2022 the 3rd International Conference on Medical Imaging and Computer-Aided Diagnosis

MICAD2022
Conference Schedule

University of Leicester, United Kingdom
Nov. 20-21, 2022
https://www.micad.org

Organised by: **Endorsed by** **Supported by:**

MICAD 2022

2022 the 3rd International Conference on Medical Imaging and Computer-Aided Diagnosis

Nov. 20-21, 2022|University of Leicester, UK

MICCAI Society Endorsed Event

Spectrum Academy

Springer

Welcome Messages

Dear Colleagues and Friends,

It is a great pleasure and honor to invite you to 2022 the 3rd International Conference on Medical Imaging and Computer-Aided Diagnosis (MICAD2022) which will take place at the University Of Leicester, UK from 20 to 21 November 2022. We are excited about the opportunities of holding an innovative hybrid conference and reaching a wider audience that a conference can include. Participants from around the world are expected to actively participate in this event.

This upcoming Conference will be held under a set of themes in medical imaging and computer-assisted diagnosis. We are certain that this will be a platform to gather and disseminate the latest knowledge in recent advancements in medical imaging and computer-assisted diagnosis fields covered during a conference that will provide a platform for leading biomedical scientists, engineers, and clinicians through several sessions.

Many thanks go out to the members of the TPC, the Organising Committee, and the Local Organising Committee for their input and support. Particular thanks to the University Of Leicester for the local support and the great interest demonstrated in hosting the event.

You can expect a very fruitful and enjoyable time in Leicester. We look forward to welcoming you to Leicester, UK for the MICAD2022.

Welcome to Leicester and enjoy the Conference!

General Chairs of MICAD2022

Prof. Yu-dong Zhang

University of Leicester, UK

Dr. Ruidan Su

Shanghai Jiao Tong University (SJTU), China

Committees (Ordered by Last Name)

Honorary Chairs
Prof. James Duncan, Yale University, USA
Prof. Leo Joskowicz, The Hebrew University of Jerusalem, Israel

Conference Chairs
Prof. Yu-dong Zhang, University of Leicester, UK
Asst. Prof. Ruidan Su, Shanghai Jiao Tong University (SJTU), China

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Prof. Moi Hoon Yap, Manchester Metropolitan University, UK

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Prof. Baiying Lei, Shenzhen University, China
Asst. Prof. Han Liu, Shenzhen University, China
Prof. Dr. Joseph M. Reinhardt, The University of Iowa, USA

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Asst. Prof. Islem Rekik, Istanbul Technical University, Turkey

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Asst. Prof. Thi Hoang Ngan Le, University of Arkansas, USA
Asst. Prof. Duygu Sarikaya, Gazi University, Turkey

Publicity Chairs
Asst. Prof. Genovefa Kefalidou, University of Leicester, United Kingdom
Dr. Shuihua Wang, University of Leicester, United Kingdom

