ROAD DAMAGE DETECTION USING YOLOv8

P. J. S. SUJITH (Y20ACS522)
K. SANDEEP (Y20ACS482)
M. V. SUBHASH (Y20ACS503)
R. L. SINDHU (Y20ACS545)

Supervised By:
MR. S.NAGA CHANDRA SEKHAR

Table of Contents

- Abstract
- Objective
- Existing System
- Proposed System
- Design Methodology
- Hardware and software Requirements
- Results
- Conclusion

ABSTRACT

- Road damage detection is crucial for infrastructure maintenance and safety, particularly in challenging conditions like monsoons.
- The proposed solution utilizes the YOLO algorithm, employing CNNs for real-time detection and classification of various road damages, primarily cracks, across seven categories.
- Evaluation results indicate significant improvement in detection accuracy using YOLOv8, enhancing safety and enabling timely repairs through advanced object detection techniques.

OBJECTIVE

- This project is to develop an road damage detection system using UAV images and deep learning algorithms to improve efficiency and accuracy in road infrastructure maintenance.

EXISTING SYSTEM

- Region-Based Convolutional Neural Network, are used for detecting road damage images and it come under two stage approach.
- YOLO algorithms is another approach for detecting road damage images and it come under one stage approach

LIMITATIONS

- Generally slower processing times compared to single-stage methods, limiting applicability in real-time applications

DESIGN METHODOLOGY

- Collect Images of damaged road
- Labels Creation for Images
- Dataset Division
- Train Using YOLOv8 Model
- Model Evaluation
- Detect Road Damage

Collect Images of damaged road

Begin by gathering a dataset of road images. These images should cover various road conditions, including damaged areas. Ensure that the dataset is diverse and representative of real-world scenarios.

Labels Creation for Images

Annotate the collected images with labels. For road damage detection, you'll need to label specific regions within the images where damage occurs. Common labels might include "pothole," "crack," etc.

Divide the Dataset into 3 Units

Divide the dataset into three subsets: train, valid, and test. The train subset is used for model training. The valid subset is for validation during training. The test subset evaluates the model's performance.

Train Using YOLOv8 Model

While training we use YOLOv8 (You Only Look Once version 8) is an efficient object detection model. Train the YOLOv8 model on your labeled dataset. The model will learn to detect road damage based on the annotated regions.

