2017 CBEES-BBS NEWARK, USA CONFERENCE ABSTRACT

October 18-20, 2017

Newark Liberty International Airport Marriott, Newark, USA

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2017 CBEES-BBS Newark, USA Conference Introduction

Welcome to 2017 Newark, USA conference which is sponsored by Hong Kong Chemical, Biological & Environmental Engineering Society (CBEES) and Biology and Bioinformatics (BBS). The objective of Newark, USA conference 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 Biomedical Imaging, and Signal Processing and Computational Biology and Bioinformatics.

2017 2nd International Conference on Biomedical Imaging, Signal Processing (ICBSP 2017)

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

International Conference Proceedings Series by ACM. 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).

Journal of Image and Graphics (JOIG). Included in Ulrich's Periodicals Directory, Google Scholar, Crossref, Engineering & Technology Digital Library and Electronic Journals Digital Library.

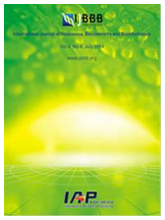
Journal of Electronic Science and Technology (JEST), which will be indexed by Scopus, EI Inspec, CAS, DOAJ, CSCD, CNKI, Google Scholar Journal of Electronic Science and Technology (JEST)

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

2017 International Conference on Computational Biology and Bioinformatics (ICCBB 2017)

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

International Conference Proceedings Series by ACM. 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 Bioscience, Biochemistry and Bioinformatics (IJBBB, ISSN: 2010-3638). Included in the Engineering & Technology Digital Library, and indexed by WorldCat, Google Scholar, Cross ref, ProQuest.

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

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 **35** Minutes of Presentation and **5** Minutes of Question and Answer
Plenary Speech: about **30** Minutes of Presentation and **5** Minutes of Question and Answer

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 October 19, 2017.

Dress code

Please wear formal clothes or national representative of clothing.

Keynote Speaker Introduction

Keynote Speaker I

Prof. Sri Krishnan
Ryerson University, Canada

Sridhar (Sri) Krishnan received the B.E. degree in Electronics and Communication Engineering from Anna University, Madras, India, in 1993, and the M.S. and Ph.D. degrees in Electrical and Computer Engineering from the University of Calgary, Calgary, Alberta, Canada, in 1996 and 1999 respectively. He joined Ryerson University, Toronto, Canada in 1999 and since October 2007 he has been appointed as a Canada Research Chair in Biomedical Signal Analysis. Sri Krishnan has published 280 papers in refereed journals and conferences, and five of his papers have won best paper awards. He is a Fellow of the Canadian Academy of Engineering, Senior Member of IEEE and a member of the Professional Engineers of Ontario. Sri Krishnan is a recipient of many national and provincial awards including the 2013 Achievement in Innovation Award from Innovate Calgary, 2011 Sarwan Sahota Distinguished Scholar Award, 208 Biodiscovery Award, 2007 Engineer Achievement Award from Engineers Canada; 2006 South Asian Community Achiever Award; 2006 New Pioneers Award in Science and Technology; 2006 Best IEEE Chapter Chair Award (Toronto Section); and 2005 Research Excellence Award from the Faculty of Engineering, Ryerson University.

Topic*: "Advances in Biomedical Signal Analysis"*

***Abstract*—**A signal can be considered to be stationary if its statistical characteristics do not change with time. However, most real world signals are non-stationary and have highly complex time-varying characteristics. Common signal analysis and modelling techniques and classical time-frequency distributions (TFDs) do not readily provide the time-varying signal features of interest. There are several limitations with the classical parametric signal representations, and these problems could be obviated by using true nonstationary signal analysis tools such as adaptive signal representations and adaptive TFDs. Construction of proper adaptive TFDs and the methodologies for extracting instantaneous and quantifiable signal parameters will be discussed in detail. The extraction and monitoring of spectral and related parameters with time is of immense use in a variety of signal analysis applications such as RADAR, biomedical, and geophysics. Recent advances in using sparse signal representation and compressed sensing of 1D biomedical signals will also be covered. The application of the extraction and classification of complex instantaneous signal parameters with respect to three real world biomedical signals (cardiac electrograms, pathological speech signals and knee vibration signals) will be discussed in detail.