Local Chair
William Wang, University of Leicester, United Kingdom

Local Co-Chair
Hunter Zhu, University of Leicester, United Kingdom

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Prof. Qiang (Shawn) Cheng, University of Kentucky, USA
Asst. Prof. Hao Chen, The Hong Kong University of Science and Technology, Hong Kong SAR, China
Dr. Sarada Prasad Dakua, Hamad General Hospital, Qatar
Prof. Smain FEMMAM, IEEE senior member, University of Haute-Alsace France, France
Prof. Dagan Feng, University of Sydney, Australia
Dr. Linlin Gao, Ningbo University, China
Prof. Juan Manuel Górriz, University of Granada, Spain
Prof. Yuzhu Guo, Beihang University, China
Asoc. Prof. Stathis Hadjidemetriou, Cyprus International Institute of Management
Asst. Prof. Yuankai Huo, Vanderbilt University, USA
Assoc. Prof. Jianming Liang, Arizona State University, USA
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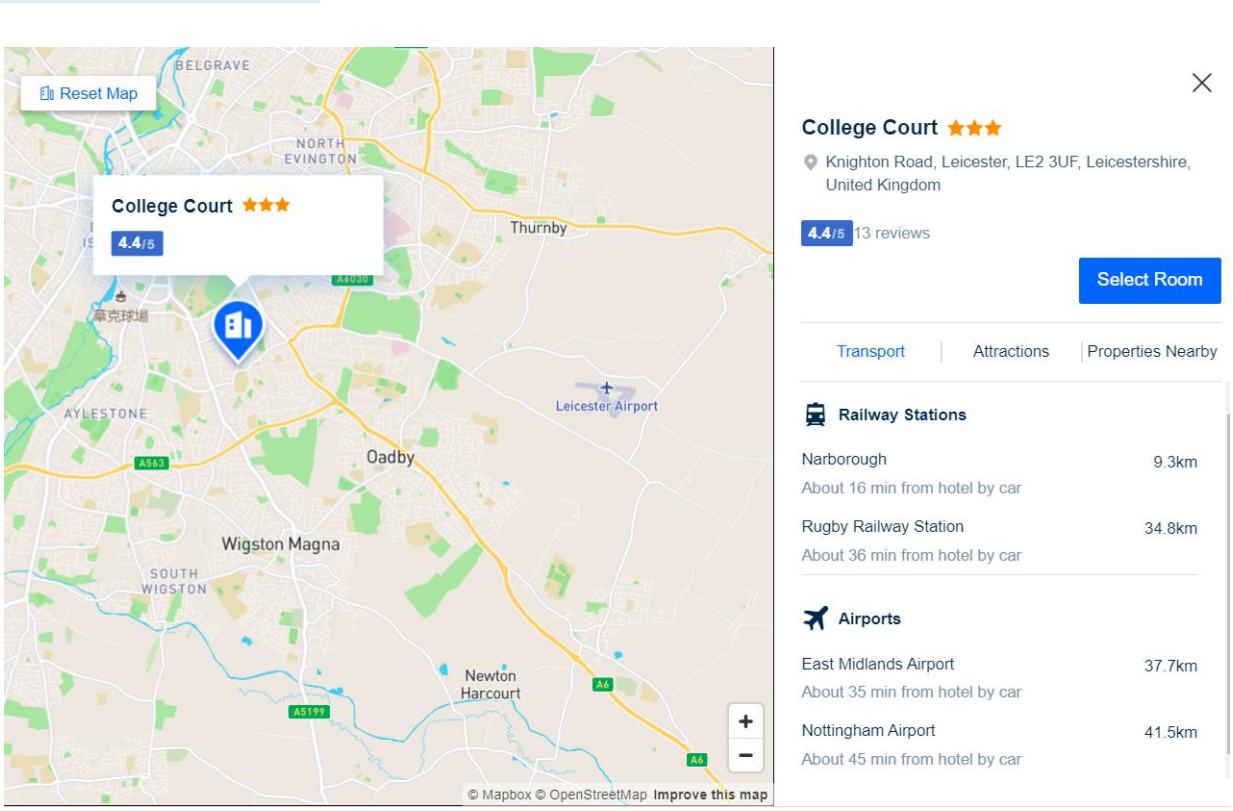
Asst. Prof. Mingxia Liu, University of North Carolina at Chapel Hill, USA
Asst. Prof. Cheng Lu, Case Western Reserve University, USA
Ms. Jiahong Ouyang, Stanford University, USA
Prof. Jianquan Ouyang Xiangtan University, China
Prof. Xiang Pan, Jiangnan University, China
Prof. Gemma Piella, Pompeu Fabra University, Spain
Prof. Su RUAN, LITIS laboratory, University of Rouen, France
Asst. Prof. MEHDI SALIMI, St. Francis Xavier University, Canada
Prof. Ute Schmid, University of Bamberg, Germany
Prof. Thomas Schultz, Institute of Computer Science II, University of Bonn, Germany
Dr. Rachel Sparks, King's College London, United Kingdom
Asst. Prof. Yanmei Tie, Harvard Medical School, USA
Dr. Tatiana Tyukina, University of Leicester, United Kingdom
Assoc. Prof. Jichuan Xiong, Nanjing University of Science and Technology, China
Dr. Guang Yang, National Heart & Lung Institute, Imperial College London, United Kingdom
Dr. Qingyu Zhao, Stanford University, USA
Dr. Jun Zhuang, Indiana University-Purdue University at Indianapolis (IUPUI), USA

Venue(Nov. 21, 2022)

College Court

Address: Knighton Rd, Knighton, Leicester LE2 3UF



MICAD2022 Medical Imaging and Computer-Aided Diagnosis

MICCAI MICCAI Society Endorsed Event

Time Schedule (London Time, UTC/GMT+0)

