Objective
Apply machine learning to study the rolling contact fatigue cracks in rail welds in railway. Crack Classification and prediction of crack growth behavior will be explored.

Project Details
Rail transport plays a pivotal role in economy through the freight transport of products and through the passenger transport for metropolitan commuters and visitors. A rail track is constructed through welding individual rail sections. Due to the variation in material characteristics that are inherent with any welding process, rail welds have higher rates of degradation than the adjacent parent rails. Under dynamic cyclic wheel-rail contact loading, localized surface damage as a result of rolling contact fatigue is frequently observed in rail welds (Fig. 1(a)). Such surface damage, without proper maintenance, can develop into fatigue cracks in the traverse direction, which may lead to a complete rail break (Fig. 1 (b)). The consequences of the latter may be catastrophic.

Machine learning is an artificial intelligence (AI) technique that allows a machine or system to learn from data automatically and make decisions or predictions [1]. Machine learning has been successfully applied in studying physical problems with uncertainties and many variables, including rolling contact fatigue [2,3]. In this summer project, the following tasks will be conducted:

1. Study machine learning theory and identify a machine learning method in this project.
2. Collect data of rolling contact fatigue cracks in rail welds.
3. Apply machine learning to examine the crack data.

Prerequisites
Good at math and computer programming, interested in studying machine learning theory.

References: