# CAPSTONE PROJECT

## Predictive maintenance of Industrial machinery

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# OUTLINE

- **Problem Statement**
- **Proposed System/Solution**
- **System Development Approach**
- **Algorithm & Deployment**
- **Result**
- **Conclusion**
- **Future Scope**
- **References**

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# PROBLEM STATEMENT

This model help us to find the anticipate failures of industrial machines before they occur. Main goal of this model is to predict the type of failure such as Power failure, Heat  dissipation , Tool wear based on the operational data..

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# PROPOSED SOLUTION

- The proposed system aims to predicting the anticipate failures of Industrial machinery. This involves leveraging data analytics and machine learning techniques to forecast demand patterns accurately. The solution will consist of the following components:

- Data Collection:

  - Gather historical data on Industrial Machines, including Product ID, Type, Air temperature, Process temperature, Power, Tool wear, Rotation, Torque[Nm].

- Data Preprocessing:

  - Collect all the data and convert the data in the form of MS Excel sheet that is better for processing and save it.

- Machine Learning Algorithm:

  - We are implementing the following Machine Learning Algorithm:

    - Snap Random Forest Classifier.
    - Snap Decision Tree Classifier.

- Deployment:

  - We created a user-friendly interface or application that provides predictions for Anticipate failures of Industrial machines before they occur.

  - This model takes very less time to predict.

- Evaluation:

  - Assess the model's performance using appropriate metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or other relevant metrics.

  - Otherwise we access the model by using the Public Endpoint link :

    - https://au-syd.ml.cloud.ibm.com/ml/v4/deployments/a16d91bf-9c9e-4139-a594-1f3232e0d4b0/predictions?version=2021-05-01

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# SYSTEM APPROACH

The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Anticipate failure prediction of industrial machinery system.

- **System requirements**
  - Large : 8 CPU and 32 GB RAM

- **Library required to build the model**
  - IBM Cloud
  - Watsonx.ai studio (service)

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# ALGORITHM & DEPLOYMENT

- In the Algorithm section, describe the machine learning algorithm chosen for predicting Anticipate failure of Industrial machine.
- **Algorithm Selection:**
  - In this model we have not implemented time-series algorithm because there is no Time column or Time related column in our data.
  - the algorithm which are implement in this model (project) are:
    - **Snap Random Forest Classifier.**
    - **Snap Decision Tree Classifier.**
- **Data Input:**
  - We have submitted the data to the algorithm through MS Excel sheet manner.
- **Training Process:**
  - After the input data is given the data is processed in the following five steps :
    - Read dataset
    - Split holdout data
    - Read training data
    - Preprocessing
    - Model selection
- **Prediction Process:**
  - After the project is deployed click on TEST button then an Excel sheet will opens.
  - Give the desire inputs and click on PREDICT button.
  - Then it gives the prediction.

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# RESULT
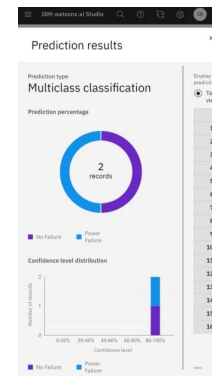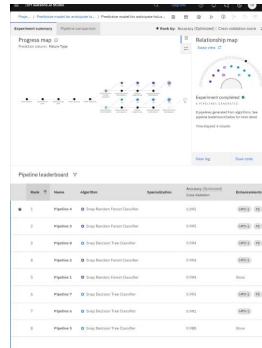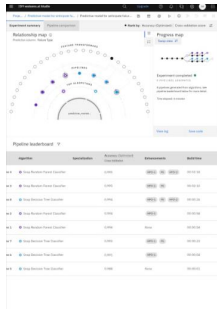


- This is the relationship map, where we can see how the project (data) is working.
- Pipeline leaderboard shows how many algorithm are selected, accuracy, enhancement and build time.



- This is the Progress Map , here we can see how the input data is processing and algorithm are selecting behind the model(project).



- This is the Prediction Result.
- Here we can Test our project if it is working correct or not.
- in case 1 it is predicting no failure and in case 2 it is predicting Power failure.
- So, it is workinkg correct.

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# CONCLUSION

- By using this model we can find the Anticipate failure of Industrial machinery before they occur. This model takes very less seconds of time to predict the failure. This model predict real failures in Industrial machinery such as Power failure, Tool wear and Heat Dissipation based on the operation data.

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# FUTURE SCOPE

- This model can predict the Anticipate failures of Industrial Machinery within the less time. But to expand this model we need to implement a Time-Series Algorithm. This makes the model performances better and can predict the Real-Time failures.

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# REFERENCES

- The instruments which are used to implement or develop this model are :

  - Historical data

  - IBM cloud platform

  - Machine Learning algorithm such as :

    - Snap Random Forest Classifier

    - Snap Decision Tree Classifier

  - watsonx.ai studio(service)

  - Cloud storage service

  - Run-Time service

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# THANK YOU

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