Making Mobile Apps Smarter With Machine Learning

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About Me

Namrata Bandekar

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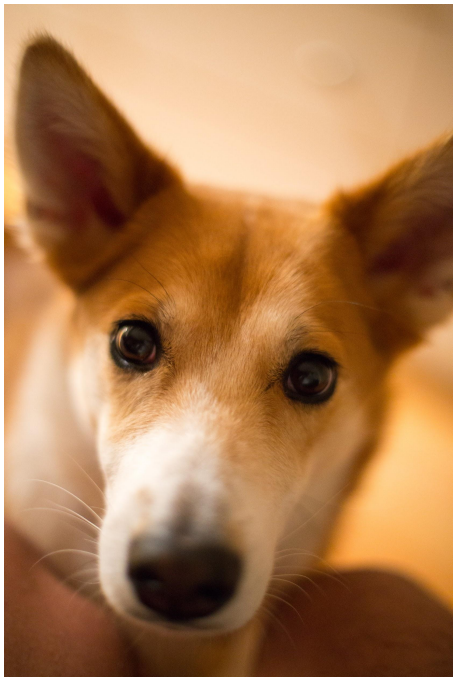


Agenda

- What is Machine Learning?
- Brief History
- ML Applications
- Getting started with ML in mobile apps

What is Machine Learning?

- Subfield of Artificial Intelligence
- Study of algorithms
- Learn from examples and experience
- No hardcoded rules

Source: https://www.youtube.com/watch?v=cKxRvEZd3Mw

Supervised Learning

Source: Machine Learning Recipes https://www.youtube.com/watch?v=cKxRvEZd3Mw

(Very) Brief History

- **1952** : First game-playing program for checkers
- **1957** : Perceptron, the first Neural Network
- **1964** : ELIZA, an NLP program simulated a psychotherapist
- **1990s** : Data-driven approaches

Source: http://www.mlplatform.nl/what-is-machine-learning/

Machine Learning in Today's World

Amazon Echo

Google Home

Self-Driving Cars

Machine Learning in Mobile Apps

Snapchat Lenses

Source: https://support.snapchat.com/en-US/a/lenses1

Google Translate

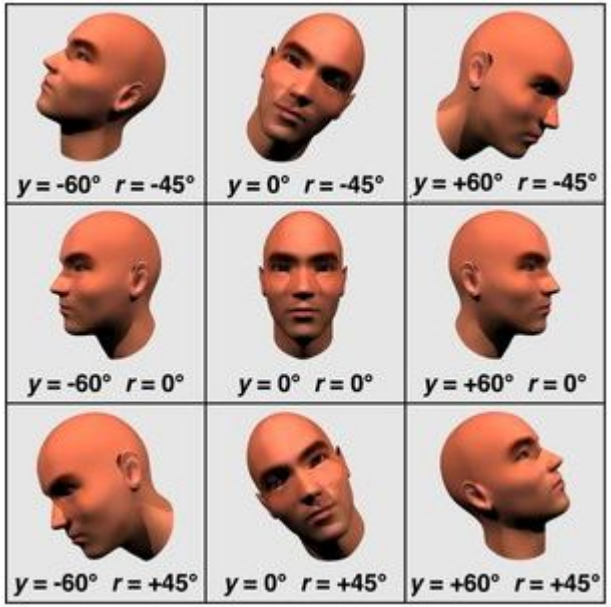
Getting Started
for mobile development

Google Mobile Vision

- Detect Faces
- Scan Barcodes
- Text Recognition (Android only)
- On-device processing

Face Detection

- Face Detection not recognition
- Detects multiple faces
- Detects faces with different orientations



