Intro to Embedded Machine Learning

Overview | Challenges | Applications

Overview

Machine Learning

Data + Labels

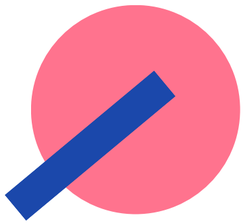
=> Rules

Made Possible By ...

- massive amounts of data
- advances in compute
- cheap storage

Training Phase

- Requires large compute
- Requires labeled data
- Model as outcome
- Model is a numerical tensor



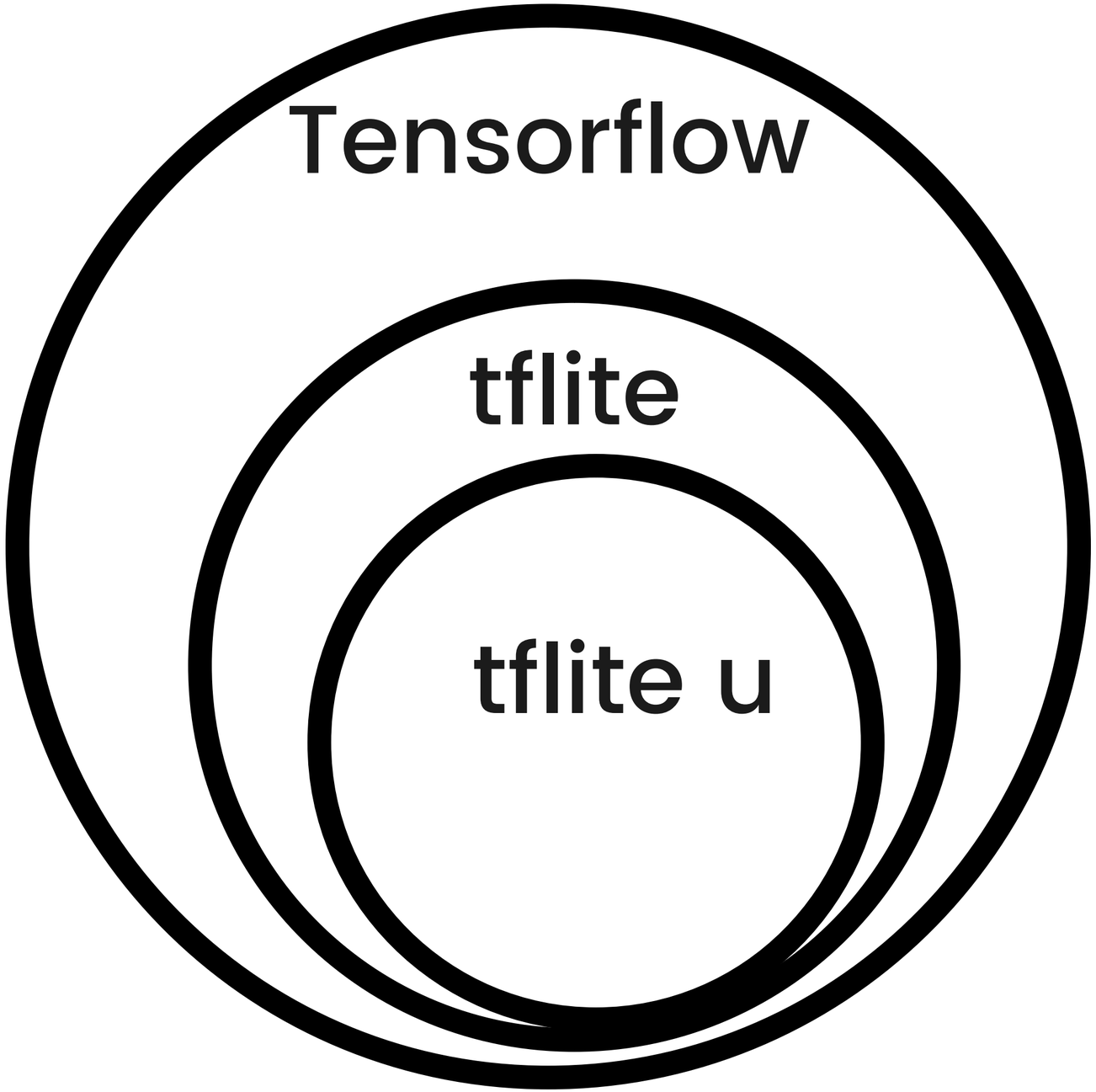
Inference Phase

- Requires unlabeled data
- Matrix multiplication of data and model
- Output is a numerical variable

