



Desktop-Based Pipeline Inspection Analysis System Using Deep Learning for MFL ILI Data

Author : Napat Thipjaipa 650510619

Advisor : Dr. Worawut Srisukkhom

Company : DEXON Technology Public Company Limited.



Abstract

This cooperative education project presents the development of a desktop-based pipeline inspection analysis system for Magnetic Flux Leakage (MFL) In-Line Inspection (ILI) data. The system supports inspection data input from CSV and MFL files and employs deep learning-based object detection to automatically identify pipeline components and anomalies. Inspection results are visualized through an interactive user interface and further processed for engineering analysis and report generation. Experimental results show that the system achieves a maximum mAP@50 of approximately 0.88 for component detection, while anomaly detection achieves an mAP@50 of approximately 0.54, demonstrating its effectiveness in reducing inspection workload and supporting pipeline maintenance decision-making in industrial applications.



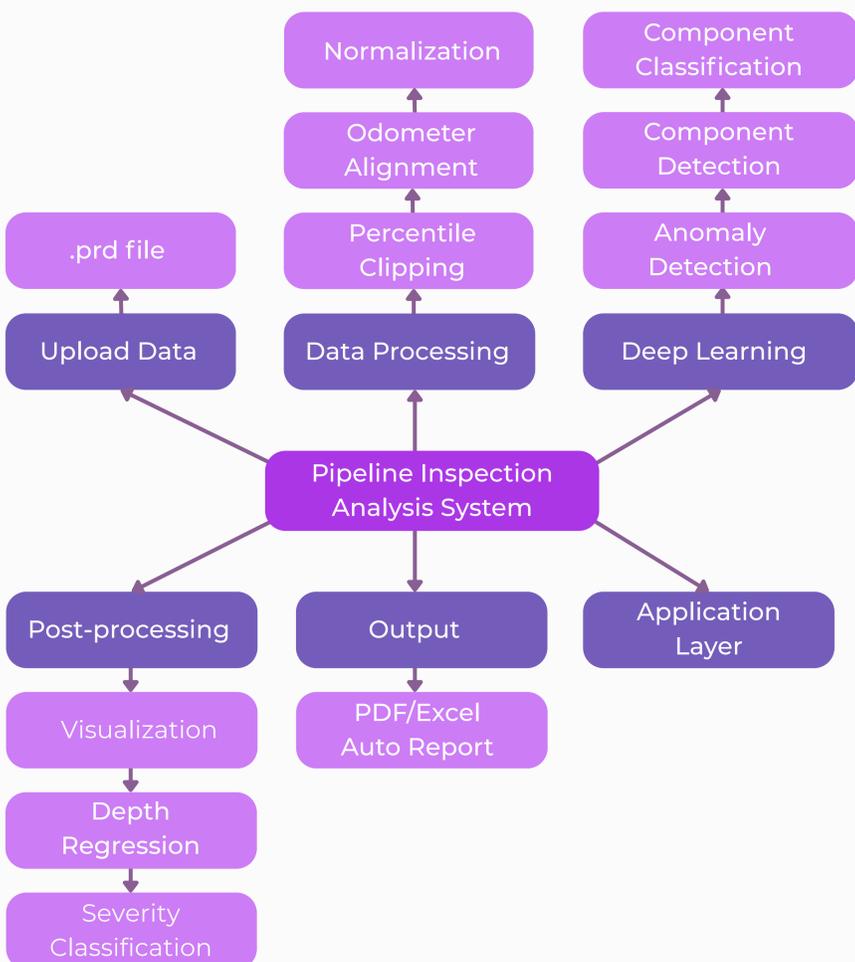
Introduction

Pipeline integrity management is essential for ensuring safety and reliability in industrial pipeline operations. Magnetic Flux Leakage (MFL) In-Line Inspection (ILI) is widely used to detect corrosion, metal loss, and structural anomalies by collecting high-resolution sensor data along pipelines. However, the interpretation of raw MFL data is complex and traditionally relies on manual analysis, which is time-consuming and may lead to inconsistent results.

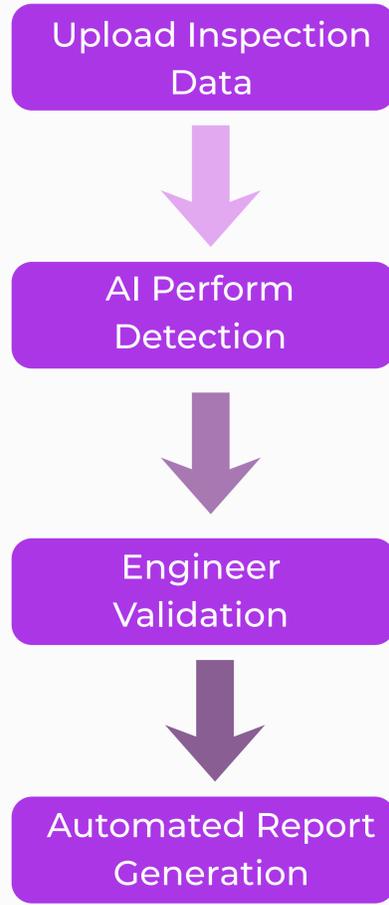
This cooperative education project presents the development of a desktop-based pipeline inspection analysis system designed to support systematic defect detection and interpretation of MFL ILI data. The system allows users to load inspection data from binary MFL files and interactively visualize inspection results through an intuitive graphical interface. By integrating deep learning-based object detection, the system automatically identifies pipeline components and anomaly regions, reducing manual workload and supporting reliable decision-making for pipeline maintenance.



Methodology



Work Flow



Technologies



Conclusion

This project demonstrates a practical desktop-based pipeline inspection system that integrates MFL visualization and deep learning-based detection. The system effectively supports component and anomaly identification, reduces manual inspection effort, and provides structured outputs for engineering evaluation and reporting. The proposed approach enhances inspection efficiency and offers a scalable foundation for future AI-driven pipeline integrity management.