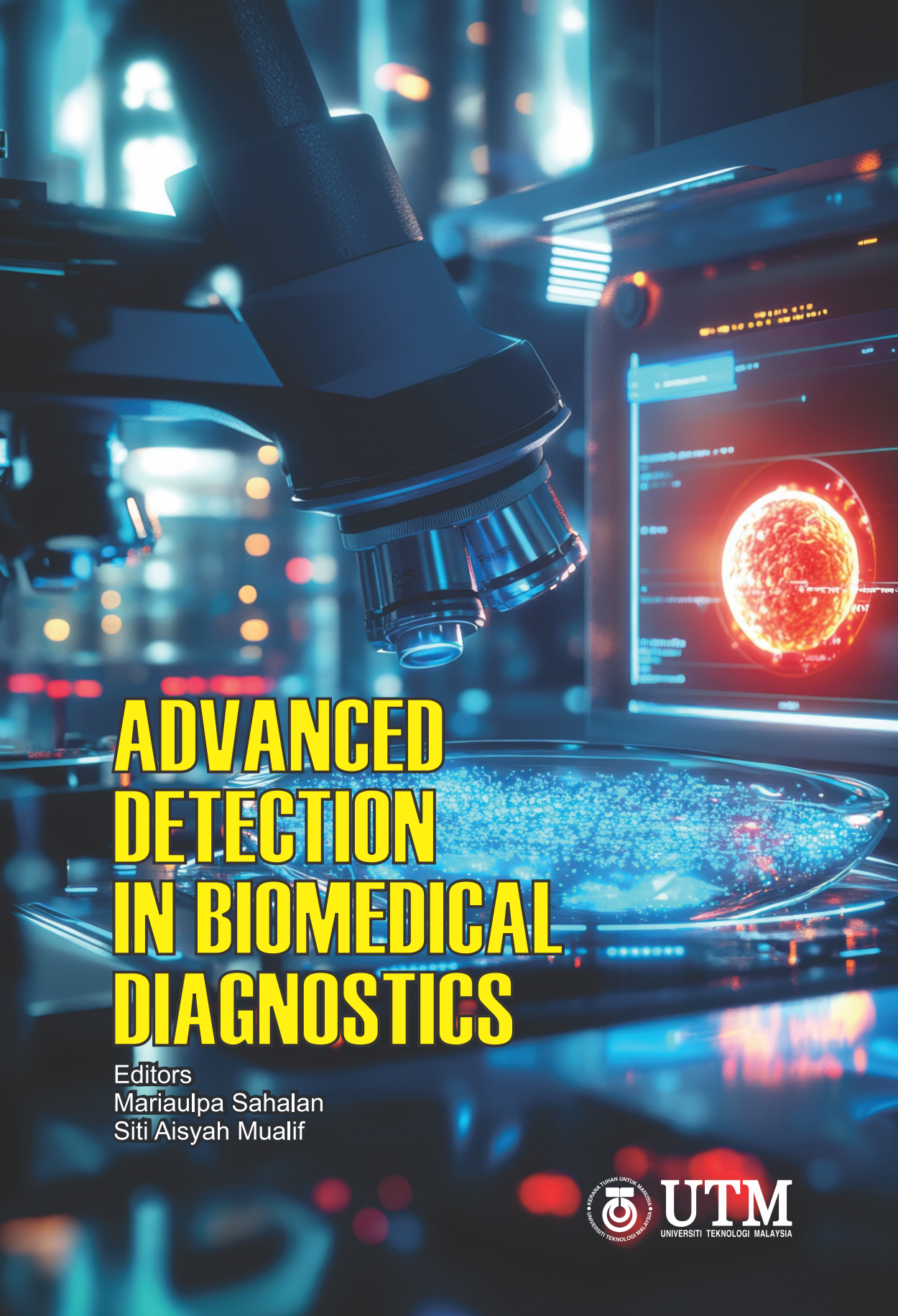




ADVANCED DETECTION IN BIOMEDICAL DIAGNOSTICS

Editors

Mariaulpa Sahalan

Siti Aisyah Mualif



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ADVANCED DETECTION IN BIOMEDICAL DIAGNOSTICS

Advanced Detection in Biomedical Diagnostics is an initiatives from the members of Advanced Diagnostics and Progressive Human Care (DIAGNOSTICS) Research Group in Universiti Teknologi Malaysia that aim to brings together a range of emerging techniques that are reshaping modern biomedical analysis. The book highlights new methods for understanding human tissues and physiological processes, including the use of convolutional neural network (CNN) models to support early breast cancer detection through accurate pectoral muscle segmentation. It also explores infrared thermal imaging for studying brown adipose tissue (BAT) and examines how dietary habits influence key metabolic markers. The discussion extends to the regulated talk test (TT) and its potential as a dependable measure of exercise intensity in cardiac rehabilitation. Other chapters introduce a mobile application designed for wound assessment that tracks temperature, oxygen and pH levels, as well as studies that use thermography to analyse breathing patterns and to identify cardiorespiratory exercise intensity with greater precision. Clear, informative and forward-looking, this book is a valuable reference for researchers, clinicians and biomedical engineers who are working to advance diagnostic practices in healthcare.