November 20, 2022 UTC/GMT+0 (Online in ZOOM)		
Speaker's time slot	**Standard Time (UK UTC/GMT+0)**	**Presentation Information**
	9:00-9:05 am	**Opening Speech**
	9:05-10:05 am	**Keynote Session 1**
10:05-10:35 am UTC/GMT+1	**9:05-9:35 am**	**Interpretable and Interactive Machine Learning for Medical Image Analysis** Prof. Thomas Schultz|University of Bonn, Germany
9:35-10:05 am UTC/GMT+0	**9:35-10:05 am**	**Scalable Deep Learning for Alzheimer's Disease Diagnosis from Large Neuroimaging Data** Prof. Liangxiu Han|Manchester Metropolitan University, UK
	10:05-12:05 pm	**Oral Session 1: Medical Image Segmentation, Registration and Reconstruction: Part 1**
18:05-18:20 pm UTC/GMT+8	**10:05-10:20 am**	**Striped-Cross Attention Network with Implicit Semantic Knowledge for Antibody Structure Prediction** 407-Miao Gu|Tsinghua University, China
19:20-19:35 am UTC/GMT+9	**10:20-10:35 am**	**Hybrid-Fusion Transformer for Multisequence MRI** 411-Jihoon Cho|KAIST, Republic of Korea
Poster	**10:35-10:50 am**	**2.5D Lightweight Network Integrating Multi-scale Semantic Features for Liver Tumor Segmentation** Zhengyao Bai|Yunnan University
	10:35-10:50 am	**Online Photo&Break**
11:50-12:05 pm UTC/GMT+1	**10:50-11:05 am**	**Lunatum Prosthetic Replacement: Modeling Based on Volume Rendering of CT Images** 351-Manal Hamda|Abulcasis international university, Morocco
19:05-19:20 pm UTC/GMT+8	**11:05-11:20 am**	**A Semi-Supervised Framework for Automatic Pixel-Wise Breast Cancer Grading of Histological Images** 349-Kenglun Chang|Tsinghua University, China
12:20-12:35 pm UTC/GMT+1	**11:20-11:35 am**	**Optimizing the Illumination of a Surgical Site in New Autonomous Module-based Surgical Lighting Systems** 371-Andre Mühlenbrock|University of Bremen, Germany
19:35-19:50 pm UTC/GMT+8	**11:35-11:50 am**	**Research on the design and production of VR rehabilitation game for Parkinson's disease patients based on real-time action acquisition** 391-Ying Zhang|Chongqing University of Posts and Telecommunications, China
19:50-20:05 pm UTC/GMT+8	**11:50-12:05 pm**	**Establishment and analysis of a combined diagnostic model of acute myocardial infarction based on random forests and artificial neural networks** 392-Zhenrun Zhan|Changzhi Medical College, China
	12:05-13:00 pm	**Break**

