# Dissertation / Project / Project Work Title:
# Sensorless Anomaly Detection in Industrial Motors

## Course No.: ESZG628T

## Course Title: Dissertation / Project / Project Work

## Dissertation / Project /Project Work Done by:

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## Degree Program: M. Tech. Embedded Systems

## Research Area: Machine Learning

## Dissertation / Project Work carried out at:

## Microchip Technology India Private Limited, Chennai



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# Contents

# 1. Broad Area of Work

Machine Learning is the technology of identifying the possibilities hidden in the data and turning them into fully-fledged opportunities. In today's modern industries Machine Learning is used for various purposes, one of the major areas is Smart Predictive maintenance. In this project, anomalies in industrial motors will be detected without using any kind of sensors with the help of Field-Oriented Control (FOC) and Machine Learning algorithm.

# 2. Background

Adapting robust management systems for maintenance work can decrease the unpredicted costs during equipment failures and shutdown periods. Smart Predictive Maintenance uses the analytic abilities of machine learning to monitor and predict machine failure thereby reducing maintenance costs, reducing unscheduled equipment downtime caused by equipment or system failure and increasing uptime. This also ensures safety by detecting anomalies in the earlier state.

Sensorless Field Oriented Control (FOC) is one of the methods used to control a BLDC motor's speed and torque. Field oriented control is a technique used to generate a 3-phase sinusoidal modulation which then can be controlled in frequency and amplitude. Sensorless control eliminates the position sensors and instead measures back electromotive force (EMF) to determine rotor position.

Normally, anomaly detection is done using gyro or accelerometer sensors, using FOC eliminates sensor cost.

Efficient anomaly detection application in the industrial motors can be implemented by combining both Machine learning Predictive Maintenance and Motor control FOC algorithms.

## 3. Objectives

The objectives of the project are the following:

- Understanding Sensor less Field Oriented Control method
- Implementing BLDC motor control application
- Understanding the machine learning concepts
- Learning machine models and analyzing suitable one for required application
- Validating end model with various datasets
- Integrating ML model with motor control application
- Validating final proposed project output

## 4. Scope of Work

The scope of this dissertation is to implement predictive maintenance application to detect anomalies in the industrial motors and validating the final project output.

## 5. Particulars of the Supervisor and Additional Examiner

|  | Supervisor | Additional Examiner |
|---|---|---|
| **Name** | Ineyaa N | Enoch Richbert |
| **Educational Qualification** | B.E Electronics and Communication Engineering | BE in Electrical Engineering MTech in Embedded Systems |
| **Designation** | Principal Engineer – Corporate Applications | Senior Engineer II - Corporate Applications |
| **Employing Organization and Location** | Microchip Technology Pvt, ltd., Chennai, India | Microchip Technology Pvt, ltd., Chennai, India |
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# 6. Remarks of the Supervisor

The outcome of the project seems very promising and this can be a useful reference implementation for our customers. The field of study of this project is used day to day in the student's office work. The student has the skills to take up this study and complete the project. I approve this project as the supervisor.

| Mahalakshmi P | Ineyaa N | Enoch Richbert |
|---|---|---|
| **Signature of Student** | **Signature of Supervisor** | **Signature of Additional Examiner** |
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