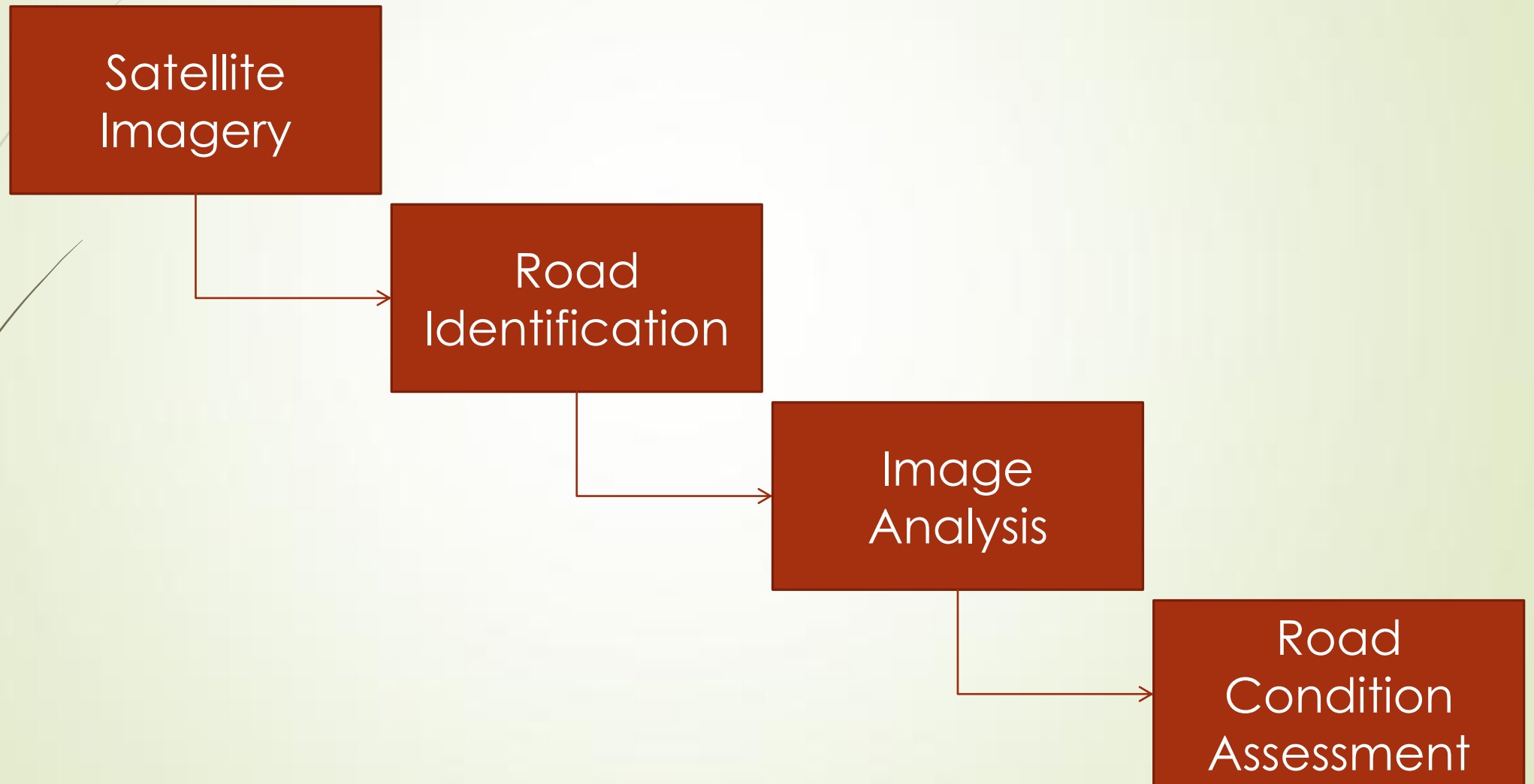


# Quality Assessment of Roads in Colorado Based on Satellite Imagery

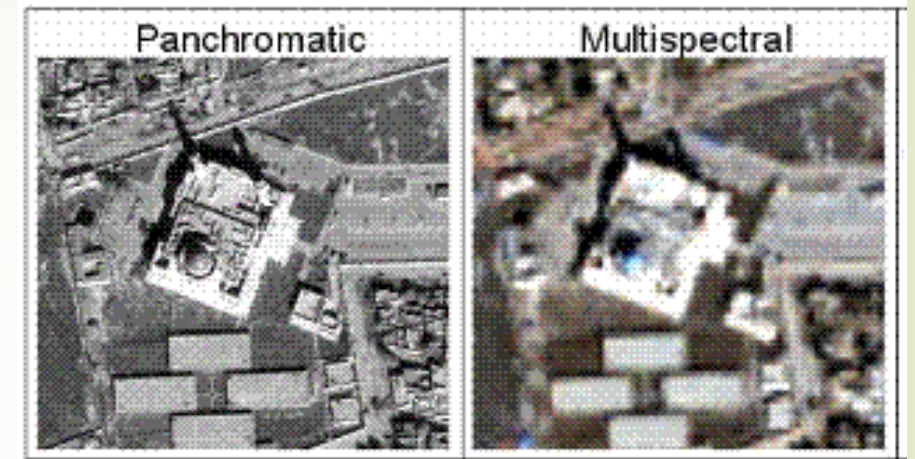
April 7, 2014

# Algorithm Overview



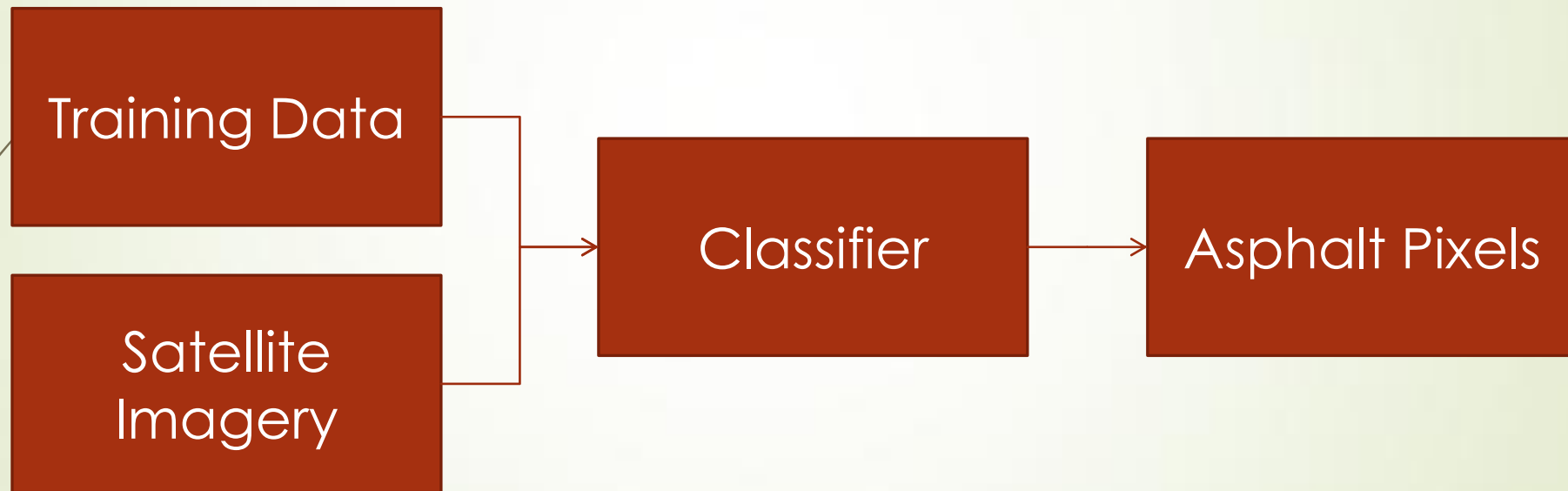
# Pan-Sharpening

- What we have
  - High resolution panchromatic imagery (B/W)
  - Low resolution multispectral imagery (Color)
- We create **high resolution color images** (Pan-sharpening)
- Helps in retaining 8 bands of information at high resolution
  - Will help automatically identify asphalt better



