COIL

Cognitive Laser

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MOTIVATION & GOALS

Industrial CO2 lasers are widely used in modern manufacturing, enabling **precision cutting, marking, engraving, and converting** applications across various industries, including food and beverage, automotive, and aerospace. This project leverages **Machine- and Deep Learning** methods to analyze **laser performance** data from **standardized tests** (12-hour and 30-minute protocols) and production data to identify differences in **performance characteristics** between laser types, components, and defect sources. Additionally, the project analyzes how **continuous operational information** can be stored and transmitted using classical and machine-learning protocols and utilized by the hardware capable of **real-time operation** and **embedded AI** capabilities.

Project FactBox

Project Name COIL
Project ID MFP II A.1-1 COIL
Duration 36 Months

Area 3
Area Analytics

Project Lead
DI Dr. Belgin Mutlu

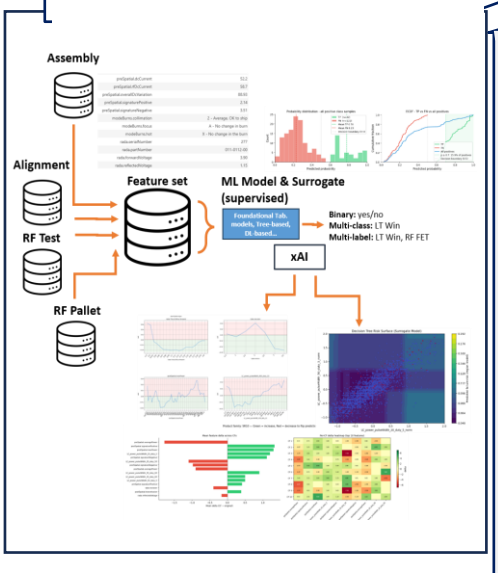
CONTRIBUTION

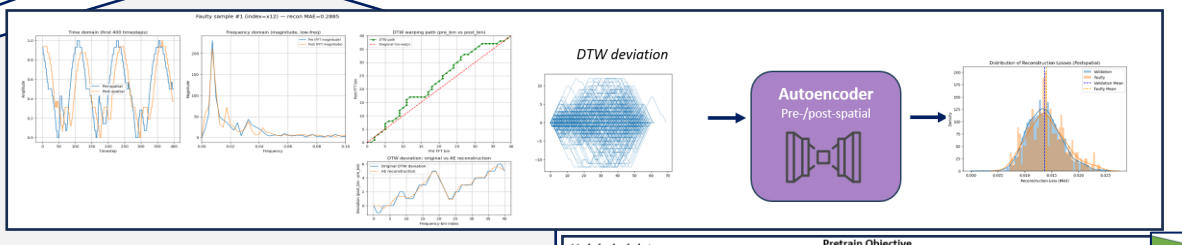
Scientific contribution
- Analytical and predictive modelling from mixed usage and test data
- Transferability and generalizability of methods across testing protocols
- Collaborative/federated learning application in laser manufacturing and usage

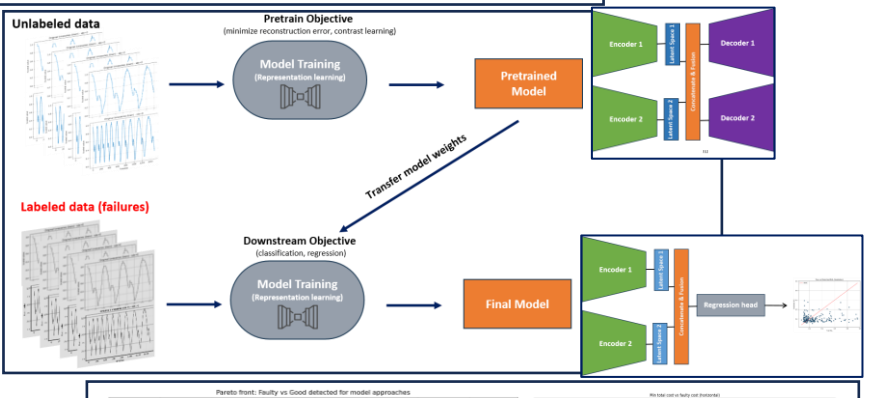
Economic contribution
- Enhanced product quality control - early detection of potential failures
- Extended laser lifespan - continuous monitoring and early intervention
- Reduced maintenance costs - predictive maintenance, remote monitoring

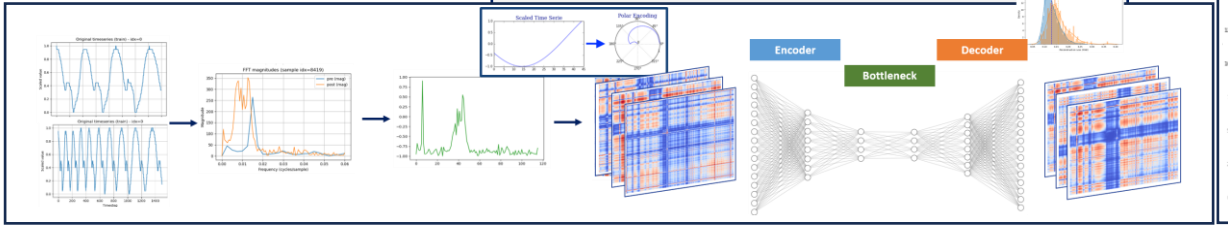
APPROACH & SYSTEM ARCHITECTURE

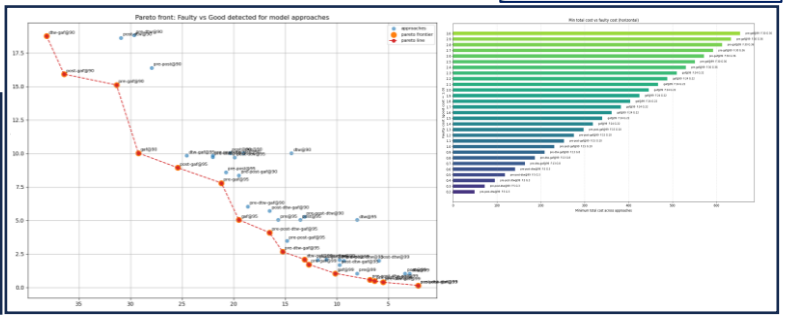
Development and Design → Sourcing parts, Supply chain → Production line/Assembly → Testing → ... → Aftersales











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IRADION CORE LASER TECHNOLOGY