November 20, 2022 UTC/GMT+0 (Online in ZOOM)		
Speaker's time slot	**Standard Time (UK UTC/GMT+0)**	**Presentation Information**
	13:00-14:00 pm	**Oral Session 1: Medical Image Segmentation, Registration and Reconstruction: Part 2**
16:00-16:15 pm UTC/GMT+3	**13:00-13:15 pm**	**Towards Developing a Lightweight Neural Network for Liver CT Segmentation** 346-Sarada Prasad Dakua|Hamad Medical Corporation, Qatar
22:15-22:30 pm UTC/GMT+9	**13:15-13:30 pm**	**Automated surgical workflow identification by artificial intelligence in laparoscopic hepatectomy** 433-Kimimasa Sasaki|National Cancer Center Hospital East, Japan
16:30-16:45 pm UTC/GMT+3	**13:30-13:45 pm**	**An Eye-Tracking Based Machine Learning Model Towards the Prediction of Visual Expertise for Electrocardiogram Interpretation** 377-Mohammed Tahri Sqalli|Hamad Bin Khalifa University, Qatar
18:45-19:00 pm UTC/GMT+5	**13:45-14:00 pm**	**NuRiSC: Nuclei Radial instance Segmentation & Classification** 347-Esha Sadia Nasir|National university of Sciences & Technology(NUST) Islamabad, Pakistan
	14:00-15:45 pm	**Oral Session 2: Image Processing and Artificial Intelligent Models: Part 1**
17:00-17:15 pm UTC/GMT+3	**14:00-14:15 pm**	**Exploring Structure-Wise Uncertainty for 3D Medical Image Segmentation** 343-Anton Vasiliuk|Artificial Intelligence Research Institute, Russia
19:15-19:30 pm UTC/GMT+5	**14:15-14:30 pm**	**Schema based Knowledge graph for Clinical Knowledge Representation from Structured and Unstructured Oncology Data** 376-Farina Tariq|National university of Sciences & Technology(NUST) Islamabad, Pakistan
14:30-14:45 pm UTC/GMT+0	**14:30-14:45 pm**	**Identification of melanoma diseases from multispectral dermatological images using a novel BSS approach** 389-Mustapha ZOKAY|Ibn Zohr University, Morocco
16:45-17:00 pm UTC/GMT+2	**14:45-15:00 pm**	**Optimizing the Non-Local Means Filtering of CT Images** 341-Ivo Draganov|Technical University of Sofia, Bulgaria
12:00-12:15 pm UTC/GMT-3	**15:00-15:15 pm**	**Convolutional Neural Networks for Newborn Pain Assessment using Face Images: A Quantitative and Qualitative Comparison** 423-Gabriel de Almeida Sá Coutrin|University Center of FEI, Brazil
16:15-16:30 pm UTC/GMT+1	**15:15-15:30 pm**	**Improved Techniques for the Conditional Generative Augmentation of Clinical Audio Data** 428-Matthias Seibold|TU Munich / Balgrist University Hospital Zurich, Switzerland
21:30-21:45 pm UTC/GMT+6	**15:30-15:45 pm**	**COVID-19 Diagnosis and Classification from CXR Images using Vision** 426-Ashfia Binte Habib, North South University, Bangladesh
	15:45-16:30 pm	**Break**

November 20, 2022 UTC/GMT+0 (Online in ZOOM)		
Speaker's time slot	**Standard Time (UK UTC/GMT+0)**	**Presentation Information**
	16:30-18:30 pm	**Keynote Session 2**
11:30-12:00pm UTC/GMT-5	**16:30-17:00 pm**	**Challenges and Opportunities for AI in Abdominal Radiology** Prof. Ronald Summers|National Institutes of Health (NIH), USA
10:00-10:30 am UTC/GMT-7	**17:00-17:30 pm**	**Stain-based Contrastive Learning for Histopathological Image Classification** Prof. Tolga Tasdizen|University of Utah, USA
9:30-10:00 am UTC/GMT-8	**17:30-18:00 pm**	**Dealing with confounders and bias in medical studies in the age of deep learning** Asst. Prof. Ehsan Adeli|Stanford University, USA
10:00-10:30 am UTC/GMT-8	**18:00-18:30 pm**	**Few-shot Generation of Personalized Neural Surrogates for Cardiac Simulation** Prof. Linwei Wang|Rochester Institute of Technology, USA
	18:30-20:00 pm	**Oral Session 2: Image Processing and Artificial Intelligent Models: Part 2**
13:30-13:45 pm UTC/GMT-5	**18:30-18:45 pm**	**Community Detection in Medical Image Datasets: Using Wavelets and Spectral Methods** 378-Roozbeh Yousefzadeh|Yale University, USA
10:45-11:00 am UTC/GMT-8	**18:45-19:00 pm**	**FedRNN: Federated Learning with RNN-based Aggregation on Pancreas Segmentation** 364-Zengtian Deng|University of California, Los Angeles, USA
14:00-14:15 pm UTC/GMT-5	**19:00-19:15 pm**	**Intelligent Fuzzy Clinical Decision Support System to Predict the Wisconsin Breast Cancer Dataset** 390-Yamid Fabián Hernández Julio|Universidad del Sinú Elías Bechara Zainúm, Colombia
21:15-21:30 pm UTC/GMT+2	**19:15-19:30 pm**	**Small animal imaging: Iterative algorithms combined with regularization schemes, an application to a dual-head small animal PET** 416-Evangelia Karali|University of West Attica, Greece
19:30-19:45 pm UTC/GMT+0	**19:30-19:45 pm**	**Learning From Failure: A Methodology for the Retrieve Stage of a Cardiovascular Case-Based Reasoning System** 432-Orlando Belo|University of Minho, Portugal

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Time Schedule (London Time, UTC/GMT+0)

