Workshop dual PhD France-USA

November 5th-6th 2013

Computional Surgery & Medicine

http://computationalsurgery.org/

This workshop is dedicated to Pr. Annick Suzor-Weiner
University of Paris-Orsay
Counselor for Science and Technology at the Embassy of France – 2009-2013

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COMPUTER SCIENCE

Methodist MITIE
Institute for Technology Innovation & Education
Houston, Texas

Barbara L. Bass

BBass@houstonmethodist.org

Biography : *Barbara Lee Bass, MD, FACS is the John F. and Carolyn Bookout Distinguished Endowed Chair, Department of Surgery, at The Methodist Hospital in Houston, Texas, and Professor of Surgery at Weill Medical College of Cornell University in New York. In addition to her clinical practice in gastrointestinal and endocrine surgery, Dr. Bass has led a funded laboratory program in gastrointestinal epithelial injury and repair for 19 years. More recently, she has held leadership roles in the development of surgical quality initiatives at the national level in both the Veteran Affairs Health Care System and at the American College of Surgeons. A recognized leader in surgical education, Dr. Bass recently completed a 7-year term as a Director and Chair of the American Board of Surgery. Dr. Bass is immediate past president for the Society for Surgery of the Alimentary Tract, and recipient of the Nina Starr Braunwald Award from the Association of Women Surgeons. Most recently, Dr. Bass was appointed to the Strategic Planning Group of the NIH National Commission on Digestive Diseases. She serves on the editorial boards of Annals of Surgery, SURGERY, the Journal of Gastrointestinal Surgery, and The World Journal of Surgery. Dr. Bass is a graduate of Tufts University and the University of Virginia School of Medicine. She completed general surgery training at George Washington University Hospital and during her residency completed a fellowship in gastrointestinal physiology at the Walter Reed Army Institute of Research, while serving as a Captain in the U.S. Army Medical Corps. She has held faculty positions at George Washington University School of Medicine and the University of Maryland School of Medicine, where she served as Professor of Surgery and Associate Chair for Research and Academic Affairs.*

Title : NA

Abstract : NA

Jean Bismuth

jbismuth@houstonmethodist.org

Biography : *Dr. Bismuth received his medical degree from Copenhagen University in Copenhagen, Denmark and completed his surgical residency at The Brooklyn Hospital Center. Subsequently, he completed his Vascular Fellowship at Baylor College of Medicine in Houston.*

Dr. Bismuth is an active member of professional societies including The Society for Vascular Surgery, American College of Surgeons, American Medical Association, The Michael E. DeBakey International Surgical Society, The Danish Medical Association, and the Peripheral Vascular Surgery Society.

Dr. Bismuth is the recipient of a Society for Vascular Surgery grant and is a national PI for two major clinical trials in the US. His is also the recipient of the Dyer Fellowship Award to support his research in vascular surgery robotics, and imaging and computational fluid dynamics.

Title : NA

Abstract : NA

Gavin Britz

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Biography : *Dr. Gavin W. Britz is Chairman of Neurosurgery at Houston Methodist Hospital and Co-Director of the Methodist Neurological Institute. He leads an acclaimed team of neurosurgeons and affiliated professionals and is recognized as one of the nation's foremost cerebrovascular and skull base surgeons.Dr. Britz is one of the most experienced surgeons for brain aneurysm procedures, including highly complex cases that require cardiac standstill or complex bypasses. He treats brain aneurysms using the traditional microsurgical techniques but also performs endovascular treatment with coiling and stenting of aneurysms as he has trained in both neurosurgery and interventional neuroradiology. He additionally specializes in the treatment of arteriovenous malformations, dural fistulas, arterial dissections, atherosclerotic disease, Moya Moya disease and diseases affecting the skull base. This includes brain tumors such as meningioma, chordomas, pituitary tumors, craniopharyngiomas, vestibular schwannomas and performs microvascular decompressions. He is among the first surgeons to test and use the latest devices for endovascular treatments. He came to Houston from Duke University Medical Center in North Carolina where he served as Director of the Cerebrovascular Center and Associate Professor of Neurosurgery. Earlier in his career, he was Co-Director of the Neurological Surgery Unit and Director of Endovascular Neurosurgery at Harborview Medical Center while serving as Associate Professor of Neurosurgery and Radiology at the University of Washington School of Medicine in Seattle. He leads basic science and clinical studies to understand stroke causation and evaluates novel tools to treat brain aneurysms and skull base tumors. The chairman has received Best Doctor in America distinction five different years. He is on the advisory boards of the Joe Niekro Foundation and The Brain Aneurysm Foundation. He serves on the editorial board for Neurosurgery,World Neurosurgery, International Journal of Vascular Medicine, Surgical Neurology International and Dataset Papers in Medicine. He has authored more than 80 peer reviewed scientific manuscripts and 25 chapters for various neurosurgical books.*

Title : NA

Abstract : NA

Nabil Chakfé

(joint presentation with Frederic Heim)

Nabil.Chakfe@chru-strasbourg.fr

Biography : *Nabil Chakfé, MD, PhD, FEBVS Born in 1961. I have done my Medical School at the Faculty of Medicine of Nancy, France. In 1984, I started my residency program at the University Hospital of Strasbourg. From 1988 to 1990, I spent 2 years at Laval University in Quebec City to get a Master in Experimental Medicine and start in the program of PhD.*

In 1991: Fellow in the Department of Cardiovascular Surgery at the University Hospital of Strasbourg.
In 1995: PhD obtained at Laval University in Quebec City and position of consultant in the Department of Vascular Surgery at the University Hospital of Strasbourg
In 1996: Habilitation à Diriger les Recherches, Université Louis Pasteur, Strasbourg
In 2001: Professor of Vascular Surgery at the Faculty of Medicine of Strasbourg
In 2011: Head of the Department of Vascular Surgery and Kidney Transplantation at the University Hospital of Strasbourg
***Other positions** : President of the GEPROVAS, Member of the UEMS council of the Board of Vascular Surgery, Member of the Board of the Euri$opean Journal of Vascular and Endovascular Surgery.*

Title : "Multidisciplinarity in Device Developments : The GEPROVAS approach."

Abstract : Vascular pathologies have been treated first with open surgery using vascular grafts since the beginning of the 1950's. First generations of vascular grafts have been mainly developed by pioneer surgeons with not always a high level of technology in their design and demonstrated high rated of failures.

Different improvements allowed proposing more stable devices Endovascular treatment of abdominal aortic aneurysm (EVAR) has undoubtedly represented second main steps of modern vascular surgery.

The goal of EVAR was to eliminate the risk of aortic aneurysm rupture by excluding the aneurysmal sac. Consequently, it was necessary to create a specific device associating a membrane for the exclusion of the aneurysmal sac, and an attachment system for the anchorage of this membrane at the level of proximal and distal necks. This device needed to be flexible and deformable enough to allow an easy intra-vascular navigation from the site of arterial entrance to the diseased aortic area and to demonstrate a long-term stability in order to guarantee good clinical performances. If the idea has been developed first by a physician, it required more technological developments.

However, first generations also demonstrated poor stability.

The GEPROVAS started to develop in 1993 a program of material surveillance on vascular devices. This program associated since the very beginning vascular specialists, physicians, and textile specialists, engineers. The aim of the program was not only to collect information about failures but to be able explain them in order to improve next generations. Two examples are presented in the field of vascular grafts and endografts degenerations.

Moreover, the knowledge given through this program allowed us thinking about new kind of devices that could be describe as innovations. That consisted in the second department of our group: research and development.

Today, the GEPROVAS proposes a complete multidisciplinary program associating now Education and Clinical Research that creates, in our opinion, the optimal multidisciplinary environment for new generations devices developments.