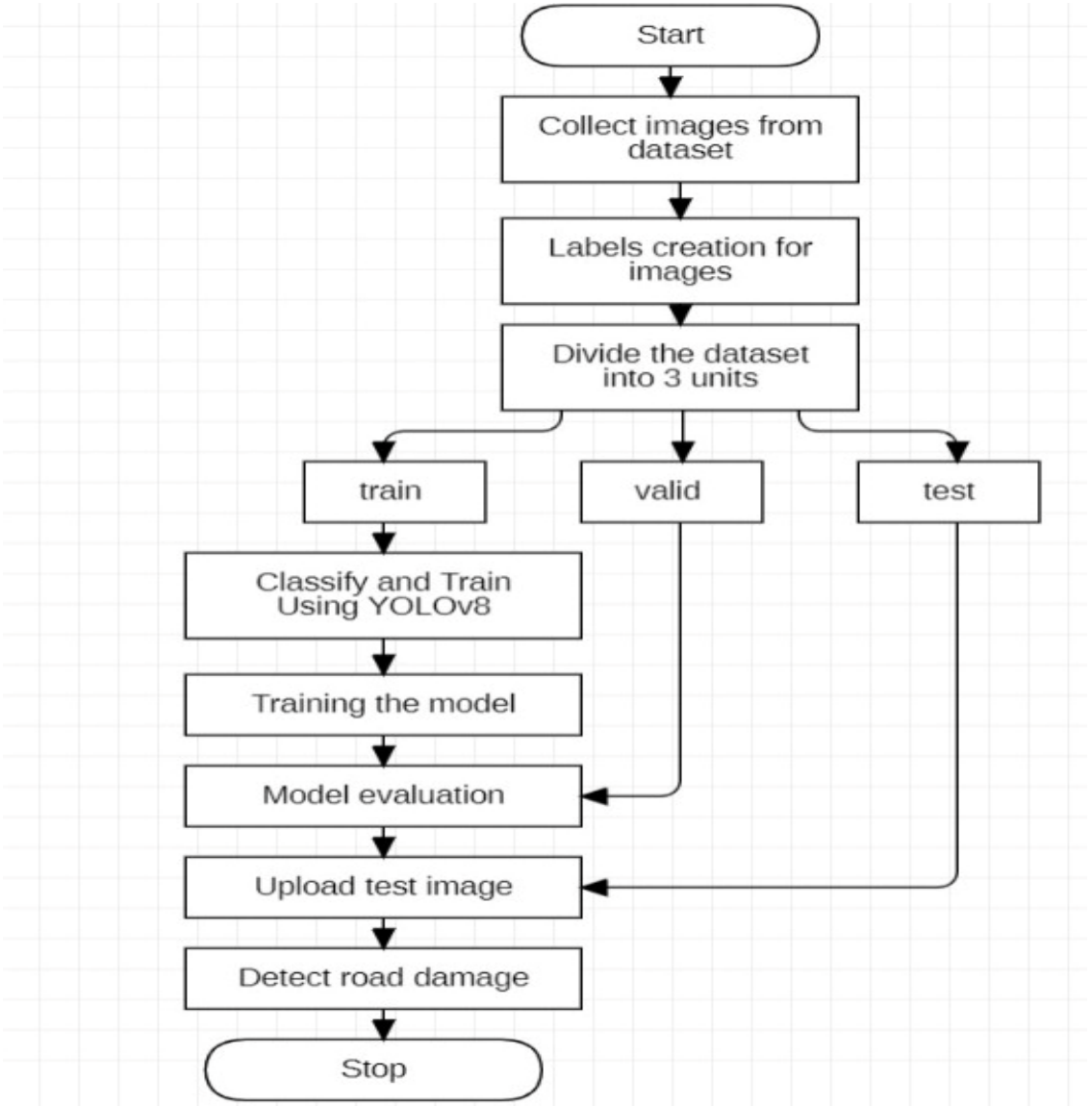
Model Evaluation

After training, evaluate the model's performance on the validation set. Metrics to consider include precision, recall, and F1-score. Fine-tune the model if necessary.

Detect Road Damage

Run the trained YOLOv8 model on the test image. The model will identify and highlight regions where it detects road damage.

Flow Chart


Start
Collect images from dataset
Labels creation for images
Divide the dataset into 3 units
train
valid
test
Classify and Train Using YOLOv8
Training the model
Model evaluation
Upload test image
Detect road damage
Stop

