Image Classification Using Rubik's Cubes

Using SAS Deep Learning with ESP for Image Analysis.

Tom Tuning

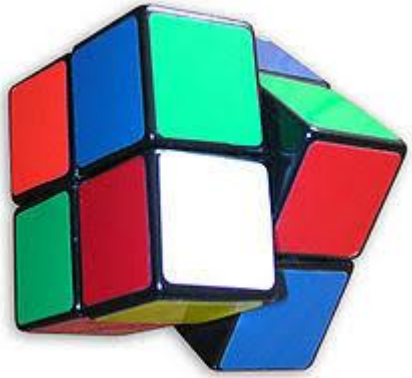
Overview

Guaranteed Quality

- Using image classification to understand quality
  - Product Control
  - Quality Management
  - Defect Prevention

- Model Training
- Computer Vision
- Streaming Analytics

Goal



Good or Bad?

Image you are responsible for cube quality

How might you determine your plants quality metrics

Determine preventive actions

Automate quality

Model Creation

Training vs Production

- Training
  - Acquire and organize images
  - Model training environment based on VDMML
  - DLPy: Python interface to Viya
  - Jupyter notebook server, used for interactive testing

- Production
  - Event Stream Processing
  - Pre-trained model
  - Score streaming images
  - ESPPy: Python interface to ESP

