



Tinyvision

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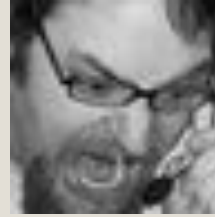
Facial Expression Recognition with CNNs



Datasets

- FER 2013
 - Large but has labelling issues
- CK Extended
 - Cleaned, standard cropping
 - Too small for our purposes

Angry



Angry

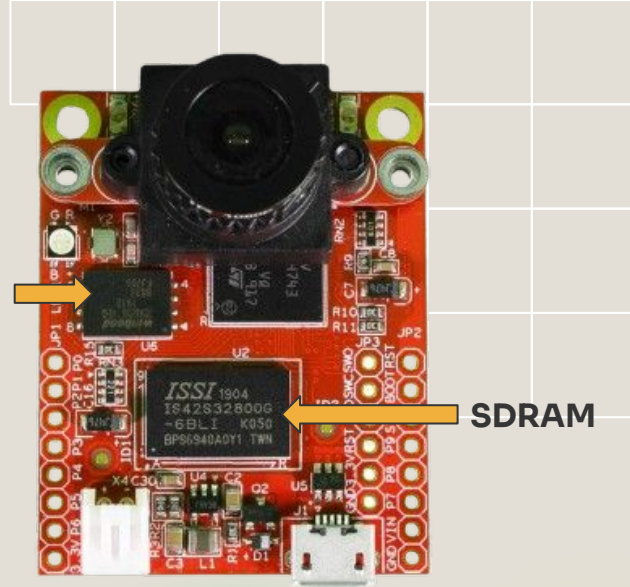


Constraints

- Image size
 - 48 x 48 or 96 x 96
 - Tradeoff acceptable for emotion detection task
- Grayscale
- Minimizing tflite arena
 - Shallower network layers
- 32 MB extern. flash
- <16 MB from 32 MB peak RAM use available; why?
 - Frame buffers
 - TensorArena → params, ops
 - Overhead

80%+ acc
>20 fps

FLASH



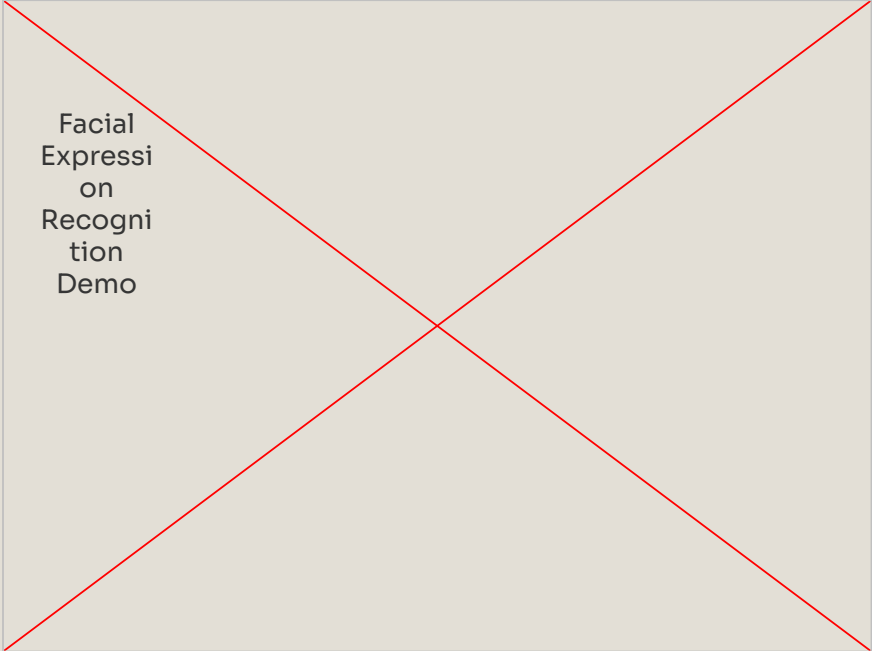
SDRAM



Model Training

- Custom CNN
 - 4x layers Conv2D; regularization & dropout to reduce overfitting
 - 50% train, 22% test, 47k RAM, 92k ROM
 - 75ms inference ... too slow!
- MobileNetV2
 - Transfer learning
 - Around 60% accuracy for 4 emotion classes, 70% for 3
 - Generalizes better than CNN to real world testing
 - Real world testing extremely sensitive to lighting conditions
 - Attempting data augmentation with varying lighting

Facial Expression Recognition Demo



Facial
Expressi
on
Recogni
tion
Demo

Next steps:

- Improve **accuracy** of detection in real-world testing under **varying lighting conditions**
 - Train with modified images to simulate lighting variation, or preprocess images before passing to training prediction
- Integrate more emotion classes and **push limits** of MobileNetV2 size on the H7 plus