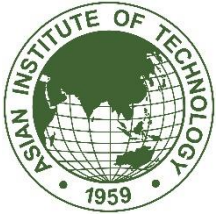


Datasets for Image Classification and Benchmarks

Dr. Mongkol Ekpanyapong

Datasets

- MNIST
- CIFAR-10
- SMILES
- Kaggle:Dogs vs. Cats

Datasets

- Flowers-17
- CALTECH-101
- Adience
- ImageNet
- Kaggle: Facial Expression Recognition Challenge

Datasets

- Indoor CVPR
- Stanford Cars
- LISA Traffic Signs
- Flickr Material Database
- DeepFashion

Challenges

- ImageNet
- Face Recognition Vendor Test (FRVT) by the Intelligence Advanced Research Projects Activity (IARPA) and the US National Institute of Standards and Technology (NIST)

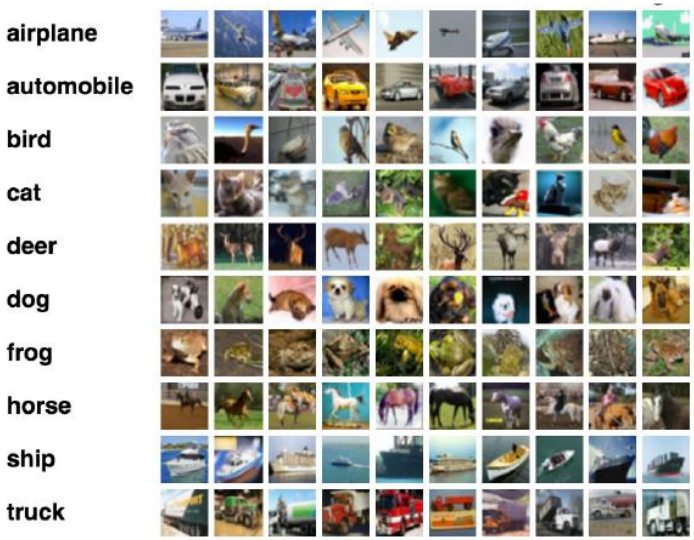
- NVIDIA AI City Challenge

MNIST

- Stands for modified National Institute of Standards and Technology released in 2004
- The goal of this dataset is to correctly classify the handwritten digits 0-9 (28x28 pixels)
- It is like “Hello, World” in machine learning
- It consists of 60,000 training images and 10,000 testing images. Pixel intensities are in the range [0,255]

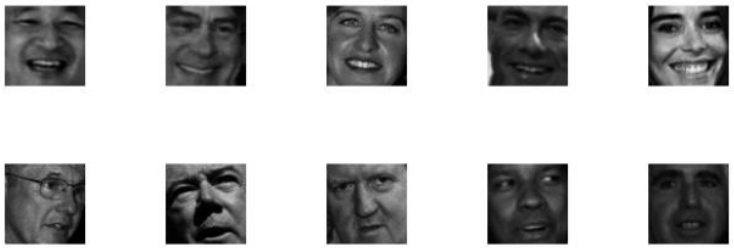
CIFAR-10

- It is considered another standard benchmark data for image classification (released in 2009)
- CIFAR-10 consists of 60,000 of 32x32x3 (RGB) (= 3072 features) images
- CIFAR-10 consists of 10 classes including airplanes, automobiles, birds, cats, deer, dogs, frogs, horses, ships, and trucks



