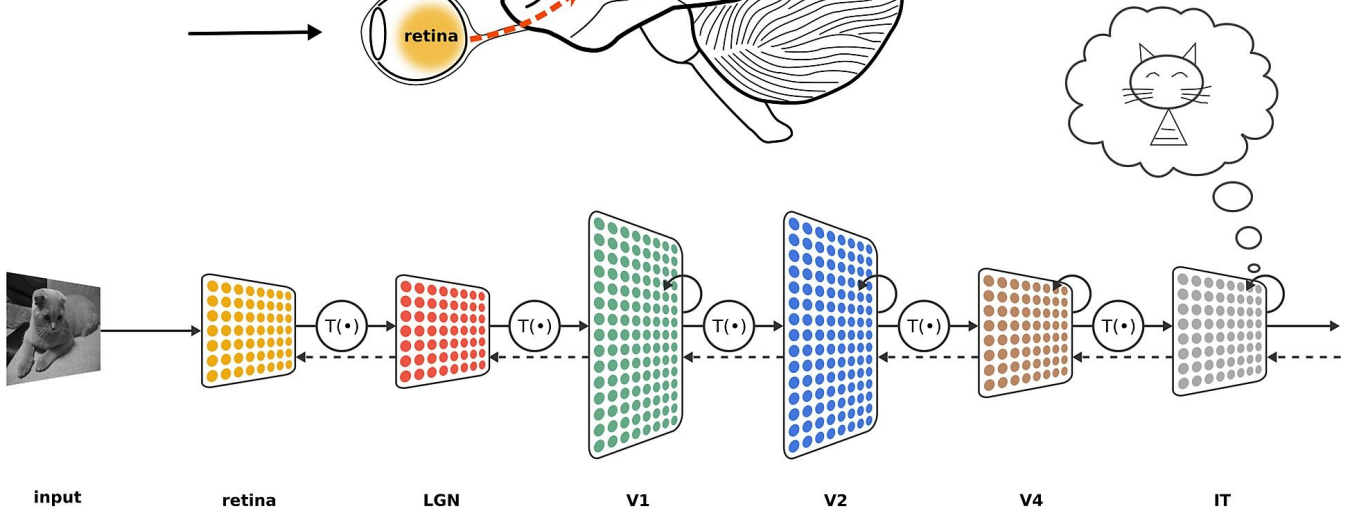




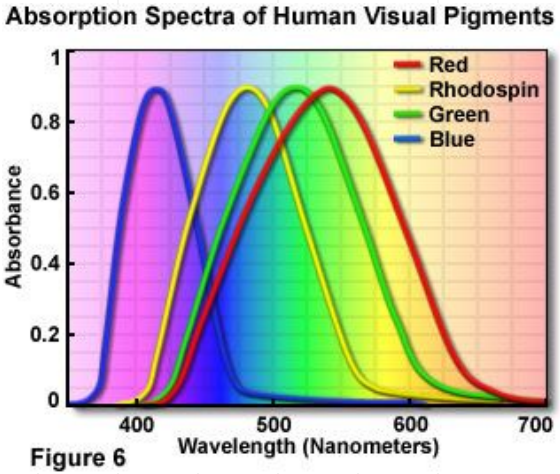
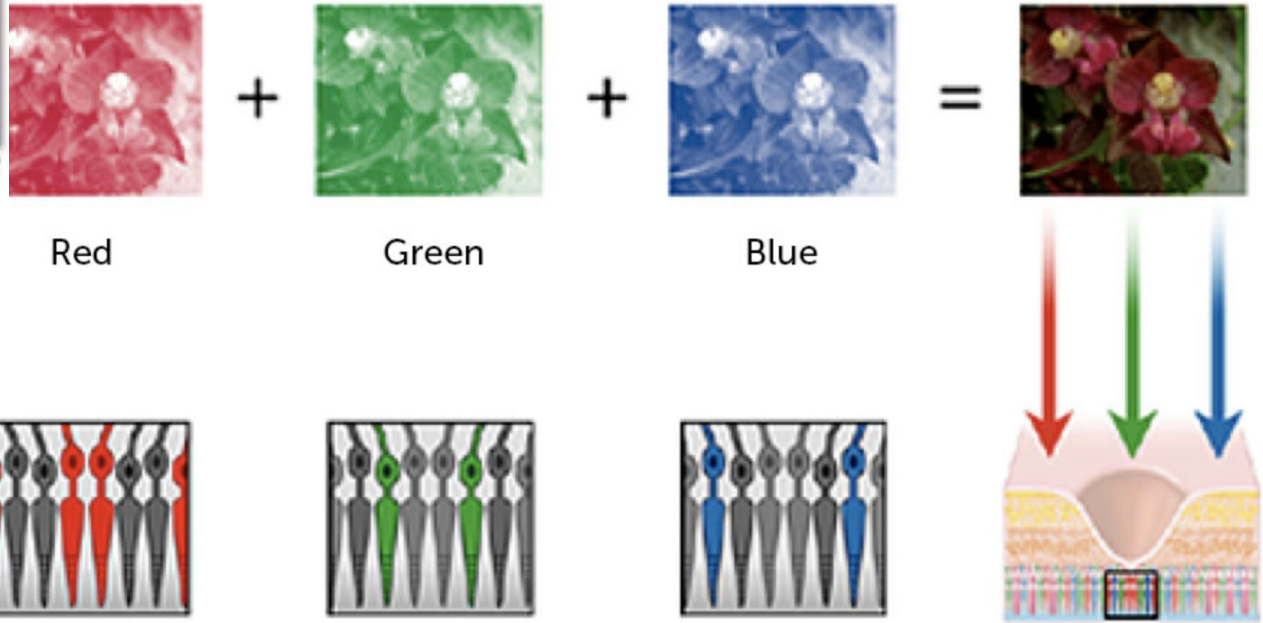
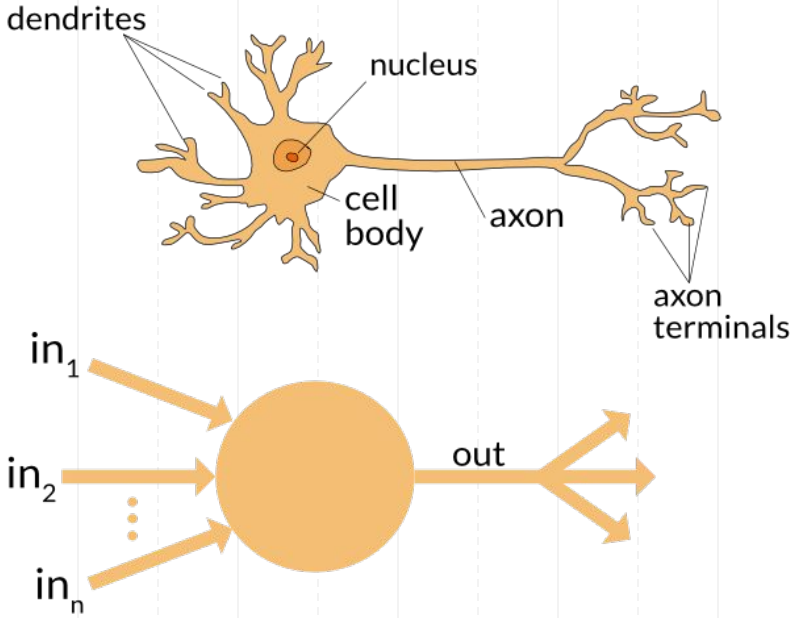


Figure 6



PERCEPTRON = SINGLE LAYER



Classification

3

What is an ML classifier?