Thierry Colin

colin@math.u-bordeaux1.fr

Biography : *Thierry Colin was a student of the Ecole Normale Supérieure de Lyon. After two internships at Argonne National Laboratory, he received his PhD at the Ecole Normale Supérieure de Cachan in 93. The subject was « mathematical study of dispersive equations occurring in plasma physics and fluid mechanics ». He became starter research scientist with CNRS in Bordeaux in 94 and full professor in applied mathematics in 97 at the University of Bordeaux and in the engineering school Enseirb-Matmeca in 2009.*

After some works on numerical simulations of complex fluids in microfluidics, he switches is interest in 2008 toward scientific computing and modeling applied to oncology, in collaboration with the university hospital of Bordeaux.

Th. Colin had 23 PhD students and published around 100 papers. He is a member of 5 editorial boards of journals.

He served at different level of the university (department, graduate school…) and at the national level (CNRS, French comity of the Universities).

Title : "Mathematical models for tumor growth: construction, validation and clinical applications."

Abstract : In the last few years there have been dramatic increases in the range and quality of information available from non-invasive medical imaging methods, so that several potentially valuable imaging measurements are now available to quantitatively measure tumor growth, assess tumor status as well as anatomical or functional details. Using different methods such as the CT scan, magnetic resonance imaging (MRI), or positron emission tomography (PET), it is now possible to evaluate and define tumor status at different levels: physiological, molecular and cellular.

These multimodal data help the decision process of oncologists in the definition of therapeutic protocols.

At present, this decision process is mainly based on previously acquired statistical evidence and on the practitioner experience. The quality of the response to a treatment is decided according to the OMS criteria by estimating the length of the two main axis of the tumor in the largest cut.

There are two blocking difficulties in this approach that we want to attack: i) previous statistical information is not patient specific; ii) there exist no quantitative mean of summarizing and using as predicting tools the multimodal patient-specific data presently available thanks to CT scans, MRI, PET scans and molecular biology data.

The aim of this talk is to show how we can provide a simulation framework based on quantitative patient-specific data by using nonlinear model based on PDE. I will present how one can build such model in order to describe the may features of tumor growth and how one can expect to obtain a suitable parametrization of tumor growth by solving inverse problem. I will present some mathematical results on the models. The applications will concern lung and lever metastasis, meningiomas and brain tumor.

Christophe Collet

c.collet@unistra.fr

Biography : ***Academic Positions***

- Full Professor at UdS (University of Strasbourg) since 2001

- Associate Professor at UDS at the University of Bretagne Occidentale, Brest (1993-2000)

Educational background

- 2000 : HDR (research advisor qualification) (May 2000) "Contribution to statistical image analysis in underwater acoustics and ceanography" University of Bretagne Occidentale, Brest, France

- 1992 : PhD in Electronics (Dec. 1992) "Cinematics of background clouds in thermal imaging", University of Toulon & Var, France

- 1989 : Master of Science (DEA) in Signal Processing and Computer Architecture, Université Orsay Paris-Sud

Main Service

- Since 2013 : Chair of the Model Images Vision (MIV) team (34 researchers : 6 Professors, 9 Associate professors, 5 research-Engineer, 14 PhD students), one of the 14 teams of iCube CNRS lab. http://icube-miv.unistra.fr/fr

- 2011-. : In charge of International Network and student mobility at Télécom Physique Strasbourg http://www.telecom-physique.fr/

- 2011-2016 : Currently serving as a member of the French National University Council (CNU 61).

- 2010-2015 : PI with Pr Garbey of Atlantis dual degree program CRISP between UH, UF (Florida), Polytecnico di Milano (Italy) and Télécom Physique Strasbourg, 1.000k$, mobility grants for a maximum of 48 dual MSc

- 2009-2011 : Partnership University Fund between UH and University of Strasbourg, 73k€, 23 internships in UH

- 2005-2015 : Currently Chairman of Master of Sciences « Images, Robotics and Biomedical Engineering » (120 students per year) http://master-iriv.u-strasbg.fr/

- 2005-2008 : Co-chairman of national research action « multicomponent Imaging and heterogeneous data » of GDR ISIS

- 2005- . : Currently Scientific Director of PASEO team (Probabilistic Analysis of Space and Earth Observations, http://lsiit-miv.u-strasbg.fr/paseo/ , since 2005 in the LSIIT lab. then since 2013 in the iCube CNRS lab.
- In charge of the Signal department at the French Naval Academy (2000)
- Scientific chair of the GTS laboratory (signal processing group) at the French Naval Academy (1994-2000).

Title : "A survey of brain segmentation and lesion detection in MR images."

Abstract : A survey of brain segmentation and lesion detection in MR images Lesion load expectation is an objective measure used to evaluate the effectiveness of a therapy against brain degeneration in the case of Multiple Sclerosis (MS).

Response to therapy requires to evaluate the evolution of the lesions (size, location, etc.) over time; however most of the lesion segmentation algorithms do not use temporal information. The main features of the segmentation algorithms strategy will be presented and the most recent important techniques will be classified into specific strategies, pointing out their strengths and weaknesses.

Even if automatic segmentation has been widely investigated recently for helping MS diagnosis, the performance of most of the algorithms remains still far from expectation. In this talk, I will draw a survey of main 3D segmentation approaches and introduced an automated method using

Markovian Bayesian inference over both time and space to detect brain lesions.

François Cornelis

francois.cornelis@chu-bordeaux.fr

Biography : *I am associate attending physician specialized in diagnostic and interventional radiology in CHU Bordeaux, France. As my main field of study is focus on cancer diagnosis but also percutaneous ablations, I currently spend a year as research fellow in the Memorial Sloan Kettering Cancer Center, New York, USA. With Thierry Colin and Olivier Saut, we working together on models of tumor growth based on imaging data.*

Title : "From imaging data to mathematical models of tumor growth : rational and new tools."

Abstract : The future challenges in oncology imaging are to assess the response to treatment even earlier. Imaging lies at the heart of patient management, particularly in oncology. Apart from the time when a disease is diagnosed, the different imaging methods are used to assess the effectiveness of both local (surgery, radiotherapy, percutaneous ablation) and systemic (chemotherapy, targeted therapy) treatments during follow-up. The protocols usually recommend assessment criteria such as the RECIST, WHO or CHOI, although these are less than perfect.

As an alternative and cross-disciplinary area of development, mathematical modeling based on the imaging may be helpful in the future. The combination of imaging and modeling can describe many facets of tumor growth or response to treatment and allow to a better understanding of the disease.

However, as many technical challenges remain to be resolved, this valuable aid of imaging may be also improved. It requires a better understanding of the available data as well as the progressive introduction of the functional imaging into the models.

Mark Davies

MDavies@tmhs.org

Biography : *Mark G. Davies, MD, PhD, M.B.A. is Professor of Surgery in the Department of Cardiovascular Surgery, The Methodist DeBakey Heart and Vascular Center at The Methodist Hospital in Houston and Weill Cornell Medical College, New York. He is Program Director of the Vascular Residencies (5+2 and 0+5) and Director of the Vascular Ultrasound services within the Methodist Hospital. He is currently Vice-Chairman for Finance, Education, Administration and Research within Cardiovascular Surgery. Within the MDHVC, Dr. Davies supervises improvement projects in OR operations, supply chain management, clinical performance and patient care.*

Dr. Davies has been very productive in both the basic science and clinic research arena through out his career and has published over 300 peer-reviewed articles on endovascular therapy and vascular biology.
His basic research interests are the study of the in vivo/in vitro cell signaling of vascular smooth muscle cells (with an emphasis on signal transduction in diabetes and metabolic syndrome) and pathobiology of intimal hyperplasia (with an emphasis on vein grafts). The three specific areas of research interest are: 1) the signal biology of phospholipids in vascular smooth muscle cells; 2) the study of signal transduction of plasminogen activators during cellular proliferation and migration of smooth muscle cells and during the development of intimal hyperplasia after arterial injury and vein grafting in murine models and 3) the signal biology of Metabolic Syndrome in the vasculature. He has completed a KO8 from the NIH and currently is funded through an RO1. His clinical Research interests are the study of the outcomes of endoluminal therapy for lower extremity disease with an emphasis on cost effectiveness, best practice and appropriate outcomes and he is presently spearheading the development of the Southern Vascular outcomes network to provide regional quality reporting and performance improvement for the south central United States.