November 21, 2022 UTC/GMT+0 Hybrid (both in-person in College Court and online in ZOOM)		
Speaker's time slot	**Standard Time (UK UTC/GMT+0)**	**Presentation Information**
8:30-9:00 am Registration in College Court		
11:00-11:05 am UTC/GMT+2	**9:00-9:05 am**	**Opening Speech** **Prof. Leo Joskowicz|The Hebrew University of Jerusalem, Israel**
	9:05-10:05	**Keynote Session 3**
10:05-10:35 am UTC/GMT+1	**9:05-9:35 am**	**Machine Learning in Medical Imaging: Current Challenges** Prof. Klaus Maier-Hein|Heidelberg University, Germany
17:35-18:05 pm UTC/GMT+8	**9:35-10:05 am**	**3D Medical Imaging and Visualization for Intelligent Minimally Invasive Surgery** Prof. Hongen Liao|Tsinghua University, China
	10:05-12:05 pm	**Oral Session 3: Machine Learning, Deep Learning, Neural Networks**
in person	**10:05-10:20 am**	**Deep learning based radiomics to predict treatment response using multi-datasets** 339-Jérôme Lapuyade|University of Rouen, France
in person	**10:20-10:35 am**	**Application of machine learning to develop diagnostic algorithm using metabolomic markers of protein glycation, oxidation and nitration in Autism** 397-Naila Rabbani|Qatar University, Qatar
Poster	**10:35-10:50 am**	**National Closed-loop Audit on Foundation Doctors Knowledge of Radiation Legislation** 396-Mehvish JamalLeeds Teaching Hospitals Trusts , UK
	10:35-10:50 am	**Photo& Coffee Break**
in person	**10:50-11:05 am**	**Transfer Learning based Classification of Diabetic Retinopathy on the Kaggle EyePACSdataset** 361-Maria Tariq|Coventry university, UK
in person	**11:05-11:20 am**	**3D-3D rigid registration : a comparative analysis study on femoral bone scans** 355-Perrine Solt|University of Strasbourg, France
in person	**11:20-11:35 am**	**Ex-vivo evaluation of newly formed bone after Lumbar Interbody Fusion surgery using X-ray micro computed tomography** 365-Jakub Laznovsky|Brno University of Technology, Czech Republic
in person	**11:35-11:50 am**	**Augmented Reality Applications for Image-Guided Robotic Interventions using deep learning algorithms** 358-Jenna Seetohul|University of Kent, UK
in person	**11:50-12:05 pm**	**Convolutional neural network classification of liver fibrosis stages using ultrasonic images colorized by features of echo-envelope statistics** 344-Akiho Isshiki|Chiba University, Japan
in person	**12:05-12:20 pm**	**Early Detection of Parkinson's Disease Dementia Using Dual-Sided Multi-Scale Convolutional Neural Networks (DSMS-CNN)** 417-Callum Altham|Edge Hill University, United Kingdom
	12:20-13:00 pm	**Buffet Lunch&Break(G floor)**

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MICCAI MICCAI Society Endorsed Event

