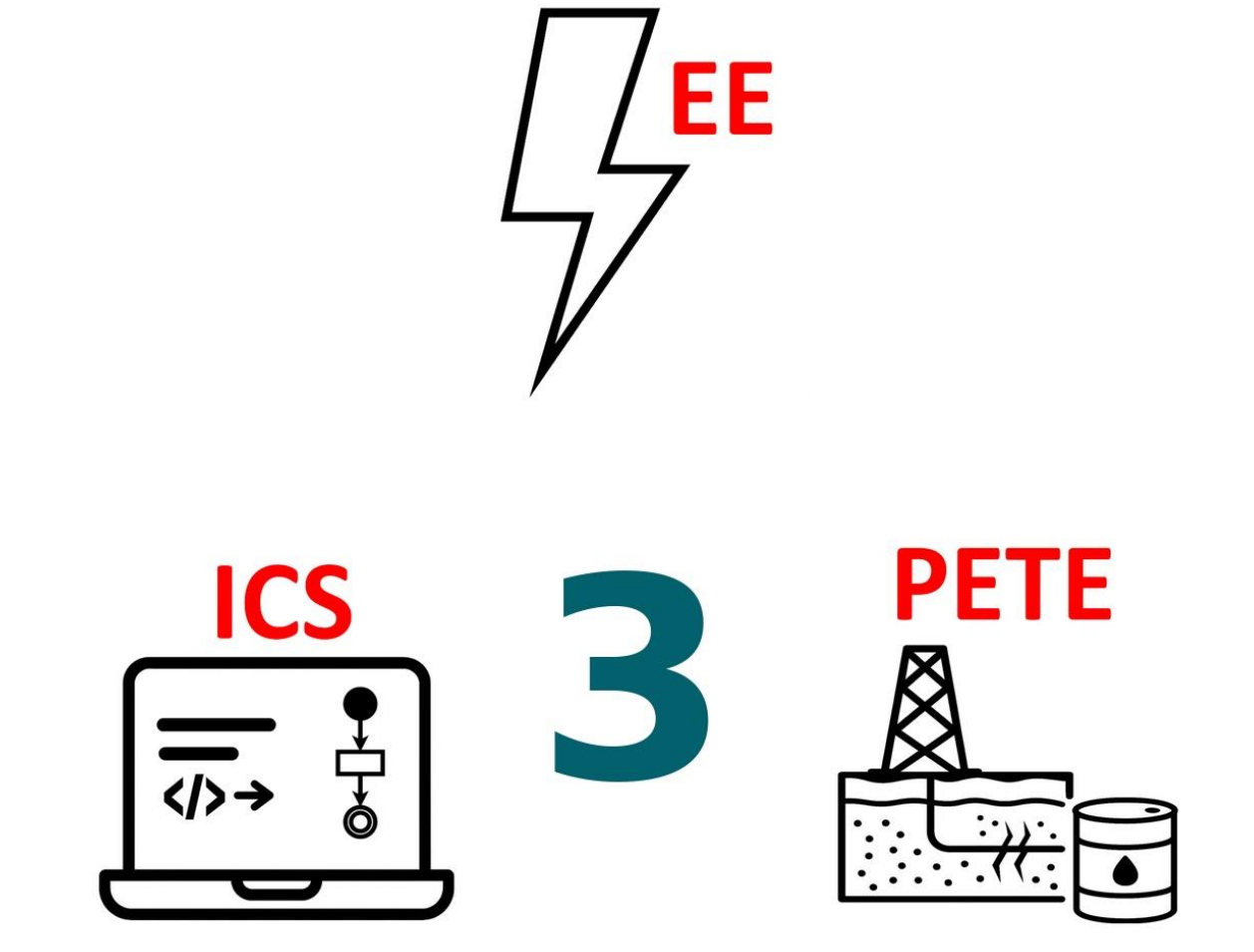


# TEAM F041

# An intelligent pipeline integrity system that predicts failures and deploys inspection only where needed

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## Overview

This project develops an AI-integrated robotic system for real-time corrosion detection and direct integrity assessment, including corrosion severity, wall loss, and failure risk.

## AI Corrosion Detection

RAW IMAGE

DETECTED IMAGE

Corrosion %	Severity	Confidence	Regions
<b>55.93%</b>	<b>Heavy</b>	<b>0.74</b>	<b>2</b>

**W22 EASTERN GOLDFIELDS GAS PIPELINE CASE STUDY**  
INSPECTION ROUTE OVERVIEW

## Prototype Design

**Corrosion Segmentation Dashboard**

Corrosion Detection  
AI Corrosion Analysis

Live Monitoring

Saved Images

Detection History

**Live Monitoring**

Mode: YOLO Segmentation Camera: Online

Corrosion %	Severity	Confidence	FPS	Regions
<b>2.73%</b>	<b>Light</b>	<b>0.82</b>	<b>11.36</b>	<b>3</b>

Live feed active | FPS: 11.36 | Regions: 3 | Severity: Light | Corrosion: 2.73%

**Controls**

Start Camera Stop Camera

Save Detection Toggle Detection

Test Saved Image

Predicts failures early

Prioritizes high-risk locations

Reduces inspection costs

Improves safety & reliability

- HD camera for visual inspection
- LED illumination for clear imaging
- Real-time data transmission
- Durable design for pipeline navigation

## Technical Requirements

### Key Specifications

- ML accuracy  $\geq 85\%$
- Detection accuracy  $\geq 85\%$
- Remote control & real-time data transmission
- Alert triggered at  $\geq 6\%$  wall loss

## Testing & Validation

**PIPELINE INTEGRITY & CORROSION DASHBOARD SUMMARY**

**Pipeline Integrity & Corrosion Dashboard**  
5-year corrosion review across pipeline segments | Alert = wall loss  $\geq 6\%$  | Fail = remaining wall  $\leq 0.300$  mm

Excel: pipeline\_integrity\_dashboard\_treatment\_for\_our\_senior\_project.xlsx [Load Excel File](#)

Total Network Length (mi)	Worst Corrosion Rate (mpy)	Minimum Remaining Wall (in)
<b>176.3</b>	<b>7.2</b>	<b>0.159</b>
Fail Locations	Alert Locations	Peak Pressure (psia)
<b>0</b>	<b>527</b>	<b>1400.0</b>
Highest Risk Score	Shortest Remaining Life (yr)	Thickest Wall (in)
<b>3</b>	<b>10.9</b>	<b>0.197</b>

Segment Summary Charts Treatment Plan

**Reading Guide**

- Higher corrosion rate and wall-loss % mean faster metal loss.
- Fails = remaining wall is 0.300 mm or less.
- Alerts = wall loss reaches 6% or more.
- Remaining life = (nominal wall - 0.300) / corrosion rate.
- Data source: Dashboard\_Data sheet.

Segment	Length (mi)	Wall Thickness (in)	Max Risk	Max Corr Rate (mpy)	Max Wall Loss (% WT)	Min Remaining Wall (in)	Min Remaining Life (yr)
Forbes	5.068	0.189	3	3.884	0.103	0.170	18.2

**PROTOTYPE TESTING**

**DATA MONITORING**

===== FINAL RESULTS =====

Total Samples: 331

Detection Accuracy: 93.05%

Severity Accuracy: 80.36%

Mean Area Error: 9.83%

Samples with Area Error  $\leq 7\%$ : 181/331 (54.68%)

