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Juris Klonovs · Mohammad A. Haque
Volker Krueger · Kamal Nasrollahi
Karen Andersen-Ranberg
Thomas B. Moeslund
Erika G. Spaich

Distributed Computing and Monitoring Technologies for Older Patients

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Erika G. Spaich

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Juris Klonovs
M-Tech
Aalborg University
Copenhagen, Denmark

Volker Krueger
Aalborg University
Copenhagen, Denmark

Karen Andersen-Ranberg
Danish Aging Research Center
University of Southern Denmark
Odense, Denmark

Erika G. Spaich
Department of Health Science
and Technology
Aalborg University
Aalborg, Denmark

Mohammad A. Haque
Architecture, Design, & Media Technology
Aalborg University
Aalborg, Denmark

Kamal Nasrollahi
Architecture, Design & Media Technology
Aalborg University
Aalborg, Denmark

Thomas B. Moeslund
Visual Analysis of People Lab
Aalborg University
Aalborg, Denmark

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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

Copenhagen, Denmark — Juris Klonovs
Aalborg, Denmark — Mohammad A. Haque
Copenhagen, Denmark — Volker Krueger
Aalborg, Denmark — Kamal Nasrollahi
Odense, Denmark — Karen Andersen-Ranberg
Aalborg, Denmark — Thomas B. Moeslund
Aalborg, Denmark — Erika G. Spaich

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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