2018 CBEES-BBS AMSTERDAM, THE NETHERLANDS CONFERENCE ABSTRACT

2018 10th International Conference on Bioinformatics and Biomedical Technology (ICBBT 2018)

May 16-18, 2018

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2018 10th International Conference on Bioinformatics and Biomedical Technology (ICBBT 2018) Introduction

Welcome to 2018 10th International Conference on Bioinformatics and Biomedical Technology (ICBBT 2018) which is sponsored by Hong Kong Chemical, Biological & Environmental Engineering Society (CBEES) and Biology and Bioinformatics (BBS). The objective of 2018 10th International Conference on Bioinformatics and Biomedical Technology (ICBBT 2018) is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in Bioinformatics and Biomedical Technology.

Papers will be published in one of the following conference proceedings or journals:

ACM Conference Proceedings (ISBN: 978-1-4503-6366-2). Archived in the ACM Digital Library, and indexed by Ei Compendex and submitted to be reviewed by Scopus and Thomson Reuters Conference Proceedings Citation Index (ISI Web of Science).

International Journal of Pharma Medicine and Biological Sciences (IJPMBS, ISSN: 2278-5221). Included in the Engineering & Technology Digital Library, and indexed by Embase (Under elsevier), ProQuest, Google Scholar, Chemical Abstracts Services (CAS), Indian Science, ICMJE(International Committee Medical Journal Editors), HINARI(World Health Organization), and NYU(Health Sciences Library).

Conference website and email: http://www.icbbt.org/; icbbt@cbees.org

Presentation Instruction

Instruction for Oral Presentation

Devices Provided by the Conference Organizer:

Laptop Computer (MS Windows Operating System with MS PowerPoint and Adobe Acrobat Reader)
Digital Projectors and Screen
Laser Stick

Materials Provided by the Presenters:

PowerPoint or PDF Files (Files should be copied to the Conference laptop at the beginning of each Session.)

Duration of each Presentation (Tentatively):

Regular Oral Presentation: about **12** Minutes of Presentation and **3** Minutes of Question and Answer
Keynote Speech: about **30** Minutes of Presentation and **5** Minutes of Question and Answer
Plenary Speech: about **30** Minutes of Presentation and **5** Minutes of Question and Answer

Instruction for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

Home-made Posters
Maximum poster size is A1
Load Capacity: Holds up to 0.5 kg

Best Presentation Award

One Best Oral Presentation will be selected from each presentation session, and the Certificate for Best Oral Presentation will be awarded at the end of each session on May 17, 2018.

Keynote Speaker Introduction

Keynote Speaker I

Prof. Raymond Veldhuis

University of Twente, The Netherlands

Raymond Veldhuis graduated from The University of Twente, The Netherlands in 1981. From 1982 until 1992 he worked as a researcher at Philips Research Laboratories in Eindhoven in various areas of digital signal processing. In 1988, he received the PhD degree from Nijmegen University on a thesis entitled Adaptive Restoration of Lost Samples in Discrete-Time Signals and Digital Images. From 1992 until 2001 he worked at the IPO (Institute of Perception Research) Eindhoven in the field of speech processing. Raymond Veldhuis is now a full professor in Biometric Pattern recognition at The University of Twente, where he is leading a research group in this field. The main research topics are face recognition (2D and 3D), fingerprint recognition, vascular pattern recognition, multibiometric fusion, and biometric template protection. The research is both applied and fundamental.

Topic: *"Forensic Face Recognition, How Pattern Recognition Can Support the Forensic Examiner"*

Abstract—In this presentation we will show how properly designed classifiers can support the task of a forensic examiner to compare the images of two faces. We will pay attention to a semi-automatic method to compare facial marks and on how the result can be expressed in a likelihood ratio in order to quantify the evidential value. In addition we will illustrate to what extend forensic facial comparison is different from biometric facial comparison as used in for instance access control.

Keynote Speaker II

Prof. José Manuel Fonseca

Faculty of Sciences and Technology of the Universidade Nova de Lisboa, Portugal

José Fonseca was born in 1962, Lisbon, Portugal. Obtained his PhD on Electrical Engineering specialty Robotics and Integrated Manufacturing by Universidade Nova de Lisboa, 10th May 2001.He his Professor on the Faculty of Sciences and Technology of the Universidade Nova de Lisboa(FCT/UNL) since 1992, and member of the Electrical Engineering Department sinceits foundation on 1993. Has been responsible for several courses in the area ofsensorial processing and real-time processing. Since its PhD supervised two PhD. Thesis, 30 MSc Thesis and 35 Final Diploma Projects. Published more than 60 papers on Journals and International Conferences, is co-author of several book Chapters, co-author of a National Patent and co-founder of a spin-off Company. Prof. Fonseca has participated on more than ten European Projects as researcher and coordinator of the FCT/UNL participation. Was leader of task force e Delivery and leader of the work package Integrating Support Activities on the Network of Excellence "BIOPATTERN - Computational Intelligence for BioPattern Analysis to Support eHealth" FP6-2004-IST-2-508803 from 2004 to 2008.

Topic: *"The (key) Role of Ergonomics in Digital Pathology"*

Abstract—For more than a century that the optical microscope has been the pathologists primordial tool for detection/diagnosis of diseases such as cancer. Nowadays, digital pathology systems are not only the future but also the present. However, the huge size of whole-slide digital images, typically in the order of tens of gigapixel, makes it difficult for any image processing procedure and, therefore, any automatic analysis. Several studies highlight that the major challenges in this area are to achieve an image quality good enough and to provide an interactive visualization tool comparable to the experience of the optical microscope. Therefore, ergonomics and human-device interaction play a major role for the more generalized adoption of digital slides on daily clinical practice. Image viewing must be optimized to compete with the analogical viewing of traditional microscopes adopting a user interface carefully designed and using the most appropriated input devices to provide the friendliest and most effective environment with special emphasis on ergonomics. In this talk automatic segmentation algorithms for nucleoids identification on thyroid scraped slides will be addressed and IPATHSCOPE, a visualization tool developed with special emphasis on the ergonomics will be presented.

Keynote Speaker III

Prof. Tuan D. Pham

Linkoping University, Sweden

Tuan D. Pham is Professor of Biomedical Engineering at Linkoping University, University Hospital Campus, Linkoping, Sweden. Prior to the current position, he was appointed as Professor and Leader of the Aizu Research Cluster for Medical Engineering and Informatics, and the Medical Image Processing Lab, both at the University of Aizu, Japan. Before his appointments in Japan, he was the Bioinformatics Research Group Leader at the University of New South Wales, Canberra, Australia. He has been an Editorial Member and Associate Editor of Pattern Recognition (Elsevier), served as Guest Editor of Computer Methods and Programs in Biomedicine (Elsevier), Computers in Medicine and Biology (Elsevier), BioMedical Engineering OnLine (BioMed Central), and Associate Editor of IEEE Engineering in Medicine and Biology Conference series. Dr. Pham has published extensively on pattern recognition, image processing, and time-series analysis in medicine, biology, and mental health.

Topic: "*Fuzzy Recurrence Analysis of Physiological Data*"

Abstract—The concepts of fuzzy recurrence plots and scalable recurrence networks have recently been introduced. A fuzzy recurrence plot displays grayscale texture, which is informative for pattern analysis. Networks derived from fuzzy recurrence plots are scalable and can be naturally modeled as either unweighted or weighted. This talk presents several applications of fuzzy recurrence analysis of physiological data for pattern classification, including gait dynamics, computer keystroke time series, and photoplethysmography signals in control subjects and patients with neuro-degenerative diseases. Extension of fuzzy recurrence analysis to medical image data is also addressed in this talk.

Keynote Speaker IV

Dr. Richard Guest
University of Kent, UK

Dr. Richard Guest is Reader in Biometric Systems Engineering at the University of Kent. His research interests lie broadly within image processing and pattern recognition, specializing in biometric and forensic systems, particularly in the areas of image and behavioral information analysis, standardization and document processing. He has significant involvement with biometric standards development as Panel Chair of the UK BSI IST/44 Working Group on Biometric Technical Interfaces and as UK Principal Expert to ISO/IEC in this area representing the UK industrial, governmental and academic interests. He has over 100 peer-reviewed publications, acted as editor of 3 international standards and has obtained funding from UK EPSRC, ESRC, EU, charitable funds and industry. He is the Project Coordinator of the AMBER EU Marie Curie ITN on mobile biometrics systems.

