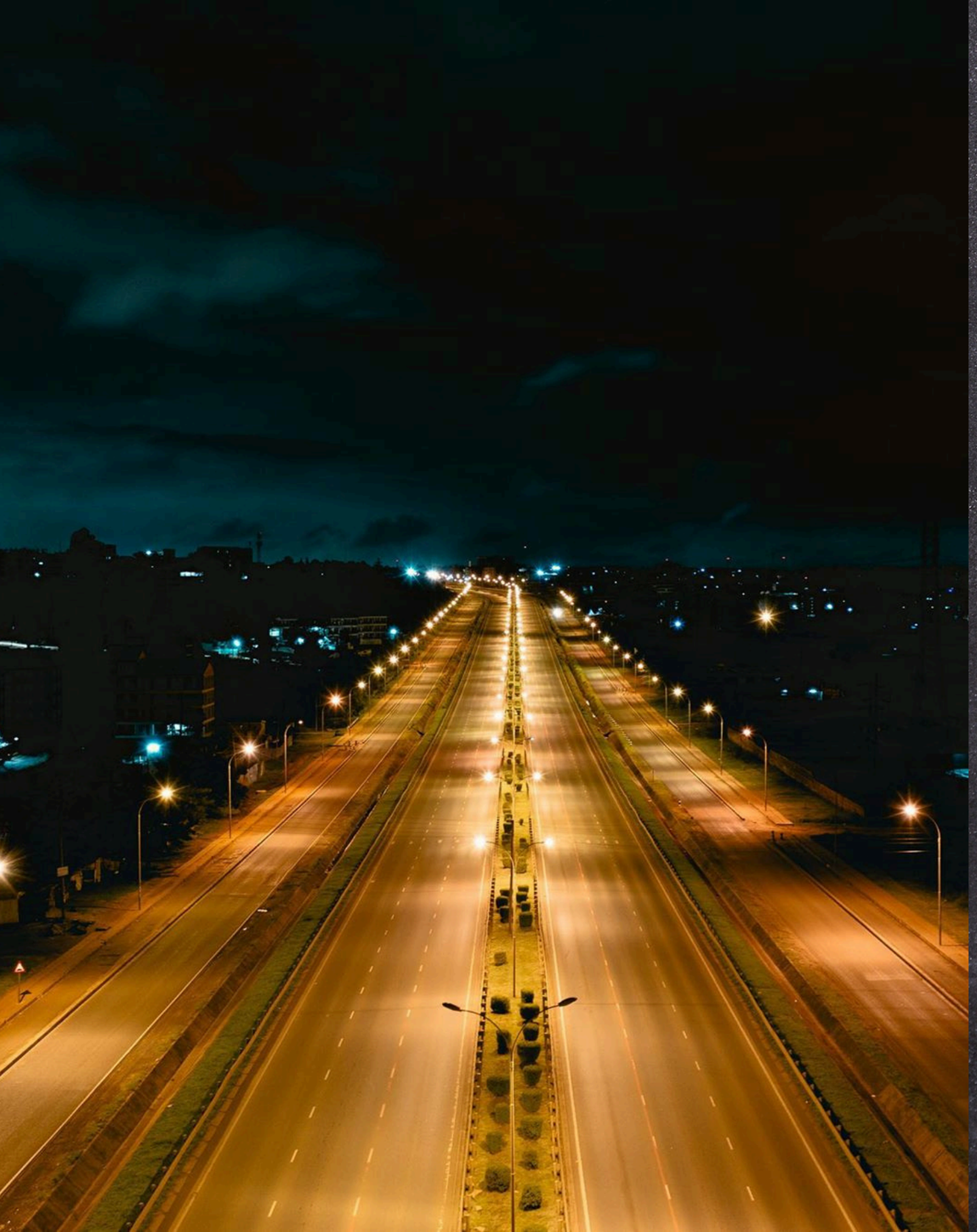