# Road Identification

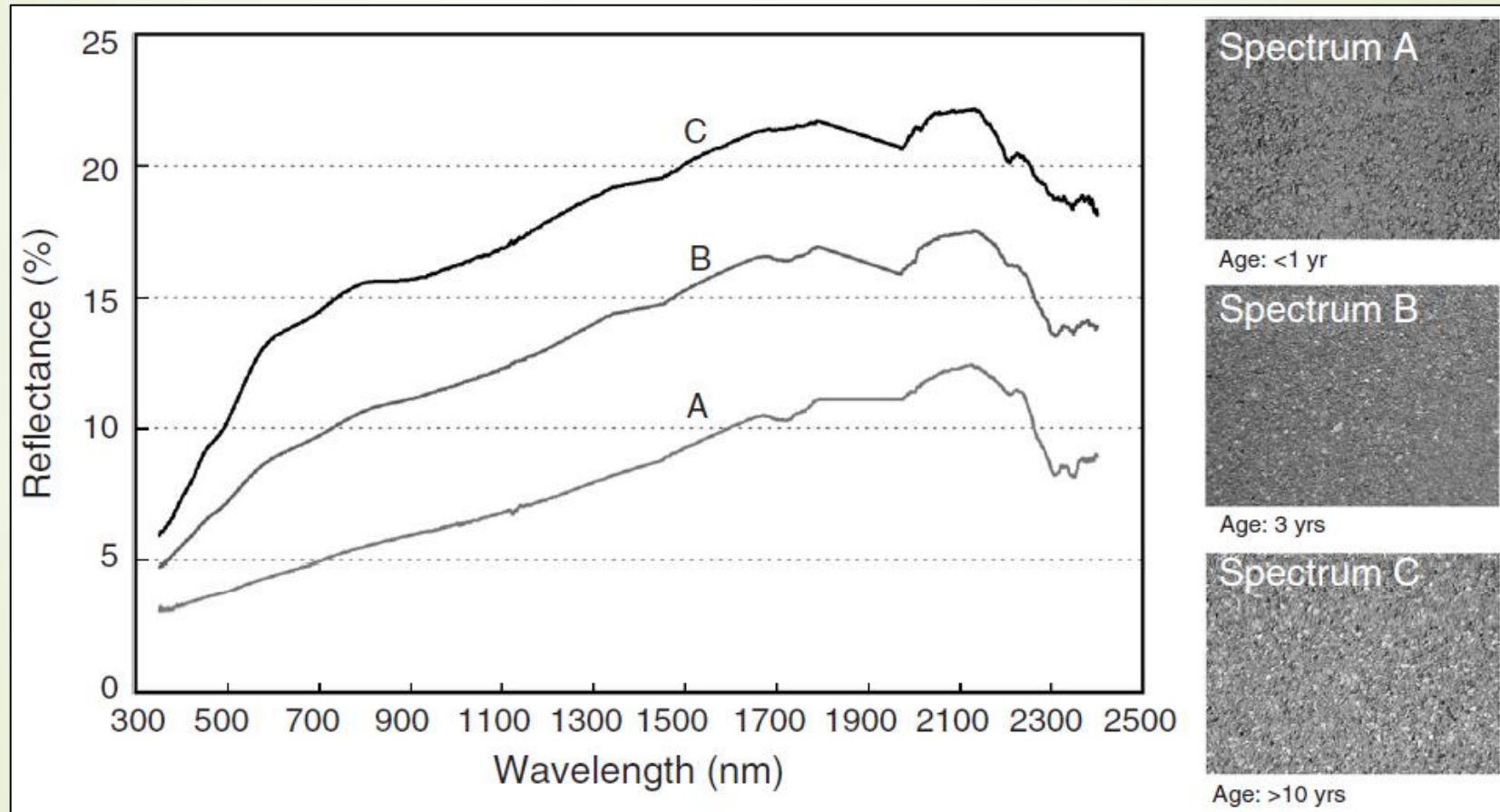
- Next we perform machine learning based classification
  - To increase infallibility of automatic extraction of asphalt pixels



# Image Analysis

- Highway pavement becomes lighter in panchromatic grayscale shade as it degrades
  - Digital number increases
  - Mean increases
- Highway pavement becomes less uniform as it degrades
  - Data range increases
  - Variance increases
  - Entropy increases
- These changes are detectable through texture filtering of satellite imagery
- Can likely be used to classify road surface conditions such as good, fair, poor and to justify repaving needs

# Asphalt Degradation



Spectral Characteristics of Aging Asphalt (Herold, 2007)



