

Machine Learning in iOS apps

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What we'll learn

- What is Machine Learning
- Machine Learning Models
- Core ML
- Natural Language Processing
- Vision

Examples of using machine learning

- Predictive keyboard
- Face detection in Camera Roll
- Apple Watch gesture detection

What is machine learning?

Machine learning is a field of computer science that gives computer systems the ability to "learn" (i.e. progressively improve performance on a specific task) with data, without being explicitly programmed

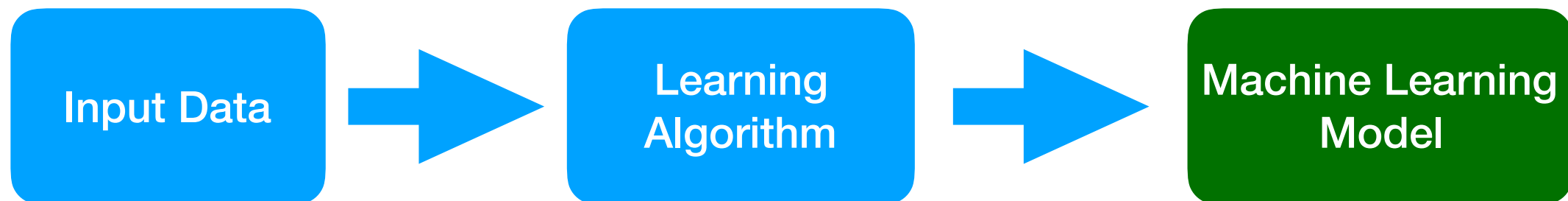
Wikipedia

The science of getting computers to act without being explicitly programmed.

Andrew Ng (Stanford/Coursera)

How it works

Train a model



Use model to make predictions (Inference)



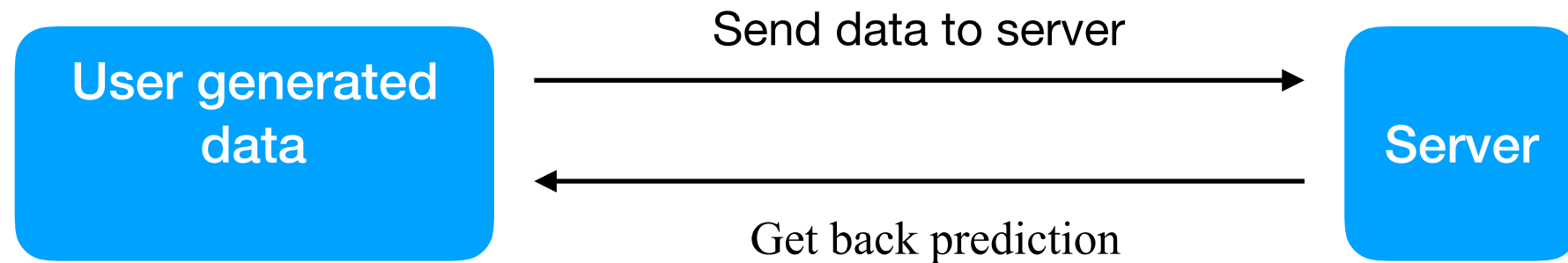
Animal: cat
Confidence: 80%

Want to learn more about training a model?

- [Google Deep Learning course on Udacity](#)
- [Stanford Machine Learning course on Coursera](#)
- [Deep Learning specialisation on Coursera](#)

What happens in an iOS app

Before



Disadvantages

- Latency
- User privacy
- Not available offline

What happens in an iOS app

- We integrate the machine learning model in our app
- Prediction happens on device, no need to make server requests
- Take advantage of device capabilities
- Enables real-time image recognition

Important!

Training a model does not happen on the device!

