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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

ONE LOVE. ONE FUTURE.

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Welding defects detection on Embedded systems

Le Hai Anh

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I-Current Situation

Welding Process operations lack of cheap, light weight test devices

Fig 1: Automotive Manufacturing

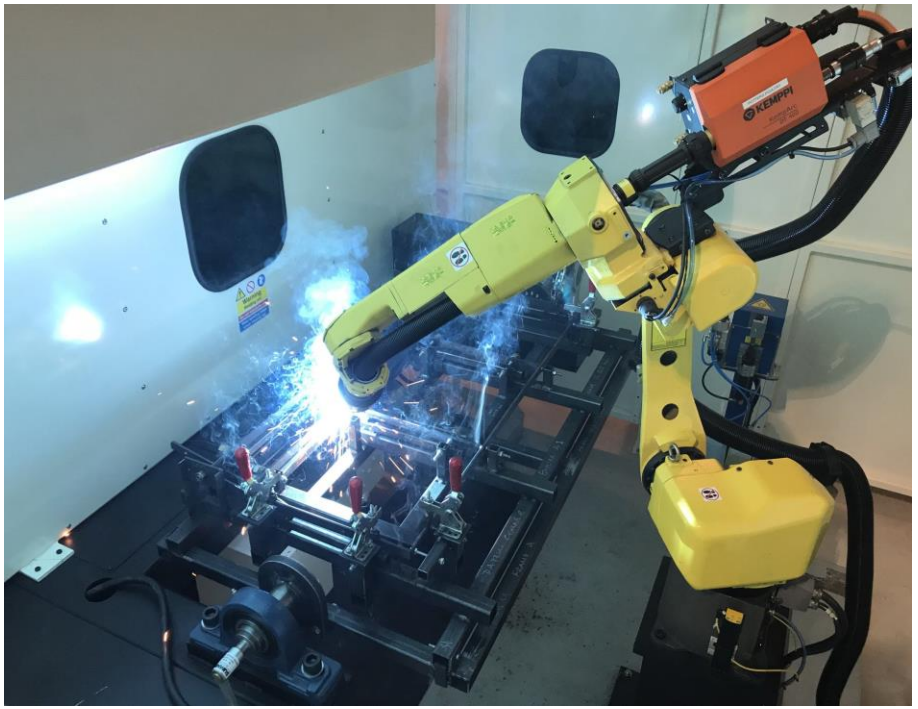


Fig 2: Welding System

I-Current Situation

Resource for Predictive Maintenance, particularly Welding Defects Detection

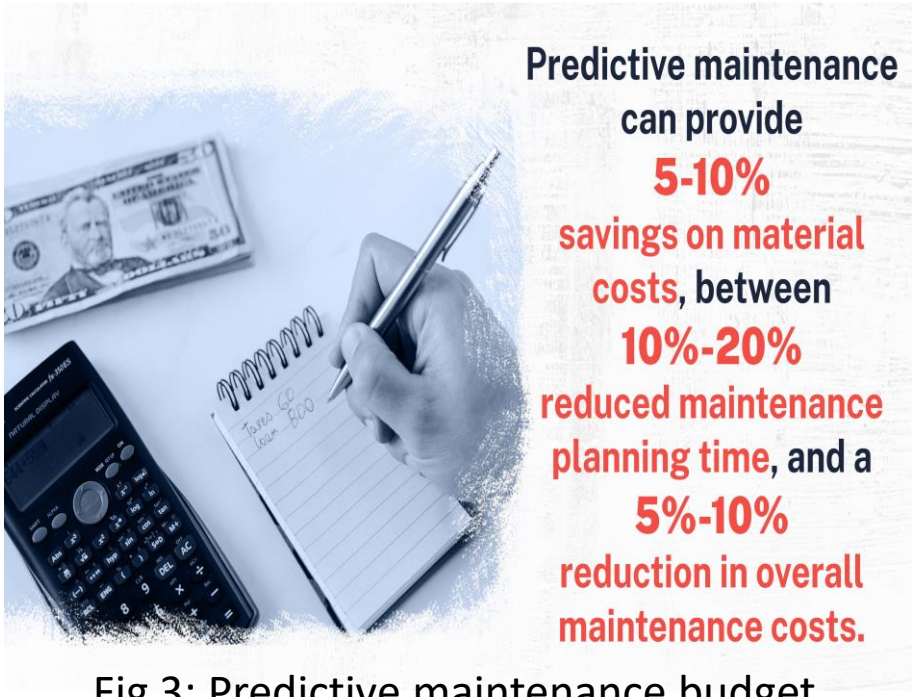


