

Gauge Watcher

CNN distributed monitoring and alerting

John Blakkan, Cheng Cheng, Andrew Mamroth, John Tabbone

Issue: Monitoring Legacy Systems

- We have many legacy systems built in an era of manual monitoring and control.
- Some of these are not practical to fully rebuild or refit with modern remote monitoring systems
- But no longer cost-effective to have a human simply watch them

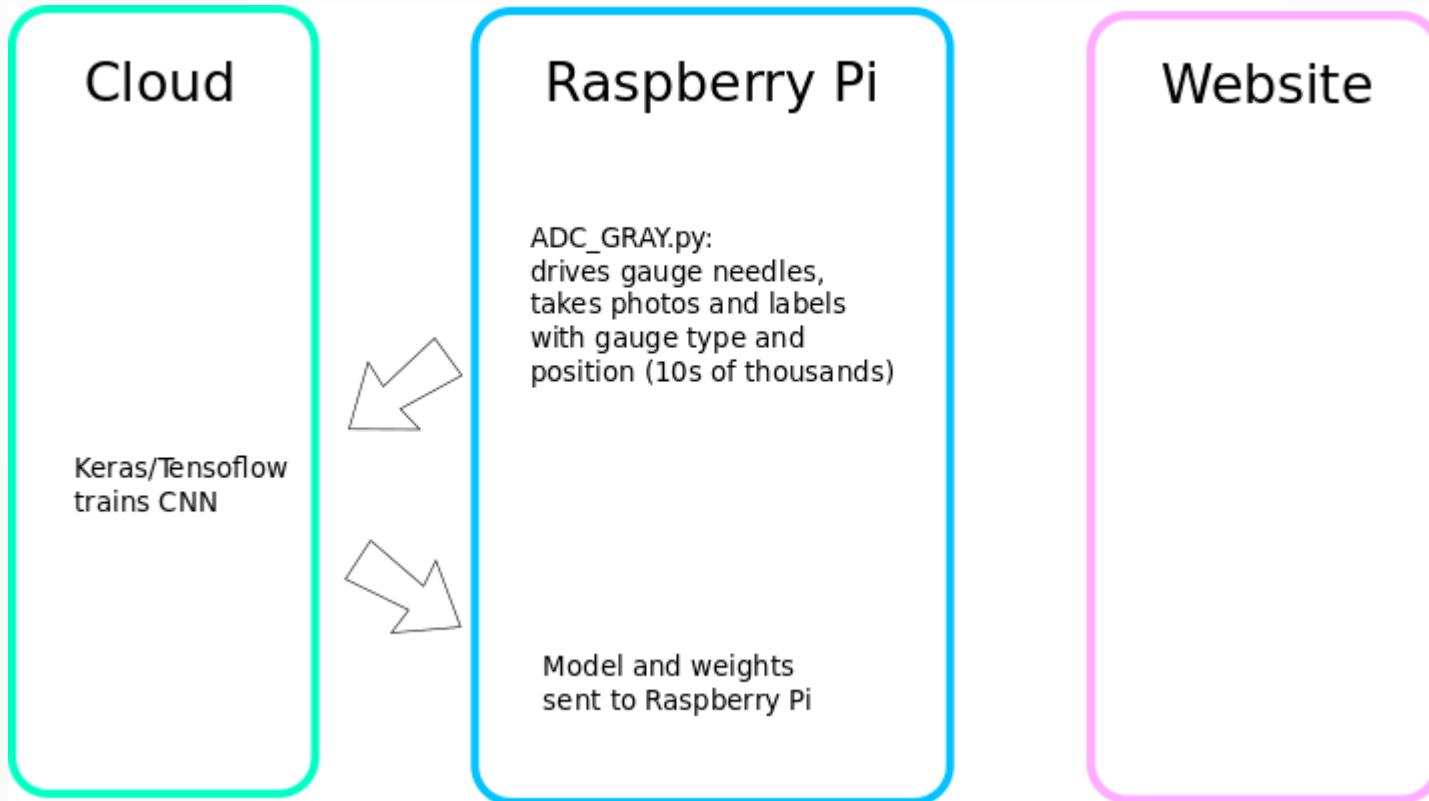
Examples

- Applications
 - Industrial facilities, Utility/Public works, Military
- Use cases:
 - Gauge might be in an environment which is no longer considered safe for human operators.
 - Gauge might be in remote area
 - No replacement electrical version of gauge may be available. (Due to cost or regulation)

