**TITLE:**

**“Real-Time Anomaly Detection in Industrial Equipment Using Self-Supervised Deep Learning”**

**Abstract:**IoT-enabled industrial systems generate vast amounts of sensor data, making anomaly detection critical for machine maintenance and operational efficiency. This project explores anomaly detection in industrial machine temperature data by leveraging machine learning techniques. The dataset used in this study includes temperature sensor readings collected over time, where normal machine operations and anomalies, such as machine malfunctions and breakdowns, are represented. Various machine learning algorithms were employed to detect anomalies, including Hotelling's T2, One-Class SVM, Isolation Forest, Local Outlier Factor (LOF), and ChangeFinder. Each model was trained and evaluated on both normal and anomalous data, aiming to identify deviations from standard operational patterns. Feature engineering techniques such as data normalization and time-series segmentation were applied to improve the models' performance. The primary goal was to detect anomalies early, potentially preventing machine failures and reducing downtime. The models were assessed based on key evaluation metrics such as precision, recall, F1 score, and accuracy. After thorough comparison, the Isolation Forest model emerged as the most effective, achieving an accuracy of 100%, followed by One-Class SVM with 88%, and LOF with 85%.

**Keywords**: Anomaly Detection, Industrial Machines, IoT, Isolation Forest, Local Outlier Factor, Machine Learning, One-Class SVM, Predictive Maintenance, Real-Time Data, Sensor Analytics.