Title : NA

Abstract : NA

Baudoin Denis de Senneville

b.desenneville@gmail.com

Biography : *Baudouin Denis de Senneville was born in France, on January 20, 1978. He obtained the PhD degree in the field of computer science from the University of Bordeaux I, France in 2005. After a Postdoctoral position in interventional MRI, he joined the French National Center of the Scientific Research (CNRS). From 2009 to 2010, he was an Assistant Professor at the Laboratory of Molecular and Functional Imaging, University of Bordeaux 2, Bordeaux, France, and worked on the development of MR-guided high-intensity-focused ultrasound. In October 2011, he defended his "Habilitation à Diriger les Recherches" (equivalent to the tenure in France). Since 2011, he has been with the Mathematical Institute of Bordeaux, University of Bordeaux 1, and the University Medical Center Utrecht, for development of real-time methods towards MR-guided thermal ablations in challenging target areas such as the kidney and the liver. He coauthored more than 50 scientific papers. His research of interests are focused mainly on mathematics and computer science in the field of real-time MR-imaging, HIFU-cancer therapy, MR-thermometry and mathematical modeling.*

Title : "Real-time image guidance of non-invasive local therapies."

Abstract : Non-invasive interventional procedures show a high potential in oncology as an alternative to classical surgery. The development of a completely non-invasive interventional method is of particular interest for the treatment of vital organs (kidney, liver and pancreas) and opens a path towards new therapeutic strategies with improved reliability and reduced associated trauma leading to improved efficacy, reduced hospitalization and costs, and improved quality of life.

The objective is to precisely control on-line an energy deposition within a pathological area in order to achieve an effective treatment, with a reduced duration and an increased level of safety for the patient.

Several therapeutic approaches are under investigation: A necrosis in pathological tissues can for example be achieved using non-invasive ablation techniques upon local radiation therapy techniques or local thermal energy deposition. In practice, the treatment must include a determination by the radiologist of the targeted volume and the identification of peripheral areas that must be preserved.

Since a complete destruction of the tumor is required to assure therapeutic success, efficient ablation control strategies are employed to stabilize the targeted energy and to prevent unwanted tissue damage in adjacent areas. However, the treatment of abdominal organs has so far been hampered by the complications arising from the physiological motion and their anatomical location: Directly located below the diaphragm, they are prone to respiratory or cardiac-induced displacements and deformations.

As a consequence, real-time organ motion estimation is rapidly gaining importance for the on-line guidance of such interventional procedures. In particular, modern Magnetic Resonance (MR) Imaging or Echography methods now allow a fast acquisition of images with an excellent tissue contrast and high spatial resolution, which opens great perspectives to estimate complex organ deformations using image registration algorithms. The estimation of the organ displacement is first the basis for the dynamic adjustment of the energy beam to track the targeted pathological tissue. Secondly, mis-registration between MR-images is compensated on a voxel-by-voxel basis to compute on-line maps of the deposited energy. For this purpose, the estimated organ displacement is the basis of an accurate on-line correction of motion related artifacts of acquired images. Finally, the obtained maps of the deposited energy are used for an adaptive ablation control, which employs automatic feedback control of the beam power and position.

This presentation deals with the recent real-time specific image processing methods designed for the real-time image guidance of non-invasive local therapies. In particular, methods are described to estimate, characterize and compensate for organ deformations with short latency, using image processing techniques applied to MR-images acquired on-the-fly.

Brian Dunkin

BJDunkin@houstonmethodist.org

Biography : *Professor of Clinical Surgery, Weill Cornell Medical College, Chair in Surgical Innovation and Technology, Head, Section of Endoscopic Surgery, Medical Director, Methodist Institute for Technology, Innovation and Education (MITIE^{SM}), The Methodist Hospital, Houston, Texas. Dr. Dunkin is the Head of the Section of Endoscopic Surgery and Medical Director of the Methodist Institute for Technology, Innovation & Education (MITIE^{SM}) at the Methodist Hospital in Houston, Texas. He did his surgical residency training at the George Washington University in Washington, DC and a fellowship in advanced laparoscopy and surgical endoscopy at the Cleveland Clinic in Ohio. He has been an Assistant Professor of Surgery at the University of Maryland and an Associate Professor at the University of Miami in Florida. He joined the staff at the Methodist Hospital in January of 2007. Dr. Dunkin's clinical practice is focused on advanced laparoscopic surgery and flexible GI endoscopy and he is the co-director of the Methodist minimally invasive surgery fellowship program. Dr. Dunkin is also the Medical Director of MITIE – a world class comprehensive education and research institute focused on helping practicing health care professionals learn new procedural skills and adopt new medical technology. Dr. Dunkin's research interests are in the development of novel methods and devices for endoscopic surgery, as well as the use of leading-edge technology in the development of improved training programs for surgeons. He is published in the areas of flexible endoscopy, minimally invasive surgery, surgical education, and gastrointestinal physiology. He is a Board member and 1st Vice President of the Society of American Gastrointestinal and Endoscopic Surgeons, Past President of the Texas Association of Surgical Skills Laboratories and serves in leadership roles in the American College of Surgeons, the Surgical Society of the Alimentary Tract, and the American Society of Gastrointestinal Endoscopy. He is also a member of the editorial boards for Surgical Endoscopy and the Journal of Laparoendoscopic and Advanced Surgical Techniques and in 2010 was appointed a Professor of Clinical Surgery at the Weill Cornell Medical College in New York – the academic affiliate of Methodist.*

Title : "Multimodal Minimally Invasive Surgery."

Abstract : NA

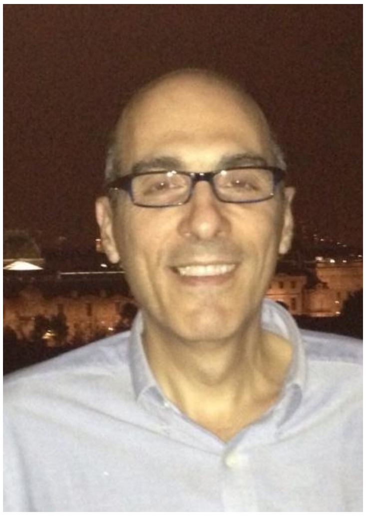
Abdallah Elhamidi

aelhamid@univ-lr.fr

Biography : *Abdallah EL HAMIDI is an associate professor at the University of La Rochelle. His research interests include the nonlinear Partial Differential Equations, the Calculus of Variation, Inverse Problems and Image Processing. He received his PhD in applied mathematics from the Claude Bernard University of Lyon (France) and his "Habilitation ‡ diriger des recherches“ (Accreditation to Supervise Research) from the University of La Rochelle (France).*

Title : “Regularity of eigenelements to compact operators and application to proper orthogonal decomposition sensitivity . ”

Abstract : In this talk, we present optimal regularity results of eigenvalues and eigenspaces with respect to self-adjoint compact operators. We show that while eigenvalues depend, in a lipschitzian way, of compact operators, the eigenspaces are only locally Lipschitz. An application to the study of the { proper orthogonal decomposition sensitivity is carried out in a general Banach framework.



Hassan Fathallah-Saykh

hfathall@uab.edu

Biography : *Dr. Fathallah-Shaykh studied medicine at the American University of Beirut and earned a Ph.D. in pure mathematics from the University of Illinois at Chicago. He trained in neurology, internal medicine and in clinical and basic neuro-oncology at the University of Chicago, Duke, and Memorial Sloan-Kettering Cancer Center, respectively. He is currently an Associate Professor of Neurology and Mathematics at the University of Alabama at Birmingham.*

Title : "Mathematical Model of Low-Oxygen Induced Accelerated Brain Invasion by GBM."