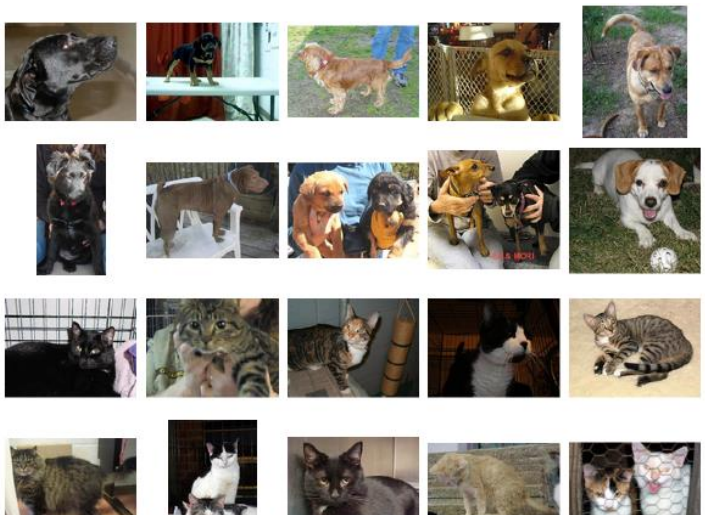
SMILES

- The SMILES dataset (smiling or not smiling) consists of 13,165 grayscale images with the size of 64x64.
- The early days of machine learning is using only cropped data with minimum background



Kaggle: Dogs vs. cats

- Dogs vs. Cats challenge is part of a Kaggle competition for machine learning algorithms
- The dataset is provided in 2013 from Kaggle company
- A total of 25,000 RGB images are provided



Flowers-17

- Flowers-17 dataset is a 17 category dataset with 80 images per class
- It is considered a challenging dataset due to the dramatic changes in scale, view-point angels, background clutter, light condition, and

  intra-class variation
- It also has 80 images per

  class

CALTECH-101

- It is introduced in 2004
- The data is a popular benchmark for object detection
- The dataset of 8,677 images includes 101 categories
- The datasets exhibits heavy class imbalances (more images for some categories than others)







Adience

- It is constructed by Edinger et al. in 2014
- It is used to study age, and gender classification
- A total of 26,580 images are included with ages ranging from 0-60

ImageNet

- ImageNet is a project aimed at labelling and categorizing images into 22,000 categories
- There are more than 14 million images in the project (more than 1,000 images per set)
- ImageNet Large Scale Visual Recognition Challenge (ILSVRC) is the de facto standard for computer vision classification algorithms
- ILSVRC has 1,000 images per class

ImageNet

- ILSVRC has 1.2 million images with 1,000 object classes for training, 50,000 for validation and 100,000 for testing
- In Computer Vision, when you refer to ImageNet, they usually means this ILSVRC
- ImagetNet is put together by Prof.

