



SMART AUTOMATED ROAD FAULT DETECTION FOR IMPROVED ROAD MAINTENANCE PLANNING

13th Annual Workshop - ANSHM

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The Problem

- X Huge road networks
- X Massive data sets
- X Constant battle to stay up to date
- X Regular audits required
- X Difficult to analyse the holistic environment
- X Labour intensive

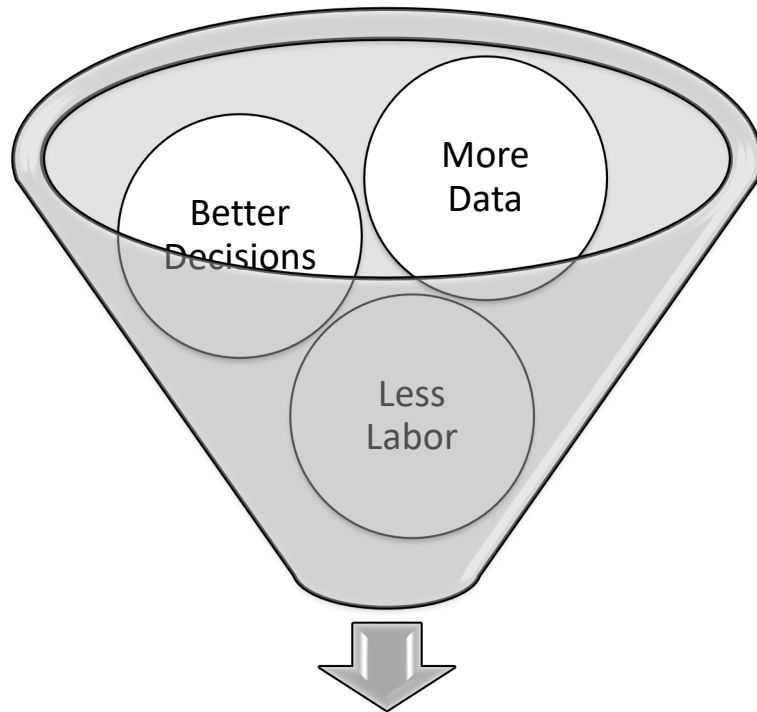


Data Collection Options

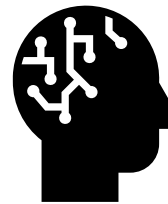
- Large scale audits
 - Costly
 - Only performed intermittently
- Asset Inspectors
 - Can only do so much
 - Often reactive
- The public
 - Only respond when effected
 - Immediate action expected



Artificial Intelligence and Asset Management



Artificial Intelligence



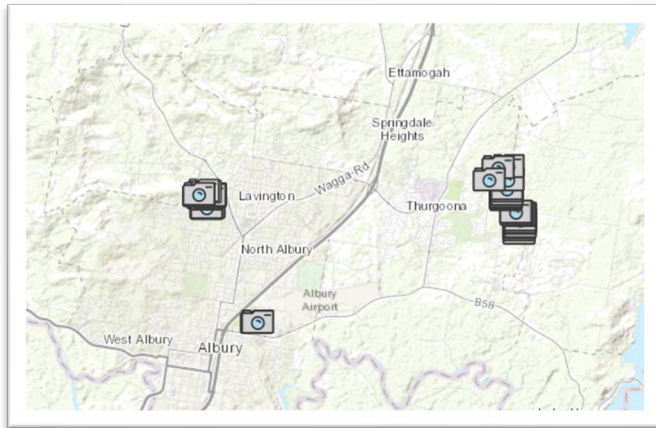
People are free to apply themselves to more engaging activities



This means happy staff and asset users



Image Collection



- Testing area in Albury NSW
- Several Sample areas throughout the city

- Esri Quick capture mobile software
- Easy to set up and use
- Records images with special data