Keynote Speaker II

Prof. Hesham H. Ali
University of Nebraska at Omaha, USA

Hesham H. Ali is a Professor of Computer Science and Lee and Wilma Seaman Distinguished Dean of the College of Information Science and Technology at the University of Nebraska at Omaha (UNO). He currently serves as the director of the UNO Bioinformatics Core Facility that supports a large number of biomedical research projects in Nebraska and surrounding region. He has published numerous articles in various IT areas including scheduling, distributed systems, data analytics, wireless networks, and Bioinformatics. He has also published two books in scheduling and graph algorithms, and several book chapters in Bioinformatics. He has been serving as the PI or Co-PI of several projects funded by NSF, NIH and Nebraska Research Initiative in the areas of data analytics, wireless networks and Bioinformatics. He has also been leading a Bioinformatics Research Group that focuses on developing innovative computational approaches to classify biological organisms and analyze big bioinformatics data. The research group is currently developing several next generation big data analytics tools for mining various types of large-scale biological and medical data. This includes the development of new graph theoretic models for assembling short reads obtained from high throughput instruments, as well as employing a novel correlation networks approach for analyzing large heterogeneous biological and health data associated with various biomedical research areas, particularly projects associated with aging and infectious diseases. He has also been leading a multi-disciplinary project for developing secure and energy-aware wireless infrastructure to address tracking and monitoring problems in medical environments, particularly to study mobility profiling of various groups and implement a population analysis approach for healthcare research.

Topic: *"Next Generation Tools for Big Data Analytics in Bioinformatics"*

***Abstract*—**With the increasing number and sophistication of biomedical instruments and data generation devices, there is an increasing pressure on researchers to develop advanced data analytics tools to extract useful knowledge out of the massive collected data. This includes advanced sequencing technologies responsible for the generation of huge amounts of genomics data as well as wearable devices and Internet of Things systems responsible for collecting different types of health and mobility related data. The currently available data is not only massive in size but it also exhibits all the features associated with big data systems such as high degree of variability, veracity and velocity. Such big biomedical data systems represent great challenges as well as unlimited opportunities to advance biomedical research. Developing innovative data integration, analysis and mining techniques along with clever parallel computational methods to efficiently implement them will be critical in meeting those challenges and take advantage of the potential opportunities. In particular, the use of graph modeling and network analysis as the backbone of big data analytics algorithms promises to play an important role in developing data-driven decision support systems in the next generation of biomedical research. In this talk, we propose new population analysis models and data analytics tools using graph modeling and network analysis along with how to effectively utilize High Performance Computing in implementing such tools. Case studies illustrating how the proposed models and tools are used to analyze data associated with infectious diseases leading to new biological discoveries will also be presented.

Plenary Speaker I

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: *"Automated Categorization of Drosophila Learning and Memory Using Video Analysis*"

***Abstract*—**The fruit fly, Drosophila melanogaster, is a well-established model organism used to study the mechanisms of both learning and memory in vivo. The techniques used to assess these attributes in flies, while powerful, suffer from a lack of speed and quantification. This talk will described an automated method for characterizing this behavior in fruit flies based on analyzing video of their movements. A method is developed to replace and improve a labor-intensive, subjective evaluation process with one that is automated, consistent and reproducible; thus allowing for robust, high-throughput analysis of large quantities of video data.

The method includes identifying individual flies in a video and tracking their motion. Once the flies are identified and tracked, various geometric and dynamic measures may be computed. These data are computed for numerous experimental videos and produce low-dimensional feature vectors that quantify the behavior of the flies. Clustering techniques, e.g., k-means clustering, may then be applied to the feature vectors in order to computationally group each specimen by genotype. Our results show that we are able to automatically differentiate between normal and defective flies. We also generated a Computed Courtship Index (CCI), a computational equivalent of the existing Courtship Index (CI), and compared CCI with CI. These results demonstrate that our automated analysis provides a numerical scoring of fly behavior that is similar to the scoring produced by human observers.

Plenary Speaker II

Assoc. Prof. Chaoyang Chen
Wayne State University, USA

Dr. Chaoyang Chen has more than 22 years of research experience focused on understanding orthopaedic biomechanics, nerve signal processing for proprioception and pain, bio-electrical signal processing for medical robot control, and carbon nanotube multi-electrode arrays (CNT-MEA) for human machine interface. He received his M.D. in Medicine from Fujian Medical University, China in 1987, and Master of Surgery degree from Beijing Medical University, China in 1990, followed by a postdoctoral fellowship in Department of Biomedical Engineering (BME) at Wayne State University (WSU), USA (1995-1998). He practiced clinical orthopaedic surgery in Fujian Medical University Affiliated First Hospital and conducted photo-elasticity biomechanical studies of spine fracture (1990-1994). In 1994, he was selected as International Fellow of the International Society for the Study of Lumber Spine, Seattle, WA. Then he joined the Department of BME, WSU in Detroit, MI, where he started in research on neurophysiology and robotic rehabilitation engineering. Currently, he is an Associate Professor and the Director of Robotic Rehabilitation Laboratory, Department of BME, WSU. He has won several academic awards from orthopaedic research society and car crash research society.