Topic: "*Mobile Biometrics: Challenges and Opportunities*"

Abstract—The use of biometric systems are becoming ever more widespread, especially on mobile computing devices such as tablets and smartphones. Conventional research into biometric systems has focussed on the development of algorithmic solutions to enhance verification and identification of subjects with solutions being used in predominantly 'fixed' implementations, where sensors and systems are deployed in controlled situations. The transition of biometric systems to mobile devices is not straightforward however as, by their very nature, devices can be used in many different environments. Minimising environmental effects and interaction problems are critical as biometrics become ubiquitous – particularly given the wider user-base and usage frequency. Balancing these challenges are the range of novel mobile device sensors and data that may be utilised to enhance personal security and authentication for the user. In this presentation we shall explore the key opportunities and challenges for future research within mobile biometrics, addressing issues such as continuous authentication, multimodality, interaction and vulnerability assessment.

Plenary Speaker I

Prof. Ralf Hofestädt
Bielefeld University, Germany

Prof. Ralf Hofestädt studied Computer Science and Bioinformatics at the University of Bonn. He finished his PhD 1990 (University Bonn) and his Habilitation (Applied Computer Science and Bioinformatics) 1995 at the University of Koblenz. From 1996 to 2001, he was Professor for Applied Computer Science at the University of Magdeburg. Since 2001, he is Professor for Bioinformatics and Medical Informatics at the University Bielefeld. The research topics of the department concentrate on biomedical data management, modeling and simulation of metabolic processes, parallel computing and multimedia implementation of virtual scenarios.

Topic: "*OMPetri: A New Petri Net Simulation Environment Based on OpenModelica*"

Abstract—This paper will discuss relevant Petri net simulation tools and focus on a new Petri net simulation environment based on the OpenModelica software tool. A user interface will be presented, which allows the access to the Petri net library (PNlib) of OpenModelica. OMPetri provides a powerful simulation environment. Based on this new tool, Petri net models can be easily created, simulated and analyzed. In addition the new system includes basic features to check and evaluate the model and to analyze simulation results generated by the simulation back-end.

Plenary Speaker II

Assoc. Prof. David E. Breen
Drexel University, USA

David E. Breen is currently an Associate Professor of Computer Science in the College of Computing and Informatics of Drexel University. He has held research positions at the Max Planck Institute for the Physics of Complex Systems, the California Institute of Technology, the European Computer-Industry Research Centre, the Fraunhofer Institute for Computer Graphics, and the Rensselaer Design Research Center. His research interests include computer-aided design, biomedical image informatics, geometric modeling, self-organization and biological simulation. He has authored or co-authored over 100 technical papers, articles and book chapters on these and other subjects. He is the co-editor of the book "Cloth Modeling and Animation" and is a recipient of the prestigious NSF CAREER Award. Breen received a BA in Physics from Colgate University in 1982. He received MS and PhD degrees in Computer and Systems Engineering from Rensselaer Polytechnic Institute in 1985 and 1993.

Topic: *"Volumetric Contour-Based Surface Reconstruction"*

Abstract—Current imaging technology produces 3D sampled data that can be interpreted as a stack of 2D slices cutting through the studied object/specimen. Frequently the process of segmenting and identifying specific structures in the slices involves a delineation procedure that produces contours around the structure of interest in each slice. These contours then need to be connected in order to produce a 3D model of the structure. Given the noise properties and sampling resolutions of different imaging modalities, a single reconstruction technique is therefore unlikely to produce satisfactory results for all types of input. To address this issue, three volumetric contour-based surface reconstruction techniques have been developed. A volumetric/implicit approach has been taken because these types of techniques easily handle changes in topology and more robustly reconstruct complex multi-component, branching objects. The first two techniques are more suitable for sparse contour sets and are based on 2D level set morphing and 2D distance field interpolation. The third method is more appropriate for high density input that contains significant noise and utilizes an implicit point set model to create a smooth surface with user-specified error bounds. These three methods will be detailed and compared using numerous reconstruction results from a variety of contour datasets.

Plenary Speaker III

Prof. Andre Ribeiro
Tampere University of Technology, Finland

Andre Ribeiro (andre.ribeiro AxT tut.fi) born in 1976, graduated in Physics in the University of Lisbon (1999) and has a PhD in Physics Engineering from IST, Technical University of Lisbon, Portugal (2004). From 2004-07, he was a Postdoc at the University of Calgary, Canada. Since 2008, he is the PI of the Laboratory of Biosystem Dynamics (LBD) at Tampere University of Technology (TUT), Finland. In April 2016 he created and is since then the head of the Multi-scaled Biodata Analysis and Modelling Research Community of TUT-UTA. Since June 2017, he is a Professor at the BiomediTech Institute, TUT. His studies focus on the in vivo dynamics and regulatory mechanisms of bacterial gene expression and genetic circuits at the single-cell, single-molecule level using time-lapse microscopy, stochastic models, molecular biosensors, single-cell signal processing, and synthetic gene engineering. The aims are to understand how genes and genetic circuits are regulated and unravel their range of functionalities, thereby assisting in the comprehensive engineering of synthetic circuits for regulating cellular processes. So far, he published 86 peer-reviewed journal articles, 41 peer-reviewed conference proceedings articles, 63 peer-reviewed conference abstract/posters, and 12 peer-reviewed book chapters. Also, he supervised 3 post-doctoral fellows, 12 PhD, 15 Masters, and 6 Bachelors theses. Finally, the LBD has 9 awards for scientific achievements and 2 awards for contributions to teaching.

Topic: *"Bacterial Gene Regulatory Mechanisms of Decision-Making"*

Abstract—Cells use past events in order to make decisions on future actions. This decision making process is based on the crossing of pre-established, tuned thresholds. At the level of gene expression and genetic circuits, these thresholds are based on RNA and protein numbers that need to be reached in order to change the *status quo* of the cell functioning. They are based on both maximum and minimum protein numbers, as well as on time-lengths that these numbers must be maintained so as to overcome safeguard mechanisms protecting the cell from spurious fluctuations in molecular numbers. We used *in vivo* single-RNA time-lapse fluorescence microscopy to extract the skewness and kurtosis of the distribution of intervals between consecutive RNA production events in individual cells. From the analysis of multiple promoters, mutants, induction schemes, and media conditions, we show that skewness and kurtosis can be tuned independently from the mean and noise in RNA numbers, by tuning the rate-limiting steps in transcription initiation. As these steps are sequence dependent and

subject to regulation, these results suggest that, in bacteria, threshold crossing by RNA numbers and, thus, decision making by gene regulatory networks, is evolvable and adaptable at the stage of transcription initiation.

Plenary Speaker IV

Assoc. Prof. Aythami Morales Moreno
Universidad Autonoma De Madrid, Spain

Aythami Morales Moreno received his M.Sc. degree in Telecommunication Engineering in 2006 from Universidad de Las Palmas de Gran Canaria. He received his Ph.D degree from La Universidad de Las Palmas de Gran Canaria in 2011. He performs his research works in the BiDA Lab - Biometric and Data Pattern Analytics Laboratory at Universidad Autónoma de Madrid, where he is currently an Associate Professor. He has performed research stays at the Biometric Research Laboratory at Michigan State University, the Biometric Research Center at Hong Kong Polytechnic University, the Biometric System Laboratory at University of Bologna and Schepens Eye Research Institute (Harvard Medical School). His research interests include pattern recognition, computer vision, machine learning and biometrics signal processing. He is author of more than 70 scientific articles published in international journals and conferences. He has received awards from ULPGC, La Caja de Canarias, SPEGC, and COIT. He has participated in 7 National and European projects in collaboration with other universities and private entities such as UAM, UPM, EUPMt, Accenture, Unión Fenosa, Soluziona and so on.

Topic: *"Behavioral Biometrics Based on Human-Device Interaction"*

Abstract—Behavioral biometrics include technology that identifies people by something that we do, rather than by what we are (e.g., fingerprint, face), what they have (e.g. card, token) or what they know (e.g. password). Behavioral biometrics emerge as a feasible way to model human interaction with electronic devices (smartphones, computers, tablets). Behavioral patterns can be used to statistical modelling users in terms of identity, age, and actions by means of existing sensors (mouse, keypad, touch screen…). Main advantages of behavioral biometrics are the transparent modelling and continuous authentication. Some of the main drawbacks are the high intra-class variability, short utterances and limited performance. This keynote will survey some of the most promising behavioral biometrics including its main challenges, applications and research opportunities.