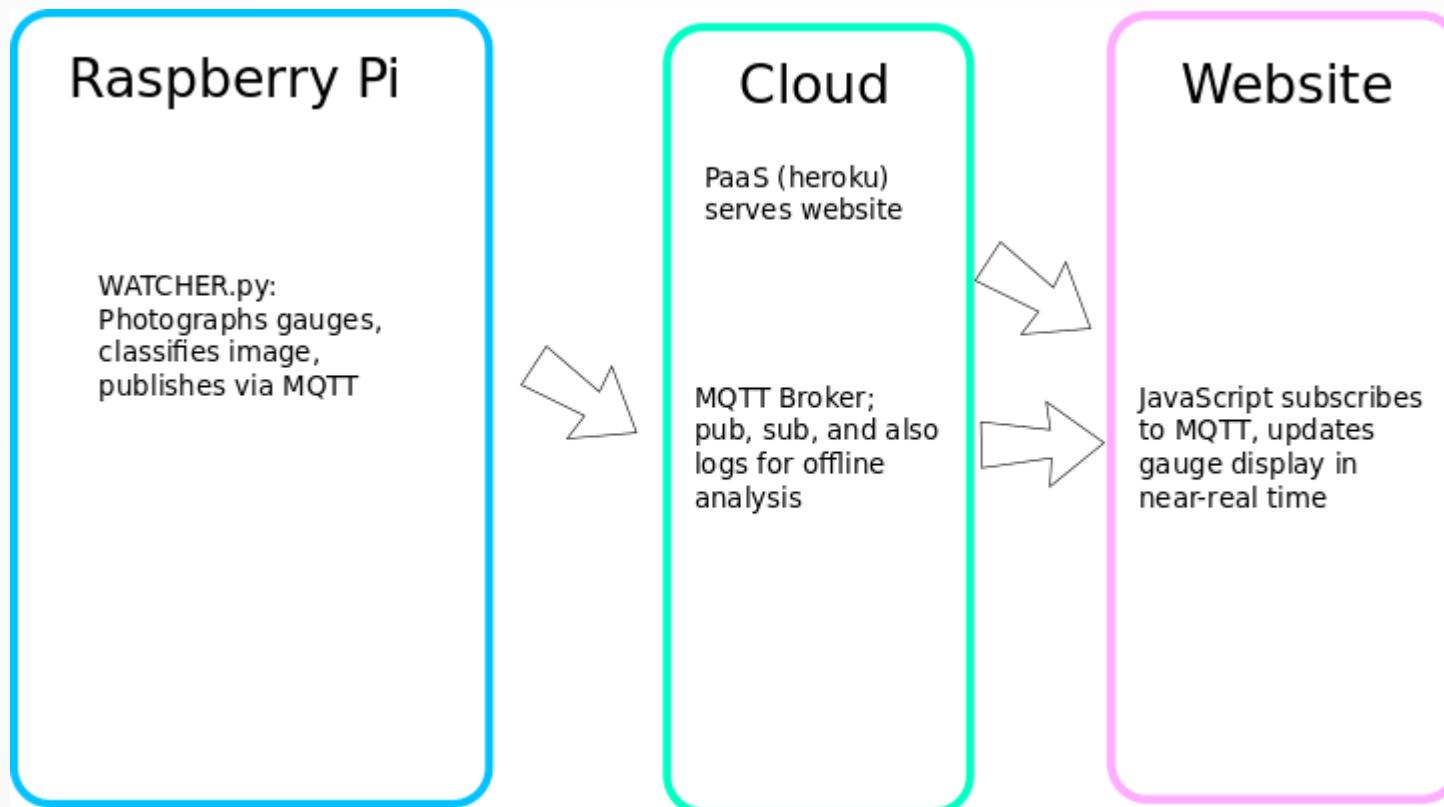
Architecture of the system

- Raspberry Pi with camera watches gauge
- RPi-resident CNN classifies gauge reading
- RPi Publishes gauge reading via MQTT pub/sub protocol
 - MQTT broker also has capability to log
- Results/alerts displayed via web interface (JavaScript)
- Offline process for training CNN in cloud
- Automated training data generation
 - Raspberry pi can control training gauges, as well as photograph them