Topic: "*Bio-Electrical Signal Processing for Medical Exoskeleton System Control*"

***Abstract*—**Computer science progress in robotics has led to its expansion into medicine. Robotic rehabilitation medicine has become one of computer application areas, actively adopting robotic principles and achievements. Over the last decade robotic exoskeletons have been developed to rehabilitate lower limb and upper arm disability caused by stroke, spinal cord injuries or diseases. Bio-electrical signal processing for medical exoskeleton system control has become a hot research topic in robotic rehabilitation engineering. In this paper, we review the most recent robotic exoskeleton systems controlled by bio-electrical signals including electromyogram (EMG) and electroencephalogram (EEG). Bio-electrical signal processing methods used in our labs are introduced, including EEG digital signal processing for brain-computer interface and robotic arm control. Physiologic signal processing and it applications in intensifying the rehabilitation process are addressed. Current limitations of robotic rehabilitation engineering are also discussed.

Brief Schedule for Conference

Day 1	**October 18, 2017 (Wednesday)** **Venue: Hotel Lobby** Arrival Registration 10:00~12:00 Academic Visit 13:00~15:00
Day 2	**October 19, 2017 (Thursday)** 8:30~18:15 Keynote Speech, Plenary Speech and Conference Presentation
	Morning Conference
	Venue: Skylands Room (Lobby Level) 8:30~8:35 Opening Remarks (Prof. Hesham H. Ali) 8:35~9:15 Keynote Speech I (Prof. Sri Krishnan) 9:15~9:55 Keynote Speech II (Prof. Hesham H. Ali) 9:55~10:20 Group Photo & Coffee Break
	Session 1: 10:20~12:05 Topic: “Medical Image Analysis and Processing Technology”
	Lunch 12:05~13:30 **Venue: Aviation Grill**
	Afternoon Conference
	13:30~14:05 Plenary Speech I (Assoc. Prof. Chaoyang Chen)
	Session 2: 14:05~15:35 **Venue: Skylands Room (Lobby Level)** Topic: “Medical Information Management and Visualization”
	Coffee Break 15:35~15:55
	15:55~16:30 Plenary Speech II (Assoc. Prof. David E. Breen)
	Session 3: 16:30~18:15 **Venue: Skylands Room (Lobby Level)** Topic: “Biological Signal Analysis and Bioinformatics”
	Dinner 18:15 **Venue: Aviation Grill**

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

Detailed Schedule for Conference

October 18, 2017 (Wednesday)

Venue: Hotel Lobby

10:00~12:00	**Arrival and Registration**
13:00~15:00	**Academic Visit** 1:00pm: Departure from Newark Liberty International Airport Marriott. 1:20pm: Arrive in Kean University. 1:30pm-3pm: Visit School of Computer Science and College of Natural, Applied and Health Sciences. 3:00pm: Go back to hotel.

October 19, 2017 (Thursday)

Venue: Skylands Room (Lobby Level)

8:30~8:35		**Opening Remarks** Prof. Hesham H. Ali University of Nebraska at Omaha, USA
8:35~9:15		**Keynote Speech I** Prof. Sri Krishnan Ryerson University, Canada Topic: *"Advances in Biomedical Signal Analysis"*
9:15~9:55		**Keynote Speech II** Prof. Hesham H. Ali University of Nebraska at Omaha, USA Topic: *"Next Generation Tools for Big Data Analytics in Bioinformatics"*
13:30~14:05		**Plenary Speech I** Assoc. Prof. Chaoyang Chen Wayne State University, USA Topic: "*Bio-Electrical Signal Processing for Medical Exoskeleton System Control*
15:55~16:30		**Plenary Speech II** Assoc. Prof. David E. Breen Drexel University, USA Topic: "*Automated Categorization of Drosophila Learning and Memory Using Video Analysis*"

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 Best Oral Presentation will be awarded at the end of each session on October 19, 2017.

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.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q1002 Presentation 1 (10:20~10:35)

Methods of Image Segmentation Based on Quantum Mechanics

Tian Chi Zhang, Jian Pei Zhang, **Jing Zhang** and He Wang

Harbin Engineering University, China

Abstract—Quantum theory application is a hot research area in recent years, especially theory of quantum mechanics. In this paper, we pay attention to the research of image segmentation based on quantum mechanics in recent years. Firstly, the theories of quantum mechanics are introduced; and then, a review of image segmentation methods based on quantum mechanics is presented; finally, the characteristics about the quantum mechanics applied in image processing are concluded. There are two goals to write this paper, one goal is to emphases that quantum mechanics can be applied more and more research area, such as in image segmentation, the other goal is to conclude some methods in image segmentation and give some suggestions for possible novel methods by applying quantum mechanics theory. Totally, this is a review paper which it presents some methods based on feasible theories in quantum mechanics aiming to achieve better performance in image segmentation.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0006 Presentation 2 (10:35~10:50)

Shape Feature Based Automatic Abnormality Detection of Cervico-Vaginal Pap Smears