Brief Schedule for Conference

Day 1	**May 16, 2018 (Wednesday)** **Venue: Hotel Lobby** Arrival Registration 10:00-16:00	
Day 2	**May 17, 2018 (Thursday) 08:30-18:25**	
	Morning Conference	
	Venue: Zwaardemaker & Hercules Room 08:30-08:35 **Opening Remarks** (Prof. Jos éManuel Fonseca) 08:35-09:10 **Keynote Speech I** (Prof. Raymond Veldhuis) 09:10-09:45 **Keynote Speech II** (Prof. Jos éManuel Fonseca) 09:45-10:20 **Keynote Speech III** (Prof. Tuan D. Pham) 10:20-10:45 Coffee Break & Group Photo 10:45-11:20 **Keynote Speech IV** (Dr. Richard Guest) 11:20-11:55 **Plenary Speech I** (Prof. Ralf Hofest ädt**)** 11:55-12:30 **Plenary Speech II** (Assoc. Prof. David E. Breen)	
	Lunch: 12:30-13:30 **Venue: Restaurant**	
	Afternoon Conference	
	Venue: **Zwaardemaker Room**	**Venue:** **Hercules Room**
	13:30-14:05 **Plenary Speech III** (Prof. Andre Ribeiro)	13:30-14:05 **Plenary Speech IV** (Assoc. Prof. Aythami Morales Moreno)
	Session 1: 14:05-16:05 Topic: Medicine Bioinformatics Engineering and Biocomputing 8 presentations	**Session 2:** 14:05-16:05 Topic: Biological Signal Processing and Biometrics 8 presentations
	Coffee Break: 16:05-16:25	
	Session 3: 16:25-18:10 Topic: Biomedical Engineering 7 presentations	**Session 4:** 16:25-18:25 Topic: Biometrics and Methods 8 presentations
	18:30~20:00 Dinner (Restaurant)	
Day 3	**09:00~17:00 Academic Visit and Tour**	

Tips: Please arrive at the Conference Room 10 minutes before the session begins to upload PPT into the laptop.

Detailed Schedule for Conference

May 16, 2018 (Wednesday)

Venue: Hotel Lobby

10:00~16:00	Arrival and Registration

May 17, 2018 (Thursday)

Venue: Zwaardemaker & Hercules Room

08:30-08:35		**Opening Remarks** Prof. José Manuel Fonseca Faculty of Sciences and Technology of the Universidade Nova de Lisboa, Portugal
08:35-09:10		**Keynote Speech I** Prof. Raymond Veldhuis University of Twente, The Netherlands Topic: *"Forensic Face Recognition, How Pattern Recognition Can Support the Forensic Examiner"*
09:10-09:45		**Keynote Speech II** Prof. José Manuel Fonseca Faculty of Sciences and Technology of the Universidade Nova de Lisboa, Portugal Topic: *"The (key) Role of Ergonomics in Digital Pathologys"*
09:45-10:20		**Keynote Speech III** Prof. Tuan D. Pham Linkoping University, Sweden Topic: *"Fuzzy Recurrence Analysis of Physiological Data"*
10:20-10:45	**Coffee Break & Group Photo**	
10:45-11:20		**Keynote Speech IV** Dr. Richard Guest University of Kent, UK Topic: *"Mobile Biometrics: Challenges and Opportunities"*
11:20-11:55		**Plenary Speech I** Prof. Ralf Hofestädt Bielefeld University, Germany Topic: *"OMPetri: A New Petri Net Simulation Environment Based on OpenModelica"*

11:55-12:30	**Plenary Speech II** Assoc. Prof. David E. Breen Drexel University, USA Topic: *"Volumetric Contour-Based Surface Reconstruction"*
12:30-13:30	**Lunch (Restaurant)**
13:30-14:05	**Plenary Speech III (Zwaardemaker Room)** Prof. Andre Ribeiro Tampere University of Technology, Finland Topic: "*Bacterial Gene Regulatory Mechanisms of Decision-Making*"
13:30-14:05	**Plenary Speech IV (Hercules Room)** Assoc. Prof. Aythami Morales Moreno Universidad Autonoma De Madrid, Spain Topic: *"Behavioral Biometrics Based on Human-Device Interaction"*

14:05-16:05	**Session 1 (Zwaardemaker Room)** Topic: Medicine Bioinformatics Engineering and Biocomputing	**Session 2 (Hercules Room)** Topic: Biological Signal Processing and Biometrics
16:05-16:25	**Coffee Break**	
16:25-18:25	**Session 3 (Zwaardemaker Room)** Topic: Biomedical Engineering	**Session 4 (Hercules Room)** Topic: Biometrics and Methods
18:30-20:00	**Dinner (Restaurant)**	

Note: (1) The registration can also be done at any time during the conference.

(2) The organizer doesn't provide accommodation, and we suggest you make an early reservation.

(3) One Best Oral Presentation will be selected from each oral presentation session, and the Certificate for Presentation will be awarded at the end of each session on May 17, 2018.

Let's move to the session!

Session 1

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, May 17, 2018 (Thursday)

Time: 14:05-16:05

Venue: Zwaardemaker Room

Session 1: Topic: "Medicine Bioinformatics Engineering and Biocomputing"

Session Chair: Prof. Andre Ribeiro

A0003 Presetation 1 (14:05-14:20)	A Novel Approach for Detecting Driver Mutated Pathways in Glioblastoma Multiform **Yassine EL Kati**, Shu-Lin Wang and Fouad Kharroubi School of Computer Science and Electronic Engineering Hunan University, China *Abstract*—Quite recently, considerable attention has been paid to finding the distinction between driver mutations that lead to tumorigenesis and passenger mutations that are neutral and do not play any role in the cancer proliferation. The main objective of this work is to come up with a new method to solve "The Maximum Weight Submatrix Problem". To that end, we introduce a new constraint named "approximate exclusivity" that helps to determine precisely the number of mutations that each patient has in the pathway. Depending on this constraint, we present a novel algorithm that detects driver mutated pathways based on an exact approach. We describe the details about our algorithm, then we compare the results with a Genetic Algorithm and a Binary Linear Programming model in both simulated and genetic data. Our exact algorithm has shown a good performance in terms of maximizing the weight and detecting all the possible driver pathways.
A0009 Presetation 2 (14:20-14:35)	Combination of L-ascorbic Acid and 2-mercaptoethanol Reduces the Damaging Effect of Hydrogen Peroxide during in Vitro Maturation of Nili Ravi Buffalo Denuded Oocytes **Ikram Ullah**, Benish Shahid, Muhammad Ijaz Khan, Khalid Farooq, Akbar Ali and Samina Jalali Faculty of Biological Sciences Quaid-I-Azam University, Islamabad,

	Pakistan
	Abstract—The objective of this study was to evaluate the anti-oxidative effect of L-ascorbic acid (AsA) and 2-mercaptoethanol (2-ME) on in-vitro maturation of Nili Ravi buffalo cumulus enclosed oocytes (CEOs) and cumulus denuded oocytes (CDOs). The medium without any supplementation was used in control group. In treatment groups the medium was supplemented in following combinations (i) 100 <mu>M H_2O_2 (ii) 100<mu>M H_2O_2 + 25 <mu>M 2-ME + 250 <mu>M AsA (iii) 100<mu>M H_2O_2 + 25 <mu>M 2-ME (iv) 100<mu>M H_2O_2 + 250 <mu>M AsA. In absence of H_2O_2 the degeneration at 24 hrs was lower. The combined additives reduced the degeneration of oocytes and increased the proportion of MII CDOs to similar levels to those achieved by CEO. Cumulus cells protect oocytes from oxidative stress. The supplementation of medium with 100<mu>M H_2O_2 + 25 <mu>M 2-ME + 250 <mu>M AsA, for the culture of denuded oocytes effectively counteracts the oxidative stress.
A0013 Presetation 3 (14:35-14:50)	Development of a Model that Uses Data Obtained in the Admission to Predict One-Year Mortality in Patients with Sepsis in the Intensive Care Unit **Javier E. Garcá-Gallo,** Nelson J. Fonseca-Ruiz and John F. Duitama-Muñoz Universidad de Antioquia UdeA, Colombia *Abstract*—Sepsis is a syndrome that occurs with physiological and biochemical abnormalities induced by severe infection and carries a high mortality and morbidity, therefore the severity of its condition must be interpreted quickly. This study presents the development of a model for the one-year mortality prediction of the patients that are admitted in a ICU with a sepsis diagnosis. 5650 patients extracted from the MIMIC III database (divided in 70% for training and 30% for validation) were evaluated and predictors available from the ICU admission was used to develop a mortality prognosis prediction model based on Bayesian Additive Regression Trees (BART) methodology. Variable importance is also presented. In order to evaluate the predictive power of the model, we used the 1695 admissions of the validation subset, and obtained an area under the Receiver Operating Characteristic curve (AUROC) of 0.7354 (95% Confidence Interval (CI): [0.7118-0.7589]). The presented model outperform the results obtained with Sequential Organ Failure Assessment (SOFA), Oxford Acute Severity of Illness Score (OASIS) and Simplified Acute Physiology Score II (SAPSII) indicators on the same validation subset. Our approach demonstrates the importance of comorbidities for the long-term mortality in patients with sepsis in the ICU and shows that it is possible to obtain a model with adequate