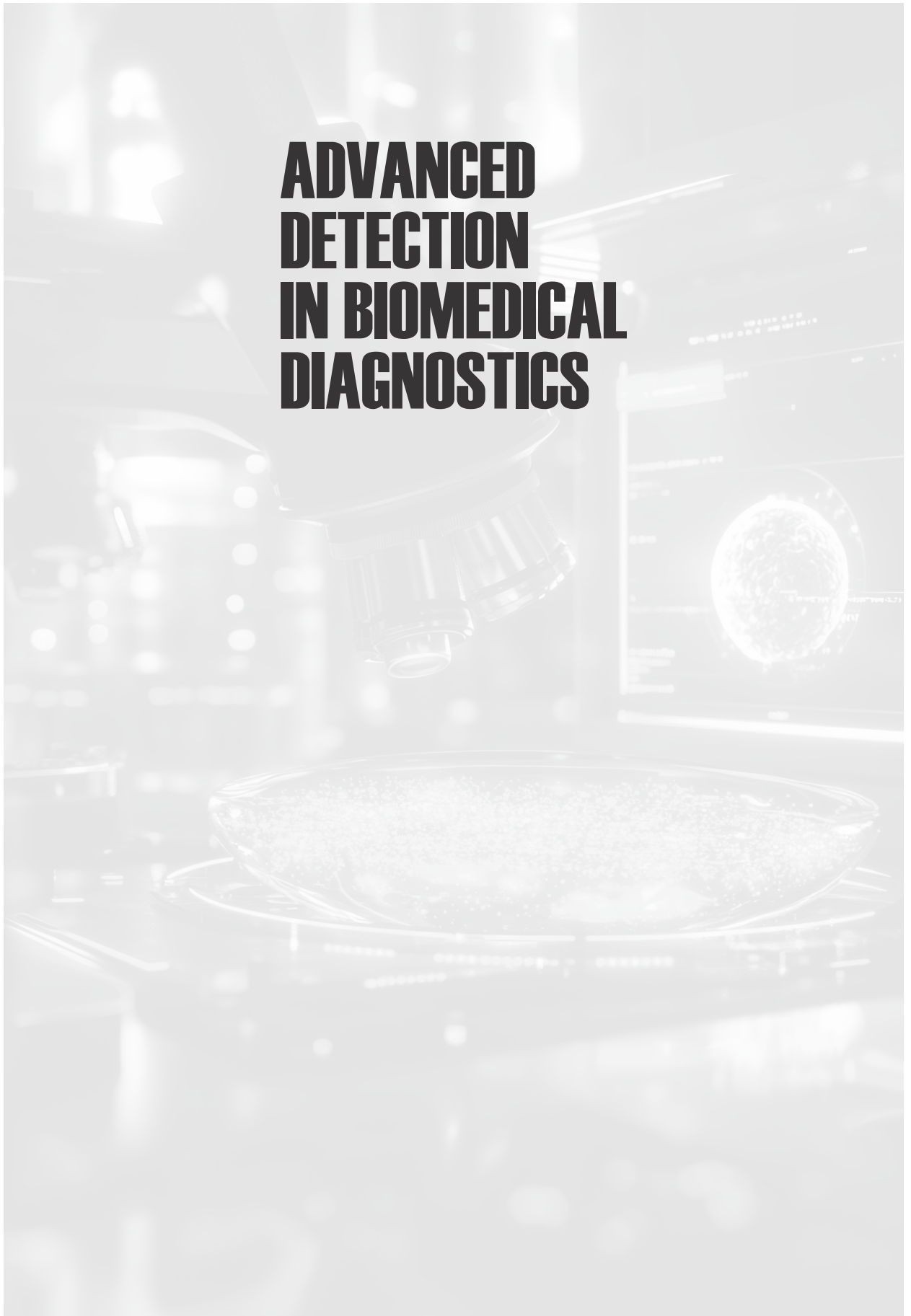


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CONTENTS

<i>Contributors</i>		<i>vii</i>
<i>Preface</i>		<i>ix</i>
CHAPTER 1	EMERGING FRONTIERS IN BIOMEDICAL DIAGNOSTICS	1
	<i>Mariaulpa Sahalan and Siti Aisyah Muallif</i>	
CHAPTER 2	DETECTION OF PECTORAL MUSCLES USING A DEEP LEARNING NETWORK	13
	<i>Aisyah Zainal Abidin, Lukman Hakim Ismail, and Mariaulpa Sahalan</i>	
CHAPTER 3	DETECTION OF BROWN ADIPOSE TISSUE USING INFRARED THERMAL IMAGING	39
	<i>Bhuwaneswaran Vijayam, Asnida Abdul Wahab, Sriwathi Angeline Hendricks, and Muhammad Faiz Md Shakhiah.</i>	
CHAPTER 4	WOUND MONITORING USING A MOBILE APPLICATION	65
	<i>Rania Hussien al-Ashwal, Nur Syakirah Mohamad Safri, Maheza Irna Mohamad Salim, and Ohoud Samir Bashir Mohamed</i>	

CHAPTER 5	DETECTION OF BREATHING USING INFRARED THERMAL IMAGING	87
	<i>Muhammad Faiz Md Shakhiah, Asnida Abdul Wahab, Siti Nurhaliza Zainal Abiden, and Siti Balqis Samdin</i>	
CHAPTER 6	DETECTION OF CARDIO- RESPIRATORY EXERCISE INTENSITY USING REGULATED TALK TEST	109
	<i>Siti Ruzita Mahmod, Nurul Nadiah Mohd Sha'ari Azyze, Mathiventtan a/l Thamilvanan, and Siti Balqis Samdin</i>	
INDEX		141

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PREFACE

This book explores advanced detection methods in biomedical diagnostics across six chapters for analysing body tissues and physiological functions. Chapter 1 provides an in-depth overview of current methods for detecting body tissues and physiological functions, highlighting their importance in medical diagnosis and rehabilitation. It focuses on pectoral muscle, brown adipose tissue (BAT), and wounds, as well as physiological functions of breathing patterns and cardio-respiratory exercise.