Computer Vision

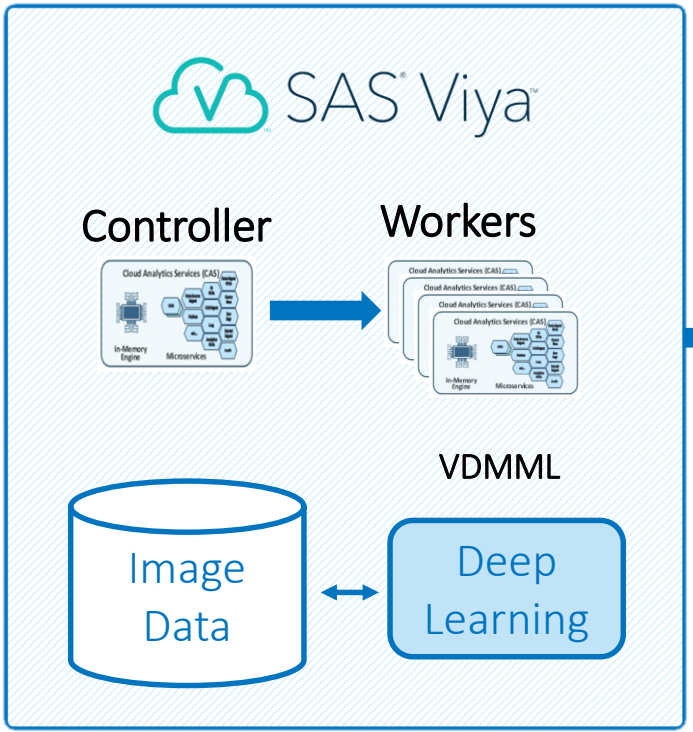
Training

Control

Images

training/
test

DLPy / SWAT

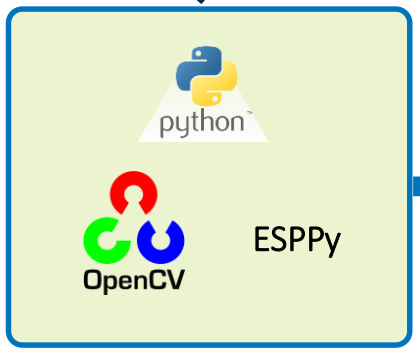


ASTORE

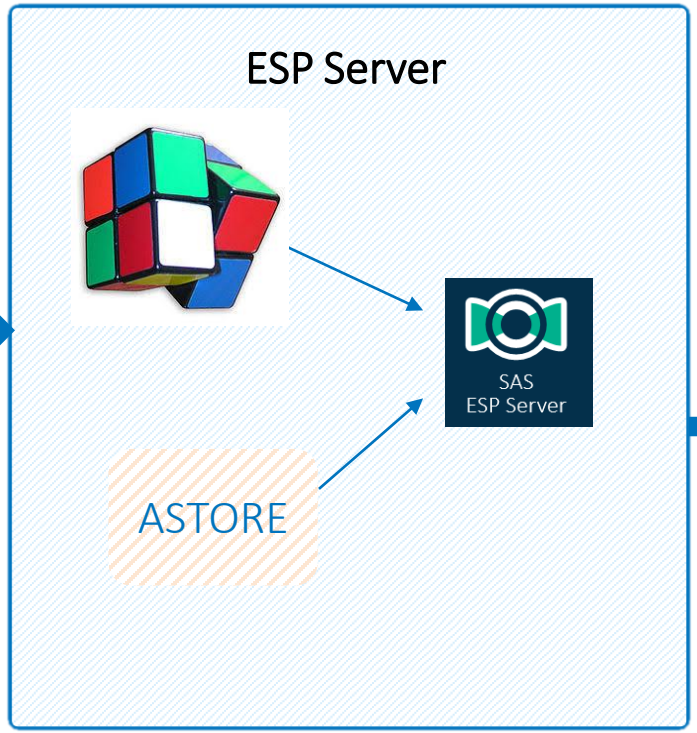
- SAS Viya
  - Viya multi node environment
  - Python interface to SAS, DLPy
  - Jupyter Notebook server, used for interactive testing

Streaming Analytics

Production



Image



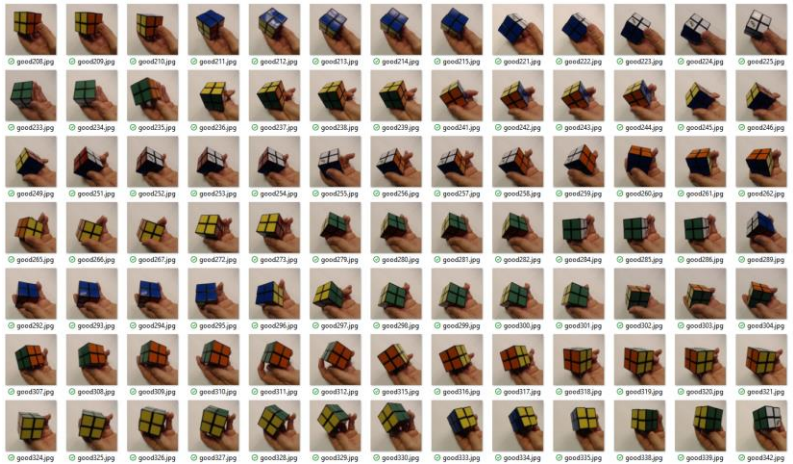
- Collect webcam image
- Python interface to ESP, ESPPy
- OpenCV

ESPPy

OR

Images

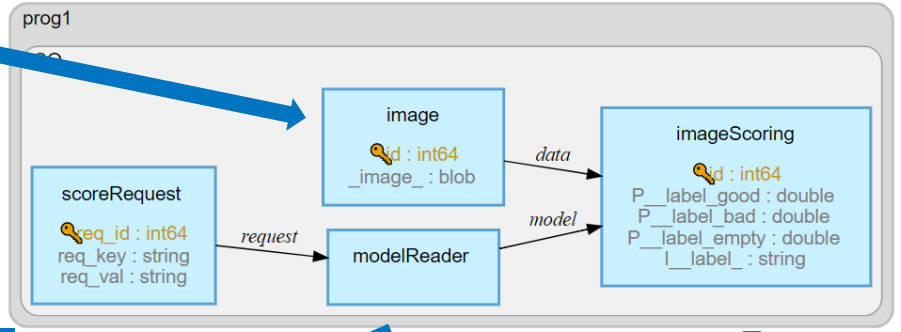
- How many
  - 1000 per class
- What size
  - Ideally 224 by 224 pixels
- Split into 2 sets, train and test
- Categorized by class
  - Good, Bad and Empty
  - More classes may be added



ESP and Computer Vision

ESP Details

- ESP Server needs the following:
  - XML file which represents the streaming model to be run
  - Access to the ASTORE file generated by the DL process
  - CSV file which is used to load the ASTORE file on startup.



ASTORE

	A	B	C	D	E	F	G	H	I
1	i	n	1	action	load				
2	i	n	2	type	astore				
3	i	n	3	reference	/home/sas/rubix/rubix_resnet50_caffe.astore				
4	i	n	4						

Building the Total Solution

Summary

- Using DLPy and SWAT you can use Python APIs and run SAS's Deep Learning modules.
  - Take advantage of existing best of class CNN models
- SAS Viya provides a fast cloud ready environment
  - Faster run times
  - Multi server throughput
- ESP enables streaming analytics
- ESPPy, python interface to ESP
  - Build and control streaming models
  - Inject and Visualize data
  - Runs on Small edge devices