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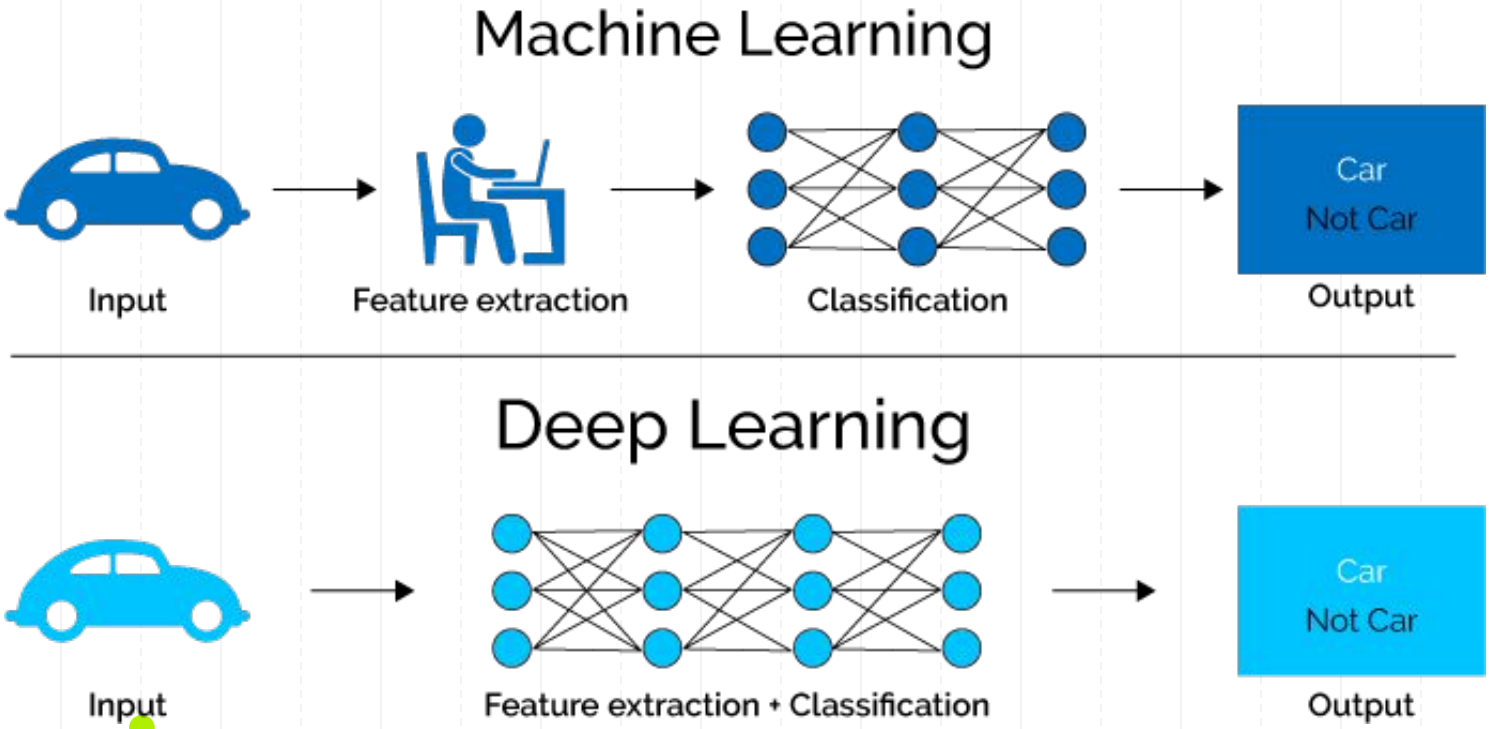
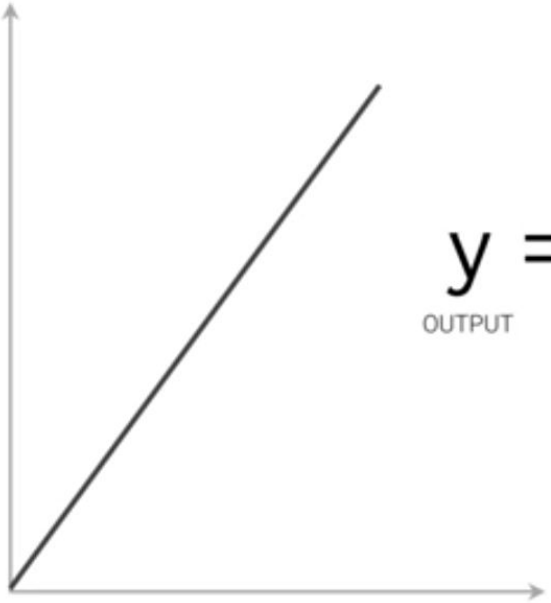
INPUT > CLASSIFIER > OUTPUT