Fig 3: Predictive maintenance budget

Fig 4: Reduce Labor Forces

II-Root Cause

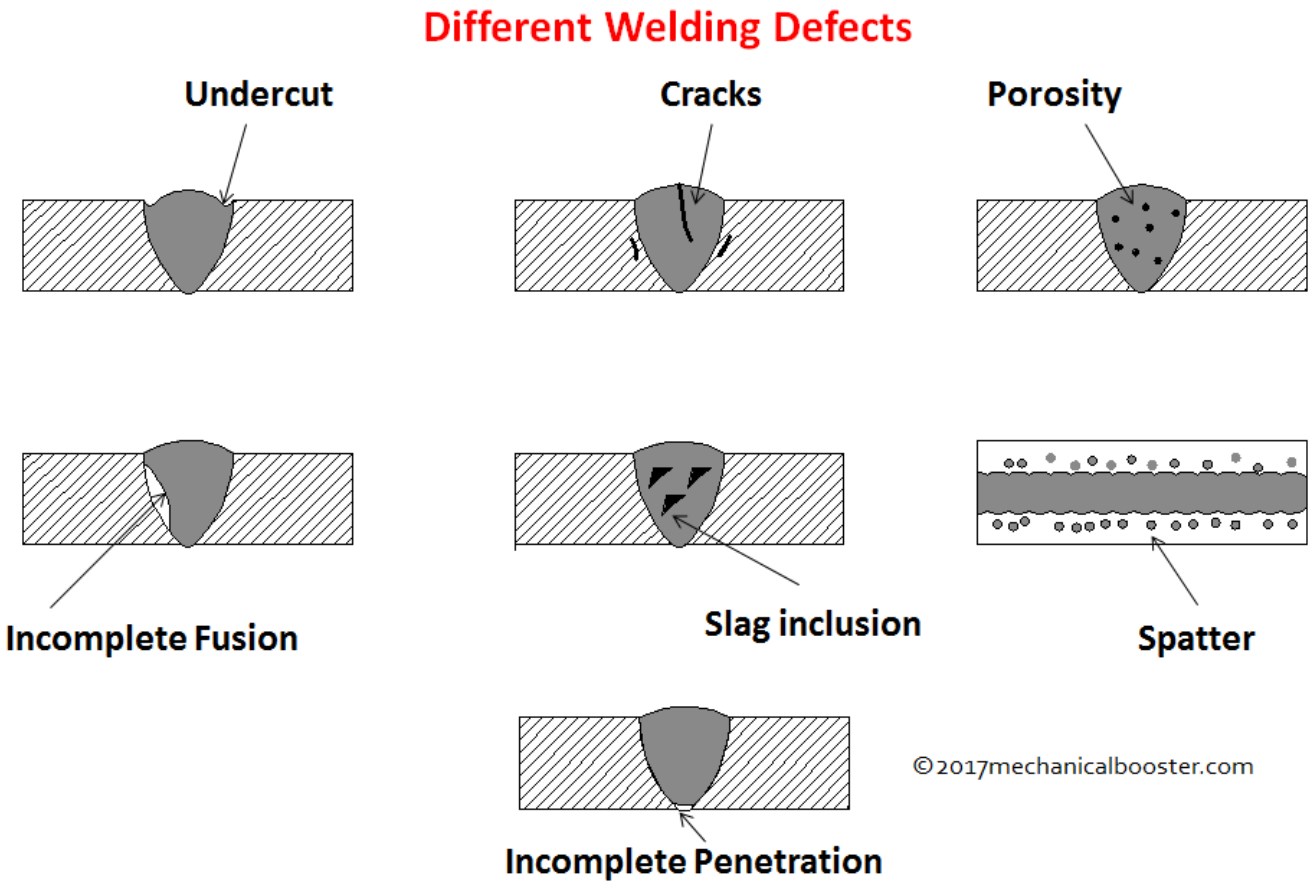


Fig 5. Common Defects

III-Target Audience & Market Potential

Fig 6: Potential markets

IV-Solution with Actionable Steps Concept Diagram,

System Requirements

- Detect all welding faults with >95% accuracy for surface faults.
- Detects 5-10 objects/second (appropriate with operation speed).
- Flexible, cost-effective < 100 dollar/devices , and adaptable to various setups.
- Supports upgrades and data collection for retraining.
- High security and compatible with packaging devices.

