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# Distributed Computing and Monitoring Technologies for Older Patients

 Springer

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# Preface

In this book, we summarize recently deployed monitoring approaches with a focus on automatically detecting health threats for older patients living alone at home. First, in order to give an overview of the problems at hand, we briefly describe older adults who would mostly benefit from healthcare supervision and explain their potential health threats and dangerous situations, which need to be detected timely. Second, we summarize possible scenarios for monitoring an older patient at home and derive common functional requirements for monitoring technology. Third, we identify the realistic state-of-the-art technological monitoring approaches, which are practically applicable to older adults, in general, and to geriatric patients, in particular. In order to uncover the majority of applicable solutions, we survey the interdisciplinary fields of smart homes, telemonitoring, ambient intelligence, ambient assisted living, gerotechnology, and aging-in-place technology among others. Consequently, we discuss the related experimental studies and how they collect and analyze the measured data, focusing on the application of sensor fusion, signal processing, and machine learning techniques whenever possible, which are shown to be useful for improving the detection and identification of situations that can threaten older adults' health. Finally, we discuss future challenges and offer a number of suggestions for further research directions. We conclude the book by highlighting the open issues within automatic healthcare technologies and link them to potential solutions.

**Keywords:** eHealth, Telemonitoring, Home care, Smart homes, Ambient intelligence (AmI), Ambient assisted living (AAL), Machine learning, Sensors, Geriatric conditions

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# Contents

<b>1</b>	<b>Introduction</b> .....	1
1.1	Definition of Terms and Relevance to This Book.....	3
1.2	Content and Audience of This Book .....	8
1.3	An Overview of the Relevant Smart-Home Projects.....	9
	References.....	13
<b>2</b>	<b>Reviews and Taxonomies</b> .....	23
2.1	Previous Reviews.....	24
	References.....	33
<b>3</b>	<b>Relevant Scenarios for Home Monitoring Solutions for Older Adults</b> .....	35
3.1	Healthy, Vulnerable, and Acutely Ill Older Adults.....	36
3.2	Relevant Geriatric Conditions and Threats of Deteriorating Health and Functional Losses .....	37
3.2.1	Falls and Injuries.....	38
3.2.2	Delirium .....	39
3.2.3	Wandering and Leaving Home.....	40
3.2.4	Malnutrition .....	40
3.2.5	Sleeping Disorders .....	41
3.2.6	Shortness of Breath .....	41
3.2.7	Hygiene and Infections .....	42
3.2.8	Problems Related to Physical Environment.....	42
3.2.9	Underlying Medical Conditions and Multimorbidity .....	43
3.3	Summary of the Needs .....	43
	References.....	44

<b>4 Monitoring Technology</b> .....	49
4.1 Sensing and Data Acquisition .....	50
4.1.1 Types of Sensors and Data Capturing Devices .....	50
4.1.2 Sensor Location and Placement .....	55
4.1.3 Summary of Parameters .....	57
4.2 Data Processing and Analysis .....	59
4.2.1 Machine Learning Approaches .....	59
4.2.2 Requirements and Challenges of Machine Learning Strategies .....	62
4.3 Standards .....	65
References .....	67
<b>5 Datasets</b> .....	85
References .....	92
<b>6 Discussion</b> .....	95
6.1 Future Challenges .....	95
6.1.1 Defining Taxonomy.....	95
6.1.2 Lack of Publicly Available Datasets .....	96
6.1.3 Inefficiency of Health-Threat Detection Technologies .....	96
6.1.4 Sampling Limitations and Time Delays in Monitoring .....	96
6.1.5 Accuracy in Measuring Physiological Parameters.....	97
6.1.6 User-Centered Design Barriers for Older Adults.....	98
6.1.7 User Acceptability in Monitoring .....	98
6.2 Future Research Directions .....	98
References .....	99
<b>7 Conclusion</b> .....	101

# Abbreviations

AAL	Ambient Assisted Living
ADLs	Activities of Daily Living
AI	Artificial Intelligence
ALT	Assisted Living Technology
AmI	Ambient Intelligence
ANN	Artificial Neural Network
ARBF	Augmented Radial Basis Function
AT	Assistive Technology
BP	Blood Pressure
CAM	Confusion Assessment Method
CEN	European Committee for Standardization
CGA	Comprehensive Geriatric Assessment
CHD	Coronary Heart Disease
COPD	Chronic Obstructive Pulmonary Diseases
CRF	Conditional Random Field
DBN	Dynamic Bayesian Network or Deep Belief Network (Depending on Context)
DS	Danish Standard
DTs	Decision Trees
ECG	Electrocardiography
EEG	Electroencephalography
EHR	Electronic Health Records
EMG	Electromyography
EN	European Norms
EU	European Union
FP7	Seventh Framework Programme
FVC	Forced Vital Capacity
GMM	Gaussian Mixture Models
GPs	Gaussian Processes

GPS	Global Positioning System
GSM	Global System for Mobile Communications
GSR	Galvanic Skin Response
HH	Hospital at Home
HMMs	Hidden Markov Models
HR	Heart Rate
HRV	Heart Rate Variability
IADL	Instrumental Activity of Daily Living
ICT	Information and Communication Technologies
IEC	International Electrotechnical Commission
IP	Internet Protocol or Impedance Pneumography (Depending on Context)
IR	Infrared
IRDA	Infrared Data Association
ISDN	Integrated Services for Digital Network
ISO	International Organization for Standardization
IT	Information Technology
kNN	k-Nearest Neighbor (Classifier)
MEDDEV	Medical Devices
NBC	Naïve Bayesian Classifier
NBN	Naïve Bayesian Network
NIRS	Near-Infrared Sensors
PDMS	Patient Data Management System
PEF	Peak Expiratory Flow
PIF	Peak Inspiratory Flow
PIR	Passive Infrared (Sensor)
PSTN	Public Switched Telephone Network
PTZ	Pan-Tilt-Zoom (Camera)
QoL	Quality of Life
QoS	Quality of Service
RF	Radio-Frequency
RFID	Radio-Frequency Identification
RGB	Red-Green-Blue
RGB-D	Red-Green-Blue Depth
SH	Smart Home
SVM	Support Vector Machine
TRF	Test Report Forms
UTI	Urinary Tract Infection
WBASN	Wireless Body Area Sensor Network
WHO	World Health Organization
WLAN	Wireless Local Area Network
WSN	Wireless Sensor Network