Chapter 2 delves into the pectoral muscle's role in breast cancer detection. Four pre-trained convolutional neural network (CNN) models – DeepLabv3+ with ResNet-18, DeepLabv3+ with ResNet-50, SegNet, and U-Net – were used for image segmentation. Chapter 3 addresses quantification techniques and current imaging processes for BAT thermometry using an Epidermal Thermal Imaging Professional (ETIP) infrared camera. It examines how the 'cold challenge' protocol activates the BAT and its thermometric properties. Subjects with different body mass index (BMI)s were recruited, and the thermometric data from thermal imaging was extracted using image processing techniques.

Chapter 4, which focuses on a novel mobile application designed to improve wound assessment accuracy by simultaneously monitoring temperature, oxygen levels, and pH, with thresholds to categorise wounds as acute or chronic. Chapter 5 examines breathing patterns as a non-contact method using thermographic images. The images were processed using an automated segmentation algorithm, offering real-time respiratory monitoring that enhances comfort for vulnerable groups such as neonates, the elderly, and individuals with skin trauma.

Finally, Chapter 6 presents cardiorespiratory exercise and reliable intensity measures for patients in cardiac rehabilitation (CR). It investigates the talk test (TT) as an exercise intensity measure, analysing its effects on speech variability, heart rate (HR), and exercise intensity, along with inter-rater reliability in CR patients.

We extend our deepest gratitude to the chapter authors, students, and lab technicians from the Department of Biomedical Engineering and Health Sciences, Faculty of Electrical Engineering, UTM Johor Bahru, for their academic, emotional, and financial support in completing this book.

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