	predictive capacity from the moment of the admission of a patient.
A0015 Presetation 4 (14:50-15:05)	Algorithmic Identification of Ring Chromosomes Using Mapped Paired Reads **Matthew Hayes** Xavier University of Louisiana, USA *Abstract*—Ring chromosomes are genomic abnormalities that occur when DNA is lost at the p-arm and q-arm telomeres, causing the fusion of the altered chromosomal arms into a ring-like shape. Ring chromosomes cause genetic disorders that lead to diseases such as epilepsy and Turner syndrome. Algorithms to detect ring chromosomes using next-generation sequencing (NGS) data can provide rapid and high-resolution methods to detect these abnormalities, which is essential for genetic counseling and diagnosis. In this study, we present an algorithm called RingScreen that uses paired-end sequencing data to determine the presence of ring chromosomes. On simulated data, the method accurately predicted the presence of synthetic rings on 18 of 23 human chromosomes. The method takes advantage of several hallmarks of ring chromosome formation that are reflected in the paired reads that map to the p-arm/q-arm junction, and in the read depth in areas flanking the breakpoint. This is the first known algorithm that exists for the problem of detecting ring chromosomes using NGS data
A0017 Presetation 5 (15:05-15:20)	An Analysis of TopHat: A Fast Splice Junction Mapper for RNA-Sequencing Bashir Khan, **Laiq Hasan,** Zahid Wadud, Muhammad Yahya and Ikram Ullah University of Engineering & Technology Peshawar, Pakistan *Abstract*—To improve the performance of a TUXEDO Pipeline, we focused on optimizing the processing time of the simulation programs running in a pipeline. First and foremost, we figured out the most critical time-consuming program among all those which are running in the intermediate parts of the pipeline. To accomplish this task we processed raw RNA-Sequencing data on TUXEDO Pipeline and recorded the time taken by each program (tool). Consequently, we identified Tophat as the most time-consuming program. However, Tophat is an efficient and fast spliced aligner, but it consumes relatively more time as compared to the other programs (tools) while aligning reads to a reference genome. To investigate the reasons behind the lengthy processing of Tophat while aligning reads to a reference genome, we executed four independent raw RNA-Sequencing datasets with Tophat using multiple numbers of threads and noted down the processing time taken by each dataset. As a matter of fact, the processing time should be reduced if the number of

	threads increased. Conversely, the results show that increasing the number of threads increases the processing time. After extensive simulation and analysis of data processing time for all datasets, we found the lack of synchronization and communication between the threads. Increasing the number of threads per unit time requires increased resolution of synchronization and communication. There is an enormous increase in alignment time resulting in processing time elongation.
A0024 Presetation 6 (15:20-15:35)	Experimental Estimation of Human Blood Plasma Viscosity Mehrnoosh Vahidi, **Hamidreza Fallah Haghmohammadi,** Masoumesadat Peyghambarzadeh and Erfan Niazi University of Ottawa, Canada *Abstract*—Plasma viscosity is an important parameter in biology and fluid mechanic. This parameter is linked to several diseases in human. Usually to measure the plasma viscosity, red blood cells should be separated from a whole blood. This process is time consuming and needs expensive viscometers. In this paper an innovative method is suggested to measure blood viscosity which does not require separating the red blood cells from plasma and it is done in a very small amount time. In this method blood viscosity is measured by finding red blood cells terminal velocity in sedimentation. An experimental set-up is designed using transparent polydimethylsiloxane (PDMS) material and video microscopic system. Image processing techniques are used to detect red blood cells and their respected velocity. Using this velocity, plasma viscosity can be estimated using force balance on red blood cells. The viscosity measured by this algorithm then is compared with the results of a viscometer.
A3007 Presetation 7 (15:35-15:50)	An Automated Colony Counter for Serial-Dilution Culture Method Naphatsawan Vongmanee, Aonjira Bunmak and **Sarinporn Visitsattapongse** King Mongkut's Institute of Technology Ladkrabang, Thailand *Abstract*—Serial-dilution method is used for estimating the concentration of unknown sample by counting the number of bacterial colonies cultured and then backtracking the measured counts to the unknown concentration. This process is time-consuming, error prone and cause eye fatigue. This paper proposes an automatic colony counter with captured image using webcam camera and uses Raspberry Pi for processing with capturing, thresholding, circular Hough transform, watershed segmentation and displaying results number of colonies on culture media.
A0010	Detection of Simulated Clonic Seizures from Depth Camera Recordings

Presetation 8	**Mareike Wendebourg**, Omer Rajput and Alexander Schlaefer
(15:50-16:05)	Hamburg University of Technology, Institute of Medical Technology, Germany
	Abstract—Tonic-clonic seizures pose a serious risk of injury to those afflicted. Therefore, patients both in home-based and residential care can require constant monitoring. Technical aids may help by alerting caregivers of detected seizures. So far, the usability of several sensor systems for seizure detection has been shown. However, most of these systems require some sensors to be physically attached to the patient or are limited with respect to their accuracy or robustness. Thus, we investigated the feasibility of using depth image sequences for the detection of seizure-like periodic motion. A static camera setup was utilized to monitor a limited region of interest comparable to a patient's bed during the night. Data of simulated limb motion including seizure-like movement was acquired with help of a robot moving a hand phantom both uncovered and covered by a duvet, ensuring the availability of a known ground truth. Subsequently, a characteristic of the recorded images which may be used to differentiate between normal and seizure-like motion was defined. Finally, linear discriminant analysis was applied to the determined characteristic. We found that the rapid detection of seizure-like periodic motion from depth image sequences is feasible even when the moving limb is covert by a blanket.

Session 2

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, May 17, 2018 (Thursday)

Time: 14:05-16:05

Venue: Hercules Room

Session 2: Topic: "Biological Signal Processing and Biometrics"

Session Chair: Assoc. Prof. David E. Breen

A0007 Presetation 1 (14:05-14:20)	Remote Heart Rate Extraction Using Microsoft Kinect v2.0 Lakmini Malasinghe, **Stamos Katsigiannis**, Naeem Ramzan and Keshav Dahal University of the West of Scotland, United Kingdom *Abstract*—Remote and contactless heart rate detection is still an open research issue of great clinical importance. Available approaches lack the necessary accuracy and reliability for acceptance by medical experts. In this study, we propose a new method for remote heart rate extraction using the Microsoft KinectTM v2.0 image sensor. The proposed approach relies on signal processing and machine learning methods in order to create a model for accurate estimation of the heart rate via RGB and infrared face videos. Electrocardiography (ECG) recordings and RGB and infrared face videos, captured using the KinectTM v2.0 image sensor, were acquired from 17 subjects and used to create a machine learning model for remote heart rate detection. Experimental evaluation through supervised regression experiments showed that the proposed approach achieved a mean absolute error of 6.972 bpm, demonstrating the capabilities of the underlying technology.
A0014 Presetation 2 (14:20-14:35)	Bionics Based Emergency Contact for Treatment of Epilepsy **Shweta Gupta**, HariPrasad S. A. and Adesh Kumar Jain University, India *Abstract*—This research paper provides the new invention and boon to people suffering with epilepsy by early detection of the onset of tremors of epilepsy and sending the emergency call and emergency sms indicating location to police, hospital and his next to kin and relatives. Early detection of the onset of tremors of epilepsy takes place through