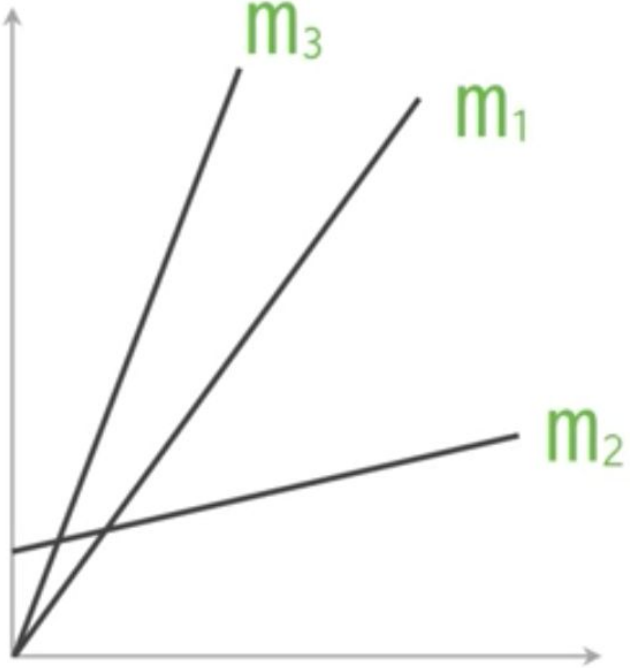


LINEAR CLASSIFIERS

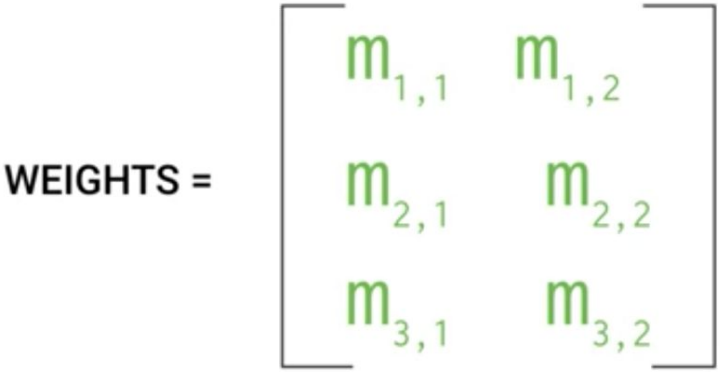


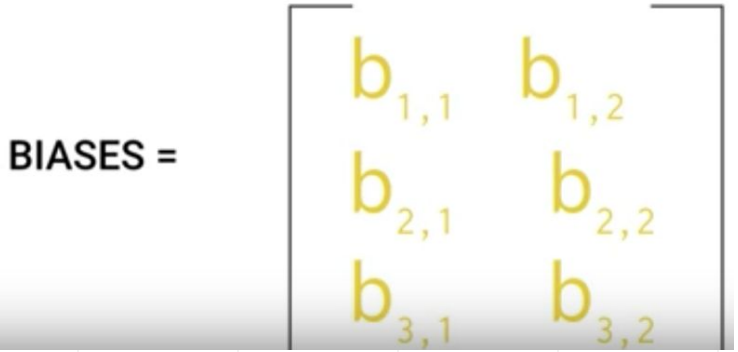
$$y = m * x + b$$

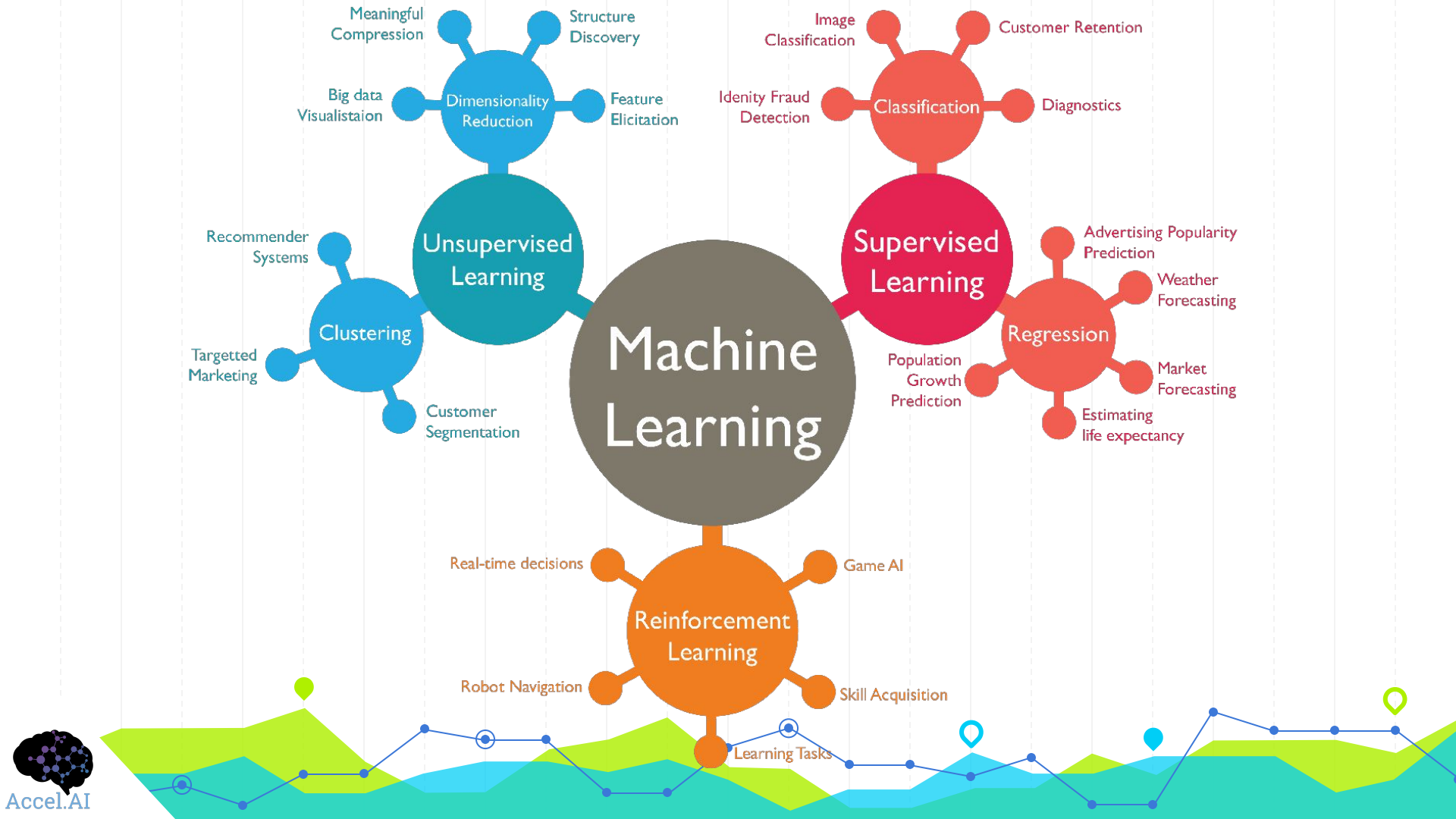
OUTPUT SLOPE INPUT Y-INTERCEPT



WEIGHTS & BIASES






Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
Classification
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Regression
Advertising Popularity Prediction
Weather Forecasting
Population Growth Prediction
Market Forecasting
Estimating life expectancy
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks

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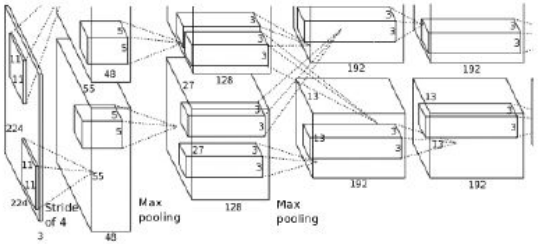
The Deep Learning "Computer Vision Recipe"

Big Data: ImageNet

+



Deep Convolutional Neural Network

+

Backprop on GPU

=

Learned Weights

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Computer Vision

4

How do computers see the world?