Abstract : Glioblastoma multiforme (GBM), a malignant glial brain tumor, continues to be associated with poor prognosis despite the recent use of anti-angiogenic drugs (AA). Characteristic features of GBM include central necrosis, brain invasion, and rapid progression when the tumor becomes resistant to AA therapy.

Experimental results reveal that some malignant gliomas exhibit enhanced brain invasion and motility under low-oxygen condition. I will introduce a new mathematical model of low-oxygen induced brain invasion by GBM at the scale of clinical magnetic resonance images.

The model replicates the mutilayer structure of GBM, ie proliferative, invasive and necrotic components. I will discuss numerical results on the effects of the phenotype of low-oxygen induced accelerated brain invasion on necrosis and brain invasion.

Yuriy Fofanov

yufofano@utmb.edu

Biography : *Yuriy Fofanov received his M.S. in Physics in 1977 and his Ph.D. in Physics and Mathematics in 1988 from Kuibyshev (Samara) State University, USSR. Since joining the Computer Science Department at the University of Houston, he has been the director of the departments Bioinformatics Lab and an adjunct assistant professor both in the Department of Biology and Biochemistry at UH and in the Department of Health Informatics at the School of Health Information Science at the University of Texas. In 2002 Fofanov also became a faculty member for the W.M. Keck Center for Computational and Structural Biology. The focus of the Bioinformatics Lab is two-fold: gene expression and genomic sequence analysis, each of which has many on-going projects. The gene expression projects consist of approaches in micro-array data normalization, using local invariants for genetic regulatory networks reconstruction, and a mutual information approach to identify nonlinear patterns in gene expressions. Genomic sequence analysis projects include studies of the statistical properties of short subsequences in microbial and viral genomes and the design of ultra-specific host/background blind probes and primers for microbial and viral identification. The latter project was recently awarded funding through the Department of Homeland Securitys Advanced Research Projects Agency, Science and Technology Directorate. The successes of the laboratory are made possible due to our many collaborations with faculty members at UH in the Biology and Biochemistry, Chemical Engineering, and Chemistry Departments as well as collaborations with the University of Texas Medical Branch in Galveston, the University of Texas at Houston, the University of Arizona, the University of Guadalajara, Mexico, and Genomics USA in Houston, Texas.*

Title : NA

Abstract : NA

Marc Garbey

garbey@cs.uh.edu

Biography : *Marc Garbey is an Applied Mathematician and a Computer Scientist trained in France. His PhD in 1984 on the asymptotic analysis of multiscale problems contributed to the matching asymptotic theory of W.Eckhaus (Neederland).*

Later he worked on stability and bifurcation theory for moving front problems in fluid dynamic and combustion with Hans Kaper (ANL) and Bernie Matkowsky (Northwestern). His works evolved into the development of parallel algorithm to solve complex physical problems that cannot be addressed by analytical methods. He has worked also extensively with Wei Shyy on several applications of fluid mechanics and a posteriori error estimates. Since 2008, his interest has shifted to computational medicine and more precisely surgery. His philosophy in science is to start from the real application with interdisciplinary collaborations led by the final application. The mathematic, computer science and algorithmic development must follow and adapt to the needs of the application problem. The foundation of the ***CO****mputational* ***S****urgery* ***I****nternational* ***NE****twork (Cosine – http://www.computationalsurgery.org) in partnership with Dr. Barbara Bass, chair of the department of surgery at the Methodist Hospital follows this strategy.*
His current work encompasses predictive model of breast conservative therapy, multiscale modeling of vascular adaptation and smart OR procedural framework.
He has about 160 peer review publications and was the editor of 6 books. He is the co-editor in chief with Barbara Bass of a new journal in computational surgery published by Springer Verlag. His work is mainly founded by NSF, NIH, DOE and CEE. His main appointments are Professor of Mathematics and Computer Science at University of Houston, Senior Scientific Liaison of the Methodist Institute for Technology Innovation and Education, Professor of Applied Mathematics at the LaSIE -FRE CNRS3474 in France.

Title : NA

Abstract : NA

Lyle J. Graham

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<u>Biography</u> : *Neural processing relies on two basic elements: First, the intrinsic properties of neurons that allow processing of synaptic input from other neurons, and generation of action potentials as the computational result; second, the network of excitatory and inhibitory pathways of a complexity orders of magnitude greater than any humans have created. How these elements interact to generate computational function in the brain is the fundamental question of systems neuroscience, and we are addressing this with a symbiosis of experiments - electrophysiology and histology in the early visual system, and theoretical models – both biophysically-detailed and formal mathematical models of neurons and networks.*

Thus our research focuses on how neurons and their networks accomplish functional computations, a.k.a. the biophysics of computation.

The themes of this work can be divided into two general areas:

- Synaptic integration and spike generation in single neurons : Each neuron in the brain instantiates a complex mapping from typically thousands of synaptic and many contextual (e.g. pancrinic) inputs, to the eventual action potential output. The biophysical structure underlying this transformation includes the non-linear interactions between synaptic inputs across neuron's dendritic tree, the neuron's voltage and second-messenger dependent membrane channels and, finally, the intracellular systems that regulate synaptic and membrane properties. Our work aims to characterize this mapping in neurons of the retina, hippocampus and cortex, with particular attention to the integrated analysis of the responses of neurons to both artificial (electrophysiological) and functional (visual) stimuli.

- Functional architecture of cortical and peripheral brain regions : Sensory systems in the brain are characterized by the notion of the receptive field, which describes the filter properties of single cells that discriminate specific features in a given sensory modality. Our research focuses on the early visual system, including the retina, the lateral geniculate nucleus and the visual cortex, where we aim to describe the contributions of synaptic connectivity and intrinsic cellular properties that underlie classical and non-classical receptive field characteristics.

Title : NA

Abstract : NA

Karolos Grigoriadis

mece2hv@central.uh.edu

Biography : *Dr. Grigoriadis research has been focusing on the development of systematic methods for control systems design subject to practical implementation limitations, such as, time delays, controller order, saturation constraints and fault accommodations. He has worked on multiple research projects sponsored by the U.S. National Science Foundation, NASA, the U.S. Army, and aerospace and automotive companies. His work on aerospace controlled systems in collaboration with aerospace companies and NASA has been addressing microgravity vibration isolation, control of smart structures, fault-tolerant control of space systems, and integrated design of structural parameters and control gains. His research on automotive engine diagnostics/controls in collaboration with U.S. federal agencies and automotive companies has been on the development of real-time optimizing controllers for engine and exhaust after-treatment to meet future automotive fuel economy and exhaust emission objectives.*

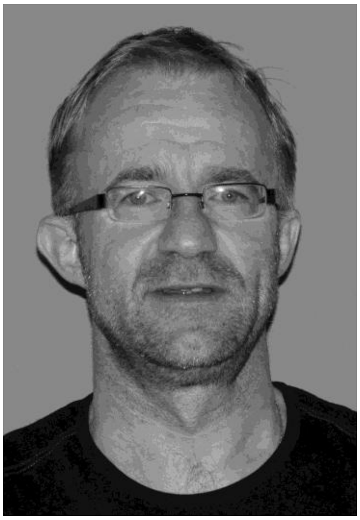
Dr. Grigoriadis has authored or co-authored over 150 journal and proceeding articles, 3 book chapters, and two books (Actuator Saturation Control, Marcel Dekker, New York, 2003, and A Unified Algebraic Approach to Linear Control Design, Taylor & Francis, 1998). He has organized several invited sessions, workshops and short-courses at national and international conferences, and he has been in the Editorial Board of international journals and international conference committees in the systems and controls area. He is the recipient of several national and university awards including a National Science Foundation CAREER Award, a Society of Automotive Engineers Ralph Teetor Award, a Bill Cook Scholar Award, a Herbert Allen Award for Outstanding Contributions by a Young Engineer and multiple Research Excellence and Teaching Excellence Awards.

