Late Purushottam Hari (Ganesh) Patil Shikshan Sanstha's
Mauli Group of Institution's,
College of Engineering & Technology, Shegaon
Department of Mechanical Engineering

Title:
Fault Detection of Electric Motor Using Machine Learning

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TABLE OF CONTENTS

LITERATURE REVIEW

Sr. No.	Author	Findings	Publication
1.	Andre A. Silva, Ali Bazi, Shalabh Gupta	Wavelet based filtering approach for feature extraction	IEEE
2.	Yuanyuan Yang, Dongling bai, Wei Tang	How the deep learning algorithms can be deployed to detect faults in Induction motors	Energies MDPI
3.	Ronny francis Ribeiro Junior, Carlos EduardoTeixeira	Vibrations based method to detect faults in motors using CNN algorithms	Elsevier

INTRODUCTION

"Understanding and Preventing Electric Motor Failures."

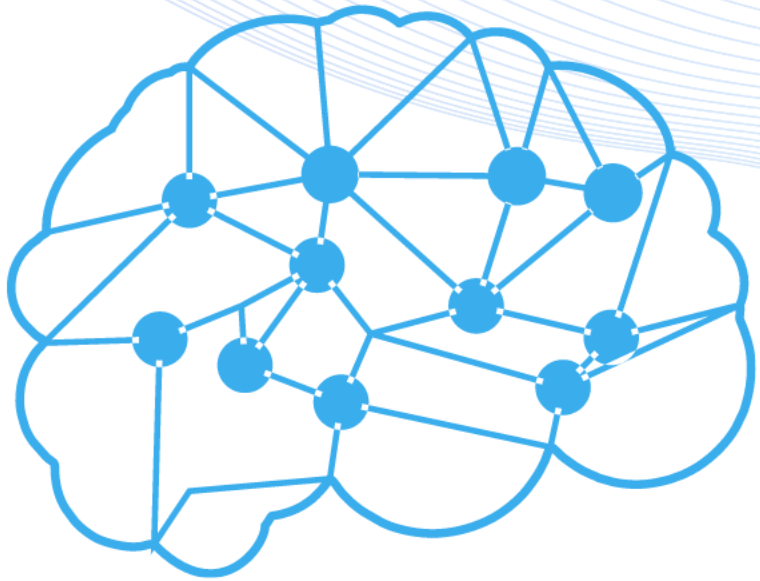
- Electric motors are crucial for varied applications.
- Voltage Imbalance
- Operational Overloads
- Motor Shaft Imbalance
- Bearings
- Premature failure of motor

SOLUTION

- Traditional approach - Hardware based
- Proposed approach - Using Machine Learning
- What is 'Machine Learning'?
- Necessary parameters