Mrinal Kanti Bhowmik, **Niharika Nath**, Abhijit Datta and Anjan Kumar Ghosh

New York Institute of Technology, USA

Abstract—Early detection of cervical cancer involves visual screening for changes in cellular morphology through microscopic analysis of Pap smears. Cytological interpretation by conventional microscopy of abnormal Pap smears performed manually is time-consuming, observer dependent and error prone. The aim of this study is to discriminate abnormal squamous cells from normal ones by quantitative image analysis of cervico-vaginal single cells with specific focus on the structure of the nuclei. In this study: 1) Six discriminative features such as nuclear area, nuclear perimeter, equivalent diameter, major axis length, minor axis length and convex area were selected and statistically justified, 2) A new dataset of 100 Pap smear cell images were collected from North-East Indian Regional population for the experimentation, and 3) Ground truth images of Pap smear cell dataset created by medical experts were compared with the automatically-segmented images with respect to the selected shape features. The cell boundary was segmented using greedy active contour model. Based on these six discriminating features, relevant cell images were classified as normal and abnormal using Support Vector Machine. Our method reports accuracy of 97.33%. Additionally, the proposed framework was applied to a known Pap smear benchmark dataset, to which we report an accuracy of 90.21%.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0008 Presentation 3 (10:50~11:05)

Statistical Fractal Analysis of Cardiac Dynamic Behavior

Javier Rodríguez, **Diego Oliveros**, Signed Prieto, Catalina Correa and Laura Abrahem

Institución Universitaria Politécnico Grancolombiano, Colombia

Abstract—The complexity of those systems that can be studied from frequency distributions can be characterized with the statistical fractal dimension. A methodology of diagnostic evaluation of the cardiac dynamics was developed from this dimension, allowing differentiating normal dynamics from those with acute dynamics.

For this study, 30 holter and continuous electrocardiographic records clinically diagnosed with acute dynamic were analyzed, also 20 dynamics clinically diagnosed as normal were taken. For each dynamic the values of maximal and minimal values by hour of cardiac frequencies were taken; with these values, the statistical fractal dimension were calculated, for this, the values were organized in ranges of 15 beat/min, and the number of times each range was presented was founded. To this distribution of numbers, the Zipf-Mandelbrot law was applied for find the fractal dimension of each dynamic. Subsequently, the diagnosis evaluation methodology was applied, and the sensitivity, specificity and Kappa coefficient values were measured, finding values for the sensitivity and specificity of 100%, and a Kappa coefficient.

Through of application of diagnosis evaluation methodology was possible differentiate normality of acute disease in the cardiac dynamic.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0019 Presentation 4 (11:05~11:20)

A Comparison of Filtered Back Projection and Maximum Likelihood Expected Maximization

Nyamlkhagva Sengee, Suvdaa Batsuuri, Chinzorig Radnaabazar and Khurel-Ochir Tsedendamba

National University of Mongolia, Mongolia

Abstract—In this study, we compare two image reconstruction methods which are the filtered back projection (FBP) and the maximum likelihood expectation maximization (ML-EM) on some medical and phantom image with noise. To evaluate those methods, we used one evaluation measurement which is called a peak signalto-noise ratio. The methods are tested with two images of computer tomography, two phantom images, and one SPECT images. Experimental result shows that FBP and ML-EM are closely similar result but MLEM is better than FBP in noisy images.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0010 Presentation 5 (11:20~11:35)

Using Deep Learning for Melanoma Detection of Dermoscopy Images

Julie Ann Salido and **Conrado Jr. Ruiz**

De La Salle University, Philippines

Abstract—Melanoma is a common kind of cancer that affects a significant number of the population. Recently, deep learning techniques have achieved high accuracy rates in classifying images in various fields. This paper uses deep learning to automatically detect melanomas in dermoscopy images. The system first preprocesses the images by removing unwanted artifacts like hair removal and then automatically segments the skin lesion. It then classifies the images using Convolution Neural Network (CNN). The classifier has been tested on preprocessed and unprocessed dermoscopy images to evaluate its effectiveness. The results show an outstanding performance in terms of sensitivity, specificity and accuracy on the PH^2 dataset. The system was able to achieve accuracies 93% for classifying melanoma and non-melanoma, with sensitivities and specificities in 86-94% range.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0016 Presentation 6 (11:35~11:50)

SWT and Spread Spectrum Coding based Copyright Protection Technique for Digital Images

Nagarjuna P V, Dhamender Tyagi and Ramachandra Reddy

Soft World Web Solutions PVT LTD, India

Abstract—In this manuscript, a new secure spread spectrum watermarking scheme for robust digital images in stationary wavelet transform domain is proposed, and that may be generalized to digital audio, video and documents. Digital image watermarking is to add some hidden message for maintaining the copyright data secure. The image is divided into four sub-bands after applying the stationary wavelet transform (SWT) and then spread spectrum algorithm is applied on the approximation coefficients for embedding process and the watermark is retrieved by using inverse wavelet transform. The experimental results demonstrate the effectiveness of the proposed scheme in terms of imperceptibility and robustness and also compared with some of the existing efficient techniques in-terms of normalized correlation and PSNR.