Title : "Medicine and Automatic Control: From Robotic Surgery to Autonomous Drug Delivery."

Abstract : This talk with present developments and application of automatic feedback control concepts to benefit advances in medical interventions.

The design and feedback control of a robotic system to assist with MRI-guided surgery will be discussed. In this context, the model-based feedback control of a 4 DOF parallel robotic device will be presented seeking to assist with aortic valve implantation under beating heart conditions. Additionally, the application of feedback control concepts to automate the delivery of drugs will be examined.

Adaptive control algorithms to autonomously regulate the infusion of vasoactive drugs for hypotensive treatment will be presented along with validation studies based on animal tests.



Frédéric Heim

(joint presentation with Nabil Chakfé)

frederic.heim@uha.fr

Biography : ***Diploms***

- Master of science in Mechanical Engineering (ENSAM PARIS)

- PhD in Biomechanical Engineering

Position

- R&D Manager at GEPROVAS (Strasbourg)

- Full Professor at Université de Haute Alsace (Mulhouse)

Title : "Multidisciplinarity in Device Developments : The GEPROVAS approach"

Abstract : Vascular pathologies have been treated first with open surgery using vascular grafts since the beginning of the 1950's. First generations of vascular grafts have been mainly developed by pioneer surgeons with not always a high level of technology in their design and demonstrated high rated of failures. Different improvements allowed proposing more stable devices Endovascular treatment of abdominal aortic aneurysm (EVAR) has undoubtedly represented second main steps of modern vascular surgery.

The goal of EVAR was to eliminate the risk of aortic aneurysm rupture by excluding the aneurysmal sac.

Consequently, it was necessary to create a specific device associating a membrane for the exclusion of the aneurysmal sac, and an attachment system for the anchorage of this membrane at the level of proximal and distal necks.

This device needed to be flexible and deformable enough to allow an easy intra-vascular navigation from the site of arterial entrance to the diseased aortic area and to demonstrate a long-term stability in order to guarantee good clinical performances. If the idea has been developed first by a physician, it required more technological developments.

However, first generations also demonstrated poor stability.

The GEPROVAS started to develop in 1993 a program of material surveillance on vascular devices. This program associated since the very beginning vascular specialists, physicians, and textile specialists, engineers. The aim of the program was not only to collect information about failures but to be able explain them in order to improve next generations. Two examples are presented in the field of vascular grafts and endografts degenerations.

Moreover, the knowledge given through this program allowed us thinking about new kind of devices that could be describe as innovations. That consisted in the second department of our group: research and development.

Today, the GEPROVAS proposes a complete multidisciplinary program associating now Education and Clinical Research that creates, in our opinion, the optimal multidisciplinary environment for new generations devices developments.

Angelo Iollo

angelo.iollo@math.u-bordeaux1.fr

Biography : ***Appointments***

- 1991: Junior Lieutenant, Italian Air Force

- 1996: Staff scientist, ICASE, NASA Langley, US

- 1997: Marie Curie Fellow, Inria Sophia Antipolis, France

- 1999: Assistant professor, Politecnico di Torino, Italy

- 2001: Associate professor Qualification, Università di Bologna, Italy

- 2004: Full professor of applied mathematics, Université Bordeaux 1

Honors

- 2011: Shared La Recherche prize for mathematics

- 1997: Marie Curie Fellowship. Two-years stipend for research funded by European Union

Collaborators & Other Affiliations

- Part-time researcher at Inria (the French national institute for applied mathematics and computer science).

- 18 PhD students, 13 have defended. Tutoring of 6 post docs.

- I have a well-established collaboration with Eyal Arian of Boeing Phantom Work (Seattle), about aerodynamic optimization.

- In 2009, with my colleagues Thierry Colin and Olivier Saut I initiated a collaboration with Jean Palusière, radiologist at the Institute Bergonié Bordeaux (the local cancerology institute), on tumor growth system identification based on scan images.

- I collaborate with Dr. G. Marsicano of the French National Health Institute on the analysis of VSDI data of neuronal activity in genetically modified mice hippocampus.

Position title

- Full Professor of Applied Mathematics

- Institut de Mathématiques Bordeaux - Université Bordeaux 1 and Inria Bordeaux - Sud Ouest

Title : “System identification in hippocampal depolarization.”

Abstract : One of the most daunting challenges in neurosciences is the ability to visualize and quantitatively analyze the activity of defined intact neuronal circuits.
In this sense, we have recently started an exploratory project with the Neuroscience Institute Magendie in Bordeaux (Inserm) relative to quantitative image analysis and modeling of the cannabinoid effects on the dynamics of neuronal circuits in the Hippocampus.

Using voltage-sensitive dye imaging (VSDi) our neuroscientist partners study the impact of the activation of cannabinoid receptors on the dynamic diffusion of neuronal signals within hippocampal circuits. Preliminary data show that the approach is feasible and that the application of agonists and antagonists of the type-1 cannabinoid receptor (CB1) alters the dynamic spreading of VSDi signals in different regions of the hippocampus. However, this imaging technique, which is able to visualize the spreading of neuronal signals, provides distributed data that need systematic approaches to be fully interpreted.

Therefore, it is necessary to provide viable mathematical tools to extract valid and reliable information from the dynamic imaging data. An objective way of inferring propagation patterns from successive frames of depolarization images consists in subsequently solving optimal mass transfer problems. These methods provide key information on the way by which cannabinoid signaling alters the spread of information in neuronal networks.

We will introduce the biological set up and concentrate on the modelling issues relative to optimal mass transfer. This work is in collaboration with A. Bouharguane of the Institute of Mathematics Bordeaux and Inria Bordeaux - Sud Ouest, M. Colavita, G. Marsicano, F. Massa of the Neuroscience Institute Magendie, Bordeaux.

Christof Karmonik

CKarmonik@tmhs.org

Biography : *After his Master's Degree in Computational/Theoretical Physics, Dr. Christof Karmonik received his Ph.D. at the University of Saarbrucken in Physical Chemistry characterizing diffusion in solid state protonic conductors. He continued this work as Visiting Scientist at the National Institute of Standards and Technology. After completing a Postdoctoral Fellowship at the MD Anderson Cancer Center in Diagnostic Imaging, he joined the faculty at the Baylor College of Medicine. He is now the Technical Director of the MRI core facility at the Methodist Hospital Research Institute with a primary academic appointment of Research Associate Professor at the Weill Medical College of Cornell University, New York.*

Title : "Advanced Imaging of Type B Aortic Dissections."

Abstract : Advances in medical imaging now enable the visualization and quantification of blood velocities in a variety of vascular pathologies. While associated with additional imaging time prolonging the clinical examination, the additional information might be of benefit to the surgeon when planning treatment. This may be particularly true in serious, life-threatening diseases, where strong deviations from the regular flow pattern exist. These kinds of conditions include DeBakey type III aortic dissection where large variations in geometry and flow physiology exist which make it difficult to obtain a thorough understanding of the altered flow conditions by generalization. An alternative to additional imaging for flow quantification is the calculation of the velocity field by computational simulations using routinely acquired clinical images. Computational fluid dynamics (CFD) had been successfully applied in this context and examples are provided in this review. In addition, computational simulations might be used to evaluate flow changes prior to the actual interventions by altering the original computational model using the concept of virtual surgery.

