Sophisticated Image Recognition in Hardware
Curse you Juan Leaver of Dishes!!!
Motivation- Look ma, no processor

Sophisticated image recognition at low power consumption

Real time detection

Reusable hardware for recognition of new objects

Hardware implementation of ML algos/Feature extraction typically done in SW
Machine Learning Approach

How can a computer recognize a face?

Texture $\rightarrow$ LBP

How do we get a better classification

Features, histograms, classification

Tallying the votes (AdaBoost) $\rightarrow$ Activation function

How does AdaBoost decide?
Algorithm Selection

Divides are expensive

Compares are cheap

Feature Rep - 8 comparisons per pixel (LBP)

Feature Extraction- 80 adds per feature (LBP Histograms)

Classification- 256 divides, 255 adds per Feature Vector,(dot product with weight vector)

Refinement- 240 divides, 239 adds per Classification Vector,(dot product with weight vector)
Overview
Preprocessing Block: Juan

8 bit LBP value

Crop to 150x128 px to limit data processed
LBP- Local Binary Patterns (texture)
Stretch Goal: Sliding Window
Feature Extraction and Classification
Feature Extraction: Juan

Sparse feature space rep

256 distinct LBP values

80 values per histogram

output is distribution of LBP/area
LBP- Local Binary Patterns (texture)
Background vs Face
LBP Histograms
Classification: Andres
Decision Refinement: Andres + Juan

Adaboost

240 Subproblems

Weighted ‘votes’

Boosts accuracy
The kitchen once our project is completed
Questions?