Morning, October 19, 2017 (Thursday)

Time: 10:20~12:05

Venue: Skylands Room (Lobby Level)

Session 1: Topic: "Medical Image Analysis and Processing Technology"

Session Chair: Assoc. Prof. Niharika Nath

Q0020 Presentation 7 (11:50~12:05)

Analysis of Chronic Wound Images using Factorization Based Segmentation and Machine Learning Methods

Kavitha I, Suganthi S S and Ramakrishnan S

Indian Institute of Technology Madras, India

Abstract—In this paper, an attempt has been made to perform an accurate assessment of chronic wound images. Pressure, venous and arterial leg ulcers are considered in this study. For this purpose, chronic wound images acquired by digital camera are enhanced using color correction, noise removal and color homogenization. Enhanced images in Cb color channel of YCbCr color space is used to extract wound bed with factorization based segmentation approach. Binary classification is performed to classify pressure ulcers and leg ulcers. The obtained results showed that the proposed segmentation method is capable of converging exactly to irregular wound boundaries. Hence, the suggested pipeline of processes seems to be promising for automatic segmentation and classification of pressure ulcers from leg ulcers aiding in the assessment of wound healing status.

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, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: "Medical Information Management and Visualization"

Session Chair: Assoc. Prof. Chaoyang Chen

C0008 Presentation 1 (14:05~14:20)

Recurrent Neural Networks with non-sequential data to Predict Hospital Readmission of Diabetic Patients

Chahes Chopra, Shivam Sinha, Shubham Jaroli, **Anupam Shukla** and Saumil Maheshwari

Atal Bihari Vajpayee Indian Institute of Information Technology and Management, India

Abstract—Hospital readmissions are recognized as indicators of poor quality of care, such as inadequate discharge planning and care coordination. Moreover, most experts believe that many readmissions are unnecessary and avoidable. In the present paper, we design a Recurrent Neural Network model to predict whether a patient would be readmitted in the hospital and compared its accuracy with basic classifiers such as SVM, Random Forest and with Simple Neural Networks. RNN showed highest prediction power in all the models used and thus this can be used by hospitals to target high risk patients and prevent recurrent admissions.

Afternoon, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: "Medical Information Management and Visualization"

Session Chair: Assoc. Prof. Chaoyang Chen

Q0002 Presentation 2 (14:20~14:35)

An Adaptive Algorithm for Accelerating Direct Isosurface Rendering on GPU

Sergey Belyaev, Pavel Smirnov, Vladislav Shubnikov and **Natalia Smirnova**

EPAM Systems Inc., USA

Abstract—One of the methods for visualizing medical data is direct isosurface volume rendering. It is based on finding the intersection points between the rays corresponding to pixels on the screen and the isosurface. This article describes a two-pass algorithm for accelerating the runtime of this method on a GPU. On the first pass, the intersections with the isosurface are found only for a small number of rays; this is done by rendering into a lower-resolution texture. On the second pass, the information thus obtained is used to efficiently calculate the intersection points of all the rays when rendering into the frame buffer. The amount of rays to be used on the first pass is determined using an adaptive algorithm, which runs on the CPU in parallel with the second pass of the rendering. New approach allows to significantly speed up isosuface visualization without loss of quality.

Afternoon, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: “Medical Information Management and Visualization”

Session Chair: Assoc. Prof. Chaoyang Chen

Q0003 Presentation 3 (14:35~14:50)

Bump Mapping for Isosurface Volume Rendering

Sergey Belyaev, **Viacheslav Chukanov** and Vladislav Shubnikov

EPAM Systems Inc., USA

Abstract—In this article a new approach for bump mapping as applied to visualizing medical data using isosurface volume rendering is presented. The method does not require any additional construction and can be used "on the fly" with any method of volumetric rendering. The algorithm is based on classic normal map approach but the normal map and the material's textures are packed as cubic ones and a priori knowledge about the nets of such textures is leveraged to calculate the normal on the fly. The algorithm can be applied to any number of isosurfaces on any gpu that supports cubic textures.

Afternoon, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: "Medical Information Management and Visualization"

Session Chair: Assoc. Prof. Chaoyang Chen

Q0007 Presentation 4 (14:50~15:05)

Improving Classification Performance by Combining Feature Vectors with a Boosting Approach for Brain Computer Interface (BCI)

Rachel Rajan and Assis. Prof. Sunny. T. D.