Milos Kojic

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Biography : *Miloš Kojić was professor of Mechanics at University of Kragujevac, Serbia, over 40 years. He has B.S. in mechanical engineering, M.S. in mechanics (University of Belgrade), Ph. D. in mechanical engineering (Rice University, Houston). He was visiting scholar at MIT, research engineer at ADINA R&D Boston, and Senior Research Scientist at Harvard University. Currently, he is Senior Member at the Houston Methodist Research Institute (HMRI), adjunct professor at University of Houston, and director of R&D Center for Bioengineering in Kragujevac. He is the author or co-author of numerous papers and books, including one published by Springer (Inelastic Analysis of Solids and Structures) and one published by J. Wiley (Computer Modeling in Bioengineering). He has been the PI of the original FE software package PAK for structural analysis, fluid mechanics, field and coupled problems and biomechanics. Currently, he is leading research in computational methods for convective and diffusive transport in biological systems, at HMRI and R&D Center in Serbia. Professor Kojic is president of the Serbian Society for Computational Mechanics and Corresponding Member of the Serbian Academy of Sciences and Arts.*

Title : "Computational models for convective and diffusive transport in capillaries and tissue."

Abstract : We first present computational models for transport of cells and particles within small vessels. Fluid and solid domains are discretized by finite elements and solved within one nonlinear system. Large deformations which occur when cells pass through capillaries are included. The developed models are suitable for study circulating tumor cells motion within small vessels and transport of drugs by nanoparticles.

Then, we present diffusion multiscale models which are developed for simulation of drug transport within tissue. They include biochemical interaction between diffusing molecules and biological environment, and can be used as the basic computational tools in tumor therapeutics and other biological processes involving mass transport.

Gwendal Le Masson

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Biography : *Pr Gwendal Le Masson is a professor in clinical Neurology and the head of the neuromuscular department of the University Hospital of Bordeaux. He is also leader of a research team on motor neuron pathology at the Neurocentre Magendie INSERM U862 at Bordeaux. He has been trained in computational neuroscience during a postdoc fellow at Brandeis University, working with Prs L. Abbott and E. Marder on modeling the dynamic of small neural network as well as in activity dependent regulation of active conductance. During the last few years and after a sabbatical in Columbia University at the Motor Neuron center for Biology and Diseases, he started a new type of models involving classical Hodgkin & Huxley paradigm linked to a description of intra-cellular biochemical pathways involved in the regulation of neuron's bioenergetics and mitochondrial functions.*

Title : "A computional model of motor neuron degeneration."

Abstract : Amyotrophic Lateral Sclerosis (ALS) is a fatal disease due to selective motor neuron degeneration where mitochondrial dysfunction is increasingly recognized as a key factor in the pathophysiology. To explore the link between mitochondrial bio-energetic defect and motor neuron degeneration, we study a realistic computational model in which detailed morphology and ion conductance are paired with an intracellular model of ATP production and consumption. Using this model, we demonstrate that the metabolic cost of a single action potential increases when ATP availability is decreased. The increased demand for ATP, caused by a shortage of ATP, introduces a K^+/Na^+ dys-homeostasis that results in chronic depolarization. This process involves fasciculation-like spiking events. In addition to producing depolarization, a shortage of ATP decreases the calcium buffering capacity of the neuron resulting in a build-up of intracellular calcium. Our results provide compelling evidence indicating that, even a mild mitochondrial dysfunction, suffice to give rise to some of the most salient, enigmatic features of ALS such as motor neuron hyper-excitability, fasciculation, distal to proximal axonal degeneration, increased calcium concentrations, and greater vulnerability of some specific subtype of neurons.

William W. Lytton

billl@neurosim.downstate.edu

Biography : *William Lytton is an M.D. trained at Harvard, Columbia, Alabama, Johns Hopkins, UCSD and Salk Institute. He is a practicing Neurologist caring for the indigent at Kings County Hospital, and is Professor of Physiology & Pharmacology at Downstate Medical Center in Brooklyn, NY. He is the author of ``From Computer to Brain,'' a basic introduction to computational neuroscience. His research is multiscale modeling at scales from molecule to brain to assist in understanding of brain diseases including epilepsy, stroke and schizophrenia, with a focus on using modeling for clinical translation from bench to bedside.*

Title : "Multiscale modeling for neurology and psychiatry."

Abstract : The histology of most body organs is amenable to the standard embedding process of multiscale modeling: subcellular elements are embedded in cells, cells are embedded in a local tissue architecture, which in turn embeds to provide a substrate for histological and organ structure.

By contrast, many areas of the brain show patterns of scale overlapping, with elements at different levels of organization which are neither segregated by physical scale, nor cleanly distinguished by each element's role in the overall input/output structure. We are developing models of brain diseases -- epilepsy, stroke, Alzheimers, Parkinsons, and schizophrenia -- to cover these scales.

Our emphasis is on the two scales where we intervene clinically: the molecular/cellular scales for neuropharmacology and the local tissue scale for implanted neuroprosthetic stimulation.

Ahmet Omurtag

aomurtag@central.uh.edu

Biography : *Ahmet Omurtag is an Associate Professor of Biomedical Engineering at the University of Houston. As Director of Research and Engineering at Bio-Signal Group he participated in the development and clinical study of a wireless EEG device which obtained FDA approval. Dr. Omurtag holds a Ph.D. in Mechanical Engineering from Columbia University and was an Assistant Professor at the Mount Sinai School of Medicine and at SUNY Downstate Medical Center. His research interests include pervasive use of portable, networked EEG devices, quantitative model and assessment of medical procedures, and computational neuroscience.*

Title : "Concept to Clinic : Example of wireless EEG."

Abstract : We discuss the characteristics of a wireless EEG machine ("microEEG") optimized for the emergency department (ED). The context of the engineering environment in the ED is introduced along with the lifecycle of a typical biomedical device - from research to regulatory approval. We explain the motivation, design and the results of a pilot study that evaluated the feasibility of EEG in ED followed by clinical trials that enrolled 393 patients in two EDs in order to determine diagnostic accuracy.

A general solution is presented for the problem of measuring true diagnostic accuracy without the use of a perfect reference standard ("gold standard") and in the presence of inter-rater variability.

Ioannis Pavlidis

ipavlidi@Central.UH.EDU

Biography : *Dr. Pavlidis is the Eckhard-Pfeiffer Professor of Computer Science and Director of the Computational Physiology Laboratory at the University of Houston. His research is funded by multiple federal agencies including the National Science Foundation and the Department of Defense, as well as corporate sources and medical institutions. He has published numerous papers and books on the topics of human-computer interaction, computational physiology, and the physiological basis of human behavior. He is well known for his work on stress quantification, which appeared in a series of articles in Nature and Lancet.*

Title : "Beware of Sympathetic Looping in Surgery and Beyond."

Abstract : In a longitudinal study of skill acquisition in inanimate laparoscopic training, we established that in challenging dexterous tasks, novices fall into sympathetic looping. In sympathetic looping, autonomic responses suppress procedural cognition.

The subject falls for the wrong step and keeps attempting it at high speed again and again throwing the process off track. Eventually, the subject backtracks, slows down, and executes the right step. In training, this makes for a long and painful experience. In real life, it may lead to an accident. In experiments we performed on children it appears that sympathetic looping is the default mode of dexterous skill acquisition for human beings.

Furthermore, we have indications that sympathetic looping is especially intense when the novice attempts to learn a mediated dexterous task, such as a laparoscopic task. Importantly, after the subject has become proficient in a mediated task if s/he abruptly moves to a direct task under critical conditions, sympathetic looping is a distinct possibility. Mediated tasks are characterized by loss of proprioception in the sensorimotor feedback loop.

This amplifies arousal, leading to a training experience dominated by sympathetic looping. Once expertise is attained, operating under loss of proprioception becomes the natural sensorimotor space, while the direct sensorimotor space becomes the challenging one, triggering sympathetic looping. Several high profile accidents in aviation bear the telltale signs of this developing hypothesis. Should our hypothesis proves correct, this type of accidents will proliferate, as the new generation of pilots, drivers, and surgeons are increasingly trained in mediated mode with little or no experience in direct mode.

Mediation and automation occasionally fail or they prove insufficient; falling back to direct mode is the only option in these cases. Training regimes need to ensure that transitions between sensorimotor spaces are within the comfort zone of the subject.