	bionics based dust sized, nano thin battery less wireless sensors, placed in cortex region of brain, which senses the tremors of epilepsy and with their external transreceiver embedded in hair thin, sweat and water resistant, three layered nano thin electronic circuit embedded in the fabric worn on head. Simultaneously, Bluetooth capabilities of electronic circuit send signals to dial emergency number on the patient's mobile, even locked mobile, just at the onset of tremors, so that his relatives can be informed immediately and simultaneously, emergency SMS service is also sent to the police, hospital, relatives with the location information so that even if the person goes unconscious, their location can be detected. Nano thin sensors are piezoelectric in nature and powered through mechanical energy developed from tremors of epilepsy which is further converted into electrical energy. Besides this, the nano thin layer in which the circuit is embedded also contains medicine, more specifically, dopamine chemical, which is delivered through the cells to the substantia nigra region of the brain because of the deficiency of which the tremors of epilepsy takes place. Pressure and temperature sensors are further added in the nano thin layer, to avoid any burning of skin when the medicine is delivered.
A0025 Presetation 3 (14:35-14:50)	Comparison of Logistic Regression and Random Forest Performance to Predict Associated Factors with Diabetes Prevalence in Turkey **Songul Cinaroglu** Hacettepe University, FEAS, Department of Healthcare Management, Turkey *Abstract*—This study aims to compare Logistic Regression and Random Forest performance to predict associated factors with diabetes prevalence in Turkey. Data came from nationally representative Turkey Health Survey data for the year 2014. Sociodemographic characteristics, comorbid factors, health behavior and factors associated with accessibility of health care services are determined as the predictor variables of diabetes. 50, 150 and 200 trees were generated for Random Forest classification and Area Under the ROC Curve (AUC) was used as a performance measure. Study results revealed that, diabetes prevalence is 8.98% in Turkey for the year 2014. Moreover, AUC value for identifying diabetes adults when using the Logistic Regression model was 0.8353, showing more accurate predictive performance and more close to ROC curve than Random Forest models generated by 50 (0.8321), 100 (0.8332), 150 (0.8335) and 200 (0.8343) trees respectively. Increasing number of trees in RF models improves predictive performance of the model. It is seen that, study models have demonstrated excellent predictive capabilities. Thus, Logistic Regression and Random Forest should be considered as useful methods to detect predictors of common diseases in large epidemiologic datasets.
A0028 Presetation 4 (14:50-15:05)	Capacitance Measures during Cochlear Implants Electrode Array Positioning **Lei Hou**, Xinli Du and Nikolaos V. Boulgouris

	Brunel Institute *for* Bioengineering, Brunel University, UK *Abstract*—During cochlear implant surgery, atraumatic electrode array insertion is considered to be a crucial step. However, during cochlear implantation, the mechanical behavior of an electrode array inside the cochlea is not known. The behavior of an electrode array inside of the cochlea is hardly diagnosed by normal methods. In this study, the mechanical behavior of the cochlear implant (CI) electrode array is studied. A CI electrode array capacitance sensor system is proposed. It is able to automatically determine the array position as a result of the capacitance variations. Instead of applying sensors to the electrode array, capacitance information from the electrodes will be gathered and analyzed. Results reveal that this sensing method is capable of recognizing electrodes' positions when fed into a pre-shaped model.
A0041 Presetation 5 (15:05-15:20)	Wheezing Sound Separation Based on Constrained Non-negative Matrix Factorization J. Torre Cruz, **F. Canadas Quesada**, P. Vera Candeas, V. Montiel Zafra and N. Ruiz Reyes University of Jaen, Spain *Abstract*—Auscultation remains the first clinical examination that a physician performs to detect respiratory diseases originated by wheezes, which are the most specific asthmatic symptoms. It is common that respiratory sounds (normal breath sounds) acoustically interfere wheezes with both frequency and time domain. As a result, the physician's cognitive ability is reduced causing a misdiagnosis or inability to clearly hear all significant sounds to detect a pulmonary disease. This paper presents a constrained non-negative matrix factorization (NMF) approach to separate wheezes from respiratory sounds applied to single-channel mixtures. The proposed constraints, smoothness and sparseness, attempts to model common spectral behaviour shown by wheezes and normal breath sounds. Specifically, the spectrogram of a wheeze can be modelled as a narrowband spectrum (sparseness in frequency). However, the spectrogram of a normal breath sound can be modelled as a wideband spectrum (smoothness in frequency) with a slow temporal variation (smoothness in time). Experimental results report that the proposed method improves the audio quality of the wheezes removing most of the respiratory sounds, being a novel way to successfully apply a NMF approach to a wheeze/respiratory sound separation.
D0008 Presetation 6 (15:20-15:35)	Studying WiFi and Accelerometer Data Based Authentication Method on Mobile Phones **Guoqiang Li** and Patrick Bours Norwegian University of Science and Technology, Norway *Abstract*—Accessing applications on mobile phones has become a habit of our daily activities. These applications either require a PIN (Personal

	Identification Number) / password for authentication or donot have any authentication measurement at all because of the priority from user friendliness. In order to enhance the security of these mobile applications while not much compromising the user friendliness, we develop an approach to authenticate the user by usingWiFi and accelerometer data collected within 3 seconds when the user opens a mobile application. The proposed approach has been evaluated on a dataset collected from a real-life scenario in which the data was collected from the participants' own mobile phones, and the participants have the full right to decide where/when to open the application. According to the experimental results, the proposed score-level fusion approach achieved EER (Equal Error Rate) at 9.19%, which indicates the feasibility of deploying such authentication mechanism on the mobile application.
D2001 Presetation 7 (15:35-15:50)	Wide Machine Learning Algorithms Evaluation Applied to ECG Authentication and Gender Recognition **Jose-Luis Cabra**, Diego Méndez and Luis C. Trujillo Pontificia Universidad Javeriana, Colombia *Abstract*—ECG signals have been widely studied for knowing heart behavior and following cardiac abnormalities. Last years have emerged new applications where ECG has being used in cryptography and biometrics. The purpose in this paper center around perform two independent experiments tak-ing advantage of the ECG properties. The rst experiment is about person authentication and the second experiment covers gender recognition. Both tests are performed extract-ing the same features and evaluating the classi cation accu-racy with several machine learning algorithms sensing the ECG signals in di erent body positions. ECG signal con-tains properties like liveness detection, ubiquity, di culty of being copied, continuity, and reclaims the mandatory user presence. These properties makes ECG study having the potential of being embedded for smartphone applications in the Internet of Things era. The best accuracy score is over the 98% for ECG authentication and 94% for gender recog-nition; as the best of our knowledge there is no ECG gender recognition with the algorithms studied in this paper.
D0017 Presetation 8 (15:50-16:05)	Iris Template Protection Using Discrete Logarithm **Morampudi Mahesh Kumar**, Munaga V N K Prasad and U S N Raju Institute for Development and Research in Banking Technology, India *Abstract*—Biometric authentication systems gained a huge public attention when compared to password authentication systems due to its direct connection with user identity. As Biometrics cannot be revoked or cancelled, several security and privacy issues will come if biometric

templates are directly store into the database. To overcome this, there is a need to protect the biometric templates by applying transformations and at the same time accuracy won't be compromised. The transformed template is called cancellable template and it must satisfies all the requirements of Biometric Template Protection Schemes (BTPS) i.e., Diversity, unlinkability, accuracy, noninvertibility. The proposed method focused on generating cancellable iris templates by using discrete logarithm. By applying 1-D log Gabor filter on the iris images, iris codes were generated. Later a row vector is formed by appending next row to the previous one. Then the row vector is partitioned and converted into decimal vector. To achieve security or noninvertibility decimal vector is subjected to discrete logarithm over a prime field. To confirm the accuracy of the proposed approach, experiments are performed on CASIA-V 1.0 & CASIA-V3-Interval and achieved EER as 0.57% & 0.79%. Although the EER seems somewhat high, proposed approach is efficient in terms of security and noninvertible perspectives.