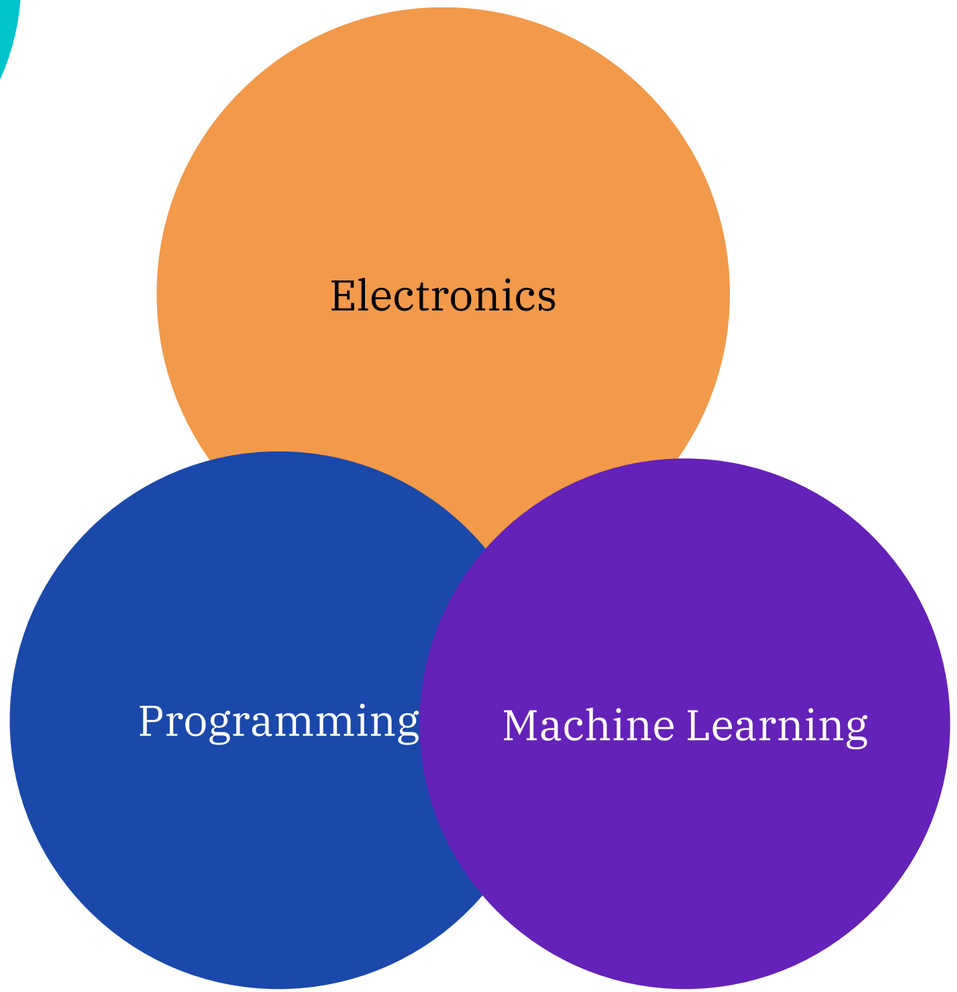
Arduino Portenta

Embedded Machine Learning

- Targeted at microcontrollers, etc.
- Strictly inference
- Normally offline
- Low power consumption
- Computational constraints


Tensorflow
tflite
tflite u

Challenges


Electronics
Programming
Machine Learning

ML Training

- Data Collection
- Data Annotation
- Model Selection
- Training
- Evaluation
- Conversion

Arduino Portenta

Microcontrollers are Constrained

- Usually no OS
- Limited space for firmware
- Limited energy
- Models must be tiny
- Math operations mostly limited
- Not all mcu support TinyML
- Mostly offline

Applications

Smart Speakers

- Dedicated MCU listens for wakeword

Fall Detection

- Reading accelerometer and gyroscope data

Illegal Logging

- Dedicated MCU listens for chainsaw sounds

Poaching

- ElephantEdge Collar
- Using IMUs to determine the state of activity of animals
- Using microphones to determine trumpeting

Questions

Thank you for attending

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