# Assignment

### Predictive Maintenance for HVAC Pumps Using Pump Sensor Data

## Objective

HVAC pumps are critical components in heating, ventilation, and air conditioning systems, ensuring efficient circulation of fluids (e.g., water, coolant). Unexpected failures can lead to system downtime, increased energy costs, and discomfort in buildings. Predictive maintenance uses sensor data to identify patterns indicative of impending failures, allowing maintenance teams to intervene before issues escalate. This assignment leverages the Pump Sensor Data to simulate predictive maintenance for HVAC pumps, focusing on anomaly detection and failure prediction.

## Assignment Tasks

1. **Data Exploration and Preprocessing**

Deliverable: Summary and one visualization

1. **Feature Engineering**

Deliverable: List of features with justifications.

1. **Model Development**

Deliverable: Model comparison table and best model discussion.

1. **Model Deployment**

Deliverable: Deployed model code and a brief guide on accessing the API endpoint.

1. **Recommendations**

Deliverable:Summary of findings and actionable recommendations.

## **Requirements**

* **Tools**: Python (pandas, scikit-learn, Flask/FastAPI).
* **Deliverable**: Report (PDF ), code (.py/.ipynb), and API deployment guide.
* **Evaluation**: Correctness, clarity, code quality, and deployment functionality.