Source: https://developers.google.com/vision/face-detection-concepts

Face Detection

- Detects landmarks like position of eyes, nose base, mouth, cheeks and ears
- Detects eyes open, closed, smiling
- Face tracking in live video

iOS Example

Import the framework

```
@import GoogleMobileVision;
```

Create a face detector

```
NSDictionary *options = @{
    GMVDetectorFaceLandmarkType : @(GMVDetectorFaceLandmarkAll),
    GMVDetectorFaceClassificationType : @(GMVDetectorFaceClassificationAll),
    GMVDetectorFaceTrackingEnabled : @(NO),
    GMVDetectorFaceMinSize: @(0.3),
    GMVDetectorFaceMode : @(GMVDetectorFaceFastMode)
};
self.faceDetector = [GMVDetector detectorOfType:GMVDetectorTypeFace options:options];
```

Find faces

```
NSArray<GMVFaceFeature *> *faces = [self.faceDetector featuresInImage:self.faceImageView.image
                                                               options:nil];
```

smiling 1.00
smiling 0.99
smiling 0.99
smiling 0.99
smiling 0.99
smiling 0.99

GMVDetectorFaceFastMode

GMVDetectorFaceAccurateMode

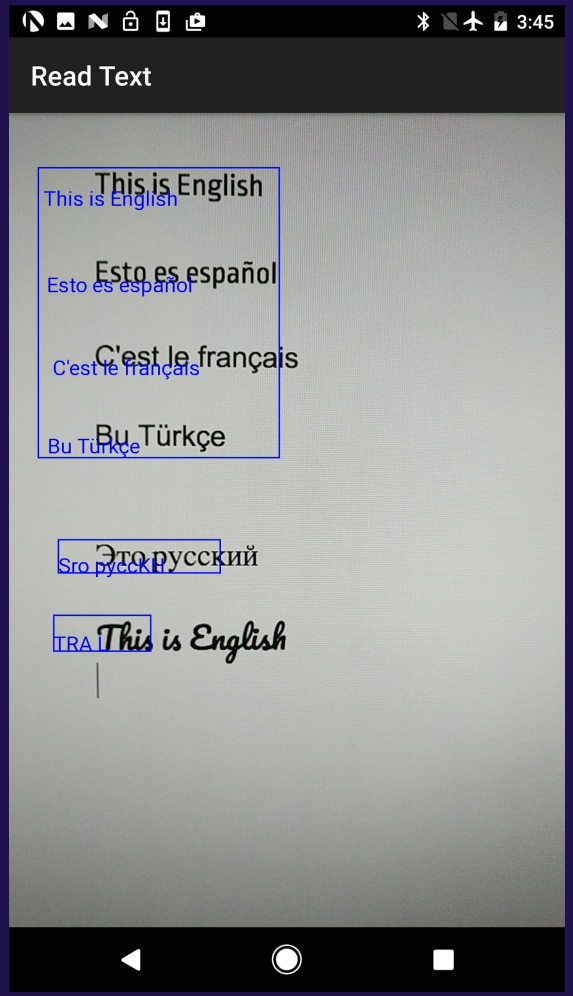
Face Tracking Demo

Limitations

- Face tracking not recognition
- Face is obstructed or disappears
- Face is too small or close to edge

Text Recognition API

- Latin based languages
- Recognizes text in images and live videos
- Text to speech
- Android only


3:45
Read Text
This is English
This is English
Esto es español
Esto es español
C'est le français
C'est le français
Bu Türkçe
Bu Türkçe
Это русский
Это русский
This is English

Where To Go From Here?

TensorFlow

- Open Source
- Needs knowledge of machine learning
- Build and train your own models
- Build static libraries for on-device use

TensorFlow Demo

Thank You!

Questions?

https://github.com/namrata-b/ios-vision

https://github.com/namrata-b/talks

Face Detector Performance

- Speed vs. accuracy
- Use lower resolution images
- Configure min face size
- Fast vs. accurate mode

Text Recognizer Performance

- Higher accuracy than Tesseract
- *Cursive* vs. sans fonts
- Hard to recognize handwriting
- Special characters
- Limited languages - Google Cloud Vision API
- Text has to be vertical