Room Classification

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Motivation

Adding vision to tiny devices by recognizing Rooms

Problem Statement

Capture image and classify image into Classroom, lift, Bedroom

Run CNN model on Arduino

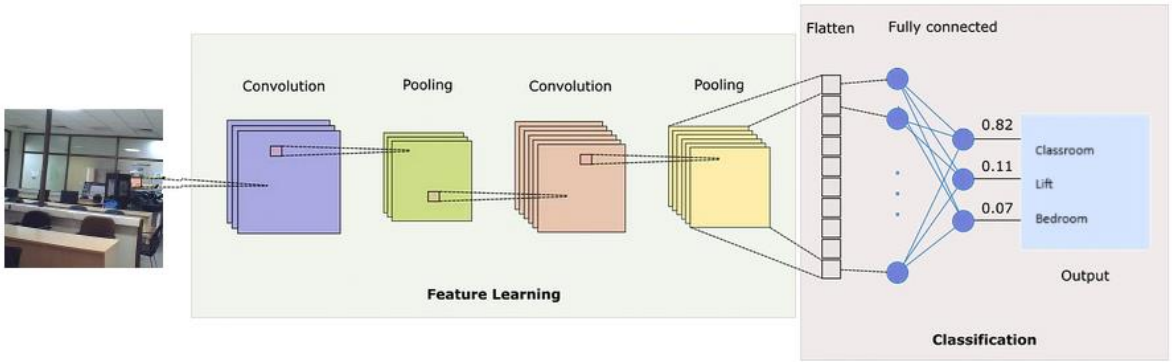
Output Label & Confidence scores

Applications

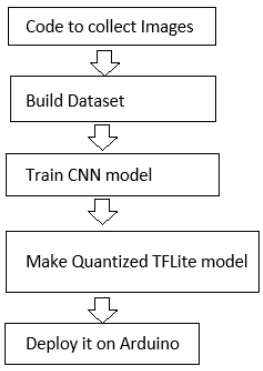
1. Assistive technology
2. Smart home devices

Architecture

```
model = tf.keras.models.Sequential([
    tf.keras.layers.Conv2D(32, (3, 3), activation='relu', input_shape=(MODEL_INPUT_WIDTH, MODEL_INPUT_HEIGHT, 3)),
    tf.keras.layers.MaxPooling2D((2, 2)),
    tf.keras.layers.Conv2D(64, (3, 3), activation='relu'),
    tf.keras.layers.MaxPooling2D((2, 2)),
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(num_classes, activation='softmax')
])
```



Workflow



Layer (type)	Output Shape	Param #
conv2d_4 (Conv2D)	(None, 46, 46, 32)	896
max_pooling2d_4 (MaxPooling 2D)	(None, 23, 23, 32)	0
conv2d_5 (Conv2D)	(None, 21, 21, 64)	18496
max_pooling2d_5 (MaxPooling 2D)	(None, 10, 10, 64)	0
flatten_2 (Flatten)	(None, 6400)	0
dense_2 (Dense)	(None, 3)	19203

Total params: 38,595

Dataset / Data collection

3 classes 101+59+45 images

Classroom 100, Lift 59, Bedroom 45

Images captured using TinyML kit

Sent to laptop through serial port

Python script to get image from serial data

Image resolution 120x120

Compressed to 48x48

Model and Results

Convolution Neural Network

int8 Post Training Quantization

Size **45KB** after compression.

154KB before compression.

38,595 parameters

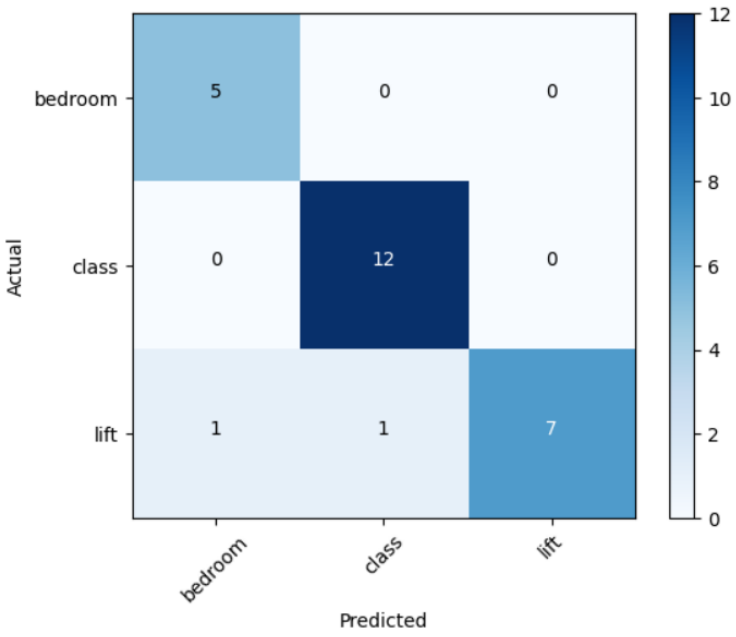
Accuracy **92%**

Inference time: **800ms**

Image capture time: 500ms

Image compression time: 35ms

Total time: 1350ms



https://github.com/saikiranbojja/RoomClassificationEdgeAI

RoomClassificationDemoVideo

Contributions

Code for Data collection	Sai & Sudhanshu
Data collection	Sai & Sudhanshu
Training	Sai & Sudhanshu
Model code and Debugging	Sai & Sudhanshu
Demonstration code	Sai & Sudhanshu
Experiments to find Inference time etc.	Sai & Sudhanshu
Purchasing and Assembling Hardware.	Sai
Github, Poster, Report	Sai & Sudhanshu
Exploring other tools like Edge Impulse	Sudhanshu