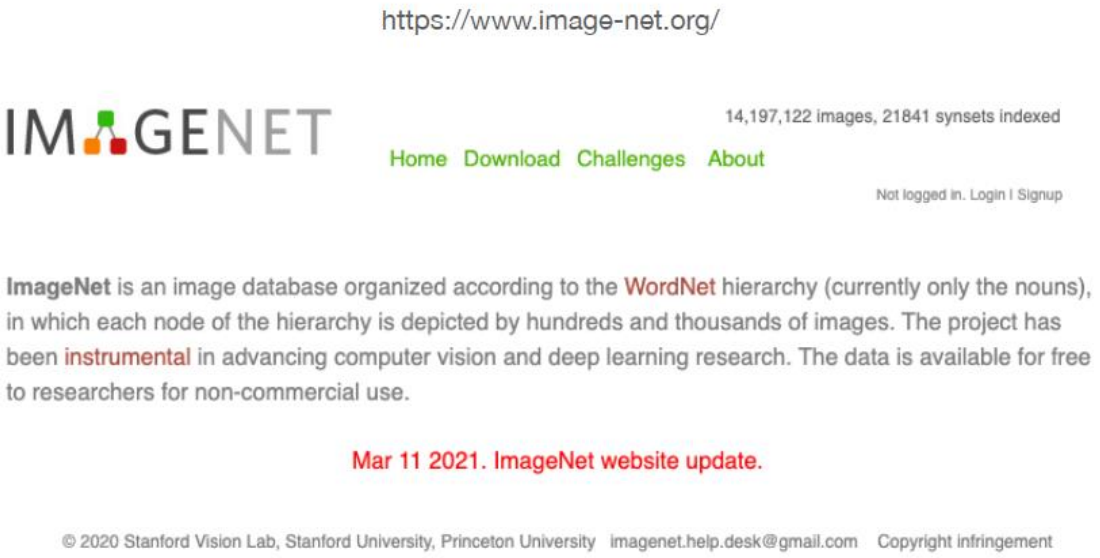
Fei-Fei Li from Stanford University

From 2010-2017

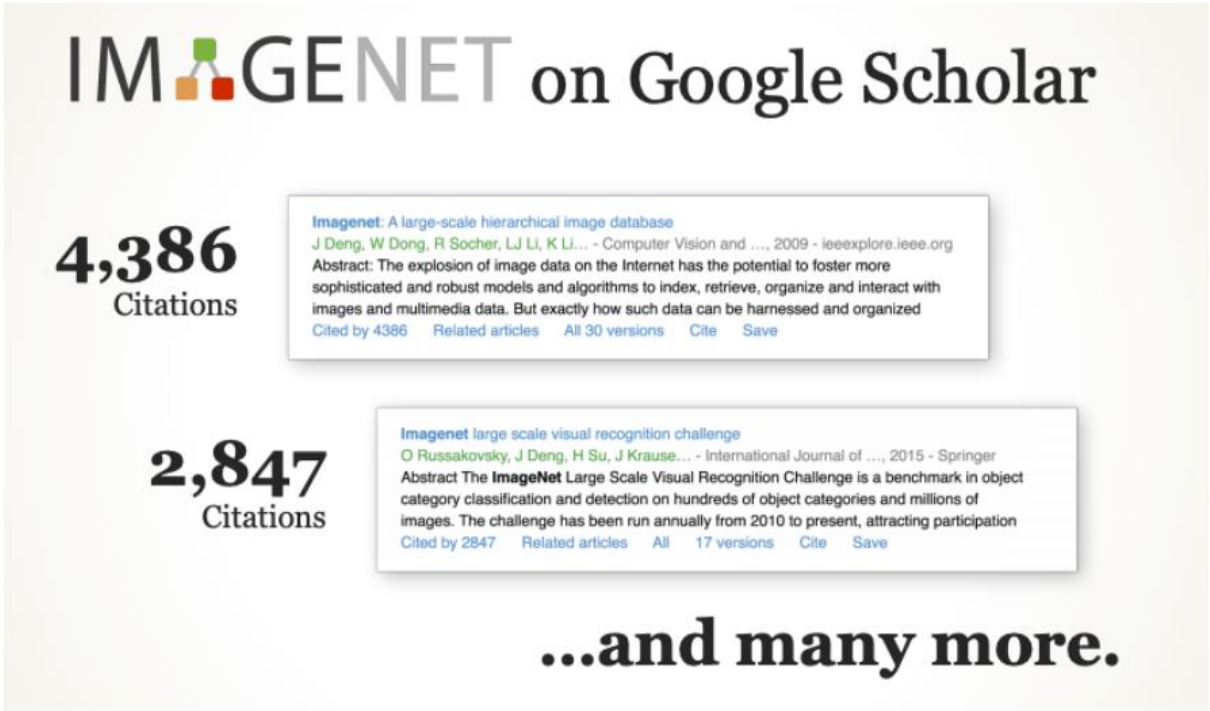
https://en.wikipedia.org/wiki/Fei-Fei_Li

