

# Fault Diagnosis with Machine Learning Methods

## First MSc Project Progress Report

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### 1 Introduction

This report summarises my progress by 28<sup>th</sup> June, 2018. Section 2 re-iterates the 3 data sets acquired for this project. Section 3 discusses main ideas and methodologies proposed in the literature that I have read. Section 4 provides update on the methodology to carry out this project. Section 5 compares the current progress against the Gantt chart from the preliminary report.

### 2 Final Data Acquisition

Previous effort has acquired 2 data set about bearing fault:(1) the bearing data set from Case Western Reserve University (CWRU), (2) the bearing data set from Society for Machinery Failure Prevention Technology (MFPT), and (3) the bearing data set from National Aeronautics and Space Administration (NASA). Based on the literature review, the CWRU bearing data set and the MFPT bearing data set are the ones that the researchers have experimented on. Therefore, the two data sets will be the primary focus of this project for relevance.

### 3 Literature Review

When I am reviewing literature, a pattern emerges that most of the proposed methods focus on finding effective methods to extract useful features and produce high-accuracy prediction with shallow classification structures. Lei et al. [1] extracts 10 features using EEMD method and produces accurate classification using wavelet neural network. Liu et al. [2] combines local mean decomposition and multi-scale entropy to feed as input features into a 3-layer BPNN to make accurate prediction. Muruganatham et al. [3] extracts features using singular spectrum analysis and predict bearing faults using ANN. Yu et al. [4] use EMD energy entropy to extract feature and make fault prediction using ANN. Zhang et al. compute 19 statistical features, and uses SVM to classify bearing faults. Hussein et al. [6] deploy advanced pretreatment to extract features and classify fault types using 1-nearest-neighbour classifier.

### 4 Update on Methodology

Based on the findings from literature review, most of the previously proposed methods focus on effective extraction of discriminative features, and achieve satisfactory performance only using shallow models. Therefore, the new methodology will adopt the procedure of controlled experiment to compare the effectiveness of different feature extraction methods followed by a

3-layer ANN. Calculation and visualisation will be executed as the attempts to explain the effectiveness of the optimally-performing feature extraction method. If time permits, further investigation of deep architectures of classification models will be made based on the optimal feature extraction method.

## 5 Update on Schedule

Everything is going according to schedule. Please refer to Gantt chart in the preliminary report. By the milestone of literature review and experiment replication, I have implemented different feature extraction methods, and am currently in the process of testing them out on the MFPT data set, trying to discover discriminative features.

## References

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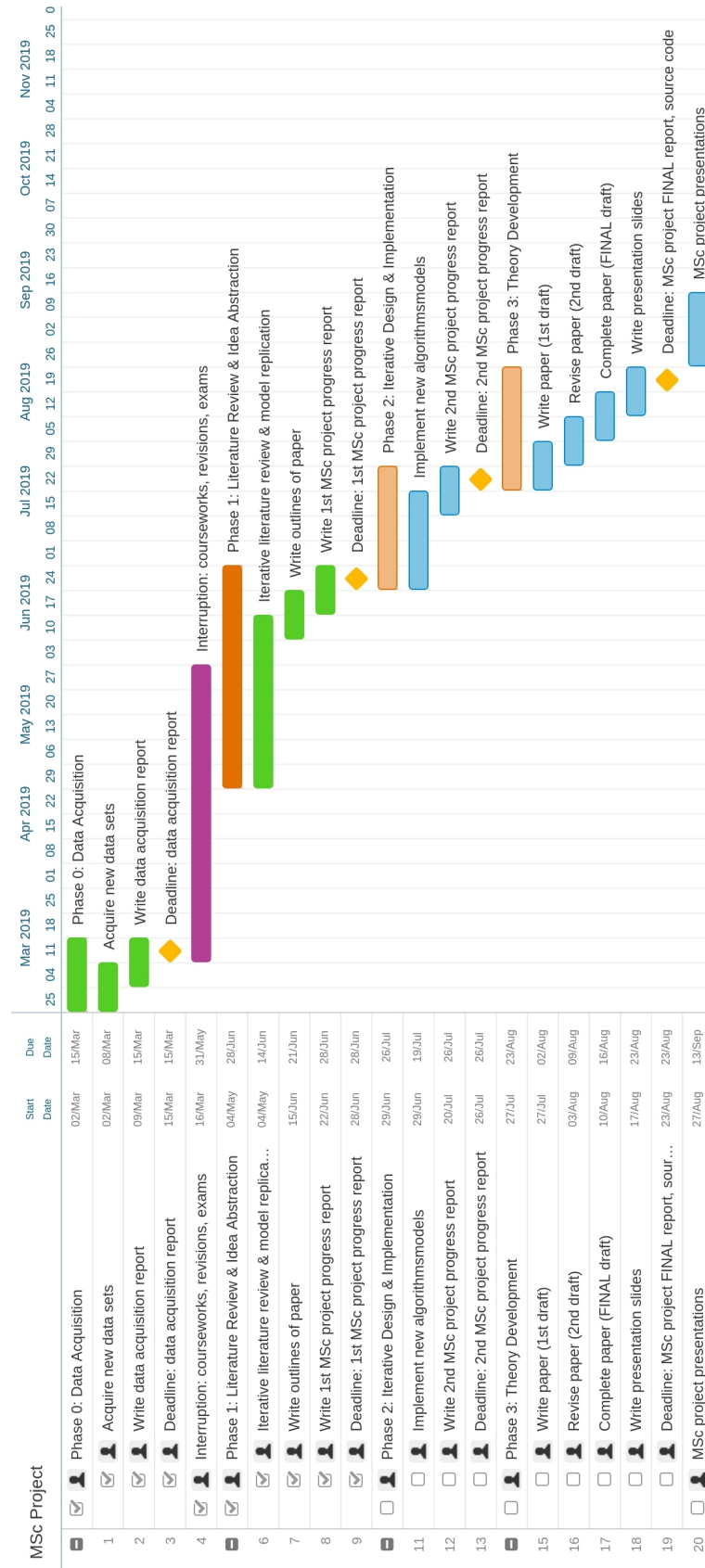


Figure 1: Project schedule