Model Card

Model Details

- The model is a classifier trained to predict likelihood of a machine failure
- The algorithm used is Light Gradient-Boosting Machine (LightGBM) classifier.
- Developed in 2024.

Intended use

- Used for plant machines to achieve predictive maintenance and avoid costly repairs.
- Assist the operators or engineers to detect machine issues before they become major.
- Assist the engineers to schedule for maintenance ahead of time.

Metrics (For each class)

- F1-score (mainly)
- Recall
- Precision

Input and output

- Input: six features (Type, Air, temperature, Process temperature, Rotational speed (rpm), Torque, Tool wear)
- Output: one binary output which “Machine Failure” defined as “0” (working) and “1” (failed)

Training Data

- The model was trained on 6000 different samples (out of 10,000), where the machine was working well and another circumstance where the machine failed.

Evaluation Data

- Validation set: model was applied and validated on 1000 samples.
- Test set: model was tested on another 1000 samples.

Limitations

- The dataset is imbalanced where class “1” is the minority class and it is 339 instances out of 10,000.
- LightGBM model managed to show an acceptable F1-score but when the “class _weight” is set to ‘balanced’

- If model class weight is set manually , and the minority class is given more weight, the model performance will be impaired.
- Model performance will also be impaired if the minority class is oversampled.

Recommendations

- Combine LightGBM model with other models such as Decision Trees (stacking)