Dear students,

The group of Tribology and Machine Condition Monitoring at UNSW is a world-leading research team in the field and has many national and international collaborations. We are currently recruiting excellent research students to join the group as a PhD or Master's (MPhil) student. If you are keen to gain deep knowledge and many useful experimental and analytical skills in the fields of health monitoring and diagnostics, you are welcome to approach us for a chat and/or discussion.

Research topics include:

- Development of advanced condition monitoring techniques for wind turbines

  To meet the requirement of rapid growth of wind turbines, especially large-scaled offshore wind farms, and to overcome the challenge of access difficulties, development of effective techniques for detecting and diagnosing incipient faults at low and variable speed is required. More importantly, to effectively minimise the maintenance cost, condition-based prediction of the remaining useful life (RUL) of the drivetrain in wind turbines is imperative and an emerging area. This project will target 3 key technical challenges. They are (a) needed effective technique(s) for detecting and diagnosing early faults of gears and bearings under low or varying speed conditions, (b) the condition-based RUL prediction capability through integration fault detection, diagnostics and prognostics in one framework, and (c) how to transfer the above developments to a large-scaled drivetrain.

- Digital technology enabled machine condition monitoring (MCM)

  The state-of-the-art technologies such as digital twins and AI have the potential to generate a new and cost-effective system to meet the demands for modern MCM. Being relatively new, digital twin technology has been used for optimising manufacturing processes, but its applications in MCM are at a very early stage. Digital technology including digital twin and AI technology will be explored and utilised to develop a new generation MCM system for Industry 4.0. If you are interested in condition monitoring as well as digital technology, you are welcome to contact us to discuss your interest and possibility of becoming a PhD student and future expert in the field.

- Production, testing and analysis of 3D printed machine elements

  With rapid development of 3D printing technology, there are more and more machine components, such as gears and bearings, fabricated using this advanced additive manufacturing process. For example, 3D printing plastic gears, which have a light weight and can transmit power quietly, is feasible and cost effective. Applications of plastic gears are expanding rapidly from the food industry to automobiles. To further extend their applications to areas where high reliability and a long service life is required, our understanding of their operating and service life behaviour needs to be improved significantly. This project aims to fill in the knowledge gaps through fabricating plastic gears using 3D printing technology, conducting run-to-failure tests in different conditions, and analysing the tribological and vibration features for understanding their behavior and performance. This exciting and interesting project can be offered as a research thesis to final year thesis students as well as a research project to MPhil/PhD candidates.

- Physiological signal processing for human health monitoring

  Similar to machine condition monitoring, human health monitoring involves collecting signals from different body parts (e.g., brain, chest, muscles) and analysing them for disorder and disease detection and diagnostics. In the past decades, many advanced signal processing techniques have been developed and applied to monitor mechanical systems and components, and better understanding of their features in relation to different types of machine faults have been achieved for fault detection, diagnostics and prognostics. Bio-signals also contain rich information about the health condition and can be used for effective health monitoring if better understanding of their features and relationship with the health condition is achieved. This cross-disciplinary project is to analyse bio-signals for health monitoring by utilising the advanced signal processing techniques developed by experts in machine condition monitoring.

  The project is likely to involve a collaboration with the School of Biomedical Engineering.

Contacts for further information:

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