

Masoud Hosseini

PhD candidate in engineering and information technology

Supervisors: Prof. Luisa F. Cabeza,
Prof. Cesar Fernandez,
Dr. Gabriel Zsembinski

Research group: GREIA (UDL)

Research topic and interests

My research focuses on the development of high-fidelity Digital Twins and artificial intelligence (AI) techniques for optimal control and energy efficiency in industrial refrigeration systems.

I combine data-driven modelling with hardware optimization to achieve zero-latency fault detection and energy-saving strategies.



AI



Digital Twin

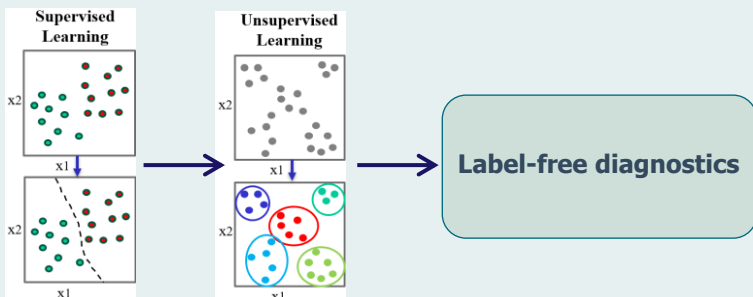


Energy efficiency

Key areas of expertise

AI & Machine learning:

- Unsupervised learning, Autoencoders, Domain Adaptive Networks.



Digital Twin & Sensor optimization:

- Sensor reduction methodologies, high-fidelity thermal modelling.



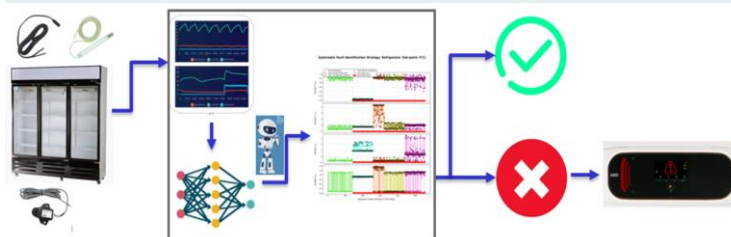
Data processing & Programming:

- Python, time-series analysis, label-free fault diagnostics.



Current work

- Development of robust, label-free Digital Twin models for industrial refrigeration units (freezers and refrigerators).
- Implementation of unsupervised anomaly detection algorithms using GMM, Kmeans, Autoencoders, and Domain Adaptive Networks.
- Topology optimization: Reducing hardware and sensor costs by omitting redundant temperature sensors.
- Integration of edge-to-cloud data processing for automated maintenance alerts.



Projects and research focus

- Unsupervised model evaluation: Comparing the performance and reliability of two advanced unsupervised learning architectures for fault detection.
- Sensor topology optimization: Investigating the impact of removing 1 or 2 primary temperature sensors to reduce hardware costs without sacrificing model accuracy.
- Generalizability & Model enhancement: Enhancing model robustness across heterogeneous refrigeration units and varying operating set-points.

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