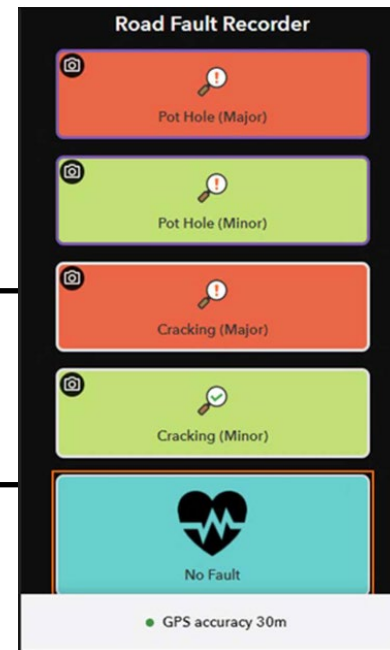




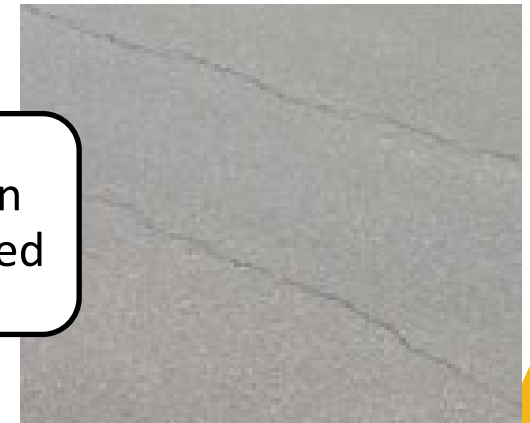
Image Input



Image
input

Fault
observed

Action
assigned





Deep learning

- GoogleNet and AlexNet
- Transfer learning image classification
- Matlab Software
- CAD specification Computer
- No programming background

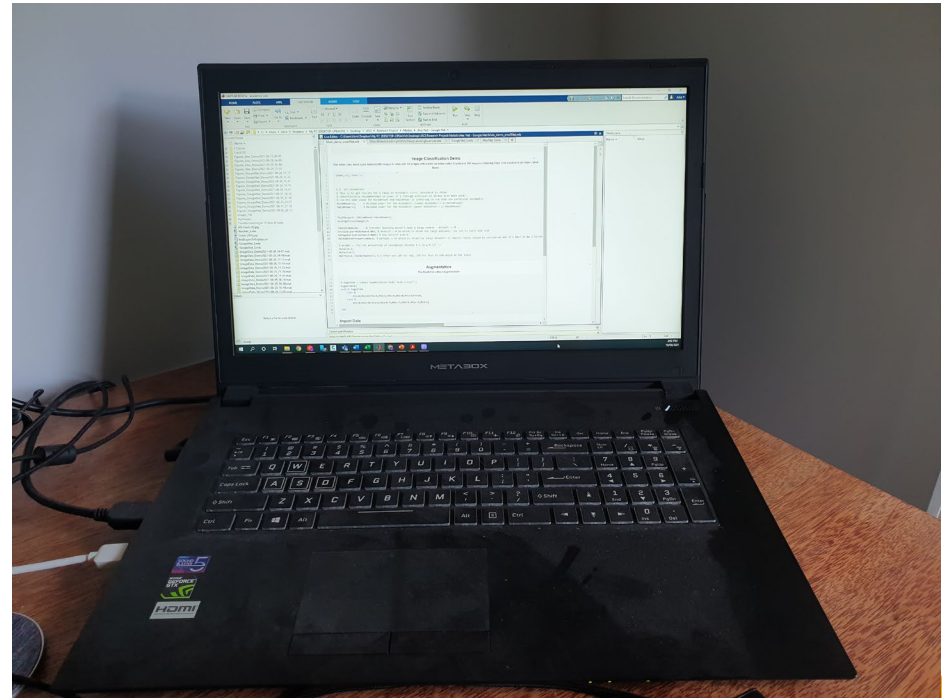




Image Database

- Over 800 Images
- Collected over 20 kilometers
- As much background confusion as possible
- Separated into 2 classifications cracked and uncracked