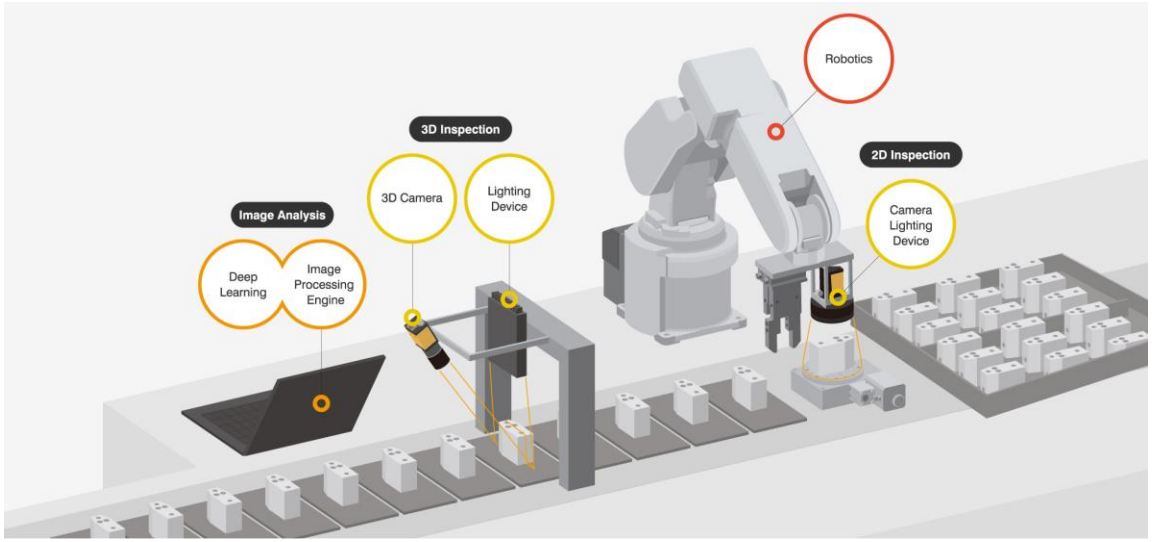


Fig 7: System Design

V-Flow

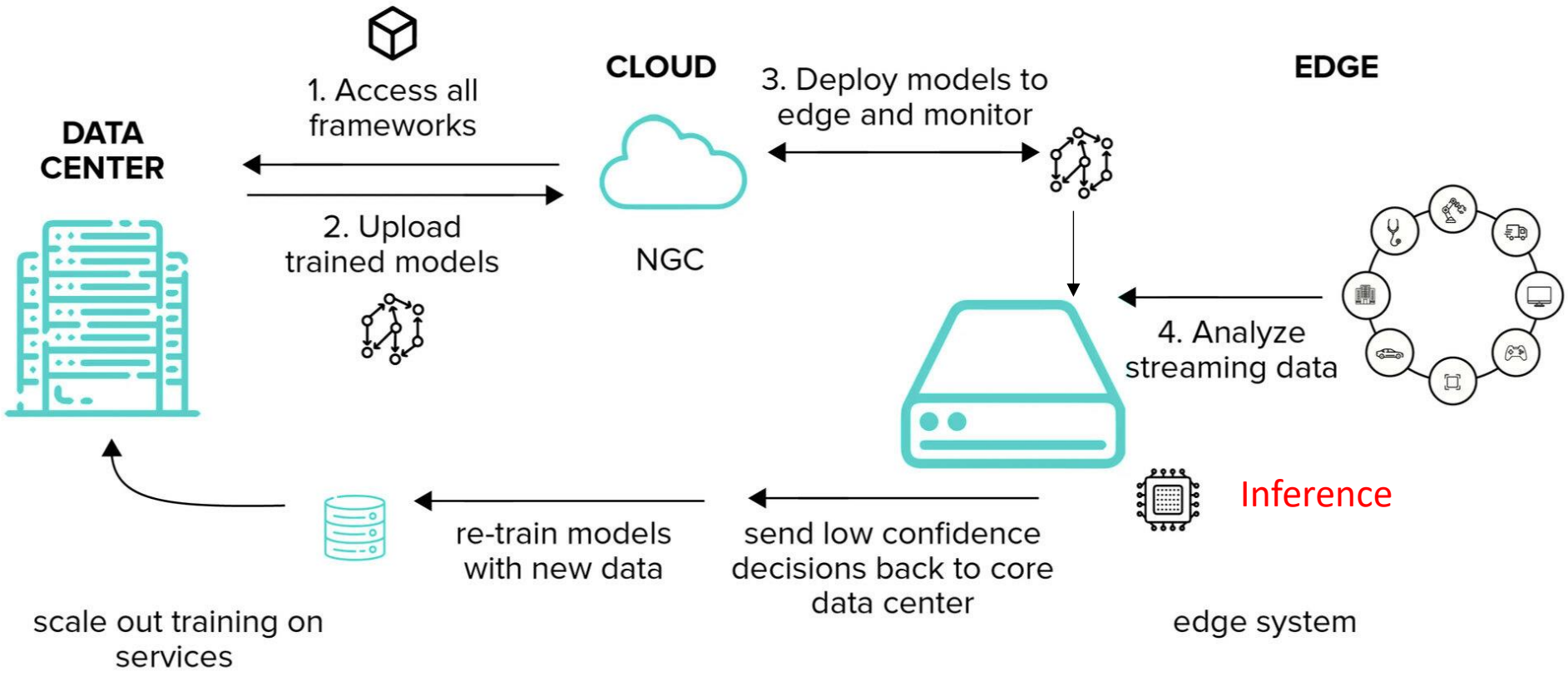
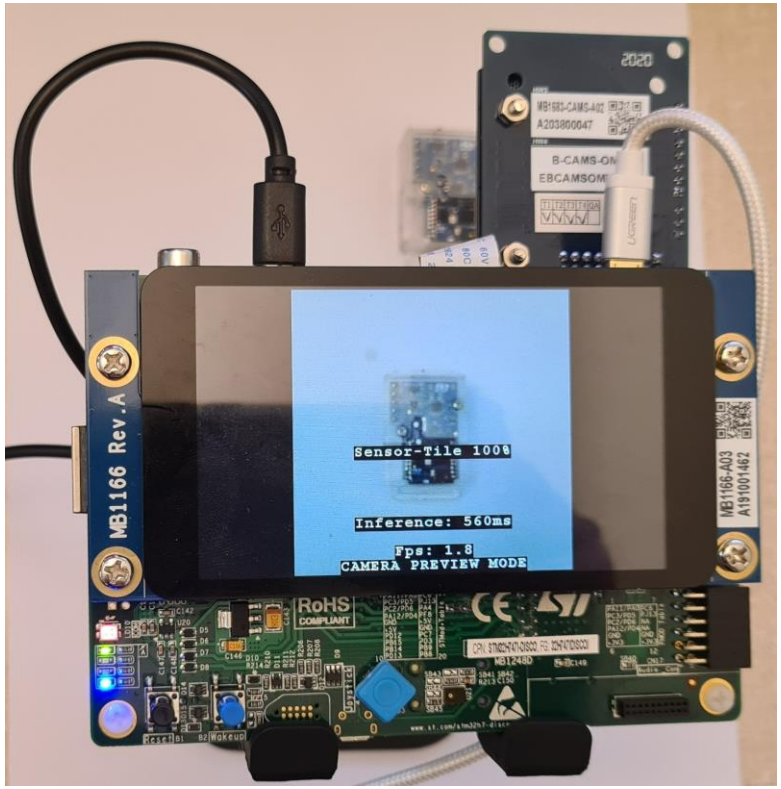


