City-Scale Road Audit System using Deep Learning
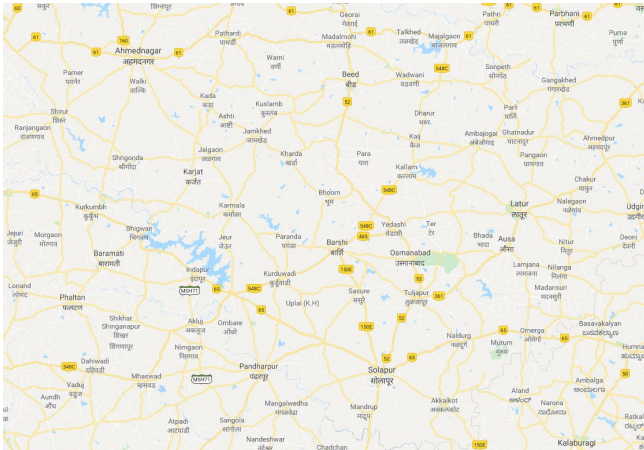
Sudhir Yarram, Girish Varma, C. V. Jawahar

IIIT Hyderabad

Motivation

Scale of the road network

Road Network in Hyderabad,
India - 1500 kms

Motivation

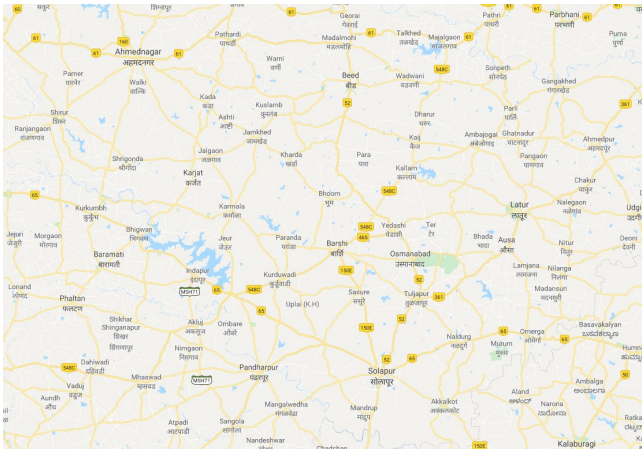Muddy Road

Water-log

Pothole + Muddy Road

Pothole

Rough Road

Wet Road

The above Images are from the ***Road-defect dataset*** that we have collected for this work

Motivation

Scale of the road network

Road Network in Hyderabad,
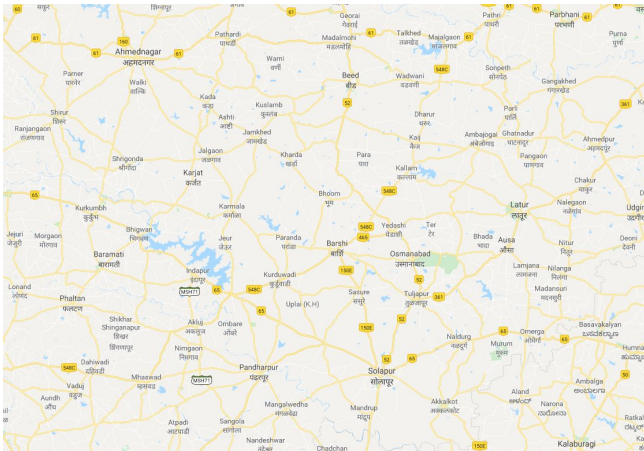India - 1500 kms

Small
disruption

Huge Inconvenience for citizens

Motivation

Scale of the road network | Quick response to disasters | Costly existing systems
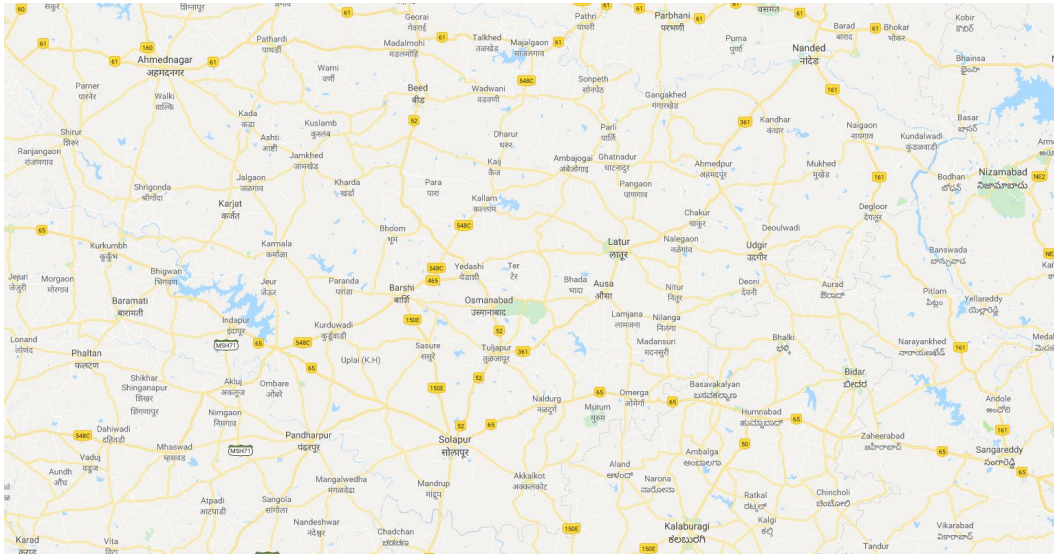
Motivation