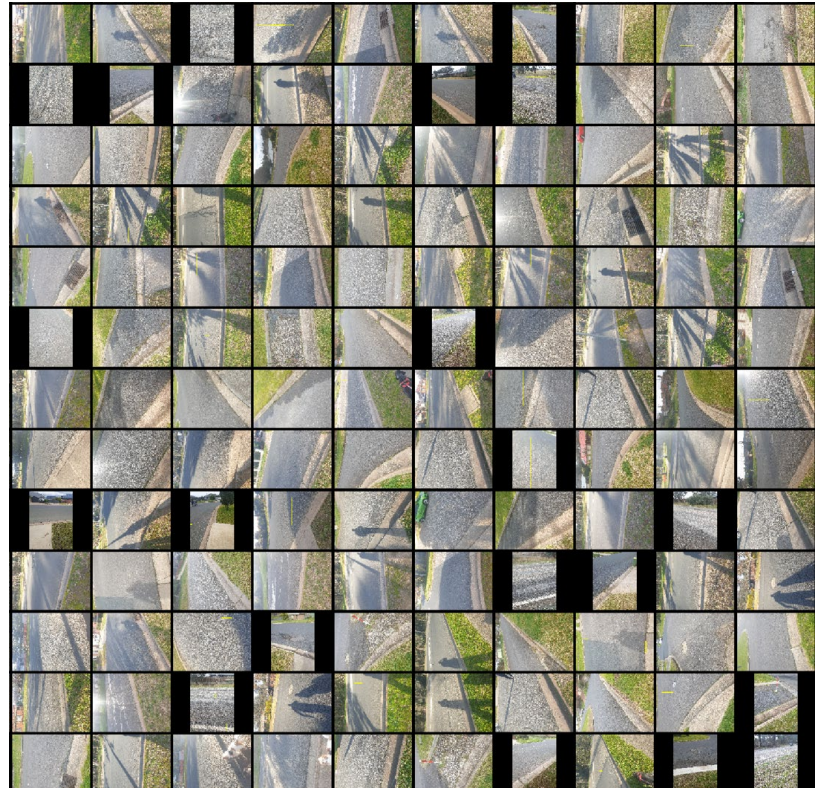
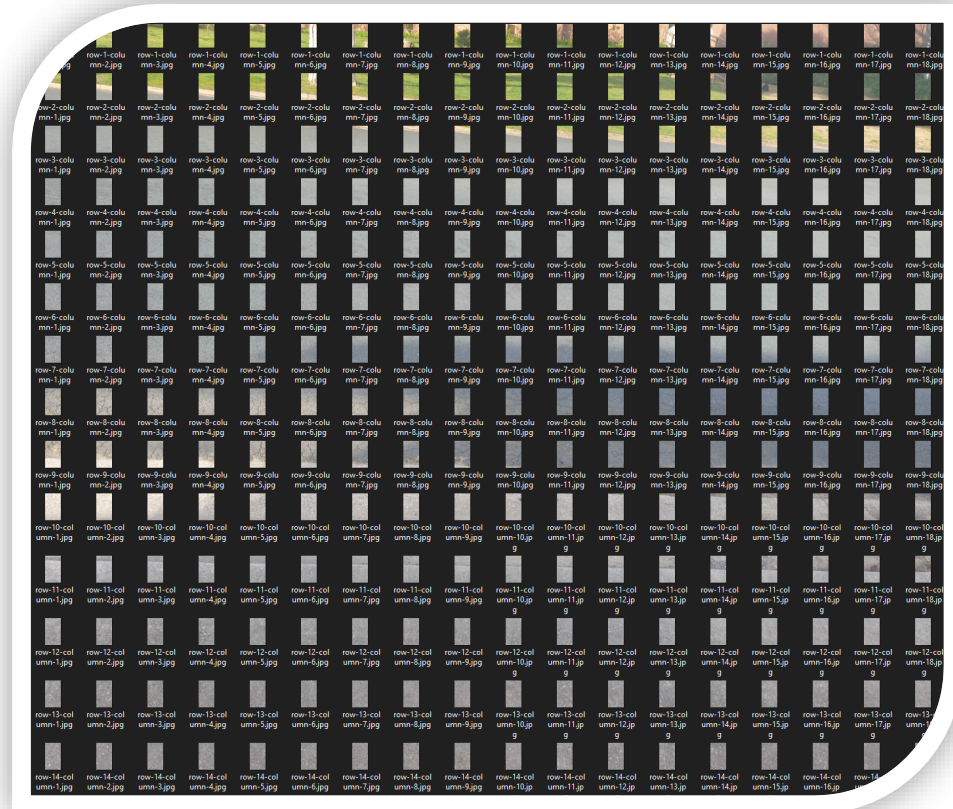




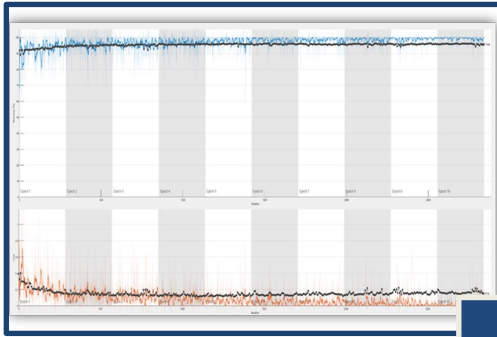
Image pre processing

- Tiling each image into 224 individual tiles
- Total image database size of 109,000 images
- Classified 12,000 images for testing





Testing



95.7% Validation
result along with a
notable reduction
in processing time



Outputs

Public Images



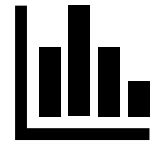
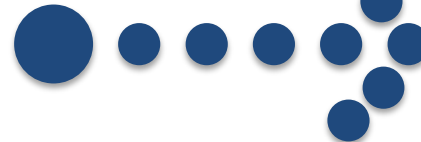
IOT Images



Internal Images



Deep
Learning

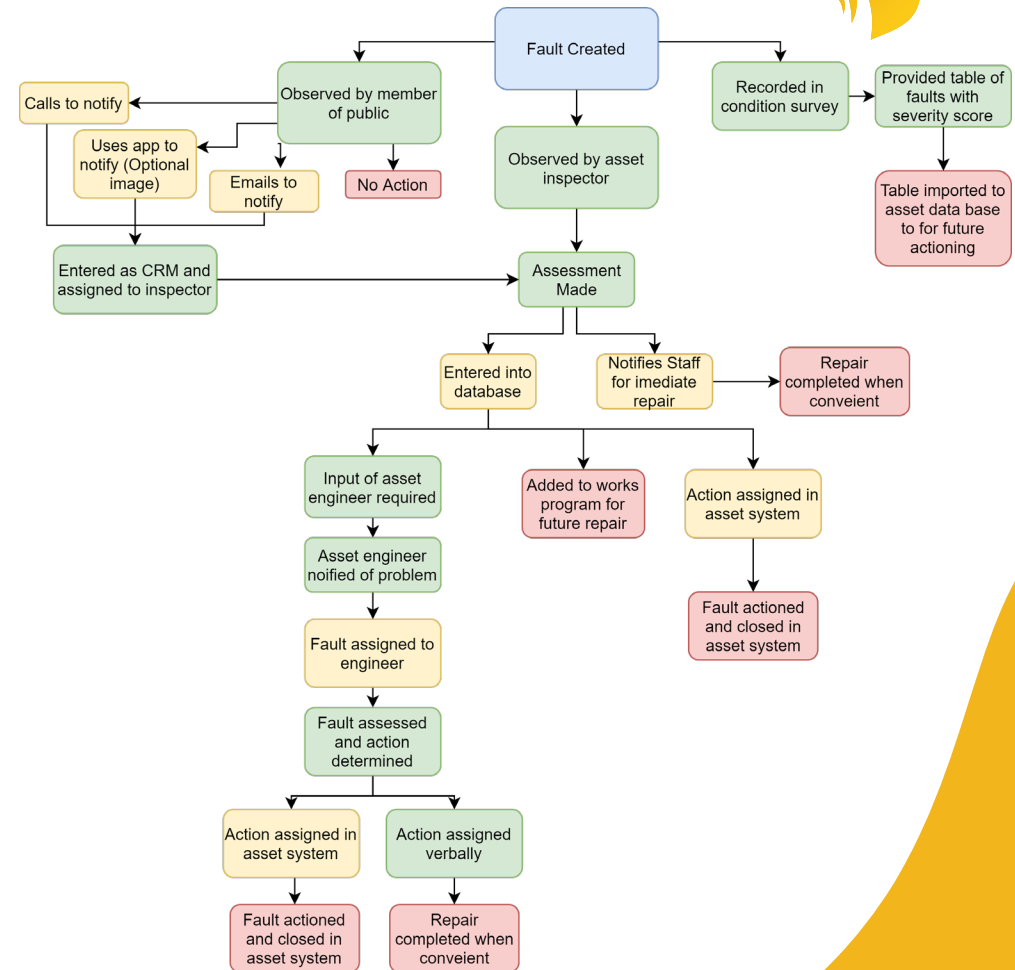


Smarter Data



Current Asset Model

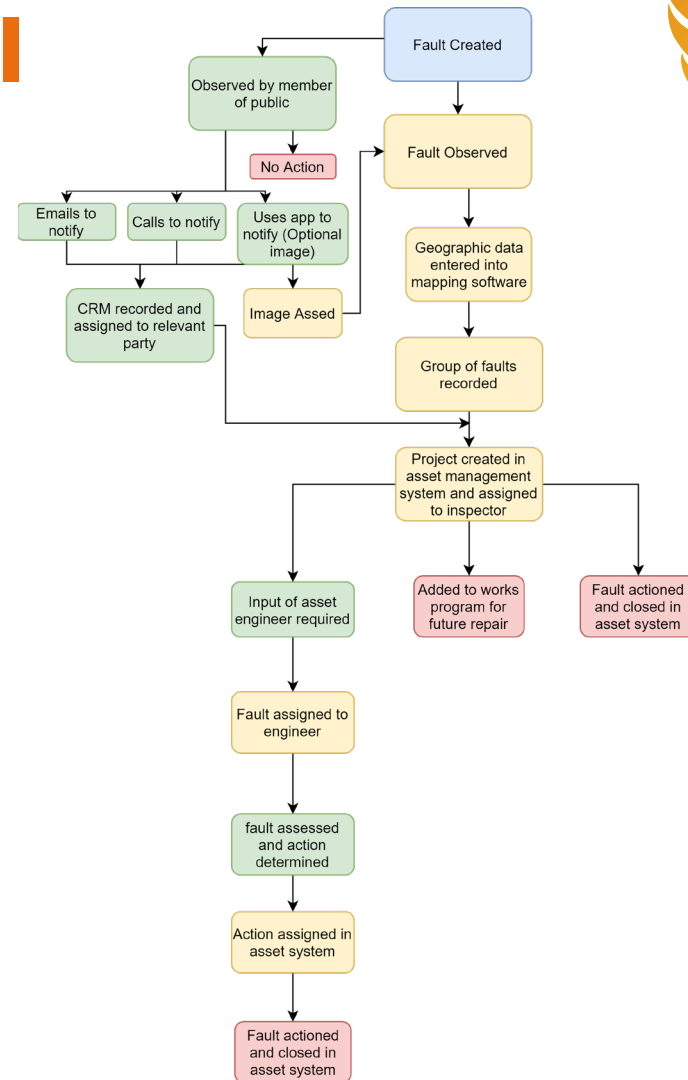
- Resource Intensive
- Reliant on people
- Prone to error
- Difficult to manage over time





New Asset Model

- Much more and better data
- Constant updates
- Eliminates a majority of double handling
- More time for higher level decision making





Future Work

- Recognise and classify more faults
- Intergrate with a GIS system to map where works are required and being completed
- Develop modern cost-effective image collection system that can be operated in regular basis
- Develop an AI edge computing system for in-site fault detection



Conclusion

Artificial intelligence is capable of generating more and better databases enabling data driven decision making using readily available software and hardware.

A network wide implementation is not far away.

...Bigger picture



This study is part of AI-driven SHM research for civil infrastructure by the **Monitoring & Infrastructure Technologies (MIT)** group at USQ





Questions?

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