Shishir Shah

shah@cs.uh.edu

Biography : *Shishir Shah studied Mechanical Engineering as an undergraduate at The University of Texas at Austin, where he received his B.S. degree in 1994. He received his M.S. and Ph.D. degrees in Electrical and Computer Engineering from The University of Texas at Austin for his thesis on Vision-based Mobile Robot Navigation and Probabilistic Feature Integration for Object Recognition, respectively.*

He joined Wayne State University in 1998 as an Assistant Professor of Electrical and Computer Engineering, where he headed research related to vision techniques for high-throughput microarray analysis and genomic data mining. From January 2000 through December 2004, he was involved in two start-up companies focused on development and commercialization of genomic assays, cellular imaging systems, and image analysis software solutions for genomic and cellular screening.

In January 2005, he joined University of Houston where he is currently an Associate Professor and Director of Undergraduate Studies in the department of Computer Science. His current research focuses on human behavior modeling and analysis, scene understanding, video analytics, biometrics, and microscopy image analysis. His long-term interests are centered on the broader area of knowledge driven intelligent systems capable of seamless incorporation of semantic information through statistical decision priors and data driven feedback, with the intent of developing 'visual decision' capabilities that would include cognitive functions for reasoning and learning.

Over the past 15 years, his research has contributed to knowledge in the areas of computer vision for navigation, surveillance, object recognition, biomedical image analysis, and pattern recognition. He has co-edited one book, and authored numerous papers on object recognition, sensor fusion, statistical pattern analysis, biometrics, and video analytics.

Prof. Shah currently serves as an Associate Editor for Image and Vision Computing and the IEEE Transactions on Biomedical Engineering. He recently served as a Guest Editor of the special issue of IEEE Transactions on Biomedical Engineering on Multiscale Biomedical Signal & Image Modeling & Analysis. He received the College of Natural Sciences and Mathematics John C. Butler Teaching Excellence Award in 2011 and the Department of Computer Science Academic Excellence Award in 2010. He is a Senior Member of the IEEE.

Title : "Human Behavior and Activity Recognition."

Abstract : Human behavior has been extensively studied by sociologists to understand social norms. It has been argued that characteristics that dictate human motion constitute a complex interplay between human physical, environmental, and psychosocial characteristics. It is a common observation that people, whenever free to move about in an environment, tend to respect certain patterns of movement. More often, these patterns of movement are dominated by social mechanisms. While much of computer vision has focused on studies that try to model the physical and environmental characteristics, psychosocial influences have largely been overlooked. Broadly speaking, human motion attributed to psychological and sociological characteristics may be evaluated at three distinct levels; individual, interaction among individuals, and group dynamics. Human movements are generally driven by purpose, making decisions locally based on the extent of information available and the cognitive capacity for calculation, prediction, and action. Our ability to increase our understanding of human behavior and activity can be extended through the development of models and algorithms that integrate social cues that codify human motion. Specific applicability for video based human tracking and activity recognition in unconstrained environments will be discussed.

Vadim Sherman

vsherman@houstonmethodist.org

Biography : *Dr. Vadim Sherman is a Board Certified General Surgeon. He is also a Fellow of the American College of Surgeons and a Fellow of the Royal College of Surgeons of Canada. His undergraduate studies were in Honors Physiology at the University of Alberta. He then went on to complete medical school at the University of Western Ontario. Dr. Sherman performed his General Surgery training at McGill University. During his training, he also earned a Master of Science from McGill University. He then completed a one year fellowship in Advanced Minimally Invasive and Bariatric Surgery at the Cleveland Clinic. Dr. Sherman is actively involved in a number of surgical societies including the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), American Society for Metabolic and Bariatric Surgery (ASMBS) and the American College of Surgeons (ACS). He has trained medical students, surgical residents, fellows and surgeons in advanced minimally invasive and bariatric techniques. He has authored a number of peer-reviewed articles, book chapters and surgical videos. He has also lectured nationally and internationally on the topic of surgical weight management. His research interests are in bariatric surgery, surgical education and advanced minimally invasive surgical outcomes. Dr. Sherman's clinical expertise is minimally invasive gastro-intestinal surgery, with the primary focus being bariatric surgery. As well, he performs surgery for reflux disease, hernia repair and other intestinal diseases. Dr. Sherman is committed to providing patients with comprehensive care and advanced surgical solutions at the highest standard of excellence.*

Title : NA

Abstract : NA

Nabil Tariq

ntariq@houstonmethodist.org

Biography : *Dr. Nabil Tariq completed his surgical residency at William Beaumont Hospital in Michigan in 2008 and is a board certified surgeon. Dr Tariq went on to complete advanced training in surgical critical care at the University of Pennsylvania in Philadelphia in 2009 and became board certified in critical care. He proceeded to complete further advanced training in minimally invasive surgery, bariatric surgery and endoscopy at the world-renowned Cleveland Clinic in Cleveland, Ohio in 2010. Dr. Tariq is a member of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), the American Society for Metabolic and Bariatric Surgery (ASMBS), the American College of Surgeons (ACS) and the Society of Critical Care Medicine (SCCM). Dr. Tariq specializes in bariatric surgery (Lap Band, laparoscopic sleeve gastrectomy and laparoscopic Roux Y gastric bypass), surgery for reflux disease, advanced hernia surgeries and other minimally invasive abdominal surgeries. He has co-authored several medical chapters and peer-reviewed articles, and currently is teaching surgical residents and fellows at The Methodist Hospital. Dr. Tariq strongly believes in a multidisciplinary approach to bariatric surgery and is committed to provide excellence in patient care with dedication and humility.*

Title : NA

Abstract : NA

Nguyen Tran

Nguyen.Tran@univ-lorraine.fr

Biography : ***Functions***

- *1999-2006 : Teaching Hospital Assistant Lecturers in Biochemistry, Laboratory of Central Biochemistry, CHU-Nancy*
- *2006 : Associate Professor in Physiology Faculty of Medicine, Lorraine University*
- *2006 : Operational Director, School of Surgery, Faculty of Medicine, Lorraine University.*
- *2012 : Member of the Lorraine Ethics Committee*
- *2012 : Vice President of Collegium of Health of Lorraine University*

Publications *: 57 peer review articles in the areas of cardiovascular research, cell & tissue engineering, imaging and pedagogical research (surgical simulation & robotic).*

Title : "Evaluation of surgical simulators on surgical learning curves : Experiences of the School of Surgery of Nancy-Lorraine."

Abstract : **Objectives:** The teaching of surgery, as in other medical disciplines, is currently undergoing a dramatically (r)evolution. Thus, development of minimally invasive techniques (laparoscopic, robotic-assisted devices, etc…) requires constant re-assessment and certification of surgical skills. This involves new educational strategies based on surgical simulation in order to improve the technical and gestural techniques and ultimately the patient's safety.

Methods: We have conducted several prospective studies using robotic (dV-Trainers ®) or dental implantology (Virteasy®) simulators to assess the learning curves of several specific skills: 3D perception, clutching, visual force feedback, EndoWrist(®) manipulation, and camera control.

Results: All our data pointed to significant differences in the gestural precision between experienced practitioners and beginners for all these parameters. Reliability of scoring was high. The most relevant criteria were time and economy of motion.

CONCLUSIONS: Simulators brings a real benefit in training for surgery. Long-term benefit and more complex exercises should be evaluated.