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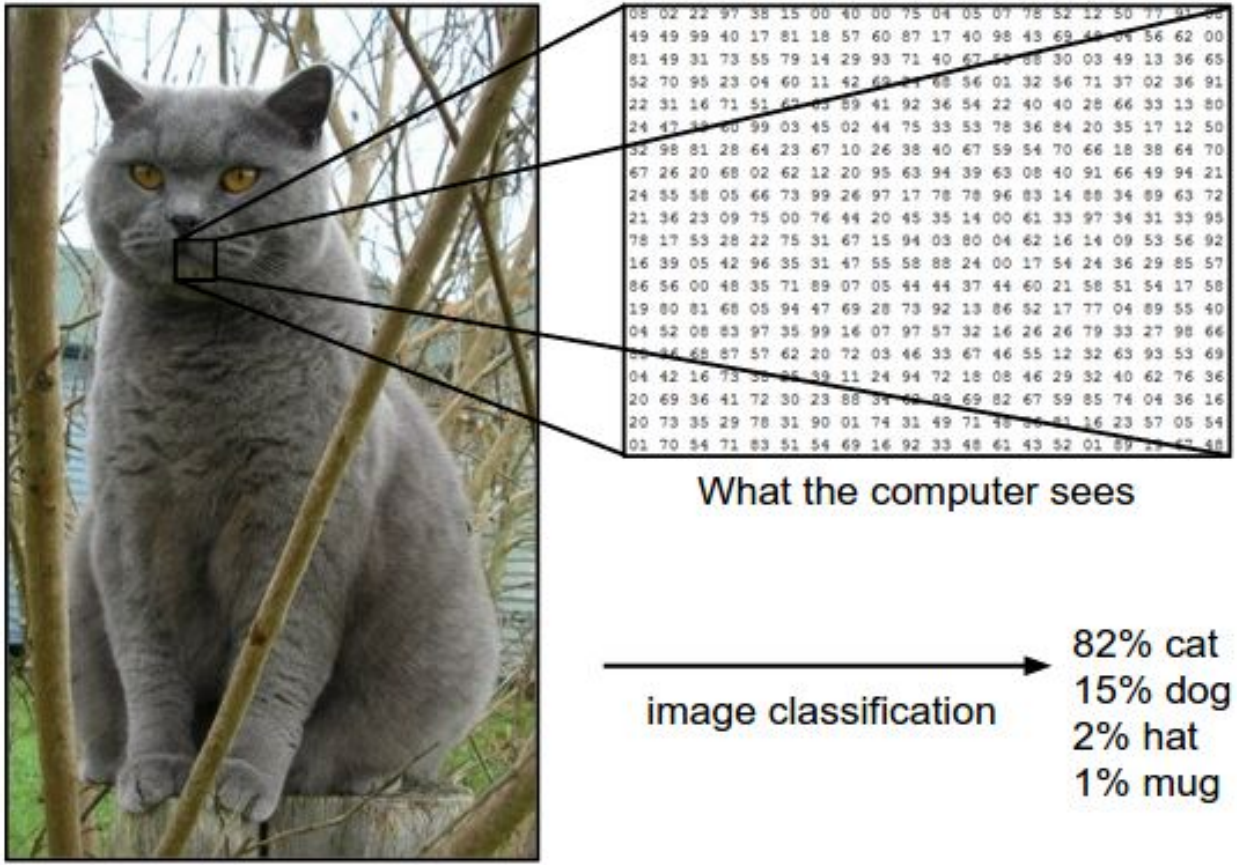

What the computer sees

image classification

82% cat
15% dog
2% hat
1% mug

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ML Steps

7 Steps in Machine Learning

5

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MACHINE LEARNING PROCESS

Training Data

Prediction

Model
[W, b]

Test & Update
[W, b]

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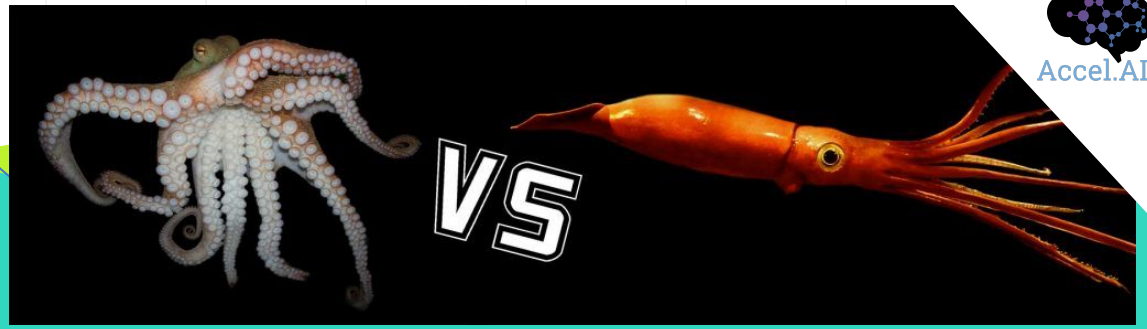


Object	Arms	Head Shape	Home	Label
1	8	round	Ocean floor den	Octopus
2	10	triangular	open ocean	Squid
3	8	round	Ocean floor	Octopus

GATHERING IMAGE DATA

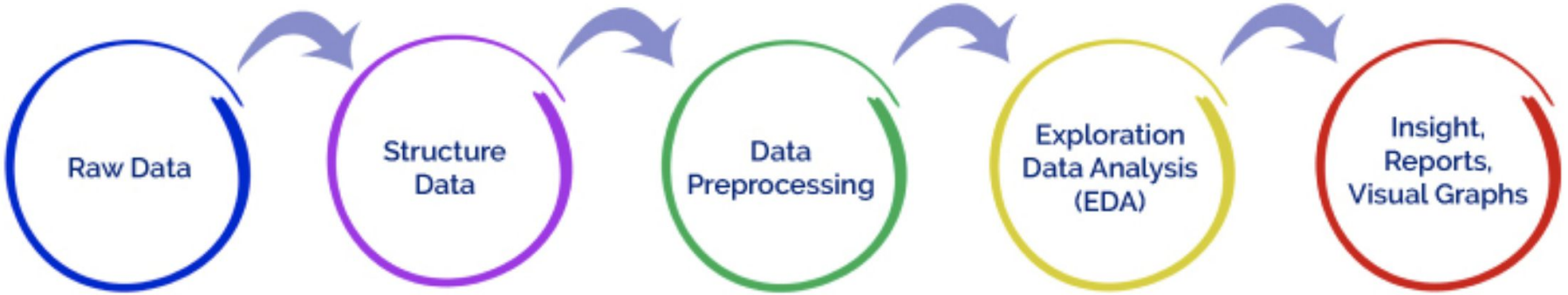
Why is it so hard to scrape images from google?

https://stackoverflow.com/questions/36438261/extracting-images-from-google-images-using-src-and-beautifulsoup

JS Google Image Scraper

https://github.com/quickresolve/img-scrapers

DATA PREPARATION



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Challenges

6

What could possibly go wrong?