16:05-16:25	Coffee Break

Session 3

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, May 17, 2018 (Thursday)

Time: 16:25-18:10

Venue: Zwaardemaker Room

Session 3: Topic: "Biomedical Engineering"

Session Chair: Prof. Tuan D. Pham

A0008 Presetation 1 (16:25-16:40)	CIROFOMITE (Crystallization Inhibitor of Uric Acid in Synovial Fluid with Implanted Thermoregulator) : Controller Device for Gout Recurrence **Rozan Muhammad Irfan** and Ilham Amien Universitas Islam Indonesia, Indonesia *Abstract*—Gout Arthritis is an articular disease caused by crystallization of monosodium urate (MSU) as the derivate of purine metabolism. The crystal formation is induced by the articular limb temperature which is lower than body temperature. Nowadays, thermotherapy has been performed by using temporary warmed substance, like the warmed water compress which contributes to patient's activity disruption. Cirofomite has been made as implanted thermotherapy device by producing heat around the ankle joint. The implanted part of this device can be controlled from smartphone by bluetooth connection and the power of the device can be recharged using a wireless charger. The design of Cirofomite has created by the following anatomical form of leg and ankle joint. This device is placed subcutaneously and implanted through two incisions, the first is on leg and the second close to medial malleolus. The silicone rubber coat used by this device aims to enhance flexibility and avoid body rejection. This device is designed to prevent the disruption of patient's activities when it has been used.
A0012 Presetation 2 (16:40-16:55)	Forces Calculation Module for the Leap-based Virtual Glove Giuseppe Placidi, Luigi Cinque, Matteo Polsinelli and **Matteo Spezialetti**

	University of L'Aquila, Italy
	Abstract—Hand rehabilitation is fundamental after stroke or surgery. Traditional rehabilitation implies high costs, stress for the patient, and subjective evaluation of the therapy effectiveness. Mechanical devices based approaches are often expensive, cumbersome and patient specific, while tracking-based devices are not affected by these limitations, though they could suffer from occlusions. In recent works, the procedure used for implementing a multi-sensors approach, the Virtual Glove (VG), based on the simultaneous use of two orthogonal LEAP motion controllers, was described. In this paper, an engineered version of VG was calibrated and measurements were performed. This article presents a model extension to be used for the off-line calculation of the hand kinematics and of the flexion/extension forces exerted by each finger when constrained by calibrated elastic tools.
A0016 Presetation 3 (16:55-17:10)	Accurate Fall Detection Algorithm Based on SBPSO-SVM Classifier Weimin Xiong, Yunkun Ning, Shengyun Liang, **Guoru Zhao** and Yingnan Ma Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China *Abstract*—For the purpose of improving the medical care which aims at the elderly and the chronic patients who are prone to falls, this paper makes use of Standard Binary Particle Swarm Optimization(SBPSO) to search for the combination of best feature subset and parameters (C, g), which can be used to train the SVM(Support Vector Machine). Experiments results show that the proposed method can get higher accuracy (about 99%) compared with non-optimized SVM, k-NN (k Nearest Neighbors) and threshold-based method when dealing with the classification of ADL (Activities in Daily Life) and abnormal falls.
A0019 Presetation 4 (17:10-17:25)	Reliability of Wearable Sensors to Detect Agitation in Patients with Dementia: A Pilot Study Christianne Nesbitt, **Ajay Gupta**, Shubham Jain, Kurt Maly and Hamid Reza Okhravi Old Dominion University, USA *Abstract*—Wearable sensors have become increasingly accurate in measuring various aspects of health monitoring in humans. Individuals living with dementia often experience problematic agitated behaviors. There are many proven methods to intervene during agitated behavior outbursts, and the earlier these methods are used the better the results. We are using off-the-shelf technology, smart watches and phones, to

	monitor the location of individuals in the facility and to measure physiological changes such as limb movements, vocalizations, and heart rate that happen during agitation state. In this paper, we describe the results of an experiment where we have instrumented eight individuals in an assisted living facility with smart sensors running the software we developed. We compare our software's detection of agitation with observations made by trained students using the Cohen-Mansfield Agitation Inventory. While the sensor data was collected, each patient was observed by one nurse and one computer science student for four or more hours to record manual observations. As the software and selection of sensors is only a prototype system to investigate feasibility, the experiment was a success as several of the data streams correlate well with the students' observations. We identified the need for individual profiles of patients so that deviations from the normal behavior can be identified on a patient by patient basis.
A0029 Presetation 5 (17:25-17:40)	Pressure Estimation from Velocity Waveform of the Ophthalmic Artery **Walter Serna**, Natalia Izquierdo, Andrés M. Álvarez, Genaro Daza and Álvaro Orozco Instituto De Epilepsia Y Parkinson Del Eje Cafetero, Colombia *Abstract*—Measures of the blood flow pattern in the ophthalmic artery (OA) with ultrasound imaging devices have proven to be useful in the diagnosis of cerebral blood circulation. As an example, Ragauskas et al. have proposed a noninvasive technique to determine the intracranial pressure (ICP) comparing the velocity waveform of two different segments of the same OA. However, to implement this method in clinical routine is challenging because of the need to capture both segments simultaneously while a changing pressure is exerted on the eyelid. With this in mind, we present a classification methodology to find the blood velocity-pressure dependence in the OA with the data of one of the segments. Therefore, both segments can be measured in independent moments without requiring the presence of the external pressure again. A neural network classifier is employed to build the model, and it is trained with a set of features extracted from the velocity waveform of the blood in the OA, registered with the PW mode of an ultrasound system, and using the exerted pressure as the target variable. We acquire the data from one healthy patient to assess our methodology, using cross-validation scheme to quantify classifier accuracy, sensitivity, specificity and F1 score.
A0037 Presetation 6	Effect of Pulsed Electromagnetic Field on Blood Flow **Sooyong Lee**, Nara Lee and Yongheum Lee

(17:40-17:55)	Yonsei University, South Korea
	Abstract—Ischemia may cause delay in wound healing and may also cause necrosis of wounded tissue. It is known that pulsed electromagnetic field(PEMF) might have effect on wound healing by improving blood flow. Thus, we focused on verify the relations between PEMF and blood flow, by extension, attest effect of PEMF on wound healing. By using six male Wistar-EPM rats which weights 280g to 320g, we checked the changes of blood flow. Rats were separated randomly by two groups, PEMF group(n=3) and control group(n=3). Each dorsum skin of rats was incised into skin flap based on cranial. By using of laser speckle contrast imaging system, we measured blood flow on 5×10cm square of flapped skin for 90 minutes. 1Hz, 100 gauss PEMF was applied for PEMF groups. Speckle flow in the control group was gradually decreased for 60 minutes and maintained until 90 minutes. In contrast, speckle flow in the PEMF group was decreased only for 30 minutes and maintained 30 minutes. After then, speckle flow was increased – not as much as initial condition - until 90 minutes. In conclusion, although limitations in number of rats, we found PEMF improves blood flow and delaying necrosis.
A3005 Presetation 7 (17:55-18:10)	Learning Clinical Vectors from Structured Electronic Health Records **Awais Ashfaq**, Anita Sant'Anna, Markus Lingman and Slawomir Nowaczyk Halmstad University, Sweden *Abstract*—Learning efficient and dense real-valued representations of high-dimensional clinical codes remain a key challenge in data-driven clinical applications like predictive modelling, comparative effectiveness research and more. In this study, we used a slightly modified version of word2vec (a word embedding technique) to vectorise diagnostic and medication codes in structured electronic health record (EHR) - MIMIC-III. Given a list of clinical codes (eg. 428.0) corresponding to a hospital visit, a shallow one-hidden layer neural network was trained to predict all neighbouring codes in the visit from a single code. Once trained, the input-hidden layer weights were used as the embedding matrix to represent each clinical code. In comparison to the traditional one-hot format, the newly learned representations are low-dimensional, dense and carry contextual similarity among codes. Moreover, the representations are learned in a fully unsupervised manner with minimal pre-processing. Representations for diagnostic codes can be visualised here. Based on ICD-9 grouping schema, we found an average 70% recall@10 (No. of same category diagnoses among top 10 similar diagnoses) for common disease codes. The learned representations are thus useful for discovering interesting comorbidities (or relationships

	between codes) from EHR. The results also motivate using similar technique to discover groups of patients that are identical in terms of their clinical profile.

Session 4

Afternoon, May 17, 2018 (Thursday)

Time: 16:25-18:25

Venue: Hercules Room

Session 4: Topic: "Biometrics and Methods"

Session Chair: Prof. Raymond Veldhuis

A0032 Presetation 1 (16:25-16:40)	A Study of Temporal Stability on Finger-Vein Recognition Accuracy Using a Steady-State Model **Shilei Liu**, Guoxiong Xu, Yi Zhang and Wenxin Li Peking University, China *Abstract*—Stability has been one of the most fundamental premises in biometric recognition field. In the last few years, a few achievements have been made on proving this theoretical premises concerning fingerprints, palm prints, iris, face, etc. However, none of related academic results have been published on finger-vein recognition so far. In this paper, we try to study on the stability of finger-vein within a designed timespan (four years). In order to achieve this goal, a proper database for stability was collected with all external influences of finger-vein features (acquiring hardware, user behavior and circumstance situation) eliminated. Then, for the first time, we proposed a steady-state model of finger-vein features indicating that each specific finger owns a stable steady-state which all its finger-vein images would properly converging to, regardless of time. Experiments have been conducted on our 5-year/200,000-finger data set. And results from both genuine match and imposter match demonstrate that the model is well supported. This steady-state model is generic, hence providing a common method on how to evaluate the stability of other types of biometric features.
D0004 Presetation 2 (16:40-16:55)	Detection of Morphed Faces from Single Images: a Multi-Algorithm Fusion Approach **Ulrich Scherhag**, Christian Rathgeb and Christoph Busch *Abstract*—The vulnerability of face, fingerprint and iris recognition

systems to attacks based on morphed biometric samples has been established in the recent past. However, so far a reliable detection of morphed biometric samples has remained an unsolved research challenge. In this work, we propose the first multi-algorithm fusion approach to detect morphed facial images. The FRGCv2 face database is used to create a set of 4,808 morphed and 2,210 bona fide face images which are divided into a training and test set. From a single cropped facial image features are extracted using four types of complementary feature extraction algorithms, including texture descriptors, keypoint extractors, gradient estimators and a deep learning-based method. By performing a score-level fusion of comparison scores obtained by four different types of feature extractors, a detection equal error rate (D-EER) of 2.8% is achieved. Compared to the best single algorithm approach achieving a D-EER of 5.5%, the D-EER of the proposed multi-algorithm fusion system is almost twice as low, confirming the soundness of the presented approach.