A **quick**, **scalable** and **cost-effective** Road Audit system for Road Maintenance is ***critical***
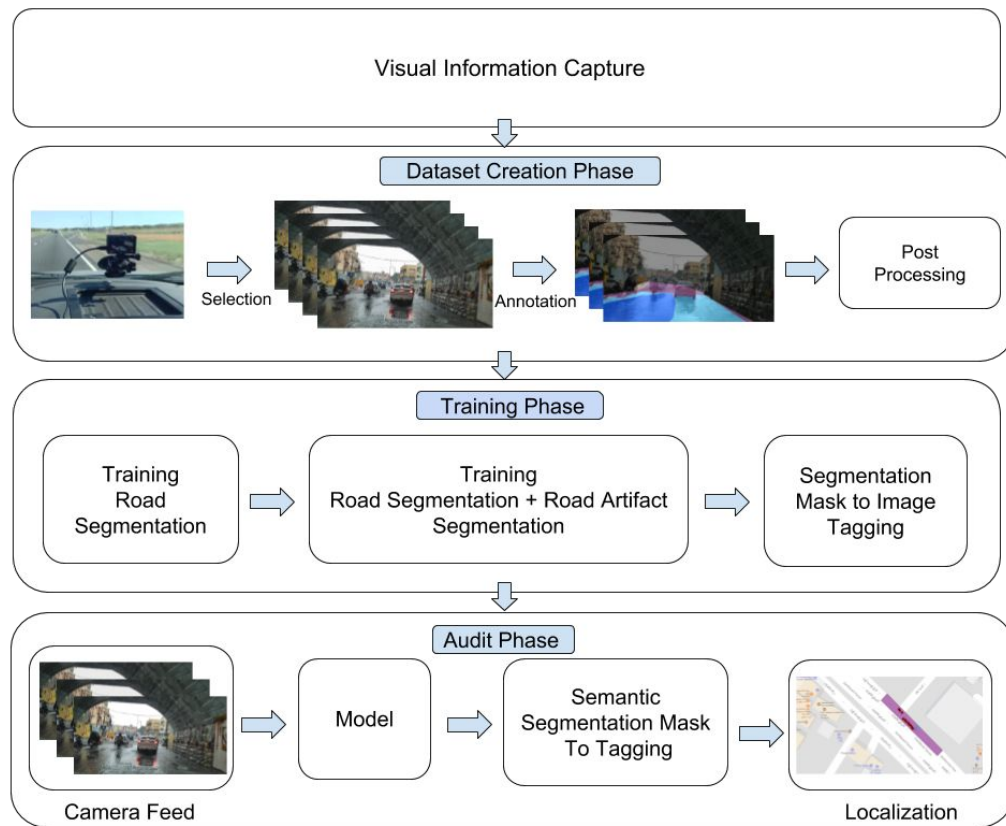
Use case