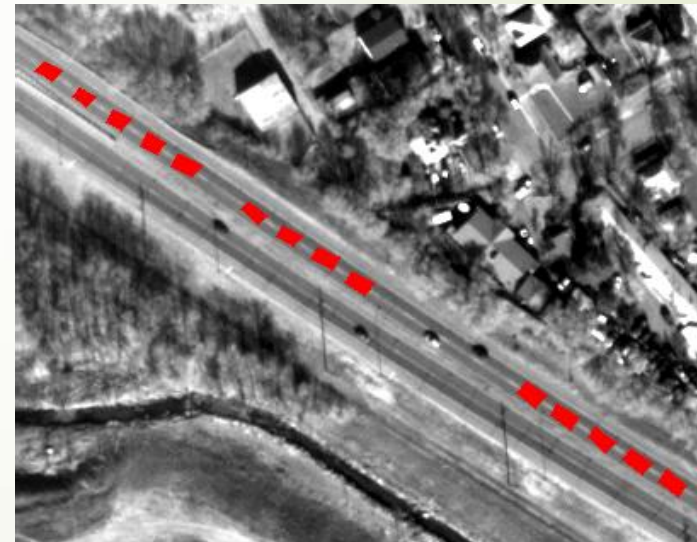
# Digital Number



21B



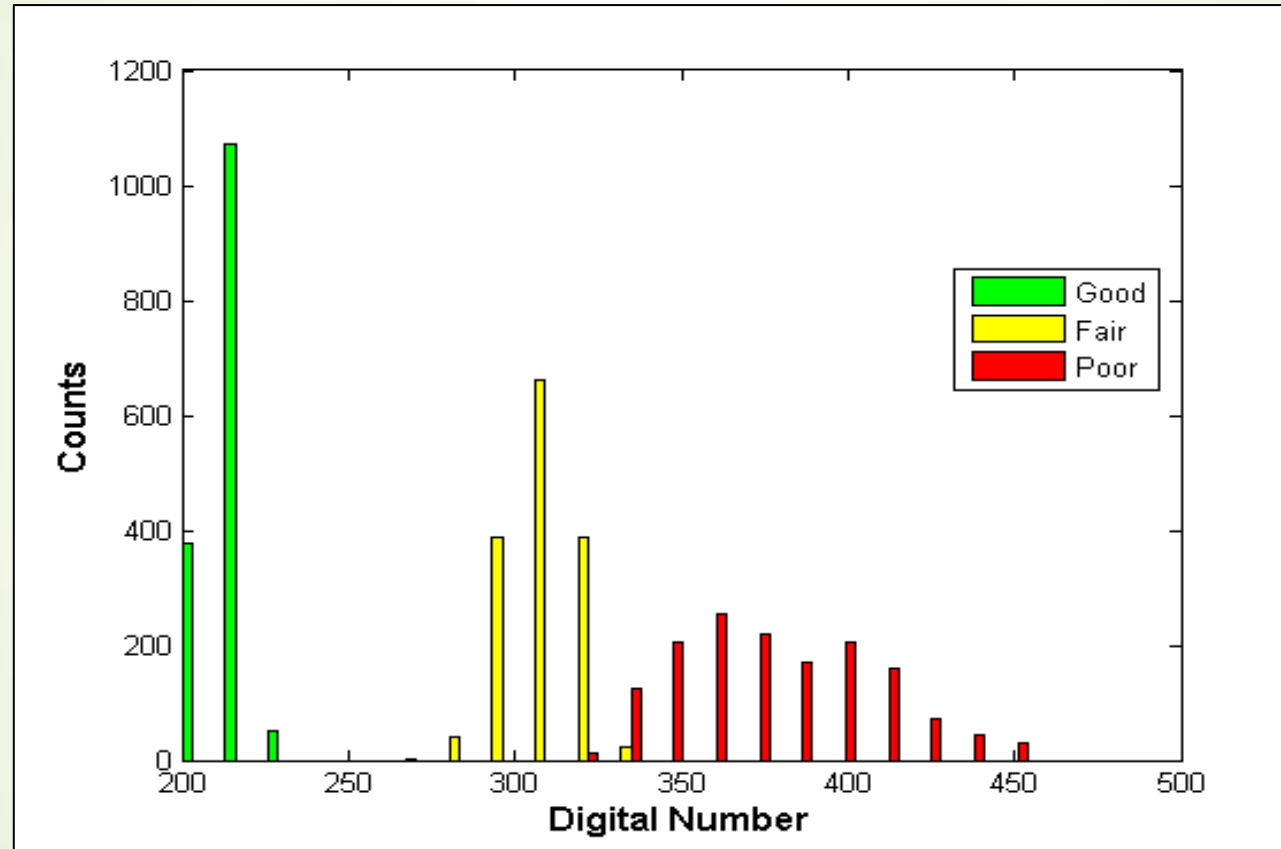
115A



24A

Highways in Colorado Springs