Overview: Training Phase

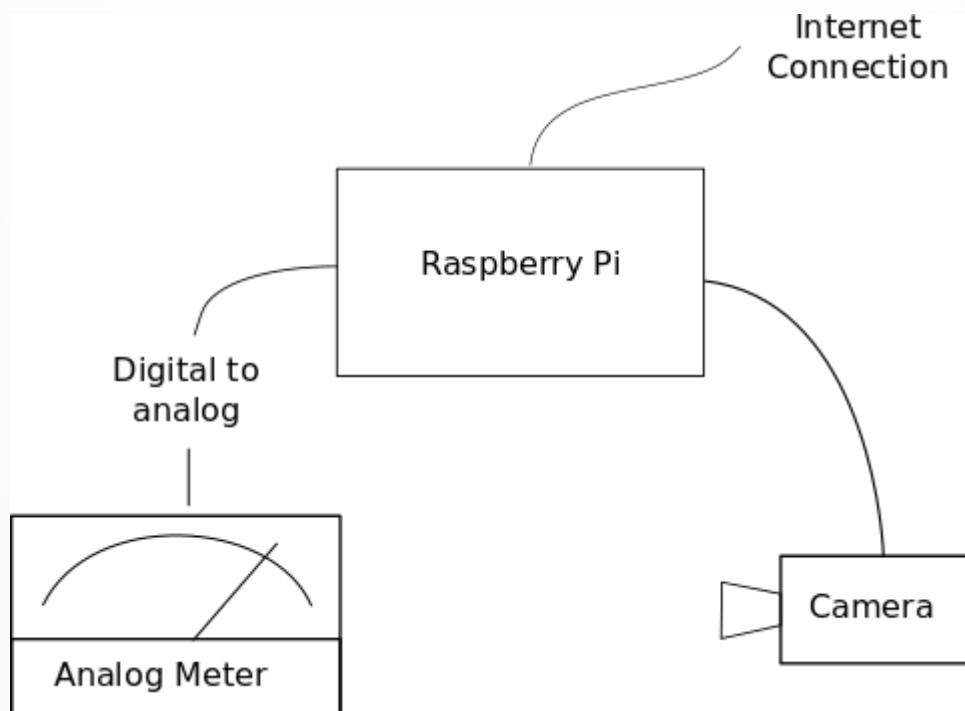


Overview: Running



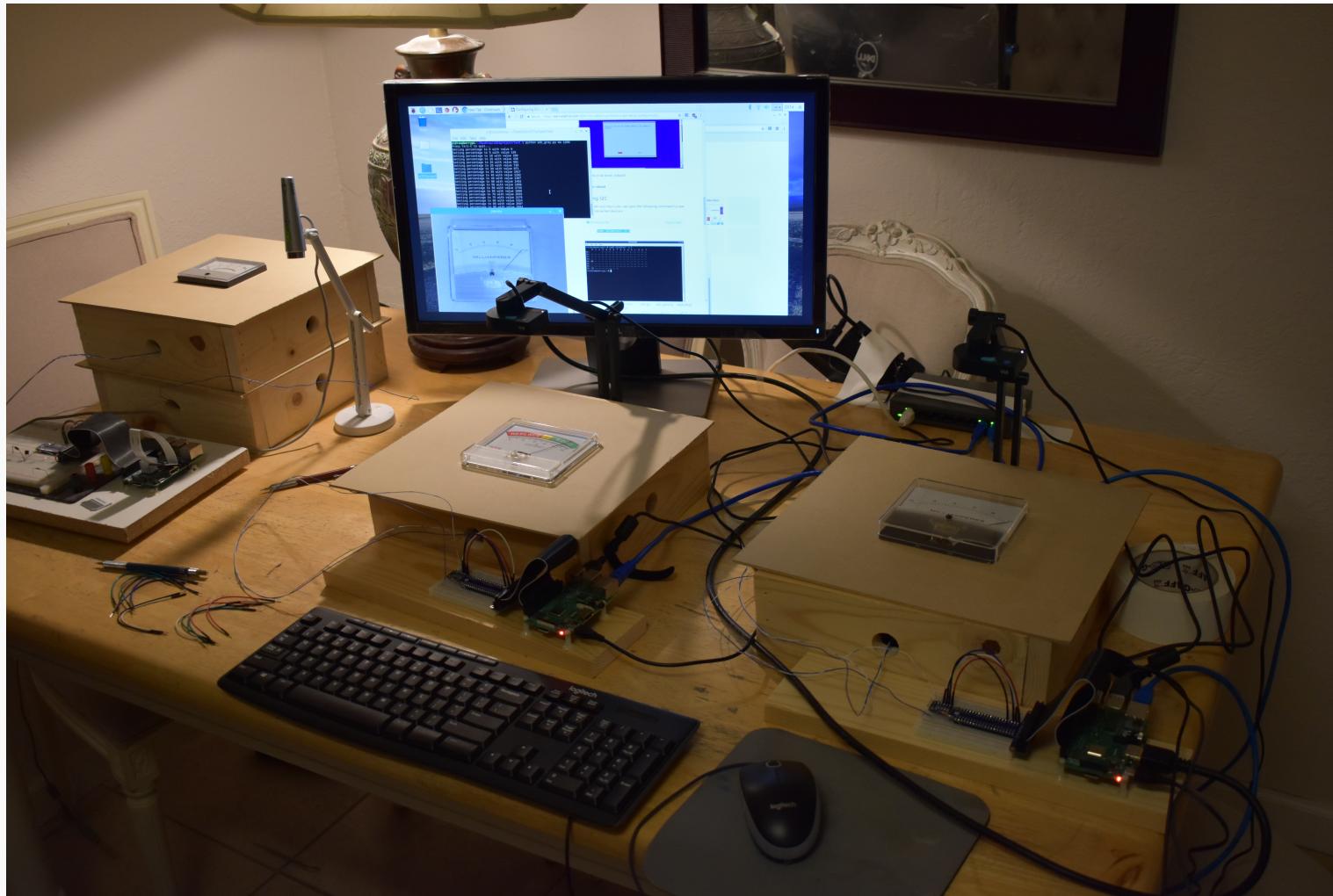
Hardware overview

- Raspberry Pi w/Camera, DAC to drive meters



Hardware overview

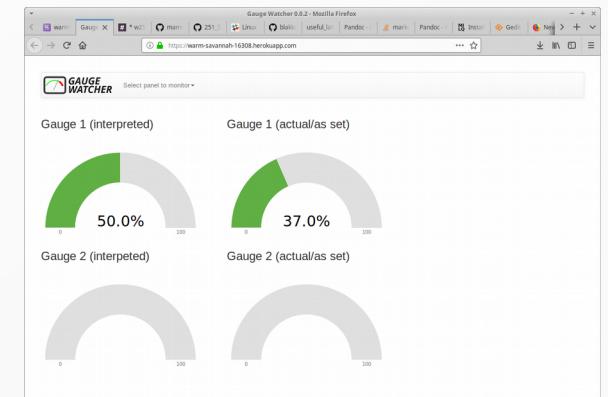
- In the real world...



Sample real gauges



Uniform display on website



Agenda

- Demo: <https://warm-savannah-16308.herokuapp.com/>
- Training: Andres & Cheng Cheng
- MQTT and data flow: John T
- Comments on technologies used: John B
 - CNN, Keras/Tensorflow, MQTT (python & JavaScript), gpfs, Cloud: IaaS (softlayer), PaaS (heroku/AWS serving website), IoT, did a local GPU installation
- Lessons learned, possible enhancements, and discussion: All

Q & A