Machine Learning frameworks

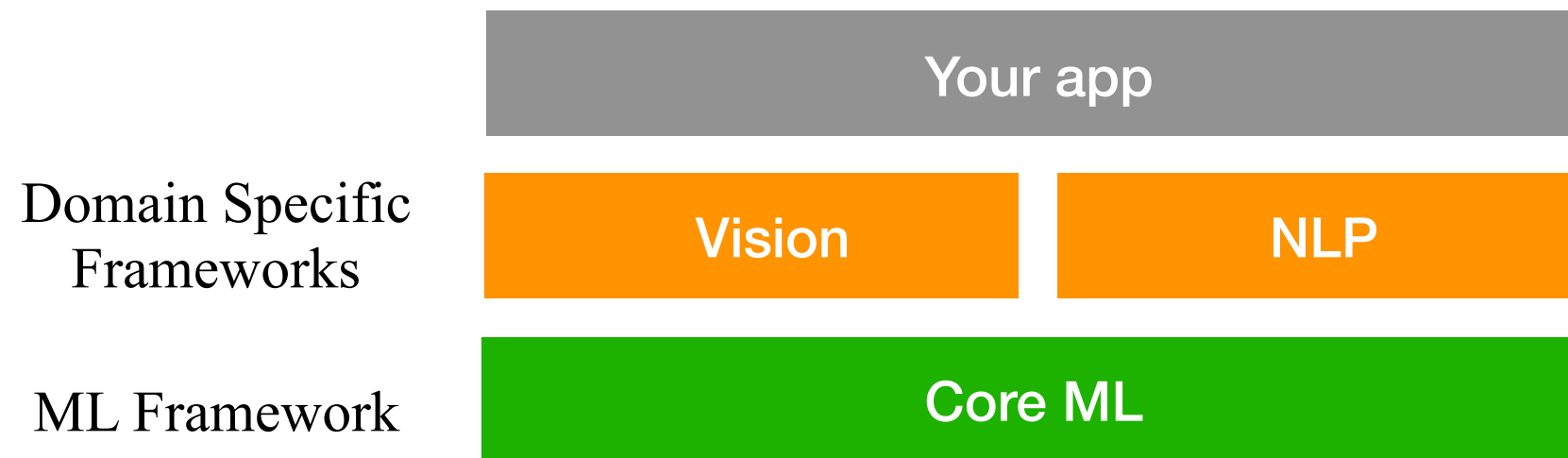


Your app

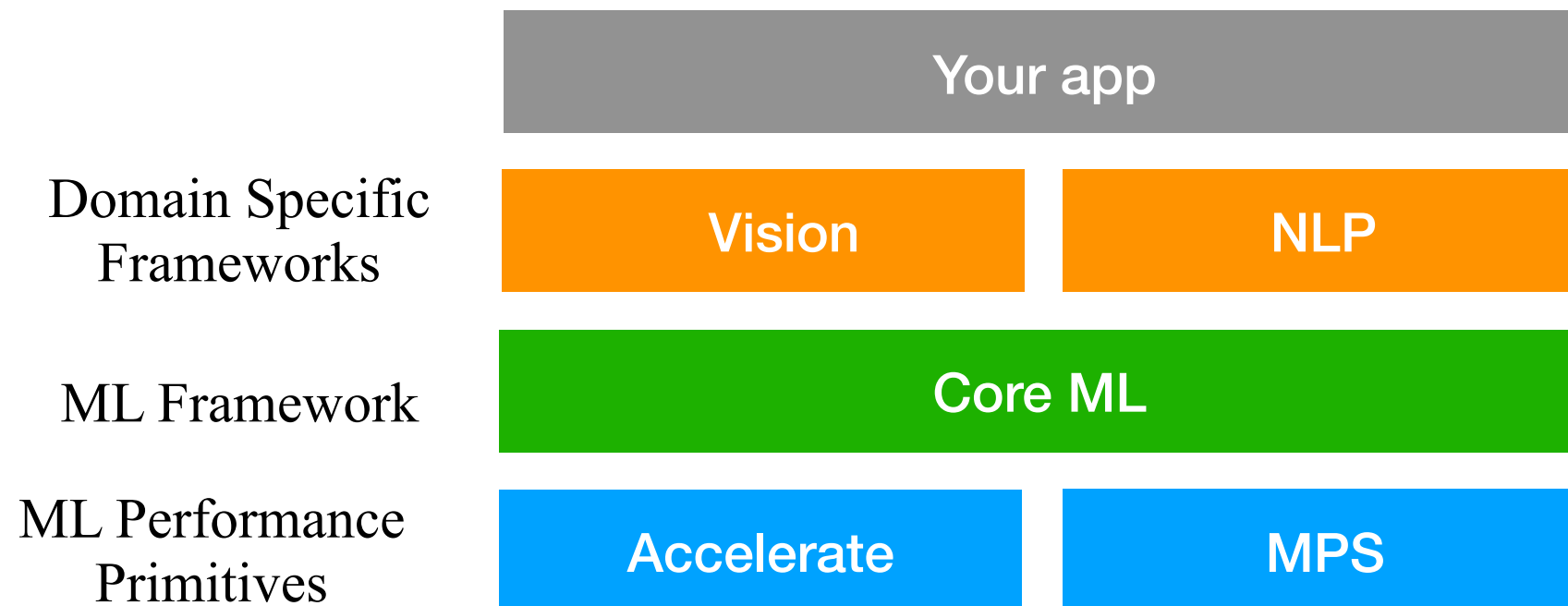
Machine Learning frameworks



Machine Learning frameworks



Machine Learning frameworks



Vision

- Face detection
- Face landmark
- Barcode detection
- Text detection
- Object tracking

Natural Language Processing

- Language identification
- Tokenize text (by word, sentence or paragraph)
- Part of speech identification
- Lemmatization

Core ML

- Music tagging
- Image captioning
- Text prediction
- Sentiment analysis

Accelerate and MPS

- High performance math
- Inference for custom ML models

How to use Core ML

- You need a model
- Add the model to the Xcode project
- Xcode generates a Swift class
- Use the Swift class to get prediction

Core ML models

- It's a file of type .mlmodel
- It's the result of a learning algorithm
- It takes a set of inputs and produces a set of outputs
- It also contains all the low level information that Core ML needs to be able to use it

Where to find Core ML models

- Apple machine learning website
- Github
- Model Zoo

Convert any model from popular formats to a Core ML format
using CoreML Tools

[https://github.com/costescv/
MachineLearning](https://github.com/costescv/MachineLearning)

[https://github.com/likedan/Awesome-
CoreML-Models](https://github.com/likedan/Awesome-CoreML-Models)

Demo

Challenge

- Download CNNEmotions model from <https://coreml.store/cnnemotions>
- Use it in the app to detect the emotion on the face
- Show an alert to say if the emotion and the text sentiment match

Additional resources

- WWDC17 videos about Core ML, Vision and NLP
- Core ML documentation
- Apple machine learning website

iOS Step by Step

Join me and Ana in our Meetup.

Follow us on Twitter:

@iOSStepByStep

@vasy_1st

@anainogal

Thank you!