HARDWARE AND SOFTWARE REQUIREMENTS

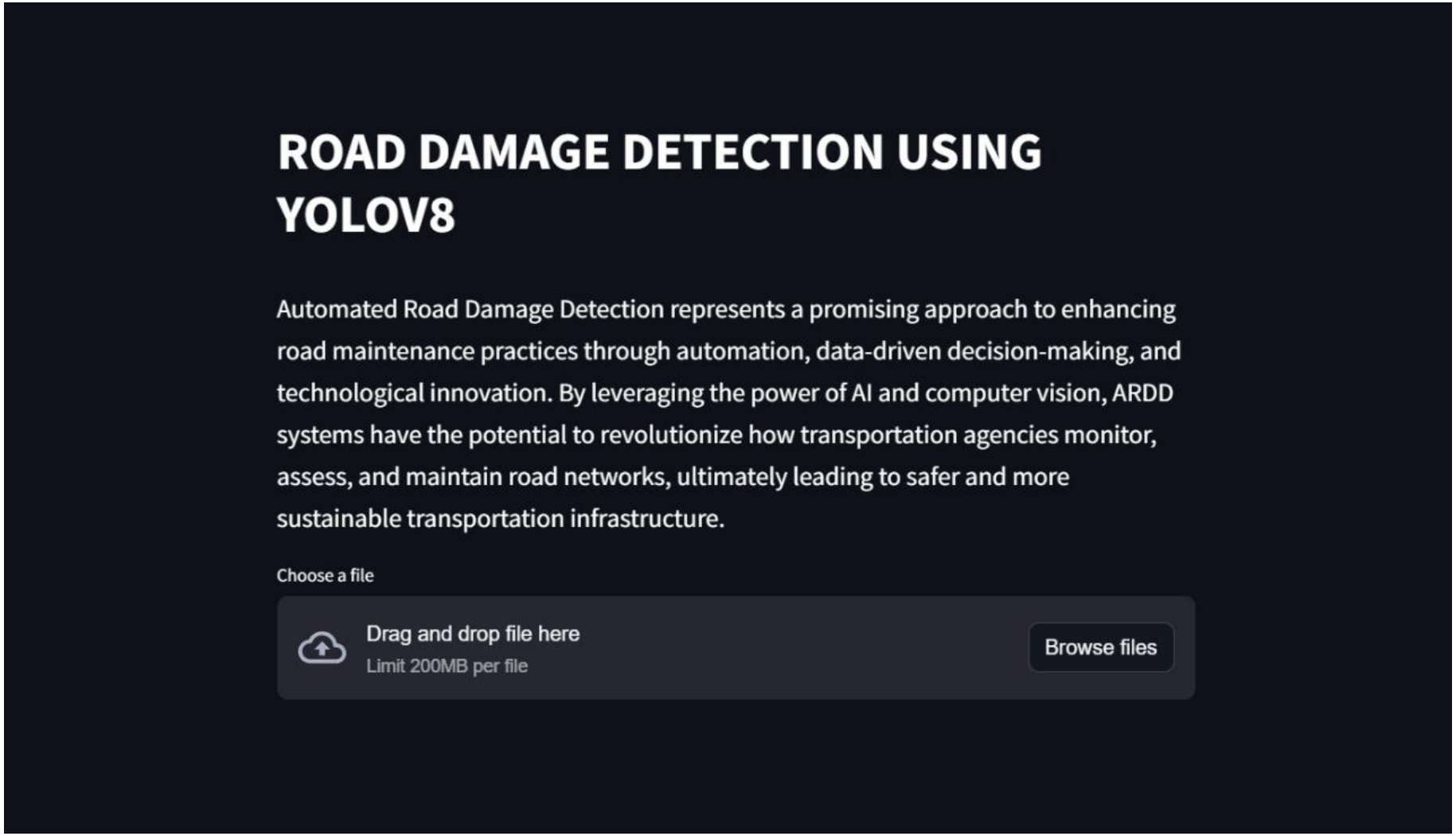
Hardware Requirements:

- RAM: A minimum of 8 GB
- Processor: x64 based Intel or AMD processor.
- Hard disk: A minimum of 20 GB of available space.