D0005 Presetation 3 (16:55-17:10)	Score Fusion Strategies in Single-Iris Dual-Probe Recognition Systems **Pawel Drozdowski**, Nikolai Wiegand, Christian Rathgeb and Christoph Busch Hochschule Darmstadt, Germany *Abstract*—Multiple samples can be utilised at the comparison stage of a biometric system in order to increase its biometric performance via information fusion or decision heuristics. It has been shown, that in a single-instance dual-probe setup, fusing the probe scores yields significant biometric performance increase over the single-probe baseline. Additionally, using the probe-probe comparison score was demonstrated to further improve the biometric performance of a fingerprint recognition system in a study by Cheng et al. In this paper, through a benchmark on the CASIA-IrisV4-Interval dataset and on the iris corpus of the BioSecure dataset, the aforementioned method is shown to be viable for an iris recognition system. However, since it requires an additional parameter, which must be estimated empirically, we propose a simpler method which exhibits similar biometric performance, while requiring no additional parametrisation.
D0013 Presetation 4 (17:10-17:25)	Iris Recognition Using Visible Images Based on the Fusion of Daugman's Approach and Hough Transform **Ravi Vishwanath Mangipudi**, Sriraam Kumar and Praveen R *Abstract*—In the paper, we proposed a novel architecture for Iris Recognition. Contrary to the conventional approaches, where iris is obtained using NIR images, iris recognition is performed using visible

	images. In the proposed methodology, iris localization is achieved using a mask generated using Hue and saturation channels. Then the localized iris region is converted to binary mask using a threshold. After the binary mask is generated, the inner circle of the iris is obtained using the fusion of a contour-based approach and Hough transform. Once the inner circle of the iris is computed, the outer circle of the iris is estimated using Daugman's approach. After the inner and outer circles of the iris are segmented normalization is achieved by converting the polar coordinates to Cartesian coordinates and features are extracted. In the proposed architecture, we have done a comparative analysis using LBPH features and Zernike features and two classifiers, random forest and Support Vector Machines. During the recognition module, the feature is extracted from the test image and compared against the existing database.
D0015 Presetation 5 (17:25-17:40)	Cancellable Fingerprint Template Generation Using Rectangle-Based Adjoining Minutiae Pairs **Morampudi Mahesh Kumar**, Munaga V N K Prasad and U S N Raju Institute for Development and Research in Banking Technology, India *Abstract*—Cancellable fingerprint templates effectively protect original fingerprint data by revoking an accorded template and reissuing a new template. Alignment-free cancellable templates require no image pre-alignment and therefore does not go through from inaccurate singular point detection. In our proposed method, we focused on generating a cancellable template which is alignment-free. The template is generated by the building of R rectangles by varying the directions over every minutia succeeded by the computation of translation invariant and rotation invariant adjoining relation. The computed feature set is quantized & mapped into a cube to produce a binary string. Further, we apply modulo operation on the generated bit string to get reduced bit string which mitigates the risk of the ARM (Attack via Record Multiplicity). Later, we apply Discrete Fourier Transform (DFT) to convert reduced binary string into a complex vector. The result is then multiplied by an arbitrary matrix to produce the cancellable template. We evaluated proposed scheme on databases FVC 2004 DB1-DB3 & FVC 2002 DB1-DB3 and results fulfills the conditions of Biometric Template Protection Scheme(BTPS) and it gives competitive performance(in terms of EER) when compared to existing methods.
D0016 Presetation 6 (17:40-17:55)	Fingerprint Authentication Using LT codes **Parth Pahariya** and Sanjay Kumar Singh IIT-BHU, India *Abstract*—Biometric is used for identifying the person based on their

	traits. Fingerprint is one of the most important and most used biometric trait for person authentication. Fingerprint database must be stored in effcient way and in most secure way so that it is unable to hack by the hacker and it will be able to recognize the person fast in large database. In this paper, we proposed an effcient way of storing the fingerprint data for fast recognition. We are using LT codes for storing the x coordinates of minutiae points and fingerprint images is stored in encrypted form with the coordinates. We are using on-the-fly gaussian algorithm for decoding the x coordinates and calculate the value for finding similarity in between two fingerprints.
D1001 Presetation 7 (17:55-18:10)	Identification of User Behavioral Biometrics for Authentication Using Keystroke Dynamics and Machine Learning Sowndarya Krishnamoorthy, Luis Rueda, **Sherif Saad** and Haytham Elmiligi *Abstract*—This paper focuses on the effective classification of the behavior of users accessing computing devices to authenticate them. The authentication is based on keystroke dynamics which captures the user's behavioral biometric and applies machine learning concepts to classify them. The users type a strong passcode ".tie5Roanl" to record their typing pattern. In order to confirm identity anonymous data from 94 users were collected to carry out the research. Given the raw data, features were extracted from the attributes based on the button pressed and action timestamp events. The Support Vec-tor Machine (SVM) classifier uses multi-class classification with one vs. one decision shape function to classify different users. To reduce the classification error, it is essential to identify the impor-tant features from the raw data. In an effort to confront the gener-ation of features from attributes an efficient feature extraction al-gorithm has been developed, obtaining high classification perfor-mance are now being sought. In this paper, we have applied minimum redundancy maximum relevance mRMR feature selection to increase the classification per-formance metrics and to confirm the identity of the users based on the way they access computing devices. From the results, we con-clude that touch pressure, touch size and coordinates effectively contribute to identifying each user. The research will contribute significantly to the field of cyber-security by forming a robust au-thentication system using machine learning algorithms.
D0002 Presetation 8 (18:10-18:25)	Electroencephalogram Based Biometrics: A Fractional Fourier Transform Approach **Sarineh Keshishzadeh**, Ali Fallah and Saeid Rashidi

Amirkabir University of Technology, Iran

Abstract—The non-stationary nature of the human Electroencephalogram (EEG) has caused problems in EEG based biometrics. Stationary signals analysis is done simply with Discrete Fourier Transform (DFT), while it is not possible to analyze non-stationary signals with DFT, as it does not have the ability to show the occurrence time of different frequency components. The Fractional Fourier Transform (FrFT), as a generalization of Fourier Transform (FT), has the ability to exhibit the variable frequency nature of non-stationary signals. In this paper, Discrete Fractional Fourier Transform (DFrFT) with different fractional orders is proposed as a novel feature extraction technique for EEG based human verification with different number of channels. The proposed method in its' best performance achieved 0.22% Equal Error Rate (EER) with three EEG channels of 104 subjects.