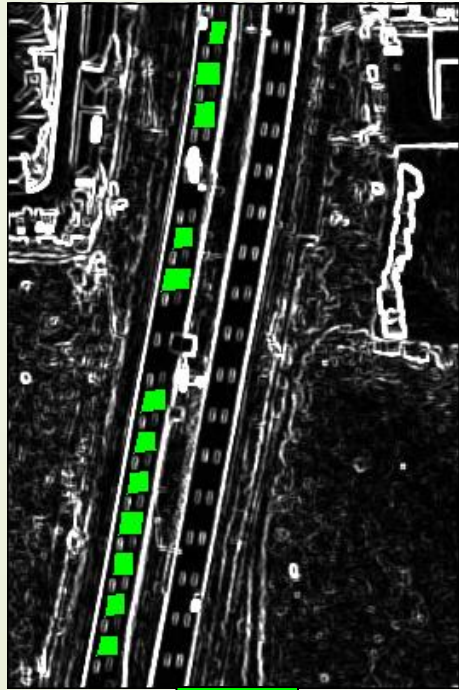
# Digital Number



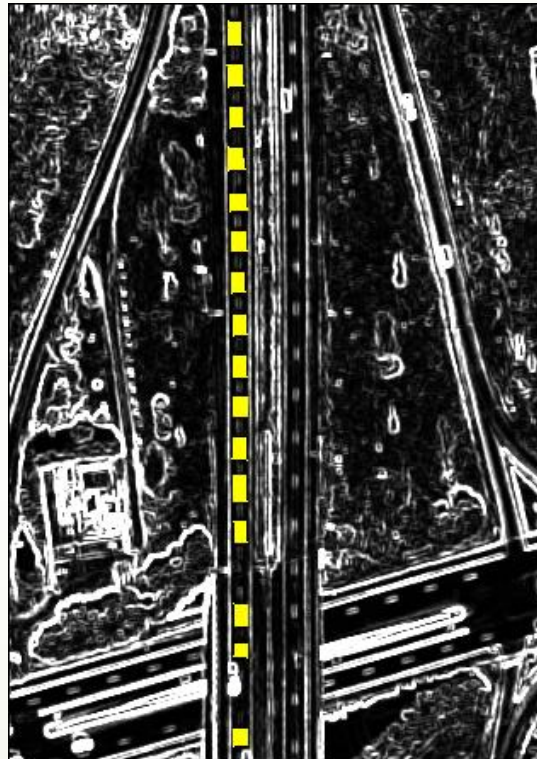
	Good	Fair	Poor
Mean	214.3	307.7	377.7
STD	5.2	10.3	29.5