Government Engineering College, India

Abstract—Brain-computer interfaces (BCI) are an interesting emerging technology providing an efficient communication system between human brain and external devices like computers or neuroprosthesis. Among assorts of neuroimaging techniques, electroencephalogram (EEG) is among one of the non-invasive methods exploited mostly in BCI studies. Recent studies have shown that Motor Imagery (MI) based BCI can be used as a rehabilitation tool for patients with severe neuromuscular disabilities. The spatial and spectral information related to brain activities associated with BCI paradigms are usually pre-determined as default in EEG analysis without speculation, which can lead to loses effects in practical applications due to individual variability across different subjects. Recent studies have shown that feature combination of each specifically tailored for different physiological phenomena such as Readiness Potential (RP) and Event Related Desynchronization (ERD) might benefit BCI making it robust against artifacts. Hence, the objective is to design a CSSBP with combined feature vectors, where the signal is divided into several sub bands using a band pass filter, and this channel and frequency configurations are then modeled as preconditions before learning base learners and introducing a new heuristic of stochastic gradient boost for training the base learners under these preconditions. The effectiveness and robustness of this algorithm along with feature combination is evaluated on two different data sets recorded from distinct populations. Results showed that Boosting approach with feature combination clearly outperformed the state-of-the-art algorithms, and improved the classification performance and resulted in increased robustness. This method can also be used to explore the neurophysiological mechanism of underlying brain activities.

Afternoon, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: "Medical Information Management and Visualization"

Session Chair: Assoc. Prof. Chaoyang Chen

Q0004 Presentation 5 (15:05~15:20)

Computational Tool to Simulate and Visualize the Blood Flow in the Femoral Artery

Camilo Naranjo, Andrés Villa, Ricardo Prato, Juan Vélez, Alberto Cadena and **Juan Pablo Tello**

Universidad del Norte, Colombia

Abstract—This paper presents the development of a computational tool to simulate and visualize the blood flow in two dimensions (2D) over the real geometry of the femoral artery in which the Navier-Stokes equations are solved using the Finite Elements Method. The velocity field obtained has a laminar behavior; therefore, the highest velocity is in the center of the artery and decreases as the blood flow approaches artery walls. In spite of all artery and blood flow properties not being considered, the values of pressure and velocity obtained are within the normal ranges.

Afternoon, October 19, 2017 (Thursday)

Time: 14:05~15:35

Venue: Skylands Room (Lobby Level)

Session 2: Topic: "Medical Information Management and Visualization"

Session Chair: Assoc. Prof. Chaoyang Chen

Q0013 Presentation 6 (15:20~15:35)

Analysis of Pre- and Post- Fatigue Thermal Profiles of the Dominant Hand Using Infrared Imaging

Arun S. Balaji, Navaneethakrishna Makaram, Sriram Balasubramanian and Ramakrishnan Swaminathan

Drexel University and IIT Madras, USA

Abstract—Despite humans' extensive usage of the dominant hand, little has been done to monitor the hand's physical health in terms of development of Upper Extremity Musculoskeletal Disorders. Most of the muscles in the palmar region of the hand are intrinsic, and hence noninvasive EMG measurements give minimal information. In this study, an attempt is made to quantify the variations in thermal profile of the hand pre- and post- fatigue using infrared thermography. Subjects are tested using pinch grip based isometric contraction of the hand until fatigue. Baseline and post-fatigue thermal images are acquired using a Meditherm IRIS infrared camera. The process of image segmentation is carried out to delineate the dominant hand from the background. Features such as average temperature and kurtosis are extracted from the segmented images. Results show that there are wide variations in the intensities depicted by the thermal profile of each subject's hand. A decrease of 1.22% in median hand temperature of the palmar hand is observed. Similarly, a 1.17% reduction in temperature of the dorsal hand is detected post-fatigue. The kurtosis of the thermal profiles increases by 5.39% in the palmar hand and 6.63% in the dorsal hand post-fatigue. The statistical Student T-test performed on these features indicate that the decrease in average temperature is non-statistically significant ($P>0.05$); however, the increase in kurtosis is statistically significant ($P<0.05$). Infrared thermography appears to be a promising tool to measure the state of activation of muscle groups using thermal profiles.