Roger Tran Son Tay

rtst@ufl.edu

Biography : *Roger Tran-Son-Tay is Professor of Mechanical & Aerospace Engineering, and Professor of Biomedical Engineering at the University of Florida. He received his B.S . in 1978 in Mechanical & Aerospace Engineering from Ecole Supérieure des Transports et Propulsion in France, his M.S. in 1979 in Biomedical Engineering from Compiègne University of Technology in France, and his D.Sc. in 1983 in Mechanical Engineering from Washington University.*

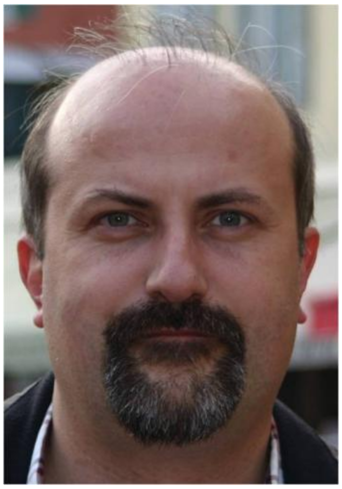
Before joining the University of Florida in 1993, Dr. Tran-Son-Tay was a faculty in the Department of Mechanical Engineering and Materials Science at Duke University. His current research interests lie in biorheology, biofluids, cellular mechanics, and the development of biomedical devices. He has co-edited 2 technical books, authored or co-authored 14 invited book chapters, over 70 publications in refereed archival journals, and numerous national and international conference proceedings.

Professor Tran-Son-Tay is a member of the North American Society of Biorheology Council (1998-present). He was Secretary General for ISB (1999-2005), Vice-President of the International Society of Biorheology (2005-2009), and a member of the US Delegation at the 4th China-Japan-US-Singapore Conference on Biomechanics in China (1995).

Dr. Tran-Son-Tay has also served on the steering committee of many international and national biomedical conferences, and has chaired many symposia.

Title : “Modeling of Vascular Adaptation .”

Abstract : *In the context of Computational Surgery, a modeling of vascular adaptation using a rule-based approach is discussed and applied to demonstrate the increasing use of simulation in surgical decision-making. Although vein grafting is one of the primary treatment options for arterial occlusive disease, the mechanism of the remodeling of vein graft is not fully understood. Hemodynamic forces are considered as an important factor, and their overall effect on vein graft remodeling can be viewed as an integration of cellular responses to hemodynamic forces. As such, the simulation of vein graft remodeling is done by treating cell level activities with a rule-based approach. Rule-based methods predict global phenomena by simulating local interactions among the components in the system. In the simulation, smooth muscle cell proliferation and apoptosis along with extracellular matrix synthesis and degradation are determined based on each probability. These probabilities are determined from experimental data. Finally, how the use of this model, and computational simulations in general, could be utilized to better improve clinical outcomes is also discussed.*



Dimitris Visvikis

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Biography : *Dimitris Visvikis is a director of research with the National Institute of Health and Medical Sciences (INSERM) in France. He is based within the Medical Image Processing Lab in Brest (UMR1101 INSERM) of which he is co-director and in charge of a group on quantitative multi-modality imaging. He obtained his PhD degree from the University of London in 1996, working within the Joint Department of Physics in the Royal Marsden Hospital and the Institute of Cancer Research. After that he has worked as a SeniorResearch Fellow in the Wolfson Brain Imaging Centre of the University of Cambridge and spent five years as a principal physicist in the Institute of Nuclear Medicine in University College London. He has spent the majority of his scientific activity in the field of PET imaging, including developments in both hardware and software domains. His current research interests focus on the development of predictive and prognostic models for cancer patient management based on multimodality imaging. Specific research programs involve an improvement in PET/CT image quantitation for oncology applications, such as response to therapy and radiotherapy treatment planning, through the development of methodologies for detection and correction of respiratory motion, partial volume correction, tumour volume segmentation and tumour activity distribution characterisation algorithms, as well as the development and validation of Monte Carlo simulations for emission tomography applications. He is a member of numerous professional societies such as IEEE, AAPM, SNM, EANM, and he is the incoming chair of the IEEE Nuclear Medical and Imaging Sciences Council (NMISC) and the vice-president international of the Institute of Physics in Engineering and Medicine (IPEM).*

Title : "Multimodality image quantification for guiding therapy and associated response assessment."

Abstract : Multimodality PET/CT imaging is today a major tool in the area of oncology for primary diagnosis as well as for assessing response to therapy. The importance of quantitative analysis is increasingly demonstrated in terms of accurately characterising the chemical and physiological in-vivo processes as well as allowing the follow up of patients in terms of time response or in comparison to a general patient population.

The advent of multi-modality imaging devices, although providing an enormous potential for the improvement of both qualitative and quantitative accuracy in image derived indices, pose new challenges.

These challenges involve not only the stages of image formation and fusion but also in terms of algorithm development for an improvement in the robustness and reproducibility of image derived indices in order to allow the construction of multi-parametric predictive and prognostic models of therapy response.

During this presentation some of the necessary steps in improving overall multimodality image quantification and the subsequent use of multi-parametric predictive and prognostic models based on PET/CT image derived indices will be discussed. On the other hand, the use of multimodality imaging in guiding treatment is continuously gaining ground, particularly in the case of radiation therapy.

However, questions persist on the way such multi-modality information should be best integrated in the overall planning process. Within this context the development of image based anthropomorphic models and associated treatment planning systems is essential.

Different key issues can be identified, including computational efficiency and multi-scale modeling. Some examples of such developments within the field of radiation therapy (external and intra-operative) will be given.

WORKSHOP France – USA, November 5th-6th 2013

Board Room – Research institute at the Methodist Hospital

Year 2013 : Computational Surgery & Medicine

www.computationalsurgery.org

Opening Remarks : Sujiro Seam, French General Consul – Pr. Barbara L. Bass, Executive Director, MITIE – Pr. Rathindra N. Bose, Vice President Research, UH.

INVITED SPEAKERS (France) :

Pr. **Nabil Chakfe**, MD, Endovascular Surgeon, CHRU Strasbourg.

Pr. **Thierry Colin**, Institut Polytechnique de Bordeaux and INRIA.

Pr. **Christophe Collet**, Telecom Physique and University of Strasbourg.

Dr. **François Cornelis**, MD, CHU Bordeaux and Memorial Sloan Kettering Cancer Center.

Pr. **Baudouin Denis de Senneville**, University of Bordeaux and Utrecht University.

Pr. **Abdallah Elhamidi**, LaSIE - FRE-CNRS 3474, University of La Rochelle.

Pr. **Lyle J. Graham**, Université Paris Descartes.

Dr. **Frederic Heim**, University of Mulhouse.

Pr **Angelo Iollo**, University of Bordeaux and INRIA.

Pr. **Gwendal Le Masson** , MD, CHU Pellegrin Bordeaux.

Pr. **Nguyen Tran**, MD, Director School of Surgery in Nancy.

Dr. **Dimitris Visvikis**, INSERM.

INVITED SPEAKERS (USA) :

Pr. **Barbara L. Bass** MD, The Houston Methodist Hospital.

Pr. **Jean** Bismuth, MD, The Houston Methodist Hospital.

Pr. **Gavin Britz**, MD, The Houston Methodist Hospital.

Pr. **Mark Davies**, MD, The Houston Methodist Hospital.

Pr. **Brian Dunkin**, MD, The Houston Methodist Hospital.

Pr. **Hassan Fathallah-Saykh**, MD, UAB School of Medicine.

Pr. **Yuriy Fofanov**, University of Texas Medical Branch.

Pr. **Marc Garbey**, UH and MITIE.

Pr. **Karolos Grigoriadis**, Mechanical Engineering, UH.

Pr. **Christof Karmonik**, The Methodist Research Institute.

Pr. **Milos Kojic**, The Methodist Research Institute and University of Kragujevac.

Pr. **William W. Lytton**, MD, Downstate Medical Center, NY.

Pr. **Ahmet Omurtag**, Bioengineering, UH.

Pr. **Ioannis Pavlidis**, Computer Science, UH.

Pr. **Shishir Shah**, Computer Science, UH.

Pr. **Vadim Sherman**, MD, The Houston Methodist Hospital.

Pr. **Nabil Tariq**, MD, The Houston Methodist Hospital.

Pr. **Roger Tran Son Tay**, Mechanical Engineering, University of Florida.

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