1st Proposal: Predictive Maintenance for Hydrogen Generators Using Sensor Data

Background & Motivation

Hydrogen generators are critical for analytical labs. Failures cause downtime and safety risks. Predictive maintenance using ML can optimize servicing and reduce costs.

Objectives

Develop ML models to predict failures in hydrogen generators using sensor data.

Scope

Focus on electrolytic hydrogen generators.

Methodology

Collect historical sensor data, preprocess, train ML models, evaluate performance, deploy predictive dashboard.

Expected Outcomes

Early failure detection, reduced downtime, improved reliability.

Deliverables

ML model, dashboard prototype, thesis report.

2nd Proposal: Feasibility Study of an ML-Based Evaluation System for Quality Assessment of MEA Cells in Industrial Manufacturing

Background & Motivation

MEA cells are key in hydrogen generators. Manual quality checks are slow and subjective. AI can automate scoring for consistency and speed.

Objectives

Create an AI model to score MEA cell quality based on production metrics.

Scope

Focus on MEA cells used in electrolytic hydrogen generators.

Methodology

Collect production data, define quality parameters, train supervised ML models, validate with historical quality scores.

Expected Outcomes

Automated, consistent quality scoring reducing human error.

Deliverables

AI model, validation report, integration plan, thesis report.

Selected

3rd Proposal: 24/7 AI-Powered Technical Support Agent for Troubleshooting VICI products

Background & Motivation

Global customers need instant support. Human-only support is costly and limited. AI can provide 24/7 troubleshooting assistance.

Objectives

Develop an NLP-based chatbot for real-time troubleshooting of VICI products.

Scope

Cover chromatography systems, gas generators, and valves.

Methodology

Build knowledge base, train NLP model, integrate with support portal, test with real queries.

Expected Outcomes

Reduced response time, improved customer satisfaction.

Deliverables

Chatbot prototype, knowledge base, thesis report.

4ᵗʰ Proposal: Computer Vision for Comprehensive Inspection of All Components Prior to Assembly

Background & Motivation

Defective components lead to assembly issues and failures. Manual inspection is slow and error-prone. Computer vision can automate this process.

Objectives

Develop a CV system to inspect all components before assembly.

Scope

Apply to valves, fittings, electronics, and MEA cells.

Methodology

Collect image dataset, train CNN models, validate detection accuracy, integrate with production line.

Expected Outcomes

Improved quality assurance reduced defective assemblies.

Deliverables

CV model, integration plan, thesis report.

5th Proposal: ML-Driven Automated Firmware Testing for Custom Electronic Boards

Background & Motivation

Firmware bugs cause delays and failures. Manual testing is time-consuming. ML can predict and automate test cases.

Objectives

Create ML models to automate firmware testing for custom boards.

Scope

Focus on electronics used in VICI instruments.

Methodology

Collect firmware logs, identify failure patterns, train ML models, automate test execution.

Expected Outcomes

Faster testing cycles, improved firmware reliability.

Deliverables

Automated testing framework, ML model, thesis report.

6th Proposal: Computer Vision-Based Interactive Training System for Employees Across All Product Lines

Background & Motivation

Training new employees on complex products is resource intensive. CV can provide interactive, visual guidance.

Objectives

Develop a CV-based system for employee training on VICI products.

Scope

Applicable to all product lines: valves, generators, electronics.

Methodology

Capture assembly videos, train CV models for step recognition, build interactive training interface.

Expected Outcomes

aster onboarding, reduced training costs, improved accuracy.

Deliverables

Training system prototype, CV model, thesis report.