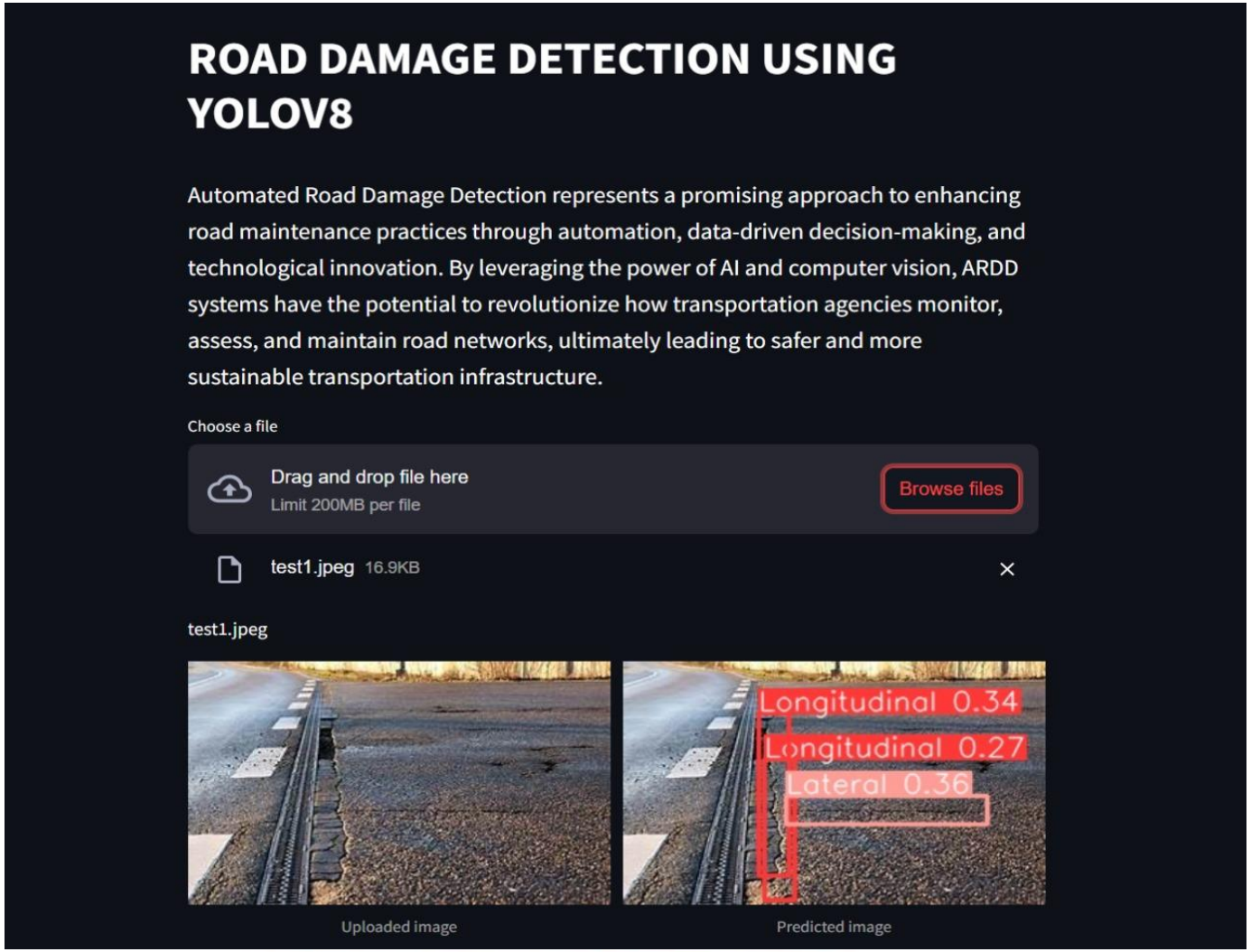
Software Requirements:

- Operating System: Windows 7 and above
- Programming language: Python
- Supporting libraries: Tensor flow, Matplotlib, Seaborn etc.

After Opening The Website



After Processing the Image



Conclusion

Road damage detection is vital for infrastructure upkeep, with machine learning and computer vision offering significant advancements. The showcased integration of Streamlit and Ultralytics YOLO model demonstrates a promising approach for automating this process.

The resulting web application facilitates real-time detection and visualization of road damage from uploaded images, empowering efficient infrastructure management and maintenance.

REFERENCES

[1] W. Wang and B. Wu, “Road damage detection and classification with faster CNN,” IEEE International Conference on Big Data, 2018 .

[2] S.T. A. K. V. S. K. a. S. V. S. Jana, “Transfer learning based deep convolutional neural network model for pavement crack detection from images,” IJNAA, vol. 13, 2022

[3] W. L. a. R. U. G. Mattyus, “DeepRoadMapper: Extracting Road Topology from Aerial Images,” International Conference on Computer Vision, 2017.

[4] D. I. E. A. Z. a. A. A. M. S. Sharif, “Utilising Convolutional Neural Networks for Pavement Distress Classification and Detection,” International Conference on Innovation and Intelligence for Informatics, 2023.

THANK YOU