# Poster Session

May 17, 2018 (Thursday)

Time: 08:30~18:25

Venue: Zwaardemaker & Hercules Room

A0001 Presetation 1	Doppler Based Algorithm for Reconstructing the Origin of the Drifting Rotor due to Spatial Temperature Gradients **Guy Malki**, Ofer Barnea and Tamir Tuller Tel Aviv University, Israel. *Abstract*—Cardiac rotors are known indicators for arrhythmias, and their characterization is key to successful ablation procedures. However, the existing mapping techniques is poorly established. Previously we showed a new strategy that caused a controlled rotor drifting under spatial temperature gradients towards. Since the rotor moves in space, we can measure the Doppler shifts in the activation frequencies at few known locations, solving the inverse problem, and reconstructed its trajectory and origin. Cardiac activity was simulated in 2D atrial tissue using thee CRN model with temperature effect compatibility. Temperature patterns were employed, leading to rotor drift. Pseudo-electrodes recorded the signals, and for each electrode the dominant frequency was calculated, leading to solve the moving-source Doppler equation and reconstructed the drifting trajectory so the origin location of the rotor can be estimated. The method was employed on 12,000 cases that differ by the initial position, number and location of electrodes, and varied SNR. In all cases the drift direction and rotor origin, was deciphered, so the maximal MSE was less than 1.5 mm. Our results demonstrate that the Doppler shifts due to rotor drifting are measurable and can be used in order to develop an algorithm for tracking and mapping rotor sources.
A0011 Presetation 2	The Expression of Brain-Type Fatty Acid Binding Protein (FABP7) in Rainbow Trout (Oncorhynchus Mykiss) **Xiaofei Yang**, Shaogang Xu, Wentong Li, Ding Yuan and Jiangqi Qu Beijing Fisheries Research Institute, China *Abstract*—The Fatty acid-binding proteins(FABP) is a 14-15kDa intracellular protein which belong to large multigene family of intracellular lipid-binding proteins and play a important role in lipid

	uptake, transport lipid homeostasis. In this study, the rainbow trout FABP7 (GenBank accession No. JN413683) and actin (GenBank accession No. AF330142) were used to design primers for analyzing the expression during temperature challenge using qRT-PCR approach. The FABP7 are detected in liver, intestine and spleen in triploid, golden and diploid rainbow trout. After the temperature dropped from 10 ℃ to 3 ℃, the relatively expression peaks at 6hr(triploid), 12hr (golden) in liver and 2hr (diploid) in intestine, the FABP7 reduced from 2hr and 6hr to 24hr in diploid and triploid rainbow trout in intestine, the FABP7 increased from 0hr to 24hr in diploid rainbow trout. After the temperature raise from 10 ℃ to 18 ℃, the relatively expression peaks at 24hr (triploid) in intestine and 24hr (golden) in spleen, the FABP7 reduced from 2hr to 12hr (diploid and triploid) in intestine and 2hr to 12hr (diploid) and from and 0hr to 6hr (triploid) in spleen, the FABP7 increased from 2hr to 12hr (golden) in intestine. Overall, these results demonstrate the expression of FABP was received impact by changes of temperature.
A0018 Presetation 3	Diffusion-Weighted MRI Based System for the Early Detection of Prostate Cancer **Ruba H. Alkadi**, Fatma Taher, Ahmed Shalaby, Ayman Elbaz, Naoufel Werghi Khalifa University of Science and Technology, United Arab Emirates *Abstract*—Prostate cancer is the second most diagnosed cancer in men. In this paper, we propose a diffusion-weighted MRI based computer-aided detection system for the early detection of prostate cancer. The proposed system calculates seven apparent diffusion coefficients (ADC) for each subject based on the b values at which the scans are acquired. The 3D maps are then represented in a lower dimensional space using a data-driven approach. The reduced maps are fed into seven independent artificial neural networks, each corresponding to the b value at which the ADC maps are calculated. The final decision of malignancy is obtained by aggregating the outputs of all learners in a score-fusion scheme. Essentially, this pipeline is expected to reveal discriminative 3D patterns relevant to subject malignancy. Preliminary results show that the proposed system yields an accuracy of 100% in a leave-one-patient-out cross validation scheme, competing well with state of the art methods.
A0040 Presetation 4	Continuous Joint Angle Estimation by Least Support Vector Machine from Time-Delayed sEMG Features Yongsheng Gao, **Yang Luo** and Jie Zhao Harbin Institute of Technology (HIT), China

Abstract—The main works of estimating continuous human kinematic information from surface electromyography (sEMG) are grounded on the extraction of useful information and the construction of proper estimation model. This paper proposes the least square support vector machine ((LSSVM) with time-delayed features (TDF) of sEMG for the continuous wrist palmar flexion-extension angle estimation. The performance of proposed method is verified via an experimental platform for sEMG and angle data records. The feasibility of introducing a time delay value into two machine learning models namely, LSSVM, back propagation neural network (BP), for sEMG-angle estimation is proved. The average correlation coefficients and the average root mean square error (RMSE) of LSSVM with TDF are 9.36 ± 2.5 degree and 0.96 ± 0.02 respectively. This paper obtains three conclusions: 1.The estimation performance of LLSVM and BP neural network have been much improved after a proper single time delay is introduced into the models; 2. An empirical calculation of the optimal time delay value can be obtained in which the optimal time delay is linear with the size of window N; 3.The LLSVM with TDF exhibits the best estimation performance in continuous wrist angle prediction from the sEMG features.
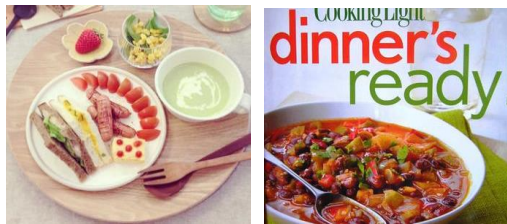
Dinner	
18:30-20:00	Restaurant

Conference Venue

Inntel Hotels Amsterdam Zaandam, Amsterdam, The Netherlands

https://www.inntelhotelsamsterdamzaandam.nl/

Add: Provincialeweg 102, 1506 MD Zaandam

Tel.: +31 (0)75 631 1711; Fax: +31 (0)75 670 1379; Email: infozaandam@inntelhotels.nl

This visually 4-star hotel has an impressive façade. The structure is a lively stacking of various traditional houses to be found in the Zaan region. The interiors of the modern hotel rooms also reflect the rich history of the Zaan area: the traditional products, the pioneers of the local craft industries and the families which made the area world famous. In short, it provides the best of tradition combined with modern-day comfort.

Inntel Hotels Amsterdam Zaandam offers besides nostalgic rooms, a Wellness Club with swimming pool, Bar & Restaurant Puur Saen and free WiFi.

Inntel Hotels has respect for people and the environment, and contributes to a healthy planet and beautiful society. With the Surprisingly Sustainable program, the hotel group is working towards a sustainable future.

Academic Visit & Tour
May 18, 2018 (Friday) 9:00~17:00

*(Tips: Please arrive at the **Inntel Hotels Amsterdam Zaandam** before 9:00 a.m. The following schedule is only for participants who registered the visit & tour. The following places are for references, and the final schedule should be adjusted to the actual notice.)*

1. (9:00) Assemble at the Inntel Hotels Amsterdam Zaandam

2. Visit Zaanse Schans

Zaanse Schans (Dutch pronunciation: [ˈzaːnsə ˈsxɑns]) is a neighbourhood of Zaandam, near Zaandijk, Netherlands. It has a collection of well-preserved historic windmills and houses. From 1961 to 1974 old buildings from all over the Zaanstreek were relocated using lowboy trailers to the area.

Zaanse Schans is one of the most popular tourist attractions in the Netherlands, being very close to Amsterdam. Since it is a fairly large site, it does not feel very crowded, even in the high season. The buildings, most of which have been transported here from elsewhere in the region, have all been meticulously restored, making it a very pretty site - but at the same time it's not very authentic: it is an idealized re-creation of a Dutch village from the late 19th century.

3. Have Lunch Together

4. Visit Zazare Diamonds

Zazare Diamonds, one of the most famous diamond plants in the Netherlands, attracts people from all over the world every year to buy Diamonds. In particular, their exclusive "Amsterdam star" is a unique cut of 257 cuts, much brighter than a typical diamond cut. During the visit, we witnessed the cutting and polishing process of the diamond, and appreciated the perfect combination of European classical art and modern cutting technology.

5. Visit Canals of Amsterdam

Amsterdam, capital of the Netherlands, has more than one hundred kilometers of grachten (canals), about 90 islands and 1,500 bridges. The three main canals (Herengracht, Prinsengracht and Keizersgracht), dug in the 17th century during the Dutch Golden Age, form concentric belts around the city, known as the Grachtengordel. Alongside the main canals are 1550 monumental buildings. The 17th-century canal ring area, including the Prinsengracht, Keizersgracht, Herengracht and Jordaan, were listed as UNESCO World Heritage Site in 2010, contributing to Amsterdam's fame as the "Venice of the North".

6. Visit Dam Square

Dam Square lies in the historical center of Amsterdam, approximately 750 meters south of the main transportation hub, Centraal Station, at the original location of the dam in the river Amstel. It is roughly rectangular in shape, stretching about 200 meters from west to east and about 100 meters from north to south. It links the streets Damrak and Rokin, which run along the original course of the Amstel River from Centraal Station to Muntplein (Mint Square) and the Munttoren (Mint Tower).

7. (17:00)Back to Inntel Hotels Amsterdam Zaandam

Note

Note

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Thank you for taking time to participate in this conference evaluation. Your comments will enable us to execute future conferences better and tailor them to your needs!