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VIEWPOINT VARIATION

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ILLUMINATION

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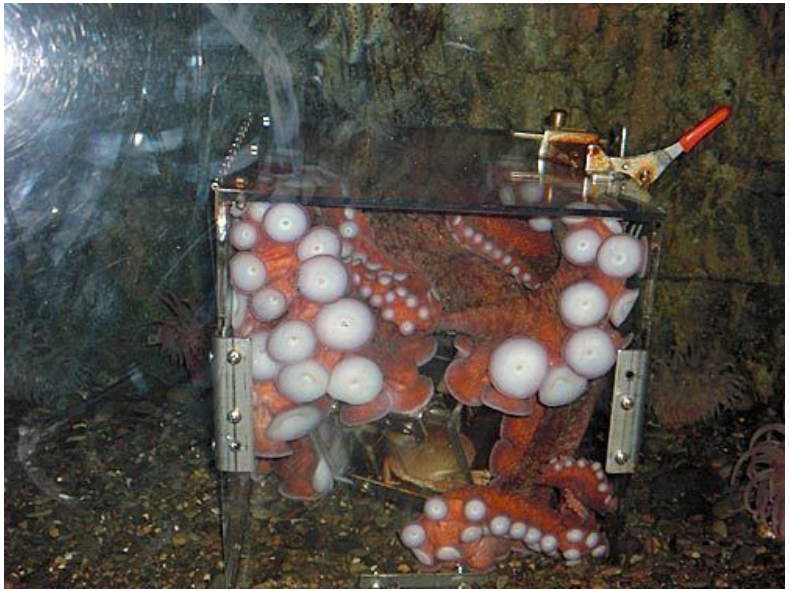
DEFORMATION



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OCCLUSION

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BACKGROUND CLUTTER

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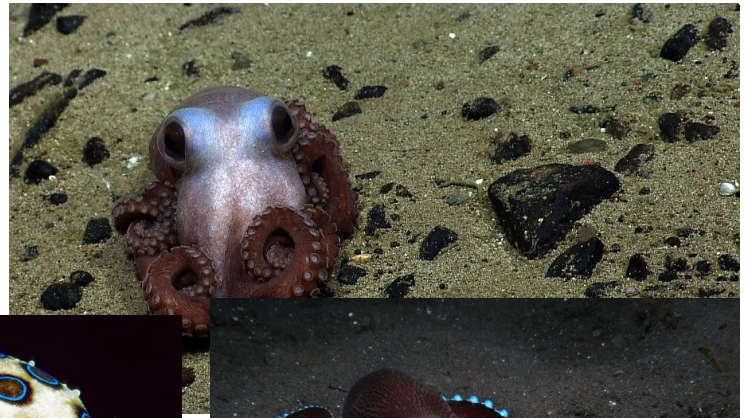
VARIATION



Models

7

What is the best model?

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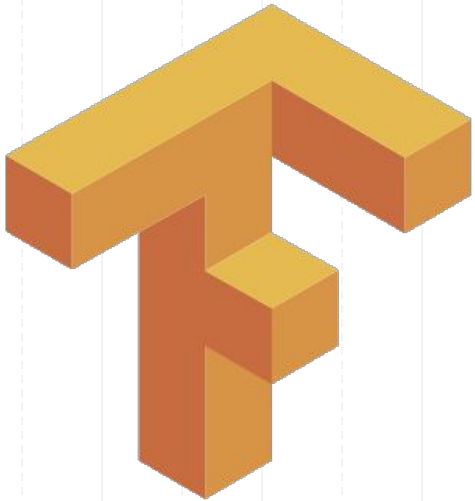
CHOOSING A MODEL

TensorFlow Models

https://github.com/tensorflow/models



TRAINING YOUR OWN MODEL

- Millions of images in hundreds of categories
- Access to multiple GPUs
- A few weeks (2-3 for Image Net) to spare

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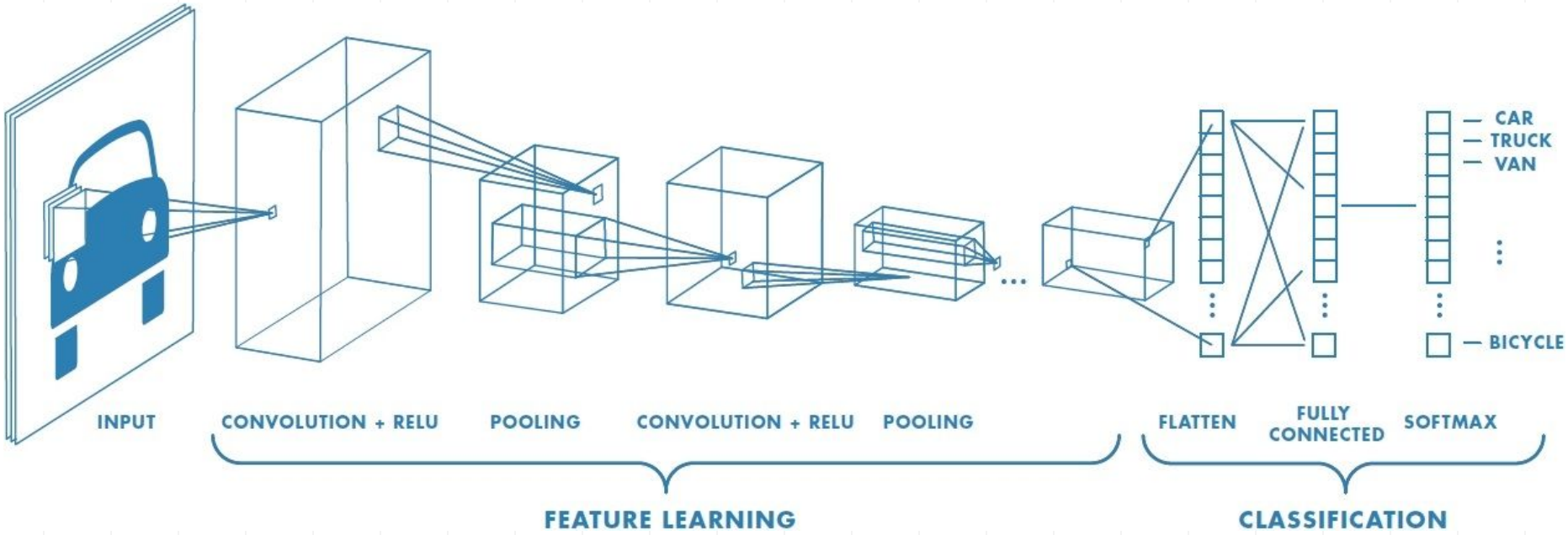
CAR
TRUCK
VAN
BICYCLE
INPUT
CONVOLUTION + RELU
POOLING
CONVOLUTION + RELU
POOLING
FLATTEN
FULLY CONNECTED
SOFTMAX
FEATURE LEARNING
CLASSIFICATION