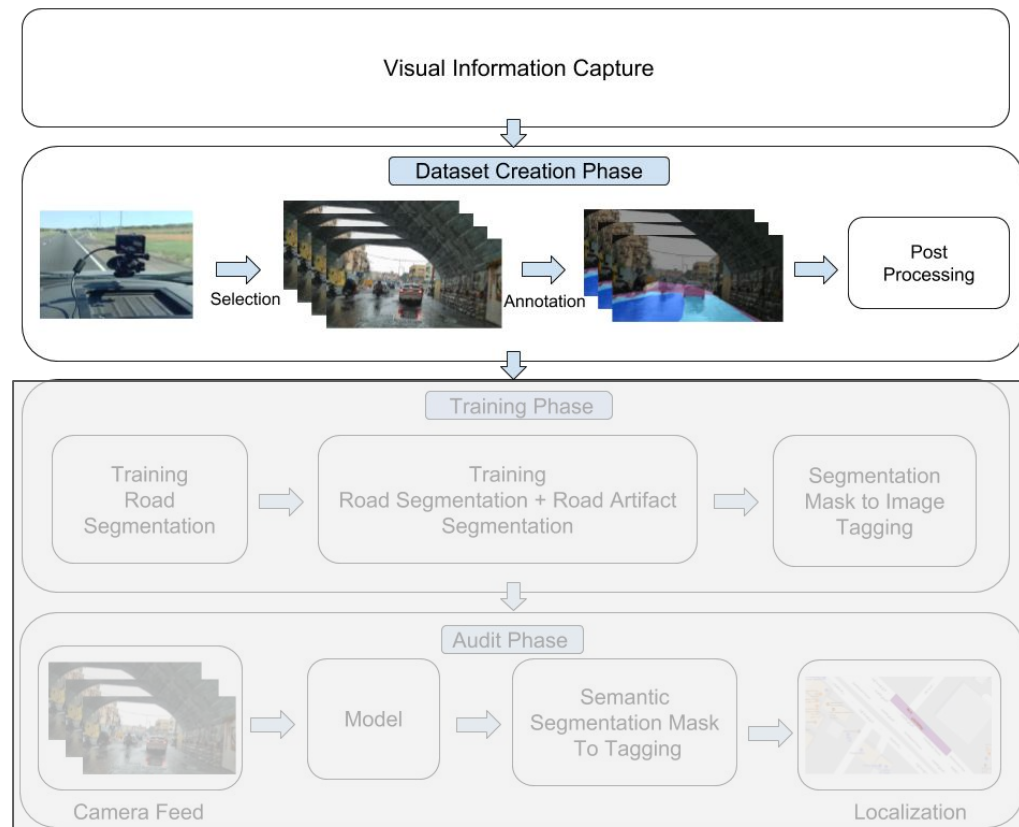| Can be useful for Municipal Authorities	Can be useful in Autonomous Navigation

System Overview

- Road Audit Dataset

- Custom Semantic Segmentation Model

- Image Tagging and Localization
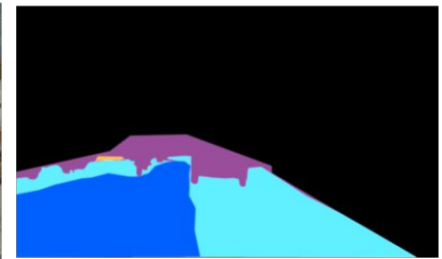
System Overview

- **Road Audit Dataset**

- Custom Semantic Segmentation Model
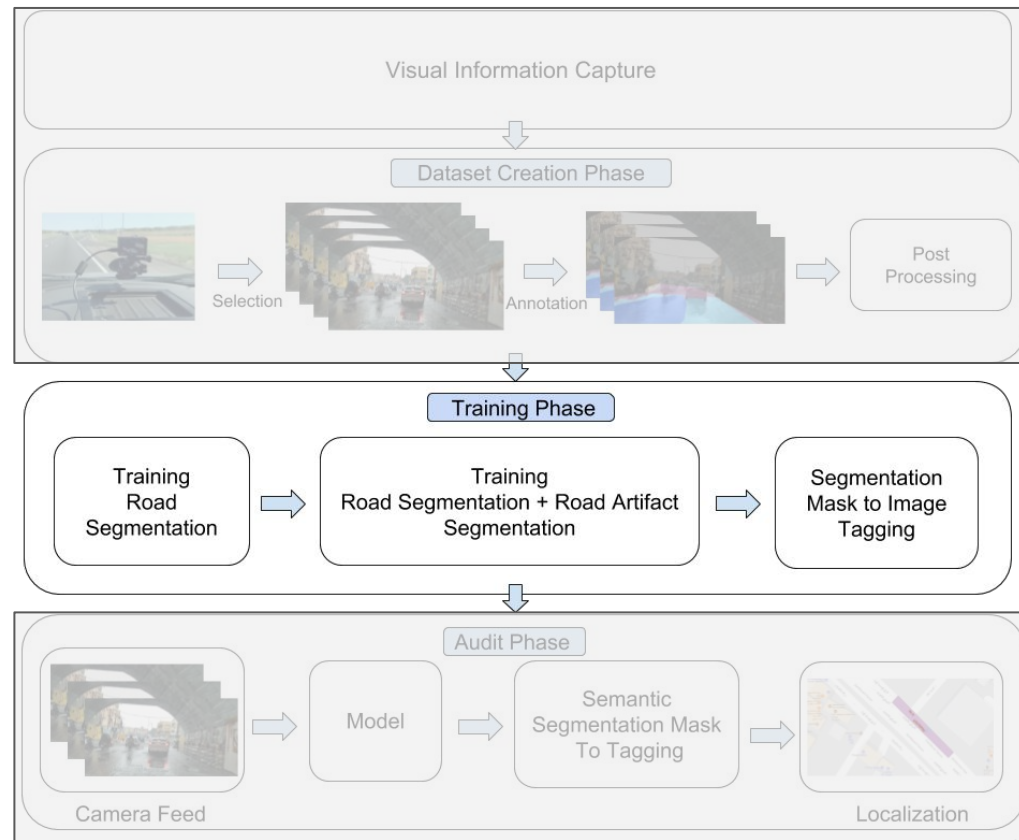
- Image Tagging and Localization

