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Proposal for EMBC 2021
Minisymposium: New trends in perinatal and pediatric imaging

E. Grisan - IEEE Member, EMBS Member
EG is with the University of Padova (Italy). His research interests include the analysis of biomedical images, and the design of computer-aided diagnosis tools, with particular interest in fetal ultrasound image analysis. He has been in the program committee of IEEE CBMS conference (2012 and 2013) and associate editor for IEEE ISBI (2015), and is currently member of the Technical Committee for Medical Imaging and Image Processing of the IEEE EMBS

M.G. Linguraru – IEEE Senior Member, EMBS Member
MGL, DPhil MA MSc, loves working with multidisciplinary teams of clinicians, scientists and engineers to help children grow healthy and happy. He is Principal Investigator in the Sheikh Zayed Institute for Pediatric Surgical Innovation at Children's National Hospital in Washington, DC, where he founded and directs the Precision Medical Imaging Group. Dr. Linguraru is also Professor with Tenure of Radiology and Pediatrics and Secondary Professor of Biomedical Engineering at George Washington University. He co-founded PediaMetrix LLC, a company focused on infant well-being by creating solutions to improve the management of conditions of early childhood. He joined the Sheikh Zayed Institute from the National Institutes of Health Clinical Center, where he maintains an appointment as Associate Investigator. He completed his doctorate at the University of Oxford and holds masters degrees in science and in arts from the University of Sibiu. He held fellowships at the French National Institute of Research in Computer Science and at Harvard University.

Dr. Linguraru is the recipient of numerous awards, including a prize for Excellence in Engineering by a Younger Engineer at the Houses of Parliament in London, UK. He is a former member of the Technical Directors Board Committee of the IEEE Signal Processing Society, Vice-Chair of the Technical Committee on Biomedical Imaging and Image Processing of the IEEE Engineering in Medicine and Biology Society and served as Distinguished Lecturer of the society. He was the General Chair of the IEEE International Symposium on Biomedical Imaging 2019 in Venice, Italy and serves of the synposium's Steering Committtee..

N. Lepore - IEEE Senior Member, EMBS Member
NL is an associate professor in Radiology at the University of Southern California and at Children's Hospital Los Angeles. Her current work involves the development of numerical tools for the analysis of brain anatomical and functional magnetic resonance imaging data. She is a member of the Technical Committee for Medical Imaging and Image Processing of the IEEE EMBS.

Y. Wang – IEEE Senior Member, EMBS Member
YW is an associate professor with tenure in School of Computing, Informatics, and Decision Systems Engineering (CIDSE) at Arizona State University (ASU), where he directs the Geometry Systems Laboratory (GSL, http://gsl.lab.asu.edu). His research is in the areas of brain imaging, computer vision and statistical pattern recognition. He has published over 300 papers in a variety of technical conferences and journals. He received the "2016 Best Junior Faculty Researcher Award" from ASU CIDSE.

NEW TRENDS IN PERINATAL AND PEDIATRIC IMAGING

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Theme: *Biomedical Imaging and Image Processing*

Keywords: fetal imaging, children imaging, MRI, X-ray, US.

Abstract The link between prenatal, perinatal (the time immediately before and after birth) and children healthcare, and the role of early life developmental alterations in later life health is a lively topic in the research community. Thus, having the possibility of monitoring developmental health through imaging and quantitative imaging biomarkers will allow a better understanding of this crucial period of life and of its long-term consequences.

Moreover, at variance with the vast number of tools developed by the research community for studying adult and elderly patients, a limited number of these is addressing the specificities and difficulties of younger patients. This discrepancy is timely and relevant to understanding the different manifestations of COVID-19 in children to be able to improve the care of pediatric patients affected by the pandemic. This invited session aims at bringing together researchers working on prenatal, perinatal and pediatric imaging, on image biomarkers discovery and quantitative image analysis of this crucial period of life.

Tentative list of Speakers (6 for 15 min each, allotted time 90 min)

A. Eduardo Romero MD, MSC, PhD, National University of Colobia, Telemedicina Centre, Bogotá DC, Colombia edromero@unal.edu.cn
Title: Characterization of Significant Child Autism Morphological Changes using a Curvelet Approach
Abstract:
Autism has been considered one of the most severe neuropsychiatric disorders in childhood. This complex developmental condition includes a large variation of symptoms at behavioral and neurodevelopmental levels. Such heterogeneity makes the diagnosis of autism a challenge physicians must deal with. Morphological brain differences related to autism are established by classic metrics which approximate geometric properties of regular shapes but they can hardly be useful in case of irregular shapes, like most brain structures. The problem at setting differences with irregular shapes is that they have to be described by both local and global approximations, i.e., relationships that characterize not only clinical changes, but also variations of development, aging and evolution of the disease.

The purpose of this work is to quantify the altered morphological relationships in a pediatric autistic population of the ABIDE database by a representation which captures the local and global changes of brain structural magnetic resonance images. Such multiresolution analysis is carried out with the curvelet transform which is applied to a mosaic of images constructed by placing together the slices of a 3D brain region. This approach was tested in a male population of 577 children with ages varying between six and thirteen years

This analysis has demonstrated subtle morphological differences in the upper cortex whose atypical changes could not be established by a visual inspection. Specifically, Left superior temporal gyrus, anterior division, Right Temporal fusiform cortex, anterior division, Left Angular Gyrus, Left Amygdala, Right Amygdala, Right Frontal Pole, Right Frontal Medial Cortex and Right Cingulate Gyrus, anterior division showed significant statistical differences (test t-student, $p < 0.05$).

