# Week 3 - AI Project Cycle for Manufacturing

## PREDICTION TASK

Train models like Extreme Gradient Boosting or Random Forest for classification or regression tasks.

## DECISIONS

Identify parts at risk of failure and schedule timely maintenance before breakdowns occur.

## VALUE PROPOSITION

- **Objective**: Predict which machine parts are likely to fail soon, enabling proactive maintenance.
- **Value**: Reduce downtime, minimize maintenance costs, and improve production efficiency by preventing unexpected failures.

## DATA COLLECTION

Gather real-time and historical data from factory sensors and equipment logs.

## DATA SOURCES

IoT sensor data (temperature, pressure, vibration), maintenance logs, operational records, and historical failure data.

## IMPACT SIMULATION

Evaluate model performance using metrics such as accuracy, precision, recall, and Matthews Correlation Coefficient.

## MAKING PREDICTIONS

Generate predictions on live data streams to identify failing components.

## BUILDING MODELS

Use predictive models such as regression for remaining useful life (RUL) estimation or anomaly detection models to flag high-risk components.

## FEATURES

Sensor readings (e.g., temperature, humidity), operational metrics (e.g., runtime), maintenance frequency, and lag features indicate trends over time.

## EVALUATION AND MONITORING

- **Evaluation**: Continuously monitor model performance using metrics like F1 score and AUC. Validate predictions against actual failures to refine the model.
- **Monitoring**: Deploy dashboards to track predictions and flag anomalies in real time. Retrain the model periodically based on new data to maintain accuracy.

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