Road Audit Dataset

- Used **GPS enabled smartphone camera**.

- **10** kinds of defects eg.., muddy area, pothole, water-log

- **18** drive sequences spanning **60 kms**

- A variety of highway roads, flyovers, and street roads

- Image Resolution : ***1024 X 512*** **px**

- Train split : 1081, Val : 149, test : 181

- Dataset is available at

  http://bit.ly/road-audit-dataset

System Overview

- Road Audit Dataset
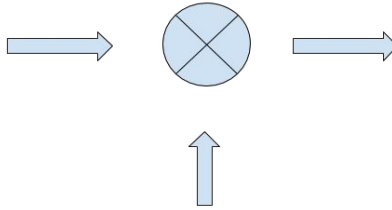
- **Custom Semantic Segmentation Model**

- Image Tagging and Localization
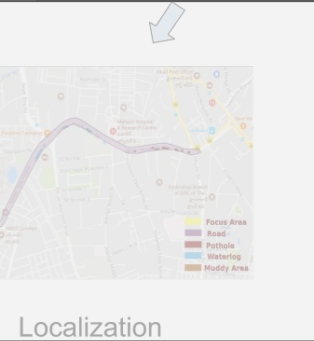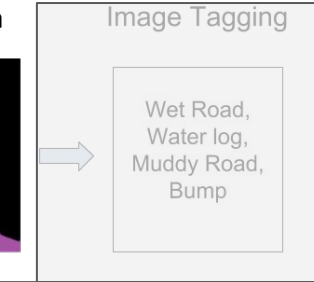
Model

Our Model

Input

Attention

Masked Road

Road Defect Segmentation

Image Tagging

Wet Road,
Water log,
Muddy Road,
Bump

512 x 256 x 16   512 x 256 x 16

256 x 128 x64

Fully Convolutional
Network

Road Segmentation

512 x 256 x 16

256 x 128 x 64   Spatial
Feature
Pooling

256 x 128 x 64

512 x 256 x 16

128 x 64 x 128

Modified ERFNet with Spatial Feature Pooling
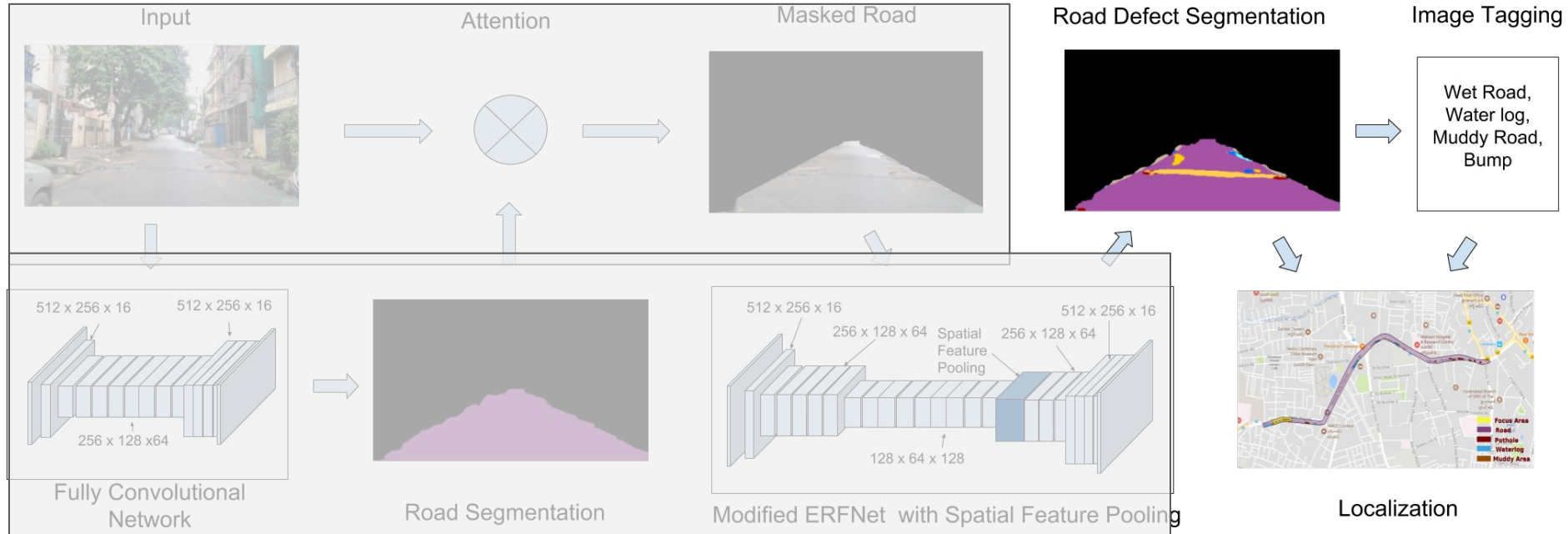
Focus Area
Road
Pothole
Waterlog
Muddy Area

