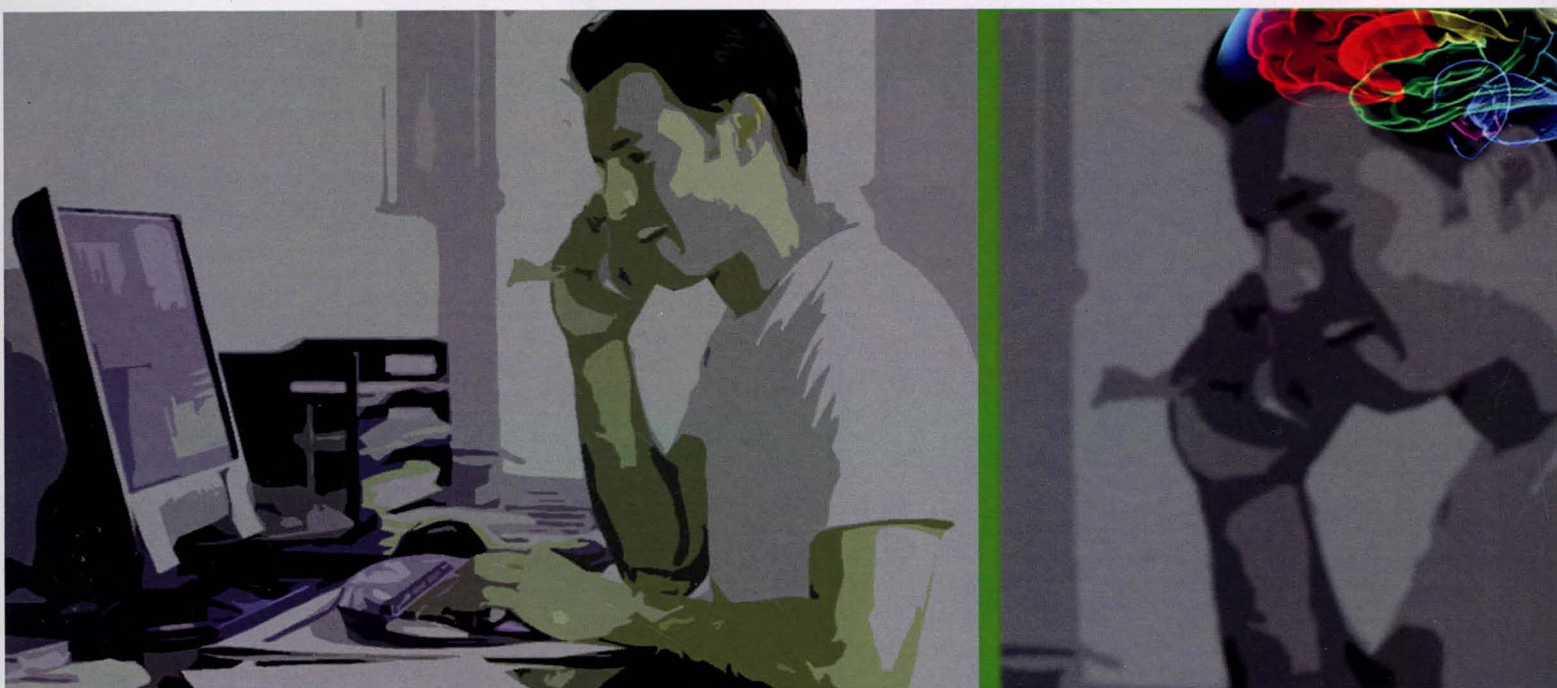


UNDERSTANDING BRAIN DEVELOPMENTAL DISORDER BASED ON EEG IN SOFT COMPUTING APPROACH

Abdul Wahab Abdul Rahman



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

**UNDERSTANDING BRAIN
DEVELOPMENTAL
DISORDER BASED ON EEG
IN SOFT COMPUTING
APPROACH**

Editors

Abdul Wahab Abdul Rahman



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia
Data

Cataloguing-in-Publication

Abdul Wahab Abdul Rahman: Understanding brain developmental disorder based on EEG in soft computing approach