15:35-15:55	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, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

Q0015 Presentation 1 (16:30~16:45)

An Online Medical Image Management System

Ching-Yu Huang, **Reuben Hernandez**, Shean Ballesteros and Xiaoding Lin

Kean University, USA

Abstract—This paper proposed an under development online medical imaging management system with advanced web-based tools at the front-end that can perform functions, in real-time to load and process images, extract important features at front-end, and save the information into the back-end database server. The modern laptops and smart phones are very powerful and the internet speed is much faster than 10 years ago. The goal of this research is to study and develop a client-server system to utilize browsers on laptops or mobile device to process images and store the images and images' information on a centralized server. The online system and architecture prototype has been developed and several functions and results will be discussed in the paper.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

Q0011 Presentation 2 (16:45~17:00)

An Emerging Study in Augmented Reality & Geographical Information System

Jonathan Rodriguez and **Ching-yu Huang**

Kean University, USA

Abstract—Augmented Reality (AR) and Geographic Information System (GIS) can be applied in various areas. They can be utilized to provide information on identifying the environments. Since most of the colleges don't offer AR and GIS courses, this paper presents an independent study framework about how college students can learn AR, GIS, Database, mobile app development through the emerging independent study. It is very important to know how Geolocation can be used to make very dynamic applications that users can interact with based on their location. This Independent Study framework will be using many new web and mobile technologies that are open-sourced. The purpose of this study is to demonstrate the usefulness and the benefits of knowledge on GIS/AR.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

Q0014 Presentation 3 (17:00~17:15)

Analysis of Muscle Fatigue using Electromyography signals in Gastrocnemius muscle during Isometric Plantar Flexion

Mayank Patel, Navaneethkrishna Makaram, Sriram Balasubramanian and Swaminathan Ramakrishnan

Drexel University, USA

Abstract—Fatigue during plantar flexion and the gastrocnemius muscles causes an increase in mediolateral sway and postural control impairment. The purpose of this study is to analyze the variation in the surface electromyography (sEMG) characteristics during isometric plantar flexion. For this, sEMG signals are recorded from the medial and lateral gastrocnemius muscle from 8 subjects and a minimum of 3 trials each, leading to a total of 25 trials per leg. The subjects performed isometric plantar flexion and are asked to hold the position until fatigue. The result shows that the endurance time of each subject vary. On comparing the endurance between legs, a marginal difference is observed. The recorded signal is nonstationary in nature. On visual inspection, the signals show an increase in amplitude with fatigue. The features such as RMS show an increase in value with 20.31% in right leg and 13.93% in the left leg for the signals from medial and lateral gastrocnemius. The proposed muscle fatigue index is a co-contraction based feature and provides better separation between non-fatigue and fatigue. The P-values obtained indicate that the proposed feature performs better than the conventional RMS value with a significance level of $P<0.01$. This study can be extended to analyze other neuromuscular conditions.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

Q0018 Presentation 4 (17:15~17:30)

Fatigue Analysis in Biceps Brachii Muscles Using sEMG Signals and Polynomial Chirplet Transform

Diptasree Maitra Ghosh and Ramakrishnan Swaminathan

Indian Institute of Technology Madra, India

Abstract—Muscle fatigue analysis finds significant applications in the areas of biomechanics, sports medicine and clinical studies. Surface electromyography (sEMG) signals have wide application because of its non invasiveness. By nature, signals recorded using surface electrodes from muscles are highly nonstationary and random. The objective of this work is to analyze muscle related fatigue using sEMG signals and polynomial chirplet transform (PCT). sEMG signals are acquired from biceps brachii muscles of twenty volunteers (Mean (sd): age, 23.5 (4.3) years) in isometric contractions. The initial 500 ms is considered as nonfatigue and final 500 ms of the signals are considered as fatigue zone. Then signals are subjected to polynomial chirplet transform to estimate the time-frequency spectrum. Four features, instantaneous mean frequency (IsMNF), instantaneous median frequency (IsMDF), instantaneous spectral entropy (ISpEn) and instantaneous spectral skewness (ISSkw) are extracted for further analysis. Results show that the PCT is able to characterize the nonstationary and multi component nature of sEMG signals. The IsMNF, IsMDF, ISpEn are found to be high in nonfatigue conditions. Further, all the features are very distinct in muscle nonfatigue and fatigue conditions ($p<0.001$). This technique can be used in analyzing different neuromuscular disorders.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

C0001 Presentation 5 (17:30~17:45)

Effects of Varying Temperature on Insecticidal Potency of Oil Extract of *Acalypha Godseffiana* against *Callosobruchus Maculatus*

Mercy Oni, Olaniyi Ogungbite and Israel Ogundare

Federal University of Technology, Nigeria

Abstract—The effect of varying temperature levels on insecticidal potency of *Acalypha godseffiana* oil extract was evaluated under the laboratory conditions at ambient temperature of 28±2 and relative humidity of 75±5%.The oil extracts applied at the rates of 2, 4 and 6% per twenty grammes of cowpea seeds were exposed to temperature levels of 0, 30, 40, 50 and 70℃ and tested against *Callosobruchus maculatus*. However, only 6% oil extract concentration achieved 100% weevil mortality at 72hour post-treatment. The probit analysis showed that only 3.59 and 5.24% concentration of the oil exposed to 0℃ temperature was required to achieve 50 and 95% insect mortality within 72 hours respectively. Oil extracts exposed to 0℃ only prevented oviposition and adult emergence of the weevil and weight loss in cowpea grains. However, oviposition and adult emergence of the insects as well as weight loss in cowpea grains decreased with increase in concentration and increased with increase in temperature. The phytochemicals present in the oil extract include, tannin, saponin, flavonoid, alkaloid and phenol. The amount of phytochemicals reduced with increase in temperature. Increase in temperature may render the oil extract ineffective. Since temperature is a determinant in the effectiveness of the plant oil in this research, against the survival of *Callosobruchus maculatus*, it can be incorporated into pest management technology.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