ImageNet

- Currently, the world largest dataset

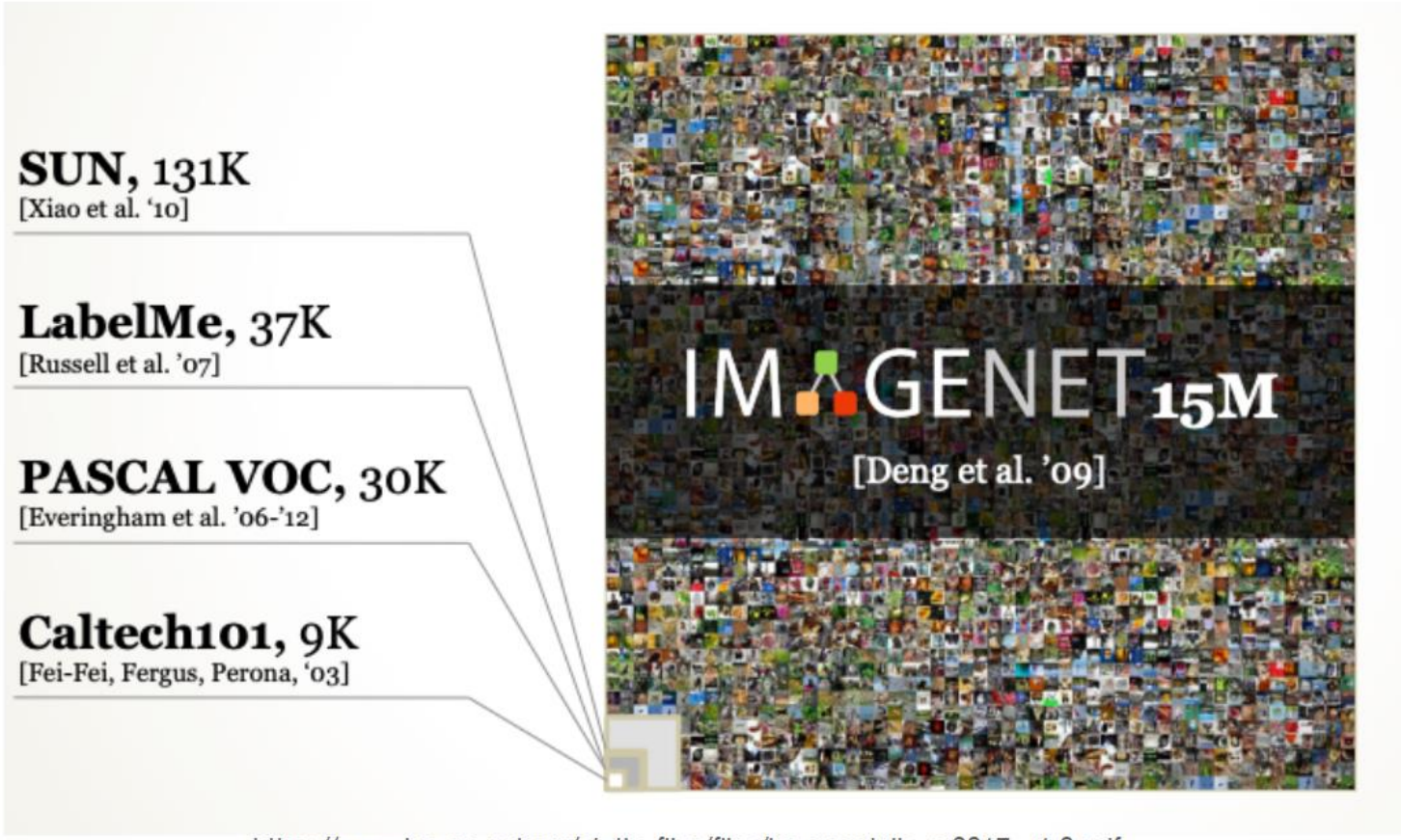


ImageNet in Research



https://www.image-net.org/static_files/files/imagenet_ilsvrc2017_v1.0.pdf

Comparing with other data set

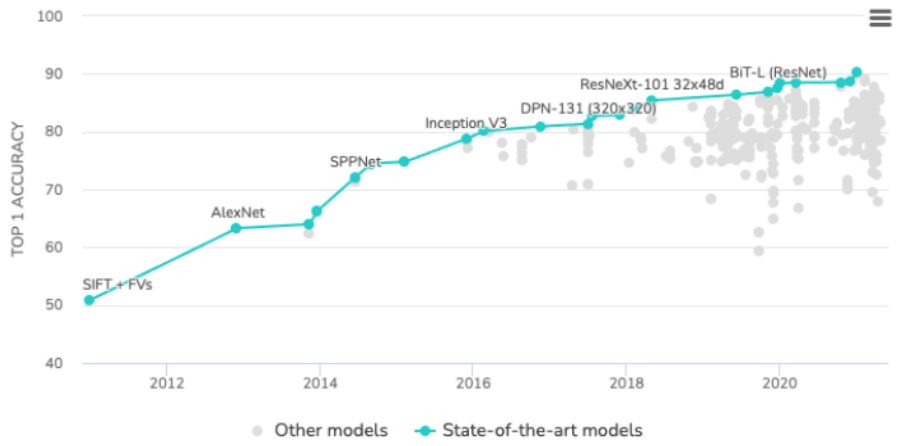


https://www.image-net.org/static_files/files/imagenet_ilsvrc2017_v1.0.pdf

ImageNet – Current State of the Art

Image Classification on ImageNet

Leaderboard | Dataset

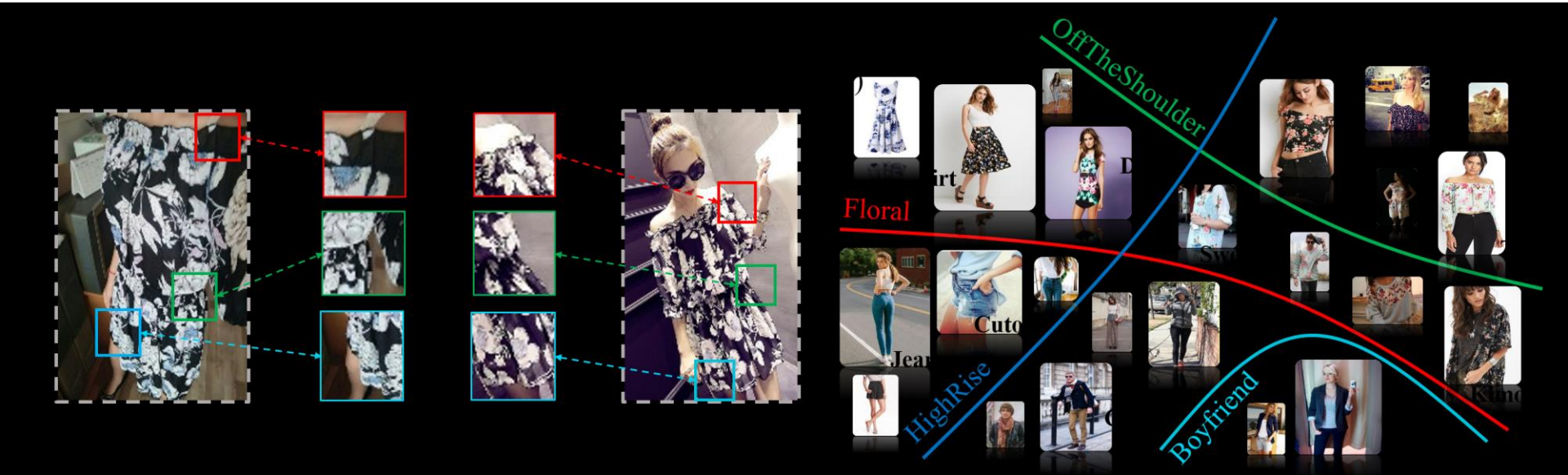


RANK	MODEL	TOP 1 ACCURACY	TOP 5 ACCURACY	NUMBER OF PARAMS	EXTRA TRAINING DATA	PAPER
1	Meta Pseudo Labels (EfficientNet-L2)	90.2%	98.8%	480M	✓	Meta Pseudo Labels
2	Meta Pseudo Labels (EfficientNet-B6-Wide)	90%	98.7%	390M	✓	Meta Pseudo Labels
3	NFNet-F4+	89.2%		527M	✓	High-Performance Large-Scale Image Recognition Without Normalization
4	ALIGN (EfficientNet-L2)	88.64%	98.67%	480M	✓	Scaling Up Visual and Vision-Language Representation Learning With Noisy Text Supervision
5	EfficientNet-L2-475 (SAM)	88.61%		480M	✓	Sharpness-Aware Minimization for Efficiently Improving Generalization

https://paperswithcode.com/sota/image-classification-on-imagenet

DeepFashion

- The dataset is proposed in CVPR 2016
- It consists of 800,000 fashion images
- The dataset is labelled with 50 categories