Localization

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System Overview

- Road Audit Dataset

- Custom Semantic Segmentation Model

- **Image Tagging and Localization**
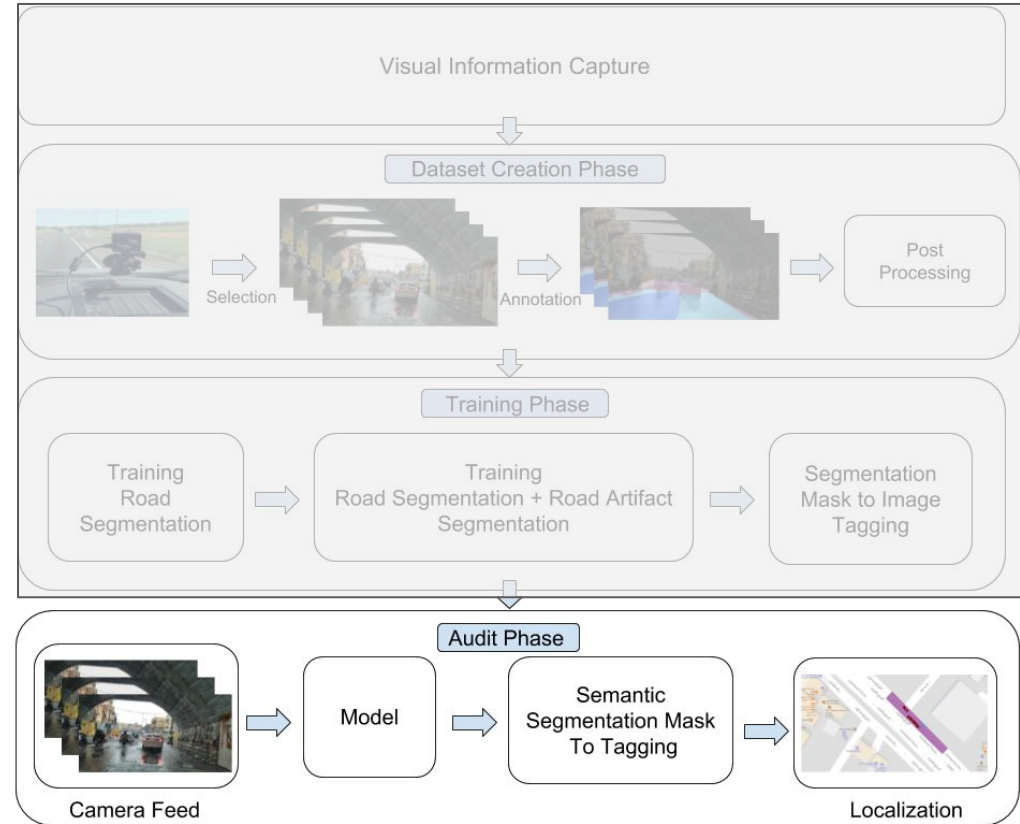
Model

Results

Method	Accuracy	W IoU	Fps (1024 X 512 px)
ErfNet (Fine tuned)	41.8	59.8	41.7
ErfNet (Scratch)	42.1	59.8	41.7
Refined ErfNet	**45.7**	**60.7**	**26.4**

Demo Video

Gracias !!
Thank you !!

Dataset and **code** are available at **http://bit.ly/road-audit**