B. Vidya Rajagopalan Ph.D., Children's Hospital Los Angeles, Los Angeles, CA, USA, vrajagopalan@chla.usc.edu
Title: Modeling of Placental Functional Changes Associated with Maternal Rise Factors.
Biosketch

Vidya Rajagopalan is a research assistant professor in Children's Hospital Los Angeles. Her research interests involve developing new methods for fetal imaging, pediatric imaging and monitor brain health in paediatric populations. She is an expert on fetal MRI analyses.

C. Antonio R. Porras Perez, Ph.D., Department of Biostatistics and Informatics of the Colorado School of Public Health, University of Colorado, Aurora, CO, USA, Antonio.Porras@cuanschutz.edu
Title: TBA
Biosketch

Antonio Porras is an Assistant Professor at the Department of Biostatistics and Informatics of the Colorado School of Public Health — University of Colorado Anschutz Medical Campus. He is also part of the Computational Bioscience Program and has secondary appointments with the Department of Pediatrics of the School of Medicine and the Children's Hospital Colorado. He received two BSc degrees in the fields of Computer Science and Engineering from the University of Cordoba, Spain, in

2006 and 2008. In 2010, he obtained his MSc degree in Biomedical Engineering from the University of Barcelona after an internship at the Chalmers School of Technology in Gothenburg, Sweden. In 2015 and funded by the Spanish Government through a University Professors Training Scholarship, Antonio received his International PhD with summa cum laude from the Department of Information & Communication Technologies of the School of Engineering at the Pompeu Fabra University in Barcelona. During his PhD, he also did a research internship at the Department Cardiovascular Sciences at the Catholic University of Leuven, Belgium. After receiving his PhD, Antonio started working at the Children's National Hospital in Washington, DC, on pediatric quantitative imaging research. During that time, he also received training in medical genetics, embryology and developmental biology at the National Institutes of Health. After been awarded a Pathway to Independence Award (K99/R00) by the National Institute of Dental and Craniofacial Research, Antonio moved to the University of Colorado Anschutz Medical Campus, where he directs the Medical Image Phenotyping lab.

D. Mathieu Dehaes Ph.D., Department of Radiology, Radio-oncology and Nuclear Medicine / Institute of Biomedical Engineering, Université de Montréal / CHU Ste-Justine Research Centre, Montréal, QC, Canada,
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Title: TBA
Biosketch

Mathieu Dehaes is an assistant professor in Department of Radiology and Institut de génie biomédical, University of Montreal. Mathieu Dehaes' Lab focuses on the development of techniques and methods for structural, functional and biomolecular imaging, which are applied in fetal and neonatal populations to better understand brain development.

E. Marius George Linguraru, D.Phil., M.A., M.Sc. Principal Investigator at the Children's National Hospital, Sheikh Zayed Institute for Pediatric Surgical Innovation, Washington, DC, USA, MLingura@childrensnational.org
Title: Early Detection of Genetic Syndromes through Facial Phenotyping
Biosketch

Marius George Linguraru, D.Phil., M.A., M.Sc., is principal investigator in the Sheikh Zayed Institute for Pediatric Surgical Innovation at Children's National Hospital in Washington, D.C., where he directs the Precision Medical Imaging Group. Dr. Linguraru is also professor of Radiology and Pediatrics and secondary professor of Biomedical Engineering at George Washington University.

He co-founded PediaMetrix LLC, a company focused on infant well-being, by creating solutions to improve the management of conditions of early childhood. He joined the Sheikh Zayed Institute from the National Institutes of Health, completed his doctorate at the University of Oxford and held fellowships at the French National Institute of Research in Computer Science (INRIA) and at Harvard University.

Dr. Linguraru is the recipient of numerous awards, including a prize for Excellence in Engineering by a Younger Engineer at the Houses of Parliament in London, UK. He serves on boards and committees of the IEEE Engineering in Medicine and Biology Society, the IEEE Signal Processing Society, and the Foundation of the International Society of Medical Information Processing and Analysis (SIPAIM). He was the General Chair of the IEEE International Symposium on Biomedical Imaging 2019 in Venice, Italy and founded the Mentorship Program of the Medical Image Computing and Computer Assisted Intervention (MICCAI) Society.

F. Natasha Lepore, Ph.D, Associate Professor, Children's Hospital Los Angeles, Los Angeles, CA, USA,
nlepore@chla.usc.edu

Title: *Combining deep learning and geodesic transform maps for neonatal cortical segmentation*
Biosketch

Natasha Lepore is an associate professor in Radiology at the University of Southern California and at Children's Hospital Los Angeles. Her current work involves the development of numerical tools for the analysis of brain structural and diffusion magnetic resonance imaging data. In particular, these include improvements to tensor-based morphometry, surface and volume registration, segmentation and statistics for group comparisons. She also works on applying these methods to different types of brain imaging data including prematurity, healthy brain development, healthy twins, blindness, deafness, HIV/AIDS, autism and Alzheimer's disease. She graduated with a Bsc in physics and mathematics from the University of Montreal and then obtained a masters in applied mathematics from Cambridge University, in general relativity. Her PhD is in theoretical physics

(Harvard University), and deals with quantum chaos in quantum billiards living on the plane and the pseudosphere. Afterward, she switched to neuroimaging and became a postdoctoral fellow at the Laboratory of Neuro Imaging, working with Dr Paul Thompson.