Kaggle: Facial Expression Recognition Challenge

- Kaggle FER challenge is to identify emotion
- It has a total of 35,888 images with these categories:
  - Angry
  - Disgust
  - Fear
  - Happy
  - Sad
  - Surprise
  - Neutral

Indoor CVPR

- It consists of number of indoor scenes including stores, houses, leisure spaces, working areas, and public spaces
- It is made available in 2009

Stanford Cars

- This is Cars Dataset put together by Stanford in 2013
- It consists of 16,185 images of 196 classes of cars
- The information includes vehicle make, model, or manufacturer year

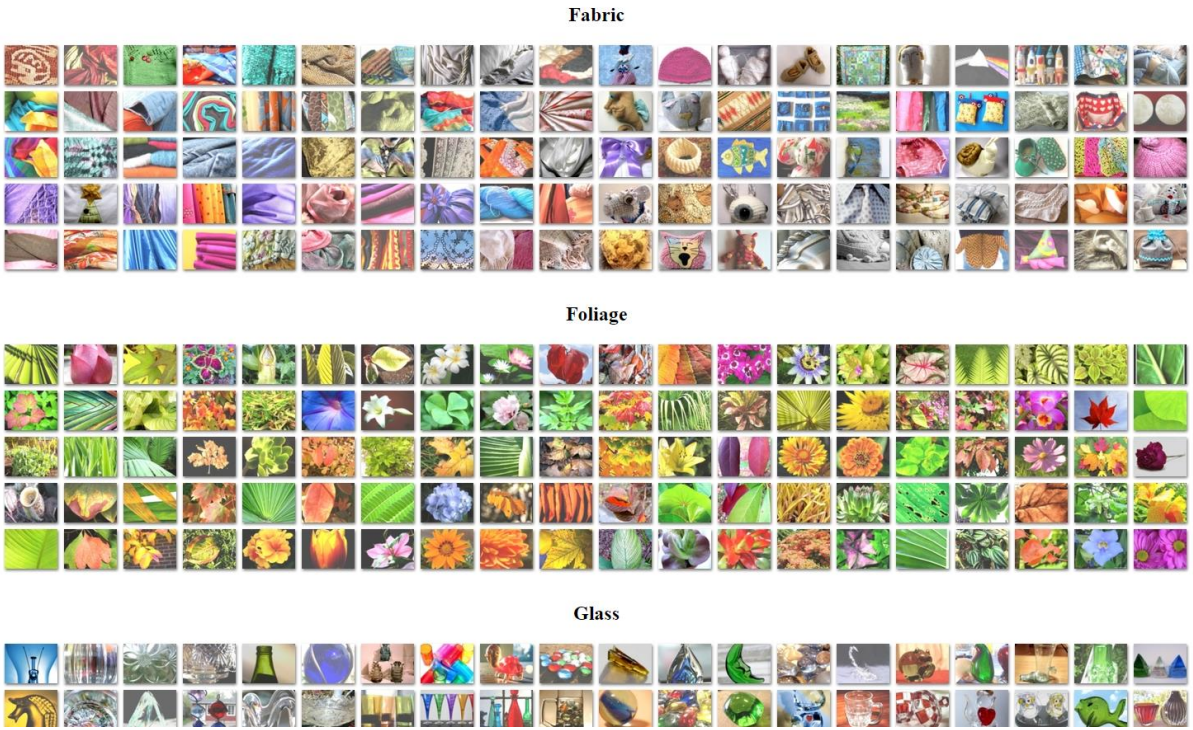
LISA Traffic Sign

- It was put by Mogelmose et al. in 2012
- The dataset consists of 47 different United States traffic sign types including stop signs, pedestrian crossing sign.