C0002 Presentation 6 (17:45~18:00)

Individual Drug Treatment Prediction in Oncology Based on Machine Learning Using Cell Culture Gene Expression Data

Nikolay Borisov, Victor Tkachev, Ilya Muchnik and Anton Buzdin

National Research Center "Kurchatov Institute", Russia

Abstract—Central stream of a progress in modern oncology is individual predictors development, which for a given patient with known type of cancer and a chosen drug, are able to estimate the patient treatment effect by the drug. Almost all researches of the direction apply machine learning technology, which designs the predictors by deep statistical analysis a set of clinical cases supported by gene expression data for every patient. The important direction, unfortunately, has a strong limitation: total set of cases for analysis is very limited (several tens, few times 2-3 hundred) to compare with many thousands of features in a gene expression profile. On the other hand, in biotech drug industry there are thousands of cell line cultures, supported by the gene expression data, which are analyzed to measure drug scoring. In this paper we show how the cell lines data can be incorporated into to machine learning analysis to improve the development of individual predictors.

Afternoon, October 19, 2017 (Thursday)

Time: 16:30~18:15

Venue: Skylands Room (Lobby Level)

Session 3: Topic: "Biological Signal Analysis and Bioinformatics"

Session Chair: Assoc. Prof. David E. Breen

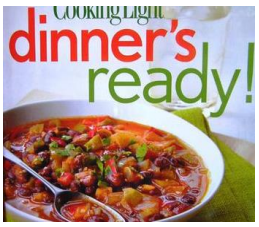
C0005 Presentation 7 (18:00~18:15)

Unsupervised Learning of Sequencing Read Types

Jan Tomljanovic, Tomislav Sebrek and **Mile Sikic**

University of Zagreb, Croatia

Abstract—In this work, we present a novel method for improvement of de novo genome assembly which is based on detection of chimeric and repeat reads. Using this information, we can facilitate the detection of unique sequences which results in more contiguous final sequences. We showed that read types can be separated by transforming a coverage graph for each read into 1D signal. We found that signals for repeat and chimeric reads differ significantly from signals for regular reads. Because manual determination of correct read types is a tedious and time-consuming job, we chose unsupervised learning. For feature extraction, we applied and compared variational and denoising autoencoders. Clustering was performed by K-means algorithm. We tested the method on four bacterial genomes sequenced by Pacific Biosciences devices. The achieved results show that using labelled read types can significant improve the contiguity of the assembled final sequence.



Dinner	
18:15	**Aviation Grill**

Conference Venue

Newark Liberty International Airport Marriott,

Newark, USA

Contact: Phone +1-973-623-0006

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Honored by Marriott International for our dramatic transformation in 2016, the Newark Liberty International Airport Marriott takes each stay to new heights. Set within Newark Liberty International Airport (EWR) and close to attractions, the free shuttle serves every terminal, bringing you to the doors of our transformed airport hotel. Inside, the new Greatroom offers a space to connect over free Wi-Fi, handcrafted cocktails and all-day dining. Soundproofed, redesigned accommodations soothe with murals that set an uplifting air. Platform beds give rise to peaceful slumber, while spa-like bathrooms evoke a sense of calm with glass-enclosed showers and waterfall heads. There are also multi-use surfaces and extendable open closets with power outlets. Guests can stretch out after a long flight in our Newark airport hotel in the fitness center, and then enjoy American fare at the Aviation Grill. For events, there's 27,000 square feet of renovated function space, including a magnificent grand ballroom. The hotel is 1 minute walk from the beach, located at Newark International Airport, 0.8 miles away from Terminal B, 1.9 miles from New Jersey Transit airport station and 4.3 miles from downtown Newark, NJ.

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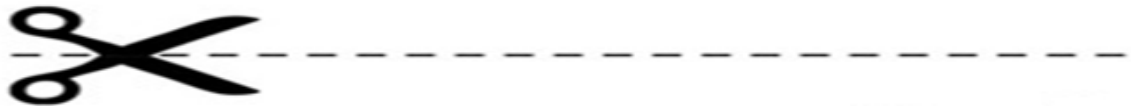

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Thank you for taking time to participate in this conference evaluation. Your comments will enable us to execute future conferences better and tailor them to your needs!