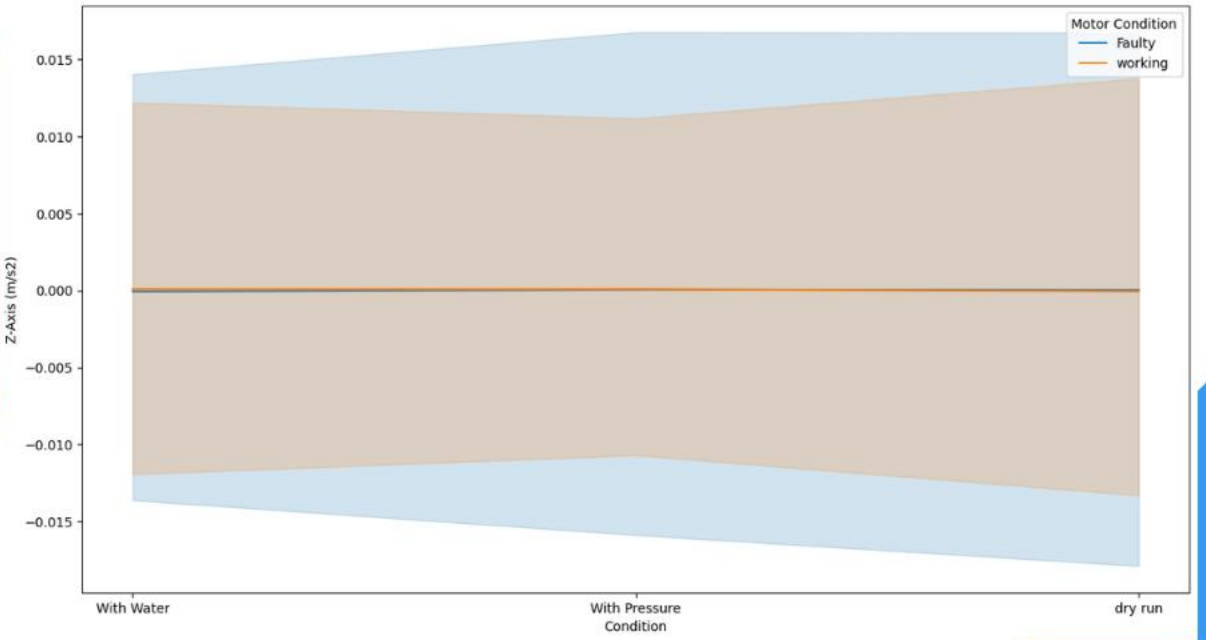
PROJECT FLOW

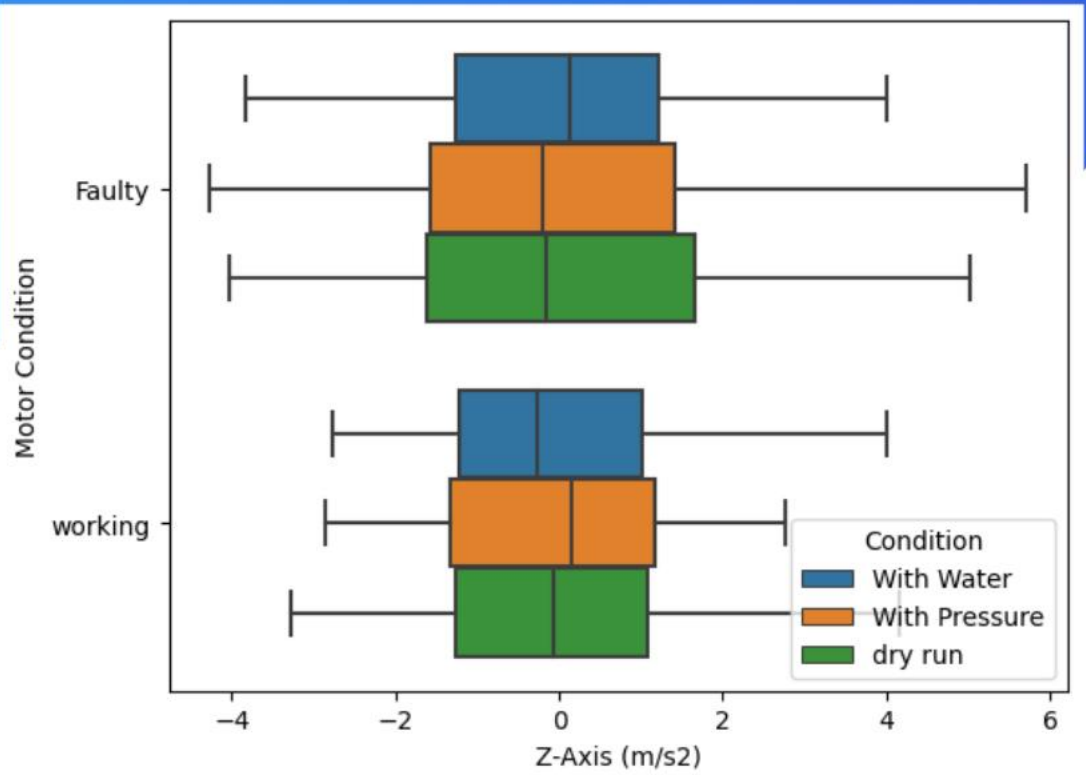
- Data Auisition
- Data Cleaning
- Exploratory Data Analysis
- ML Model Building
- Model Application



- Tools Used:
  - Python
  - Google Colab
  - Excel
  - Bosch INVH App

RESULTS





model SVM

```
from sklearn.svm import SVC
svc=SVC()
mymodel(svc)
```

```
Model accuracy : 0.953
              precision    recall  f1-score   support

           0       0.98      0.92      0.95     30103
           1       0.93      0.99      0.95     29897

    accuracy                           0.95     60000
   macro avg       0.96      0.95      0.95     60000
weighted avg       0.96      0.95      0.95     60000
```

ADVANTAGES

- Early detection of faults
- Improved reliability
- High accuracy
- Cost effective
- Accident prevention

DISADVANTAGES

- Require domain expertise
- Complex algorithms
- Limited Applicability
- Requires huge data

FUTURE SCOPE

- Data collection on varied motors and conditions
- Hyperparameter tuning
- Cloud deployment of ML Model
- Interactive dashboard for visualization

CONCLUSION

- Maximum vibrations occur in the 'Z' direction of the Electric Motor.
- The vibrations are also maximum in the 'Dry Run' state of the motor i.e. when the motor (water pump) is running without water.
- The SVM - Support Vector Machine algorithm can predict the working and faulty motor with 95% accuracy.

REFERENCES

- A. Siddique, G. Yadava, and B. Singh, “A review of stator fault monitoring techniques of induction motors,” IEEE Transactions on Energy Conversion, vol. 20, no. 1, pp. 106–114, Mar. 2005
- A. Gandhi, T. Corrigan, and L. Parsa, “Recent advances in modeling and online detection of stator interturn faults in electrical motors,” IEEE Transactions on Industrial Electronics, vol. 58, no. 5, pp. 1564–1575, May 2011
- W. Huang et al. , An improved deep convolutional neural network with multi-scale information for bearing fault diagnosis Neurocomputing (2019)

THANK YOU