Flickr Material Database

- It is available in 2014
- It consists of 100 images per category and 10 categories
- It consists of:

fabric,foliage,
glass,lather,
metal,paper,
plastic,stone,
water, wood



FRVT Challenge

- FRVT challenge is the event once 3-4 years
- In 2014, NEC won the first prize
- In 2018, Yitu technology ranked first place with 95.5 % accuracy subjected to false match rate of 10 million (based on 10 billion samples)
- In 2021, IDEMIA from France ranked first place with

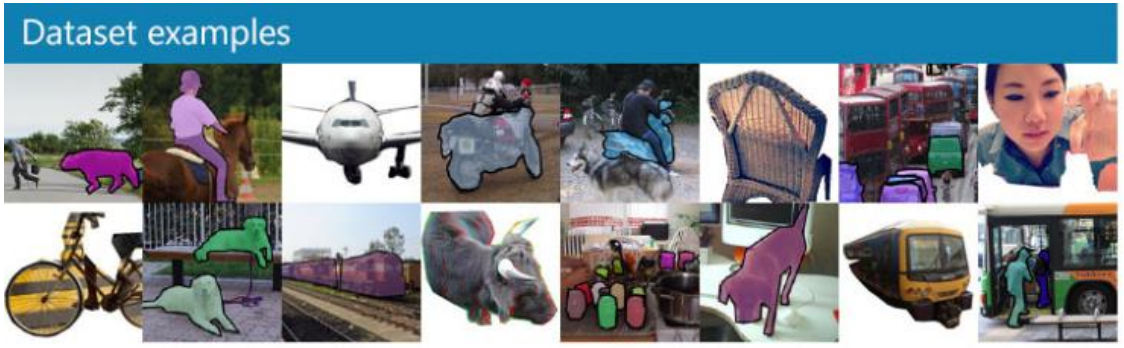
NVIDIA AI City challenge

- First time in 2017
- Estimating vehicle speed
- Detect anomalies caused by crashes
- Multi-sensor tracking

COCO Dataset

COCO is a large-scale object detection segmentation and captioning dataset:

- Object Segmentation
- Recognition in context
- 330k images
- 1.5 Million objects
- 80 object categories
- 5 captions per image

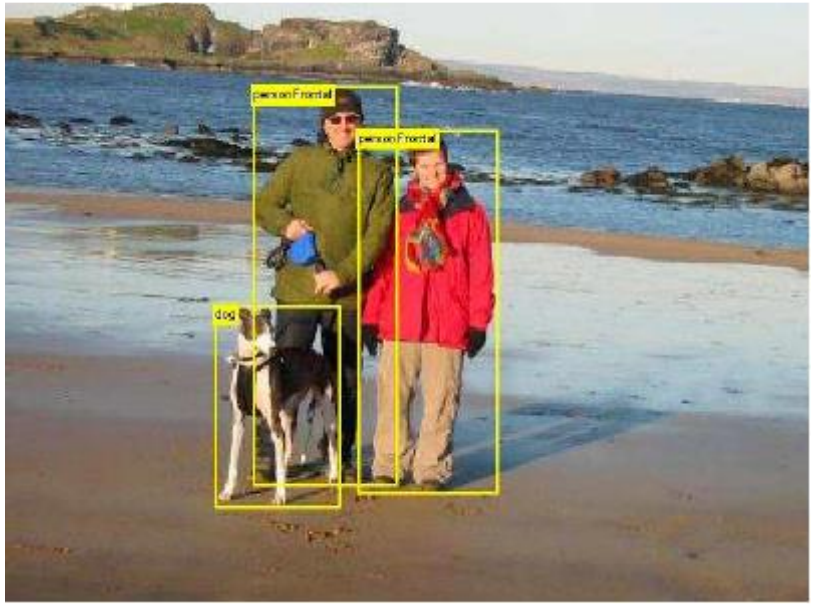


Pascal VOC

The PASCAL Visual Object Classes Challenge

2012 challenges:

- 20 classes, 11,530 images containing 27,450 objects



Kaggle

- Website that post many challenge regulary including sample data

Questions?