Fig 8: System Flow

VI-Innovation & Creativity

STM32 Series



Raspberry PI-4 with multi options

Fig 9: Recommended Hardware Devices

VII-Architecture Comprehensiveness of the proposal

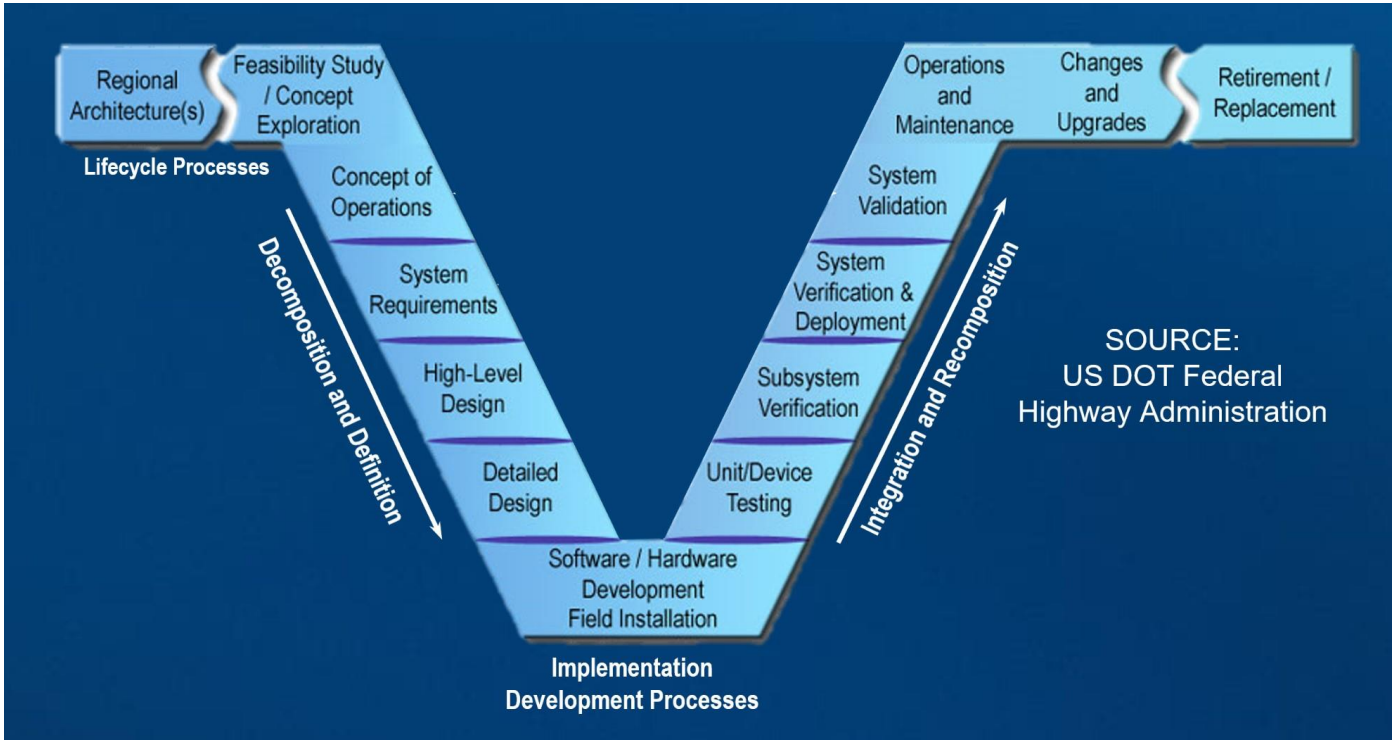


Fig 10: MBSE