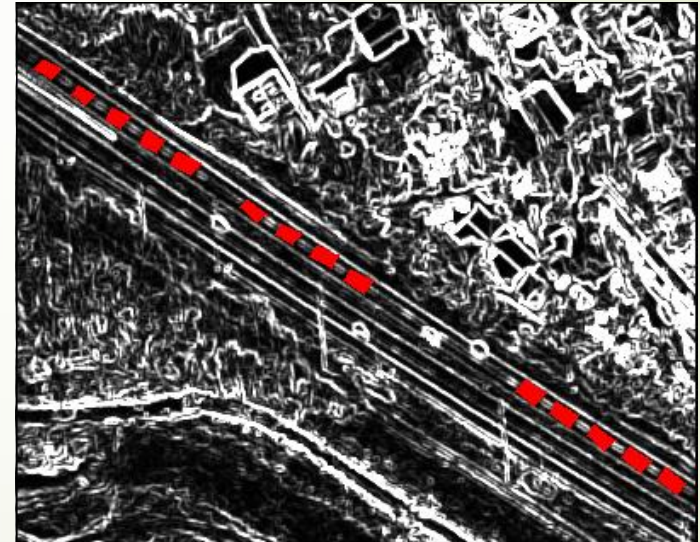
# Variance



21B



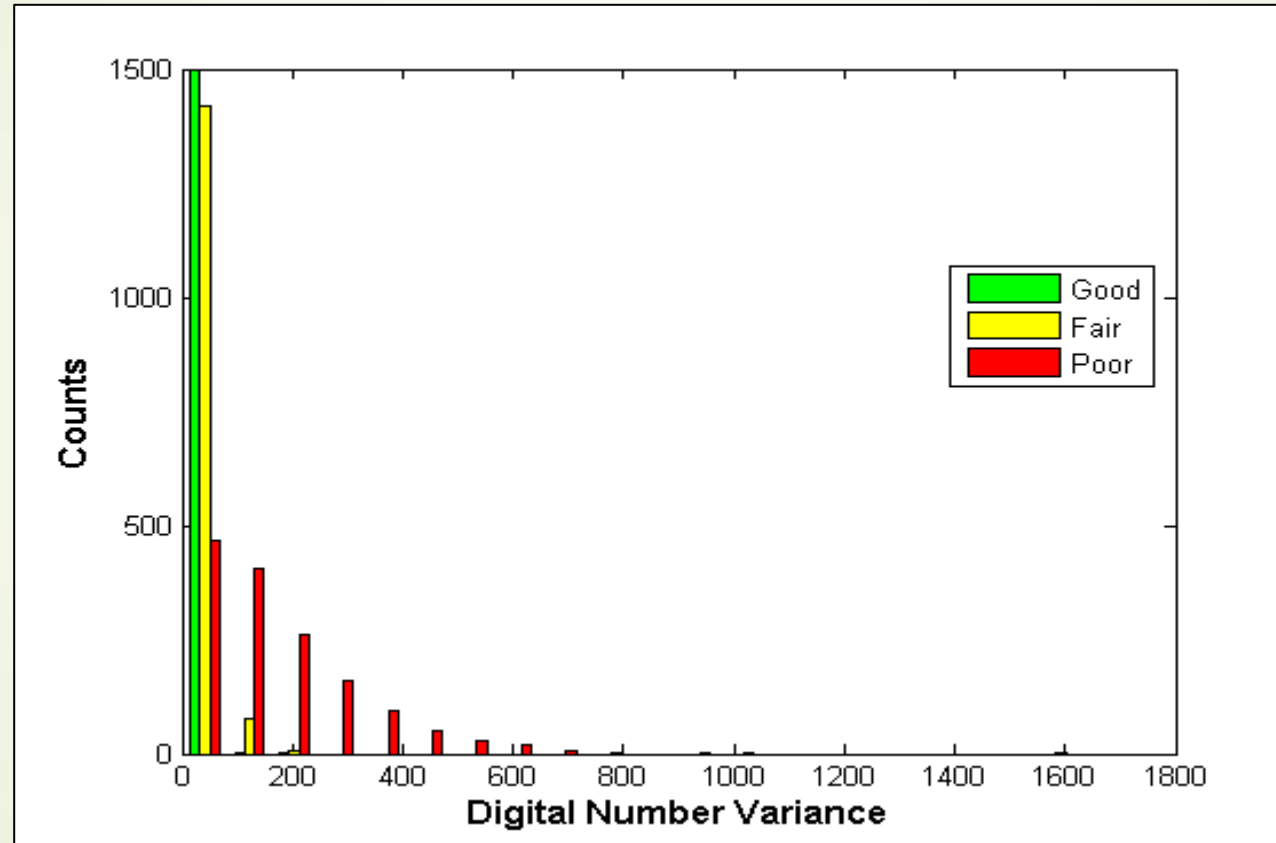
115A



24A

Highways in Colorado Springs

# Variance



	Good	Fair	Poor
Mean	18.7	31.5	174.0
STD	10.7	27.6	145.7

# Remote Sensing Road Quality Assessment





# Result Comparison and Verification

- CDOT and PPACG perform *in situ* road surveillance at specific regions of interest
- University of Colorado implements its remote sensing based road condition assessment scheme on same regions
- Compare the results and quantify the degree of agreement

# Conclusion

- A technically detailed scheme is in place
- Project moving ahead on schedule
- May supplement or replace current techniques
- Investment towards faster and easier surveillance