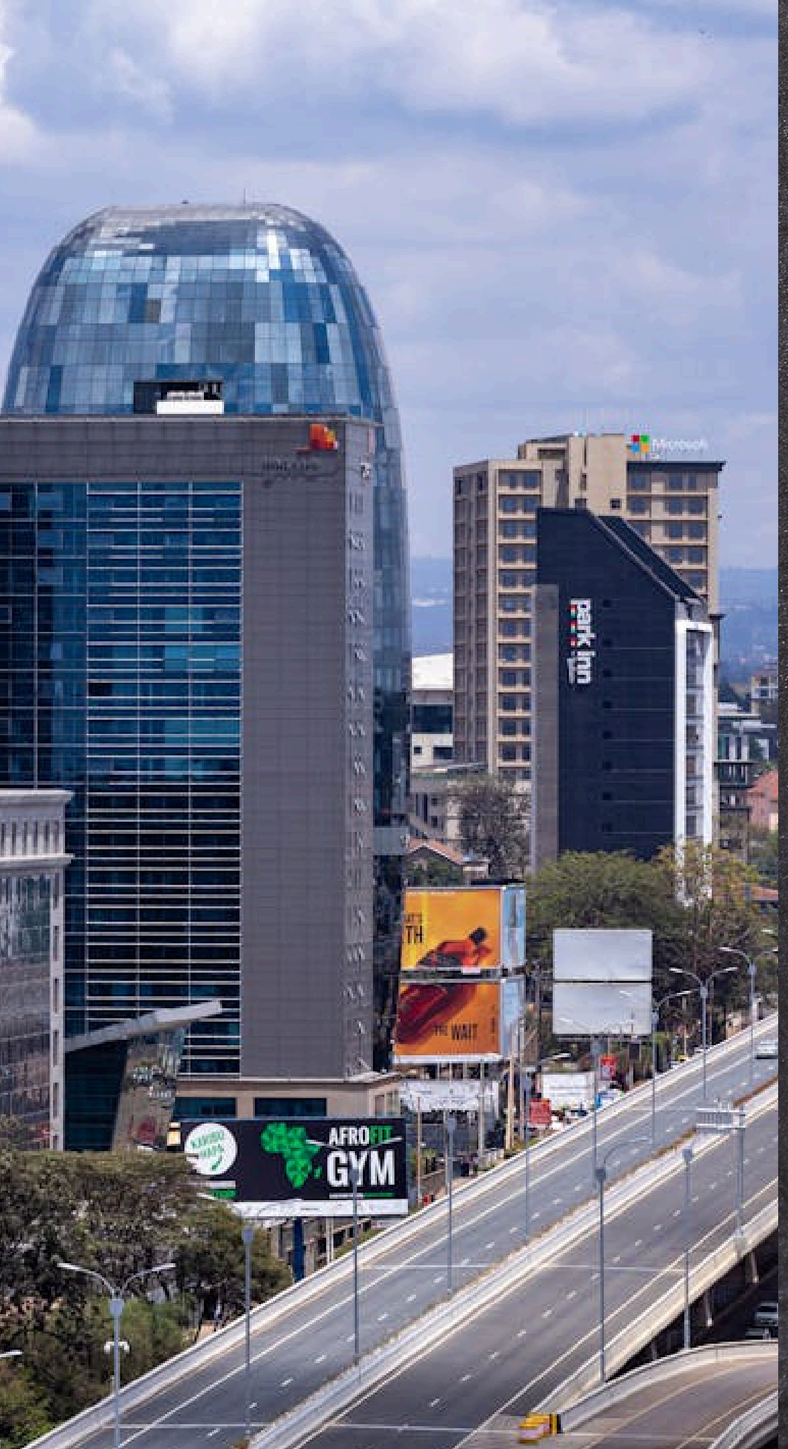