VII-Architecture Comprehensiveness of the proposal

A- Data Collection and Processing

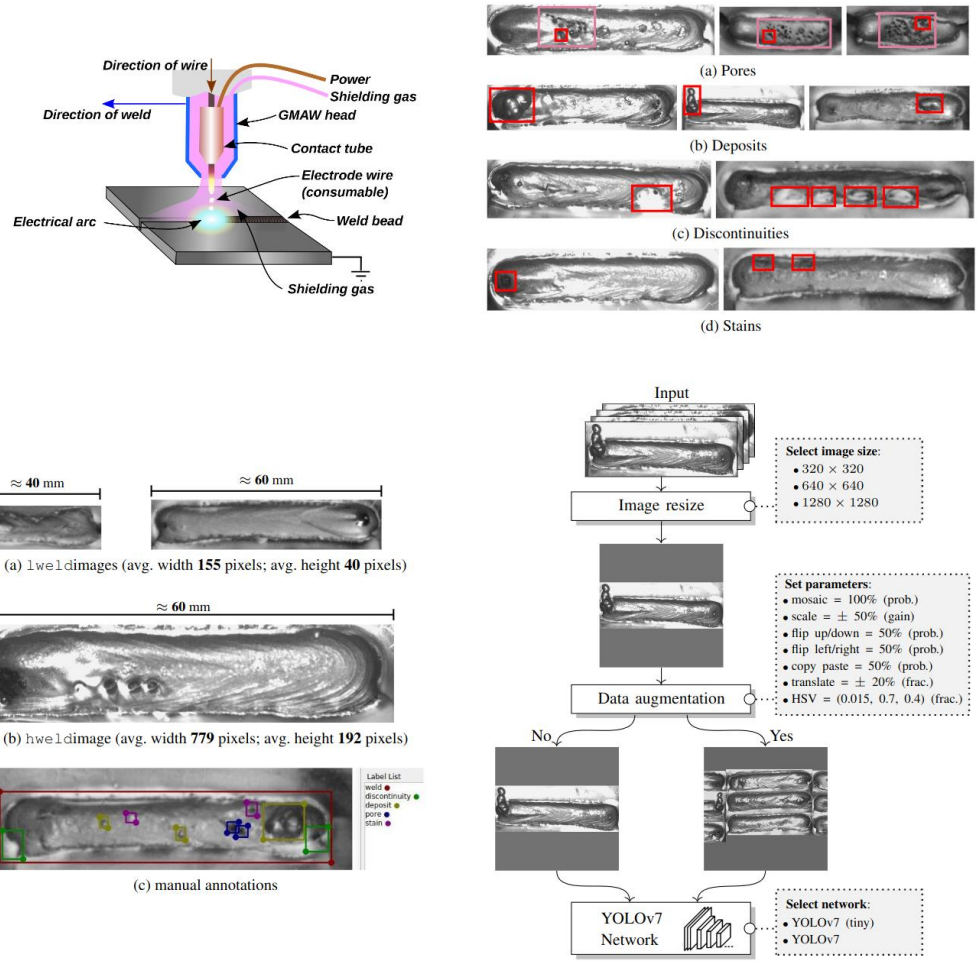


Fig 10: Data collection and pre-processing

VII-Architecture Comprehensiveness of the proposal

B - Framework

TensorFlow Lite

OpenCV

ultralytics YOLO11

