INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	Purushottam Gangsar
Roll Number	:	146103011
Programme of Study	:	Ph.D.

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Name of Thesis Supervisor(s)	:	Prof. Rajiv Tiwari
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SHORT ABSTRACT

Continuous and trouble-free operation of induction motors (IMs) is an essential part of the modern power and production plants. Accordingly, this study presents fault diagnostics of the mechanical and electrical faults in IMs through an artificial intelligence (AI) methodology, i.e. the support vector machine (SVM) algorithm. Ten IM fault conditions are considered for the diagnosis, i.e. four mechanical fault conditions (i.e., the bearing fault, the unbalanced rotor, the bowed rotor and the misaligned rotor) and five electrical fault conditions (i.e., the broken rotor bar, the stator winding fault with two severity levels, and phase unbalance with two severity levels), and a healthy IM. In order to generate relevant fault signatures of IM faults, vibration signals in three orthogonal directions and current signals of all three phases have been acquired for a wide range of operating conditions (i.e., the speed and the load) using an experimental test rig. The fault diagnostics in IMs have been performed through the SVM based on the time domain, frequency domain and time-frequency (CWT & WPT) domain features. A comparative investigation of the vibration and current signals have been done in time domain in order to find out which signal(s) (i.e., vibration or/and current) is/are required for an effective diagnosis of the mechanical and/or electrical faults in IMs. Prediction performances have been checked with the low and high frequency resolution time domain data. . From the industrial perspective, the fault diagnosis in this study is extended to the intermediate load as well as speed cases in order to perform the diagnosis when database is not available at all the required operating conditions of IM. In all three domains, the fault diagnosis for the same speed and load case is found to be nearly perfect. The fault diagnosis in case of the intermediate speed are found to be satisfactory. However, fault diagnosis in the case of intermediate load are also found to be effective.