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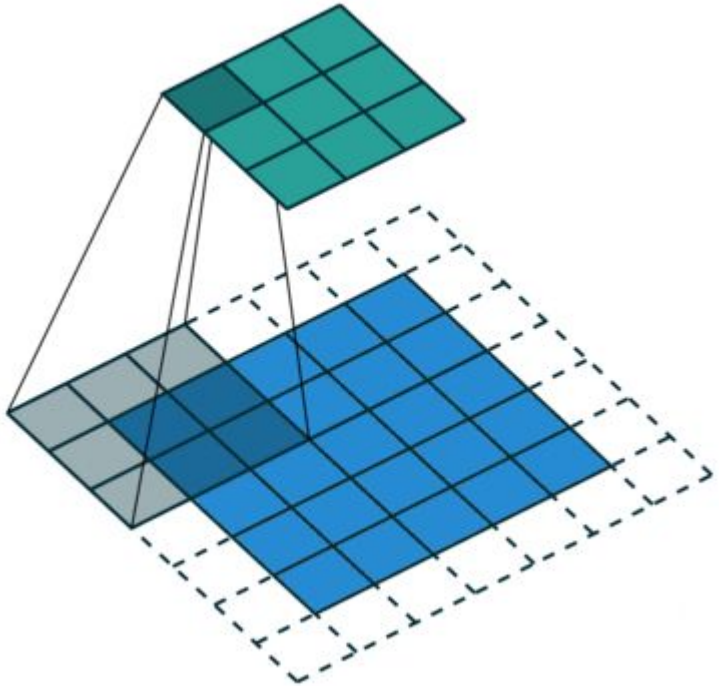
Convolutional Arithmetic



https://github.com/vdumoulin/conv_arithmetic

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Evaluation & Tuning

8

How do we improve accuracy?

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EVALUATION

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HYPERPARAMETERS

Choices about the algorithm that we set rather than learn.

Problem Dependent

Trial and Error Experimentation

- Idea #1 - Choose parameters that work best on Dataset
- Idea #2 - Split data into **train** and **test**, choose hyperparameters that work best on test data
- Idea #3 - Split data into **train**, **validation**, and **test**; choose hyperparameters on validation and evaluate on test

Which option will tell you how your algorithm is performing on unseen data?

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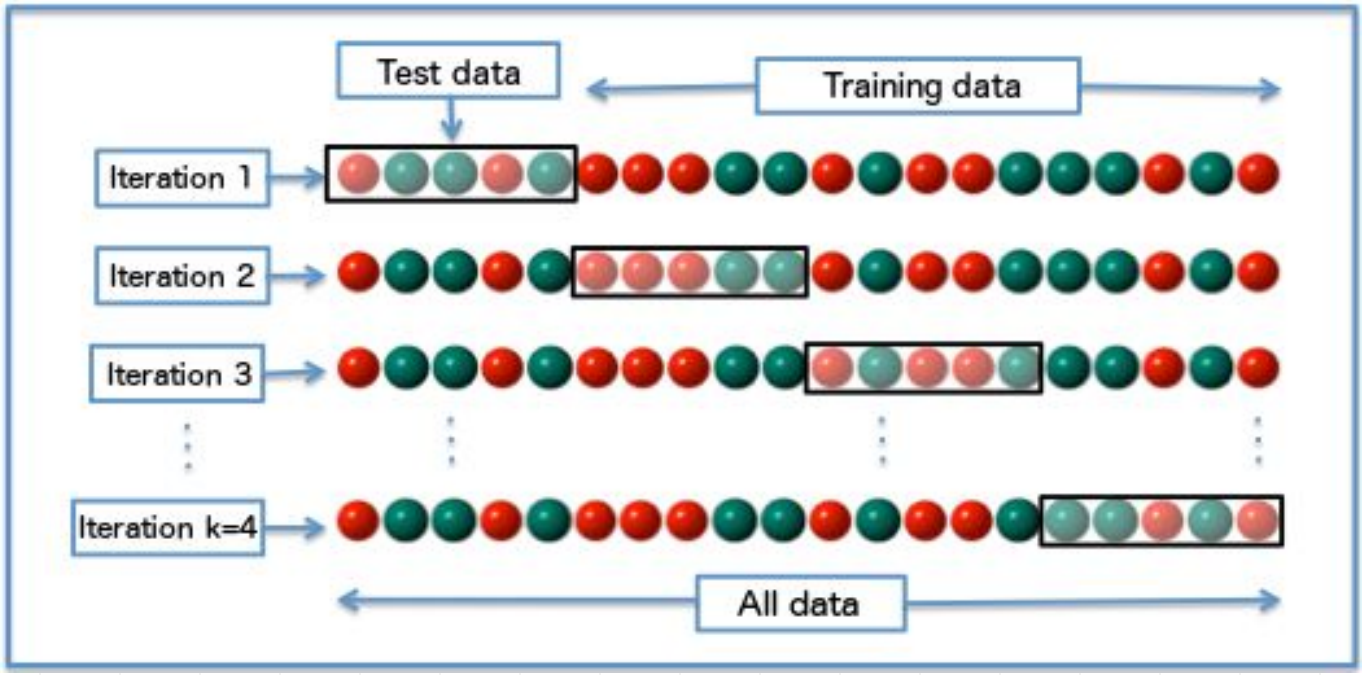
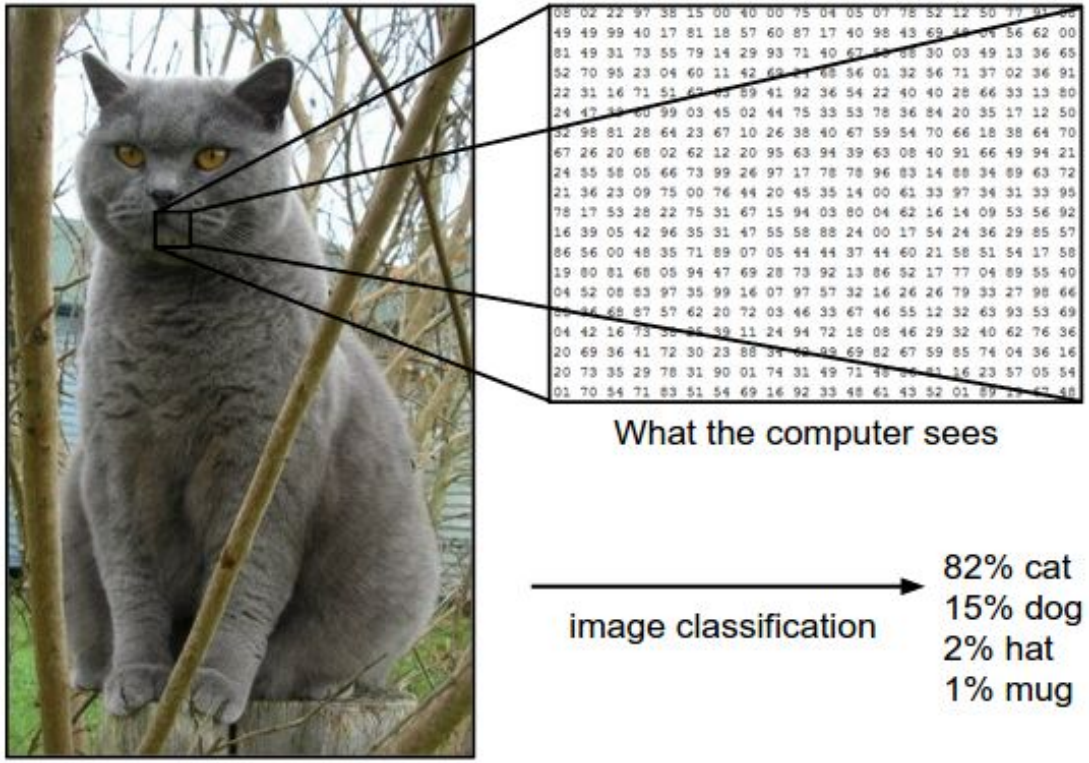
CROSS VALIDATION



INFERENCE


What the computer sees
image classification
82% cat
15% dog
2% hat
1% mug

Applied Lab

What are we working on today?

9

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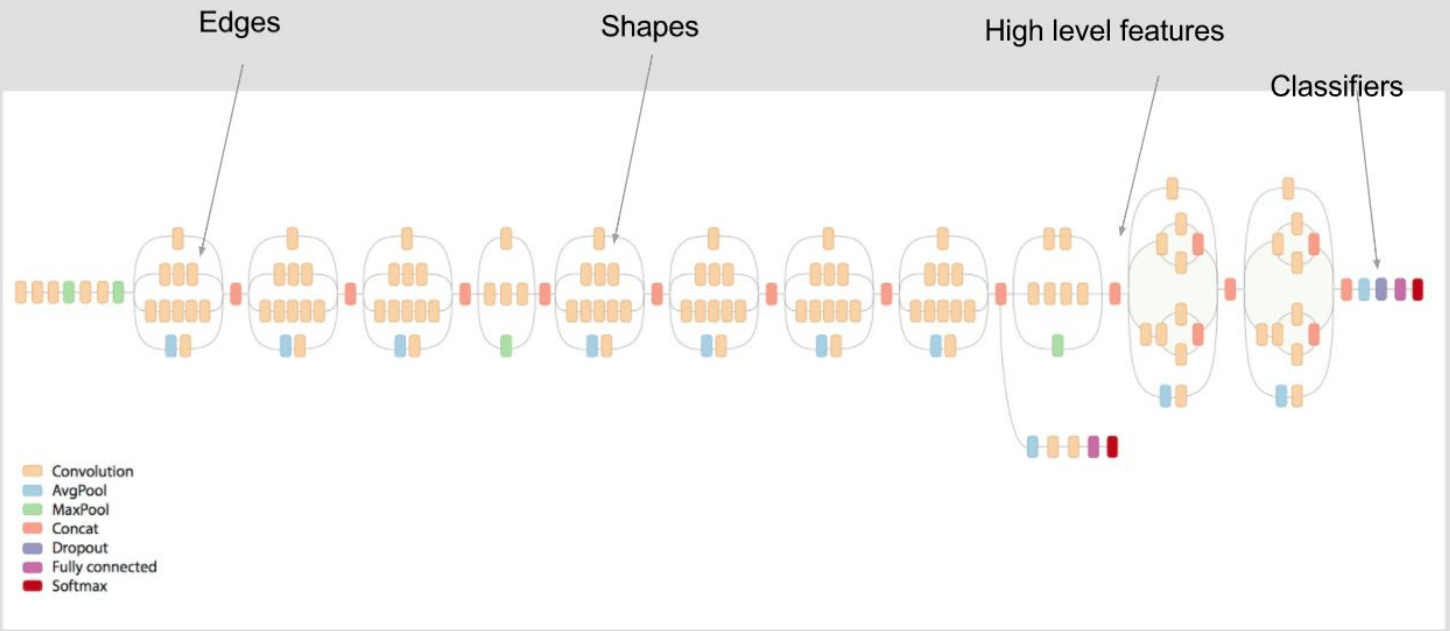
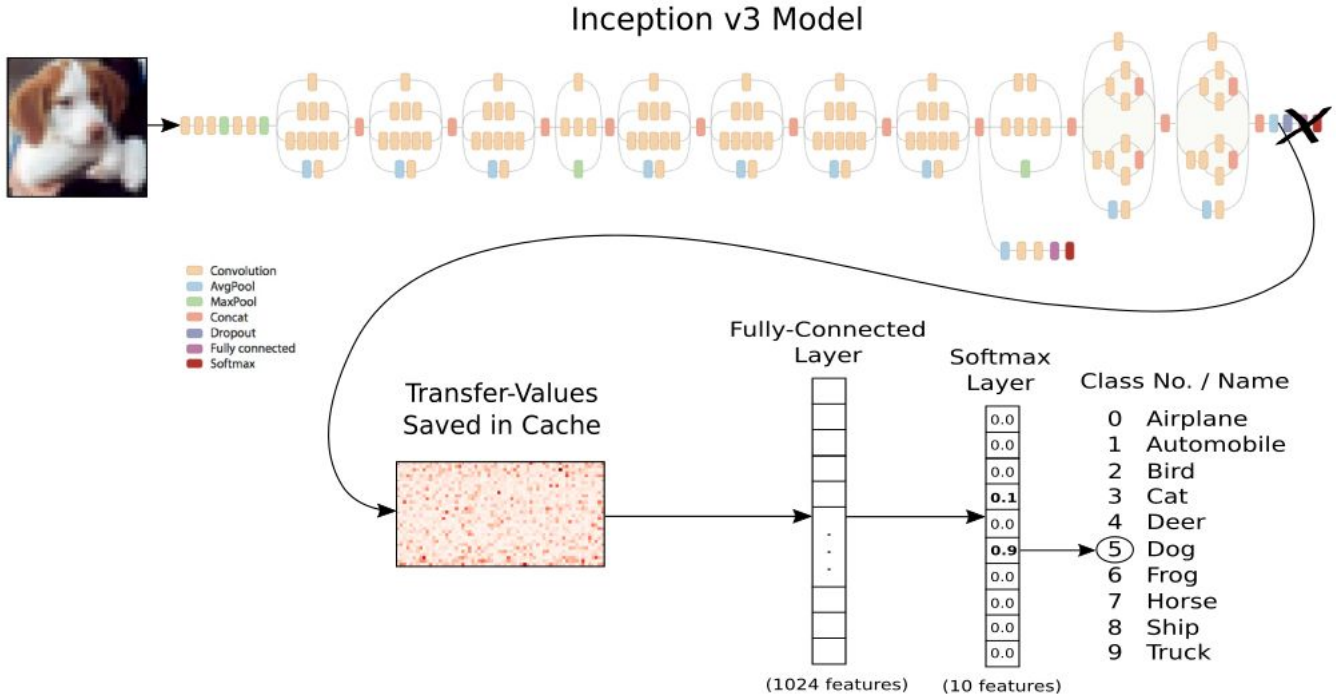
What does the layers learn?