Fig 10: Frameworks for development

VII-Architecture Comprehensiveness of the proposal

C- Model Selection

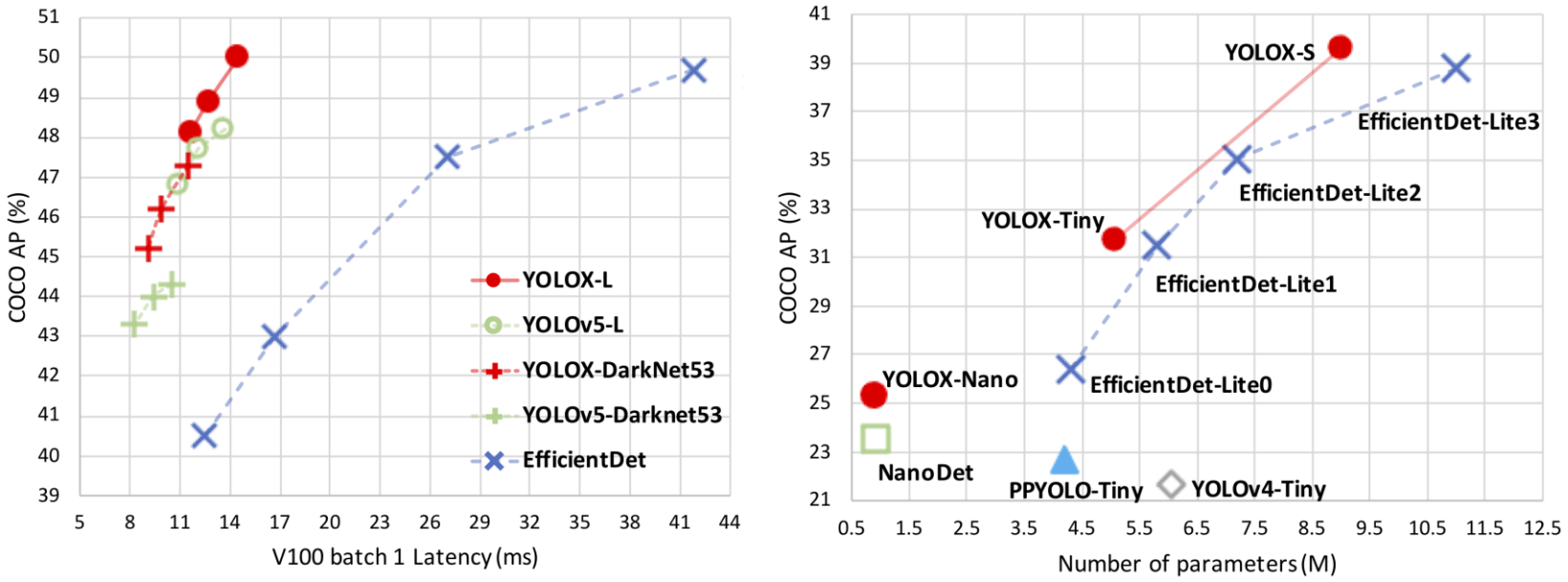
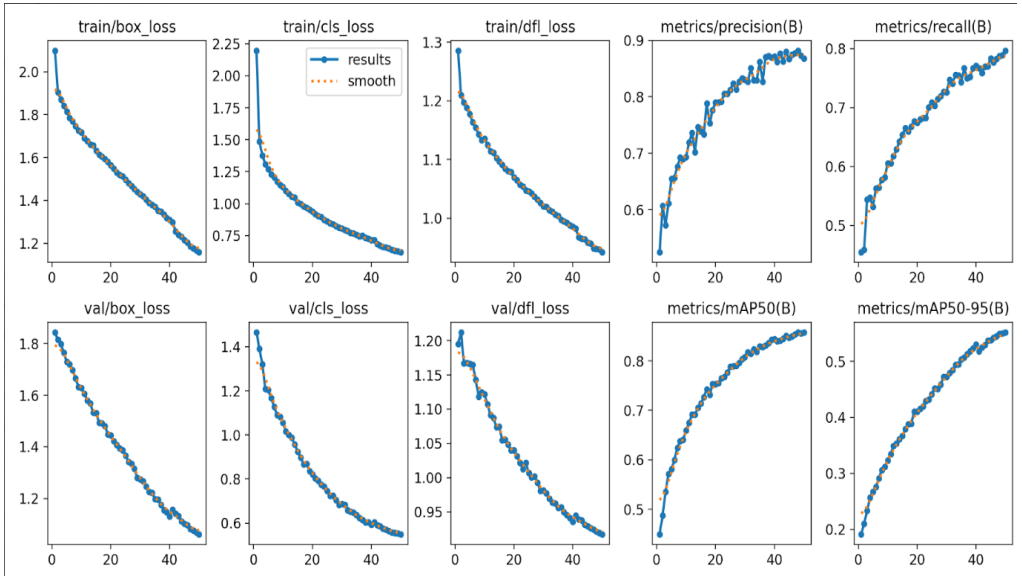
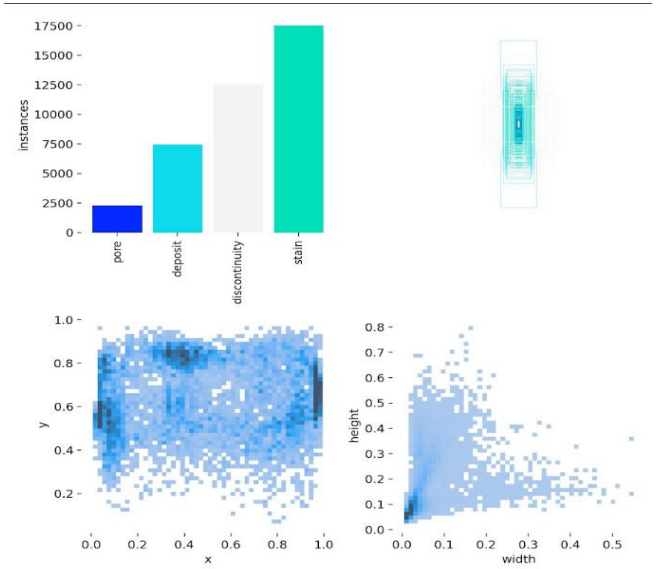
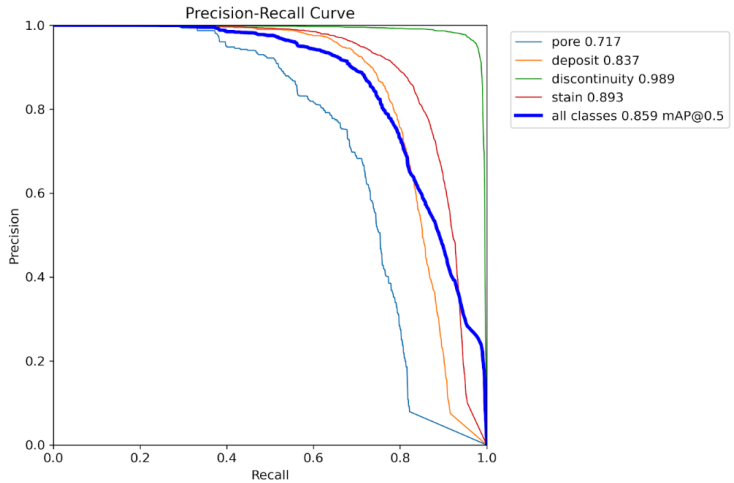


