Supervisory Team	Lead supervisor: BOON GIIN LEE Co-supervisor: Matthew Pike Co-supervisor: Horia Maior (University of Nottingham)
Short introduction & description of research project	Current methods for rehabilitation monitoring often rely on what can be rather invasive and costly technologies, coupled with somewhat subjective clinical evaluations, a combination which can significantly affect patient compliance and their overall recovery. To address the limitations of current rehabilitation practices, this research project aims to investigate the potential of millimetre-wave (mmWave) frequency modulated continuous wave (FMCW) radar for continuous, non-contact patient monitoring. Through placing a strong emphasis on the use of eXplainable Artificial Intelligence (XAI) to improve the interpretation and subsequent clinical application of the FMCW radar data, this research seeks to evaluate the feasibility and effectiveness of an XAI-based mmWave FMCW radar system for unobtrusive, real-time patient monitoring within a rehabilitation context. The project aims to develop a comprehensive signal processing framework that integrates XAI methods, important for extracting clinically significant information from the raw and complex radar data, thereby bridging the gap between cutting-edge radar-based monitoring and real-world healthcare applications. This development is leaned towards ensuring the technology is both feasible and scalable within hospital environments. Ultimately, this research is focussed on improving both the interpretability and accuracy of rehabilitation assessments, and to provide clinicians with actionable insights and a deeper understanding of patient progress, enabling more personalised rehabilitation strategies. The anticipated outcome of this research is a more efficient, accessible, and scalable rehabilitation monitoring solution, one which is suitable for a variety of healthcare settings, and particularly beneficial in settings with limited resources, addressing a global need for improved healthcare services.
Contact points	BOON GIIN LEE: boon-giin.lee@nottingham.edu.cn

Supervisory Team	Assoc. Prof. Dr. Kian Ming Lim Prof. Ruibin Bai Asst. Prof. Dr. Daokun Zhang
Short introduction & description of research project	**Transductive Self-supervised Large Model with Embedding Propagation for Few-shot Medical Image Analysis** Deep learning has achieved state-of-the-art performance in various domains, including medical image analysis. However, its reliance on large amounts of labeled data is a significant limitation in medical applications, where labeled data is scarce and expensive to obtain. Few-shot learning (FSL) has emerged as a promising solution, enabling models to generalize well to unseen tasks with minimal data. Despite its potential, FSL faces challenges such as limited generalization, sensitivity to domain variations, data distribution shifts, and difficulties in establishing strong decision boundaries with scarce data. This project proposes a novel FSL framework for medical image analysis, leveraging a transductive self-supervised large model with embedding propagation. Self-supervised learning will be used to learn intermediate representations from unlabeled data, capturing meaningful semantic and structural features to improve generalization across medical tasks. Large pre-trained models will provide robust feature embeddings, even with limited labeled samples, while embedding propagation will smooth the feature manifold, reducing the impact of data distribution shifts. Additionally, transductive information maximization will optimize decision boundaries by leveraging mutual information between query samples and their predicted labels. This approach enhances the model's ability to make accurate predictions with scarce data, which is critical for medical applications requiring high diagnostic accuracy. The proposed framework will be evaluated on benchmark medical image datasets and compared with state-of-the-art FSL methods. Expected outcomes include improved diagnostic accuracy, enhanced clinical decision-making, high-impact publications, and scalable solutions for real-world healthcare challenges, particularly in data-scarce scenarios.
Contact points	Assoc. Prof. Dr. Kian Ming Lim: Kian-Ming.Lim@nottingham.edu.cn

Supervisory Team	Dr Qian Zhang
Short introduction & description of research project	Title: Context-Based Learning with Large Language Models for Video Understanding in Activity Recognition and Quality Assessment This research aims to develop a novel context-based learning framework that enhances video understanding for activity recognition and quality assessment by integrating Large Language Models (LLMs), Vision-Language Models (VLMs), and motion capture data. Traditional models for video-based action recognition rely heavily on large-scale annotated datasets and struggle with capturing contextual and temporal dependencies. As a result, they perform poorly in evaluating action correctness, sequence adherence, and execution quality—critical in fields such as rehabilitation, sports analytics, and industrial training. The proposed project explores three key directions: (1) using context-aware knowledge distillation to train action recognition models with auxiliary textual data, reducing dependency on paired video-text datasets; (2) integrating visual, textual, and skeletal inputs through LLMs to enhance spatiotemporal reasoning in activity quality assessment; and (3) employing motion capture data to benchmark model performance and support fine-grained evaluation of movement quality. By incorporating domain knowledge, sequential understanding, and multimodal fusion, this research addresses core limitations in current models, enabling improved generalization, explainability, and feedback generation. The outcome will be a scalable and robust AI system capable of understanding complex human activities in real-world contexts with reduced annotation cost and enhanced interpretability.
Contact points	Qian Zhang: qian.zhang@nottingham.edu.cn

Supervisory Team	Ruibin Bai Xinan Chen Rong Qu
Short introduction & description of research project	The increasing demands on modern manufacturing systems necessitate significant advancements in operational efficiency. While current approaches to production scheduling (decision making) often struggle with either a lack of transparency or limitations in adaptability and performance, this research aims to explore a novel paradigm for dynamic scheduling in intelligent manufacturing, leveraging cutting-edge Artificial Intelligence (AI) technologies. This PhD project will investigate the application of approaches such as reinforcement learning, large language models, and evolutionary algorithms to create innovative scheduling methods that can optimize complex production processes while ensuring that decision-making remains understandable and adaptable to real-world changes. We seek to develop AI-powered scheduling systems that offer enhanced performance, maintain clarity in their operation, and can be readily integrated into existing intelligent manufacturing environments. This research offers the opportunity to contribute to the forefront of intelligent manufacturing by developing next-generation scheduling solutions that balance efficiency with transparency and adaptability, utilizing the power of advanced AI techniques.
Contact points	Xinan Chen: xinan.chen@nottingham.edu.cn