November 21, 2022 UTC/GMT+0 Hybrid (both in-person in College Court and online in ZOOM)		
Speaker's time slot	**Standard Time (UK UTC/GMT+0)**	**Presentation Information**
	13:00-14:00 pm	**Keynote Session 4**
13:00-13:30 pm UTC/GMT+0	**13:00-13:30 pm**	**Diffusion Models in Medical Imaging and Analysis. Hype or Hope?** Prof. Sotirios A Tsaftaris|University of Edinburgh, UK
8:30-9:00 am UTC/GMT-5	**13:30-14:00 pm**	**Organ Segmentation: A Journey from Level Sets to Shape Denoising** Prof. Adrian Barbu|Florida State University, USA
	14:00-15:00 pm	**Oral Session 4: Computer-Aided Detection/Diagnosis: Part 1**
in person	**14:00-14:15 pm**	**Diagnostic accuracy and reliability of deep learning-based human papillomavirus status prediction in oropharyngeal cancer** 366-Agustina La Greca Saint-Esteven|ETH Zurich, University Hospital of Zurich and University of Zurich, Switzerland
in person	**14:15-14:30 pm**	**STResNet: Covid-19 detection by ResNet transfer learning and stochastic pooling** 414-Wei Wang|University of Leicester, UK
in person	**14:30-14:45 pm**	**Preprocessing for automatic cervical cancer screening: image segmentation and movement detection** 360-Anna OLIVERAS TOUS|Politecnic university of catalonia (UPC), Spain
in person	**14:45-15:00 pm**	**Optimising Chest X-Rays for Image Analysis by Identifying and Removing Confounding Factors** 350-Bojidar Rangelov|University College London, UK
	15:00-15:15 pm	**Coffee Break**
	15:15-17:00 pm	**Oral Session 4: Computer-Aided Detection/Diagnosis: Part 2**
in person	**15:15-15:30 pm**	**Fully Automatic Axial Vertebral Rotation Measurement of Children with Scoliosis Using Convolutional Neural Networks** 359-Jason Wong|University of Alberta, Canada
in person	**15:30-15:45 pm**	**BD-Transformer: A Transformer-based Approach for Bipolar Disorder Classification using Audio** 386-Alice OTHMANI|University Paris-Est Créteil, France
in person	**15:45-16:00 pm**	**Lung CT analysis using 3D Disparity-regularised Block matching for Stereotactic Ablative Body Radiotherapy** 388-Durai Arun Pannir Selvam|University of Edinburgh, UK
in person	**16:00-16:15 pm**	**CT Angiogram for Mechanical Thrombectomy Adherence to Guidelines & Effect of Vetting on Image Acquisition Delays: An Audit** 410-Muhammad Saad Asghar|Southend University Hospital, England
in person	**16:15-16:30 pm**	**Registration of medical image sequences using auto-differentiation** 409-Roman Jakubicek|Brno University of Technology, Czech Republic
in person	**16:30-16:45 pm**	**Synthetic Data as a Tool to Combat Racial Bias in Medical AI: Utilizing Generative Models for Optimizing Early Detection of Melanoma in Fitzpatrick Skin Types IV–VI** 380-Daniel Kvak|Masaryk University, Czech Republic
in person	**16:45-17:00 pm**	**A change detection with machine learning approach for medical image analysis** 419-Mauro Mazzei|CNR, Italian National Research Council, Italy
	Closing Speech	

Keynote Speakers (in chronological order)

Keynote Session 1

Thomas Schultz

University of Bonn, Germany

Head of the Visualization and Medical Image Analysis Group

Thomas Schultz is a university professor for Life Science Informatics and Visualization at the University of Bonn, Germany, where he is heading the Visualization and Medical Image Analysis Group at the B-IT and Department of Computer Science. His work focuses on the development and integration of computational tools for quantitative image analysis, machine learning, and interactive visualization, in order to gain insights from large, complex, and dynamic image data, which challenges traditional approaches to image analysis and interpretation. He has served as an area chair/IPC member at various conferences, including MICCAI, MIDL, IEEE VIS, EuroVis, PacificVis, and VCBM.

Title: Interpretable and Interactive Machine Learning for Medical Image Analysis

Abstract:

In this talk, I will argue that making machine learning approaches interpretable and interactive is important to realize their full potential for medical image analysis. Interpretability increases the trustworthiness of automated methods by providing some level of insight into their decision making process. Suitable interaction techniques make it efficient to proofread automated results and to correct remaining errors. I will illustrate these points with specific examples from our recent work on detecting peripheral arterial disease based on color fundus photography, and on segmentation correction in optical coherence tomography.

Liangxiu Han

Manchester Metropolitan University, United Kingdom

Co-Director of Centre for Advanced Computational Science

Prof. Liangxiu Han has a PhD in Computer Science from Fudan University, Shanghai, P.R. China (2002). Prof. Han is currently a Professor of Computer Science at the Department of Computing and Mathematics, Manchester Metropolitan University. She is a co-Director of Centre for Advanced Computational Science and Deputy Director of ManMet Crime and Well-Being Big Data Centre. Han's research areas mainly lie in the development of novel big data analytics/Machine Learning/AI, and development of novel intelligent architectures that facilitates big data analytics (e.g., parallel and distributed computing, Cloud/Service-oriented computing/data intensive computing) as well as applications in different domains (e.g. Precision Agriculture, Health, Smart Cities, Cyber Security, Energy, etc.) using various large scale datasets such as images, sensor data, network traffic, web/texts and geo-spatial data. As a Principal Investigator (PI) or Co-PI, Prof. Han has been conducting research in relation to big data/Machine Learning/AI, cloud computing/parallel and distributed computing (funded by EPSRC, BBSRC, Innovate UK, Horizon 2020, British Council, Royal Society, Industry, Charity, respectively, etc.).