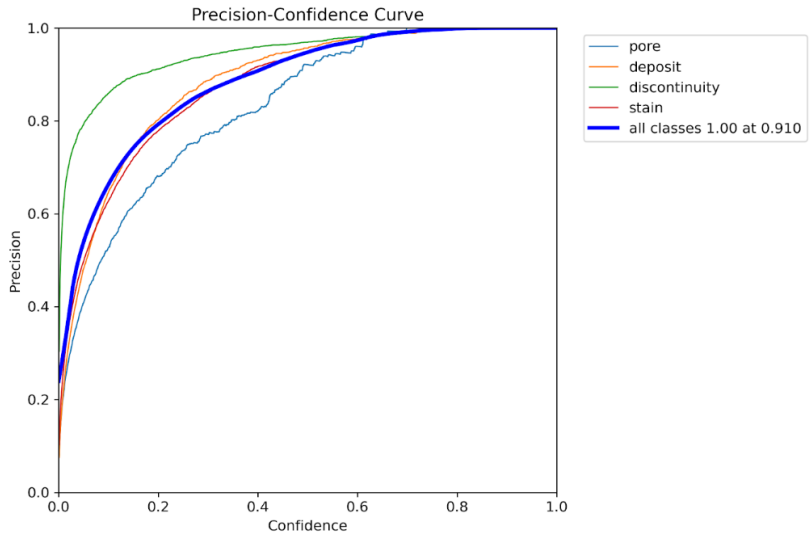
Fig 11: Model comparison

VIII – Experiments results

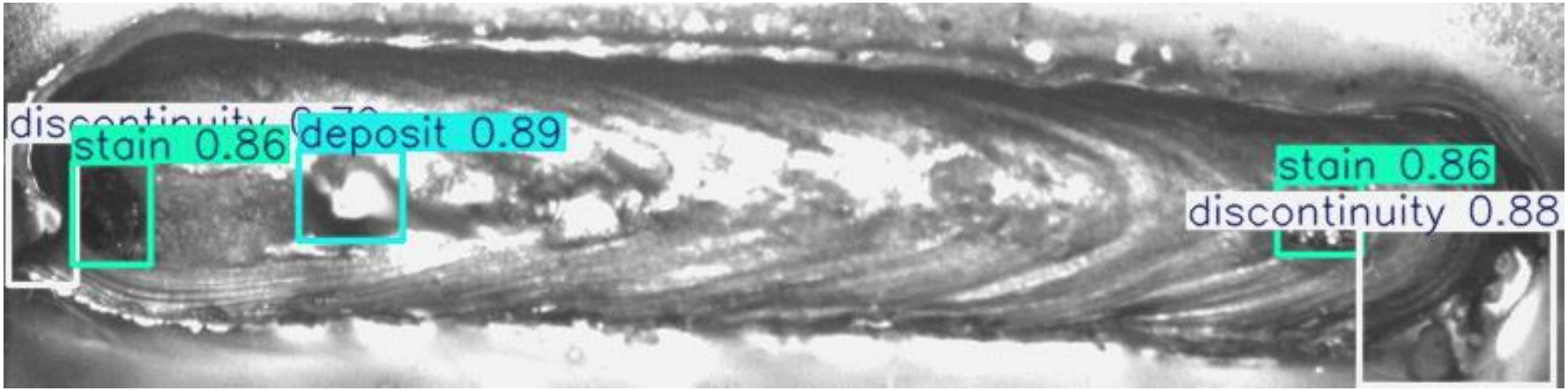








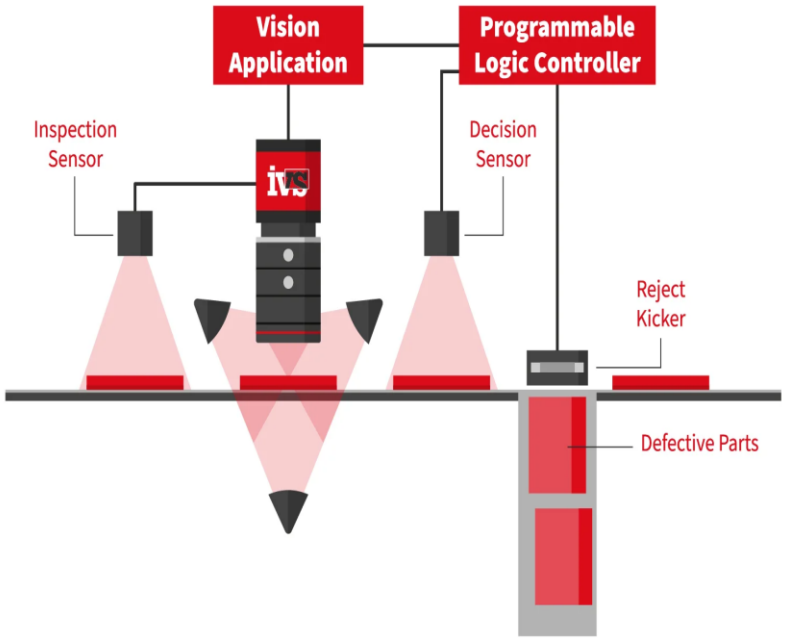