Inception V3 Google Research

(Re)TRAINING - TRANSFER LEARNING



Object Detection

Photo by Juanedc (CC BY 2.0)

Finegrain Classification

Photo by HarshLight (CC BY 2.0)

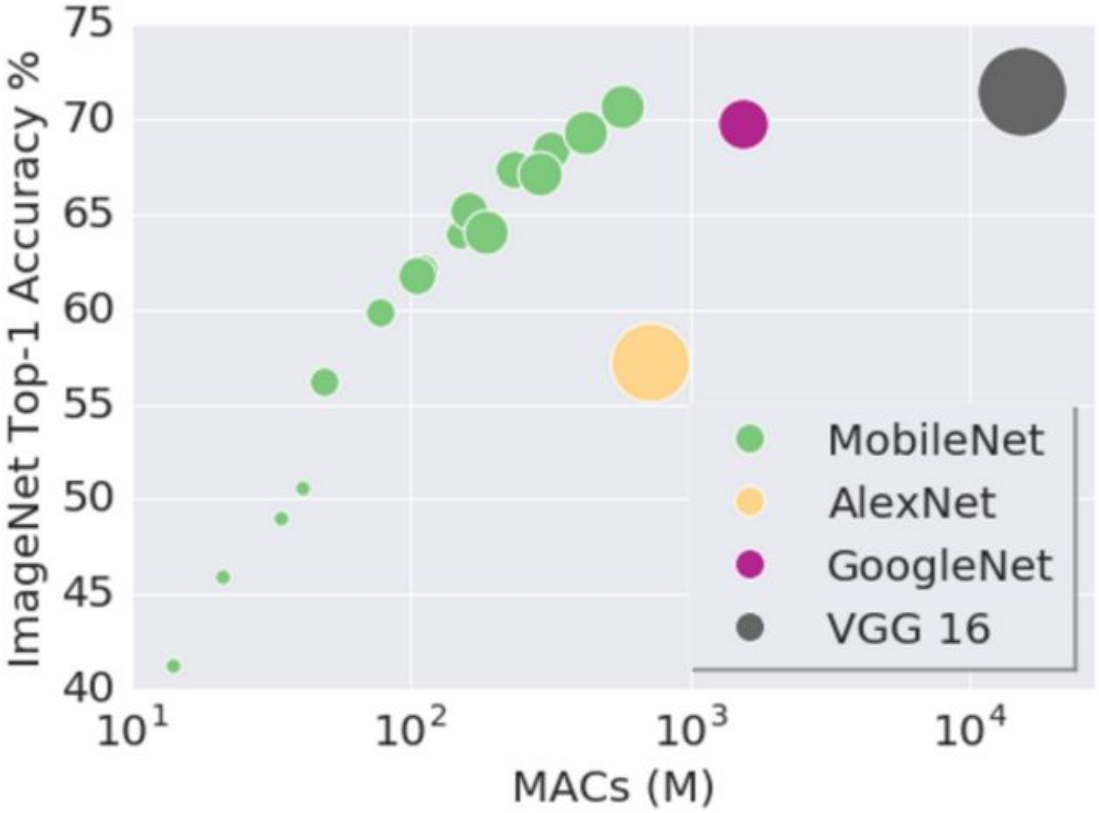
Face Attributes

Google Doodle by Sarah Harrison

Landmark Recognition

Photo by Sharon VanderKaay (CC BY 2.0)

[MobileNets: Open-Source Models for Efficient On-Device Vision]



https://github.com/tensorflow/models/blob/master/slim/nets/mobilenet_v1.md

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APPLIED AI LAB

Image Classification in TensorFlow
https://github.com/AccelAI/Image-Classification-TensorFlow

JS Google Image Scraper

https://github.com/quickresolve/img-scrapers

Lowering the barriers to entry in engineering artificial intelligence...

We focus on integrating AI and Social Impact through training, study sessions, and events with a focus on mindfulness and Applied AI engineering.

Our target audience includes underrepresented groups in tech, social justice advocates, and those experiencing job loss due to automation.

Accel.AI

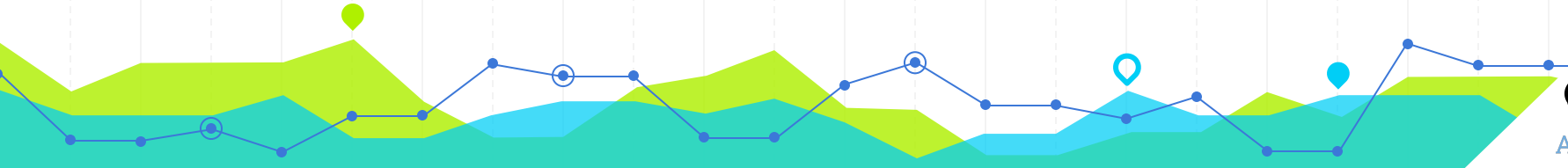
www.accel.ai | info@accel.ai

THANKS!

Any questions?

You can find me at

@quickresolute / info@accel.ai



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REFERENCES

Irene Chen A Beginner's Guide to Deep Learning PyCon 2016

MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications

Stanford CS231n: Computer Vision

http://news.mit.edu/2014/in-the-blink-of-an-eye-0116

How Vision Works

TensorFlow Image Recognition

Deep Learning Book

TensorFlow for Poets

Google Research Blog: Train your own image classifier