Keynote Speakers (in chronological order)

Prof. Han has served as an associate editor/a guest editor for a number of reputable international journals and a chair (or Co-Chair) for organisation of a number of international conferences/workshops in the field. She has been invited to give a number of keynotes and talks on different occasions (including international conferences, national and international institutions/organisations). Prof. Han is a member of EPSRC Peer Review College, an independent expert for Horizon 2020 proposal evaluation/mid-term project review, and British Council Peer Review Panel.

Title: Scalable Deep Learning for Alzheimer's Disease Diagnosis from Large Neuroimaging Data

Abstract:

Computer-aided early diagnosis of Alzheimer's disease (AD) and its prodromal form mild cognitive impairment (MCI) based on structure Magnetic Resonance Imaging (sMRI) has provided a cost-effective and objective way for early prevention and treatment of disease progression, leading to improved patient care. In this work, we have proposed a new scalable deep learning solution for efficient and early Alzheimer's Disease Diagnosis. Meanwhile, to understand inside our model and how our model reach decisions, visual explanation approach was also applied to identify and visualize those important areas contributing to our model decisions. The experimental evaluation shows the proposed work has a competitive advantage over existing methods.

Keynote Session 2

Ronald Summers

Senior Investigator and Staff Radiologist at the NIH

Ronald M. Summers received the B.A. degree in physics and the M.D. and Ph.D. degrees in Medicine/Anatomy & Cell Biology from the University of Pennsylvania. In 1994, he joined the Diagnostic Radiology Department at the NIH Clinical Center in Bethesda, MD where he is now a tenured Senior Investigator and Staff Radiologist. In 2013, he was named a Fellow of the Society of Abdominal Radiologists. He is currently Chief of the Clinical Image Processing Service and directs the Imaging Biomarkers and Computer-Aided Diagnosis (CAD) Laboratory. In 2000, he received the Presidential Early Career Award for Scientists and Engineers, presented by Dr. Neal Lane, President Clinton's science advisor. In 2012, he received the NIH Director's Award, presented by NIH Director Dr. Francis Collins. His research interests include deep learning, virtual colonoscopy, CAD and development of large radiologic image databases. His clinical areas of specialty are thoracic and abdominal radiology and body cross-sectional imaging. He is a member of the editorial boards of the Journal of Medical Imaging and Academic Radiology and a past member of the editorial board of Radiology. He is a program committee member of the Computer-aided Diagnosis section of the annual SPIE Medical Imaging conference and will be co-chair of the entire conference in 2018 and 2019.He was Program Co-Chair of the 2018 IEEE ISBI symposium.

Title: Challenges and Opportunities for AI in Abdominal Radiology

Abstract:

AI in radiology is demonstrating explosive growth. Beneficial applications of AI in radiology for patient care are being implemented and on the horizon. AI for abdominal radiology is a relatively understudied area with potential clinical benefits. In this presentation, I will describe some of the many applications of AI in abdominal radiology including opportunistic screening, body composition analysis, and detection, segmentation and classification of major organ diseases.

Keynote Speakers (in chronological order)

Tolga Tasdizen

University of Utah, United States

Dr. Tasdizen is a Professor of Electrical and Computer Engineering and a faculty member of the Scientific Computing and Imaging (SCI) Institute at the University of Utah. His areas of expertise are image processing, biomedical image analysis and machine learning. His laboratory has been funded by the National Institutes of Health, the National Science Foundation, the Department of Energy and the Department of Homeland Security. He received the National Science Foundation's Early CAREER award in 2012. Dr. Tasdizen's research emphasizes developing novel solutions in image analysis and machine learning as well as making contributions to the driving medical applications. He is particularly interested in deep learning applications where labeled data is scarce, and researches alternative methods of supervision and semi-supervised learning approaches for solving these problems. He has served as an Associate Editor for IEEE Transactions on Image Processing, IEEE Signal Processing Letters and BMC Bioinformatics, Area Chair for MICCAI, and currently serves as a Senior Area Editor for IEEE Transactions on Image Processing.