IX - Product quality and completion



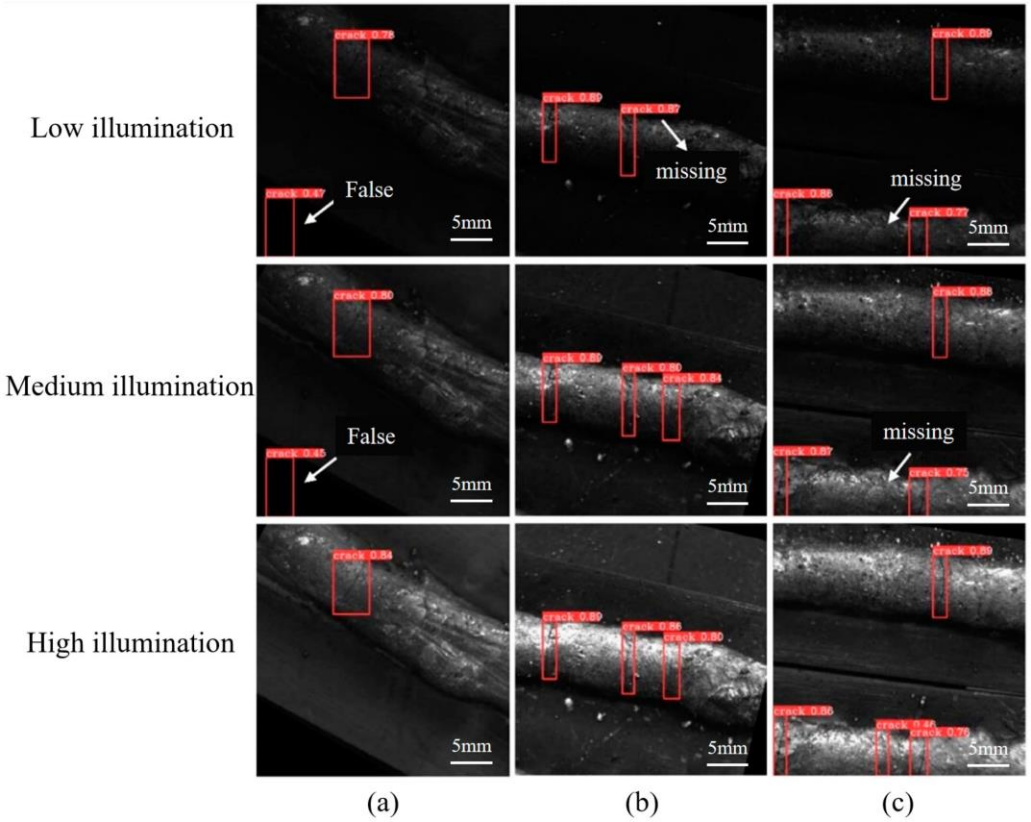
X-Development in the future

What can improve

System design



Data quality



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