3RD MAY 2024

Deep Learning for Road Condition Classification

DSPT05 GROUP 11



Introduction

The Road Inventory and Condition Survey (RICS), conducted by the Kenya Roads Board, is a critical but labor-intensive process used to evaluate the state of road infrastructure in Kenya. Recognizing the challenges associated with the manual aspects of RICS, our project proposes a revolutionary and innovative shift towards an automated, efficient, and objective method for road condition assessment using advanced computer vision and deep learning methodologies. This project developed a robust classification system that categorizes roads into five distinct conditions: 'good,' 'fair,' 'poor,' 'flooded,' and 'unpaved.'

Problem Statement

The Road Inventory and Condition Survey (RICS) conducted every three years by the Kenya Roads Board, is a vital but labor-intensive method for assessing road conditions in Kenya. Its manual nature, often relying on visual assessments, result in delays and inaccuracies in categorizing road conditions, hindering effective maintenance planning and resource allocation. This poses challenges for road maintenance authorities, government agencies such as KeNHA, KURA, KeRRA, County Governments, and the Ministry of Transport & Infrastructure and Civil Engineers involved in road infrastructure management.

What's the Goal?

- Develop an automated road condition classification system using computer vision and deep learning.
- Assess the effectiveness of transfer learning from pre-trained models in enhancing road condition classification.
- Evaluate the impact of data augmentation techniques on model performance and generalizability.
- Identify an optimal deep learning model architecture for accurately classifying road conditions.
- Analyze the potential socio-economic impacts of implementing the automated road condition classification system

How We're Doing It

EDA & DATA PREPROCESSING

Initial analysis to understand data distribution and classes as well as to prepare it for modeling

01

MODELING

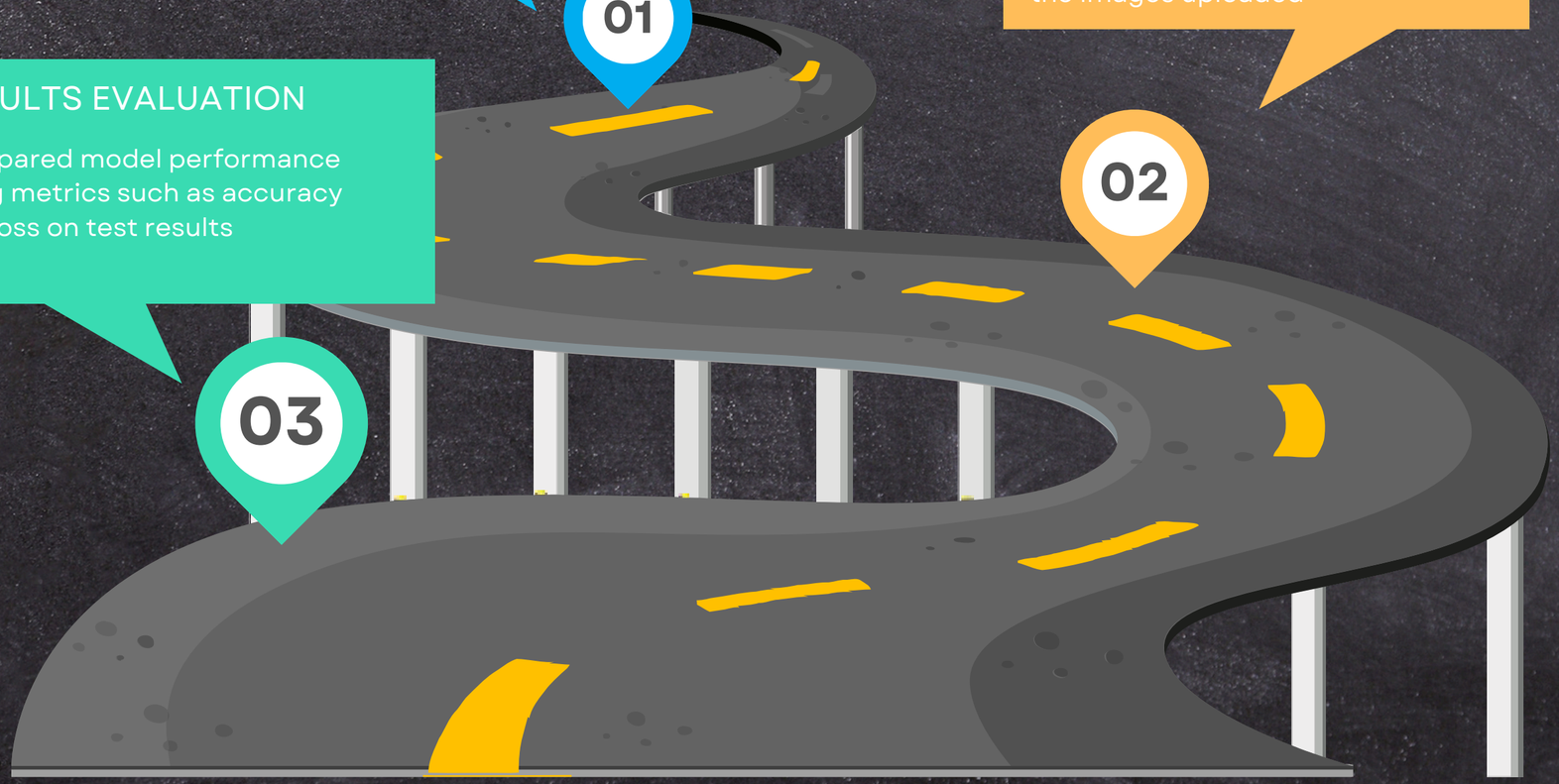
Developed and trained various Deep Learning algorithms to classify road condition based on the images uploaded

02

RESULTS EVALUATION

Compared model performance using metrics such as accuracy and loss on test results