ISBN: 978-967-418-111-6

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

TABLE OF CONTENTS

| | |
|--|------|
| Dedication | v |
| Table of Contents | vi |
| Preface | x |
| Acknowledgement | xii |
| Introduction | xiii |
| | |
| Viewing emotions from categorical and dimensional perspectives <ul style="list-style-type: none"> - Hamwira Sakti Yaacob - Abdul Wahab Abdul Rahman | 1 |
| Emotion recognition based on EEG: Brain waves <ul style="list-style-type: none"> - Abdul Wahab Abdul Rahman - Norhaslinda Kamaruddin - Palaniappan L.K | 14 |
| Emotion recognition using EEG signals <ul style="list-style-type: none"> - Normaziah Abdul Aziz - Abdul Wahab Abdul Rahman - Najwani Razali | 37 |
| EEG emotion recognition using features of mel frequency cepstral coefficients <ul style="list-style-type: none"> - Marini Othman - Abdul Wahab Abdul Rahman | 58 |

| | |
|---|-----|
| - Reza Khosrowabadi | |
| Emotion detection from brain signals based on musical and visual stimuli - Marini Othman - Abdul Wahab Abdul Rahman - Reza Khosrowabadi | 77 |
| Understanding students' emotion while solving mathematical questions using EEG signals - Normaziah Abdul Aziz - Abdul Wahab Abdul Rahman - Marini Othman - Najwani Razali | 94 |
| Understanding stress by analyzing the brain when solving mathematical task - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor | 111 |
| Classification of EEG signals for understanding affective face processing impairment in autism - Abdul Wahab Abdul Rahman - Marini Othman | 135 |
| Detection of autism spectrum disorder based on 2D affective space model (ASM) - Abdul Wahab Abdul Rahman - Najwani Razali | 155 |
| Detection of autism spectrum disorder (ASD) based on motor imitation - Abdul Wahab Abdul Rahman - Najwani Razali | 177 |

| | |
|--|-----|
| Critical features among autistic children based on EEG for motor imitation: Dynamic analysis approach - Abdul Wahab Abdul Rahman - Najwani Razali | 195 |
| Principle component analysis for detecting autism during motor movement - Abdul Wahab Abdul Rahman - Wafaa Khazaal | 215 |
| Understanding human stress and depression with relation to cultural and language differences - Abdul Wahab Abdul Rahman - Rahnuma K.S - Hariyati - Bjorn Cruts | 237 |
| Understanding stress using EEG-VA approach - Abdul Wahab Abdul Rahman - Rahnuma K.S | 252 |
| Understanding driver behavior based on driver identification and driver's emotion verification - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor | 271 |
| Understanding driver behavior according to brain signal and DASS 21 analysis - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor | 303 |
| Post accident analysis by using valence arousal approach (VAA) - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor | 334 |

| | |
|---|-----|
| <ul style="list-style-type: none"> - Hariyati - Norhaslinda Kamaruddin | |
| <p>Understanding driver behavior based on the relationship between pre-post accident and pre-cursor emotion</p> <ul style="list-style-type: none"> - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor - Norhaslinda Kamaruddin - Hariyati | 358 |
| <p>Understanding long term memory effect towards driver's pre-emotion by using EEG</p> <ul style="list-style-type: none"> - Abdul Wahab Abdul Rahman - Norzaliza Md. Nor - Hariyati - Norhaslinda Kamaruddin | 383 |
| <p>Classifying users emotions towards the quranic recitation using EEG: A preliminary study</p> <ul style="list-style-type: none"> - Akram M. Zeki - Ahmed M. Zeki - Daeng A.Z.Z - Rosyuhadah Tahir | 404 |

**UNDERSTANDING DRIVER BEHAVIOR BASED
ON DRIVER IDENTIFICATION AND DRIVER'S
EMOTION VERIFICATION**

**ABDUL WAHAB ABDUL RAHMAN AND
NORZALIZA MD NOR**

15.0 Abstract

Driver behavior is a major factor that contributes to the high accidents rates. However, if we are able to identify their behavior, it may be possible for us to detect driving idiosyncrasies that may prevent accidents. Therefore, this research study presents simple and effective methods for an in-car data acquisition in collecting real time driving data. The data has been classified into three emotions for each driver which are happy expression, talking on the phone and normal driving. These data will be used to investigate the effectiveness of driver behavior which focusing on the driver's response towards the brake and gas pedals as well as its rate of change. From these data we will demonstrate simple yet effective technique in driver identification and driver verification. We use the kernel density