03



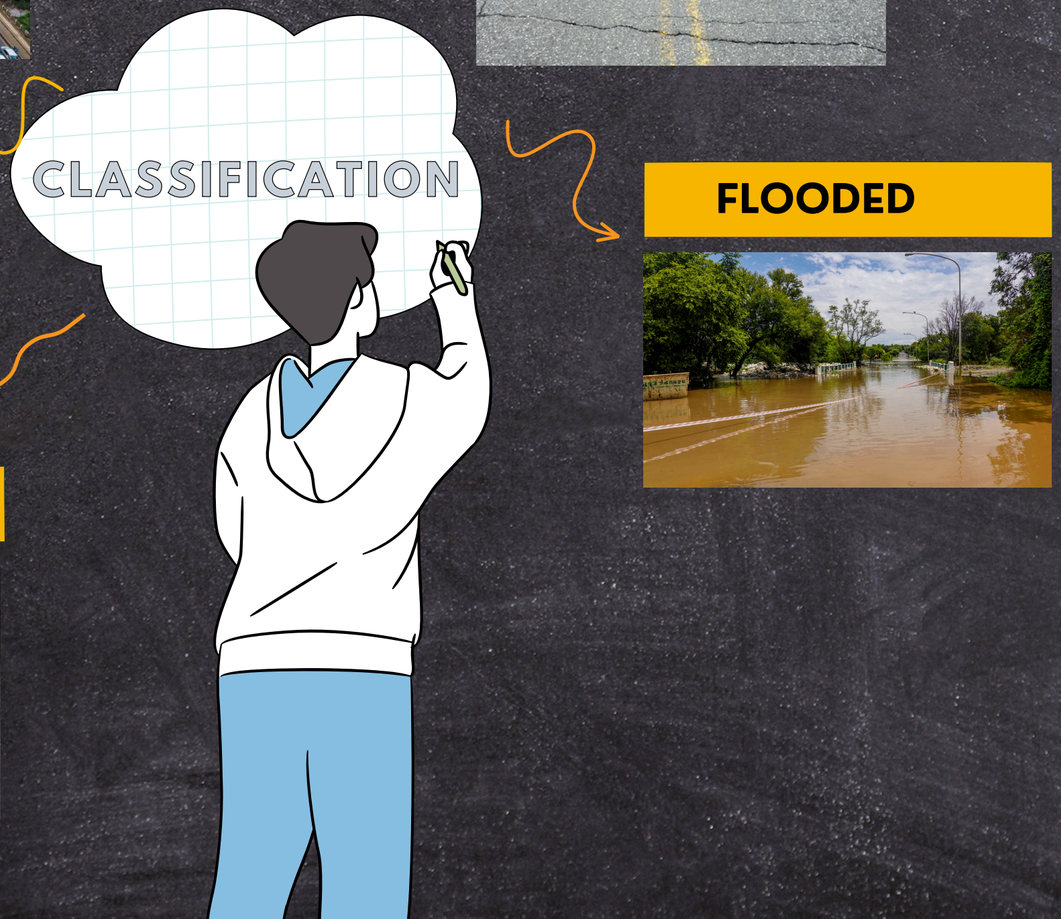
Making Sense of the Pictures

GOOD

FAIR

UNPAVED

POOR



FLOODED

Training the road classification system to categorizes roads into five distinct conditions: 'good,' 'fair,' 'poor,' 'flooded,' and 'unpaved.'

How Well Does It Work?

- Our selected optimal road classification model attained an accuracy of 91%.
- It stands out for its high efficiency, competitive performance and efficient training time.

Conclusion

Automation

Deep learning transforms road assessments, replacing manual methods with automation.

Accuracy

DenseNet model excels, ensuring accurate classification for enhanced safety and resource allocation.

Innovation

Deploying this system revolutionizes surveys, offering scalability and global adaptability.

RECOMMENDATIONS

- Integration with Geographic Information Systems (GIS)
- Development of a Crowdsourced Data Collection Platform
- Policy Development Based on Predictive Analytics
- Enhancing Training and Capacity Building
- Partnerships with Technology Providers and Academia

What's Next?

- Develop a pilot project to deploy IoT devices along critical road sections to continuously monitor conditions and gather data for real-time processing.
- Continuously expand the dataset to include more varied road conditions, especially from underrepresented regions or conditions influenced by seasonal changes.
- Develop a dedicated mobile application that allows for easier data collection.
- Develop a crowdsourcing platform to engage more community members in data collection, possibly offering incentives for contributions.

SCAN THE QR CODE TO VISIT THE APPLICATION

MEET THE TEAM

Stephen Kariuki

Collins Wanjao

Lisa Maina

Valerie Vinya

Wilkins Nzioka


Q
A

Thank you

Appendix

Visualization of the Kenyan Roads Distribution

Use this LINK to proceed to the interactive dashboard.