Title: Stain-based Contrastive Learning for Histopathological Image Classification

Abstract:

We will present a novel semi-supervised learning approach for classification of histopathology images. We demonstrate how strong supervision with patch-level annotations can be combined with a novel co-training loss to create a semi-supervised learning framework. Co-training relies on multiple conditionally independent and sufficient views of the data. We separate the hematoxylin and eosin channels in pathology images using color deconvolution to create two views of each slide that can partially fulfill these requirements. Two separate CNNs are used to embed the two views into a joint feature space. We use a contrastive loss between the views in this feature space to implement co-training. We evaluate our approach in clear cell renal cell and prostate carcinomas, and demonstrate improvement over state-of-the-art semi-supervised learning methods.

Ehsan Adeli

Stanford University, United States

Co-director of Stanford AGILE Consortium

Director of Mind and Motion Lab

Senior Member of IEEE

Ehsan Adeli, Ph.D., is an Assistant Professor at the Stanford University, Department of Psychiatry and Behavioral Sciences and is affiliated with the Computer Science department. His research interests include computational neuroscience, computer vision, machine learning, and healthcare. Dr. Adeli is an executive co-director of Stanford AGILE (Advancing technoloGy for fraIlty and LongEvity) Consortium, which aims to develop methods to diagnose and treat frailty. He is an Associate Editor of two journals in the field: IEEE Journal of Biomedical and Health Informatics and the Journal of Ambient Intelligence and Smart Environments. He is a Senior Member of IEEE and has served as area chair for several conferences (MICCAI, CVPR, ICLR, AAAI) over the past 3-4 years.

Keynote Speakers (in chronological order)

Title: Dealing with confounders and bias in medical studies in the age of deep learning

Abstract: The presence of confounding effects is inarguably one of the most critical challenges in medical applications. They influence both input (e.g., neuroimages) and the output (e.g., diagnosis or clinical score) variables and may cause spurious associations when not properly controlled for. Confounding effect removal is particularly difficult for a wide range of state-of-the-art prediction models, including deep learning methods. These methods operate directly on images and extract features in an end-to-end manner. This prohibits removing confounding effects by traditional statistical analysis, which often requires precomputed features (image measurements). In this talk, I will present methods to learn confounder-invariant discriminative features and novel normalization techniques to remove confounding and bias effects while training neural networks.

Linwei Wang

Rochester Institute of Technology, United States

Dr. Linwei Wang is a Professor of Computing and Information Sciences at the Rochester Institute of Technology in Rochester, NY. She directs RIT's Signature Interdisciplinary Research Area in Personalized Health Technology. She also directs the Computational Biomedical Lab (CBL) that conducts interdisciplinary research at the intersection of artificial intelligence and healthcare, especially in the development of Bayesian inference and Bayesian deep learning techniques for health data understanding. Her group's research is supported by over 8-million funding from the National Science Foundation and the National Institutes of Health. Dr. Wang serves as a current member on the Board of the MICCAI Society. She is a recipient of the NSF CAREER Award in 2014 and the United States' Presidential Early Career Awards for Scientists and Engineers (PECASE) in 2019.

Title: Few-shot Generation of Personalized Neural Surrogates for Cardiac Simulation

Abstract: Clinical adoption of personalized virtual heart simulations faces challenges in model personalization and expensive computation. While an ideal solution is an efficient neural surrogate that at the same time is personalized to an individual subject, the state-of-the-art is either concerned with personalizing an expensive simulation model, or learn- ing an efficient yet generic surrogate. This paper presents a completely new concept to achieve personalized neural surrogates in a single coher- ent framework of meta-learning (metaPNS). Instead of learning a single neural surrogate, we pursue the process of learning a personalized neural surrogate using a small amount of context data from a subject, in a novel formulation of few-shot generative modeling underpinned by: 1) a set- conditioned neural surrogate for cardiac simulation that, conditioned on subject-specific context data, learns to generate query simulations not included in the context set, and 2) a meta-model of amortized varia- tional inference that learns to condition the neural surrogate via simple feed-forward embedding of context data. As test time, metaPNS deliv- ers a personalized neural surrogate by fast feed-forward embedding of a small and flexible number of data available from an individual, achieving – for the first time – personalization and surrogate construction for ex- pensive simulations in one end-to-end learning framework. Synthetic and real-data experiments demonstrated that metaPNS was able to improve personalization and predictive accuracy in comparison to conventionally-optimized cardiac simulation models, at a fraction of computation.

Keynote Speakers (in chronological order)

Keynote Session 3

Klaus Maier-Hein

Heidelberg University, Germany

Managing Director of Data Science and Digital Oncology at the German Cancer Research Center (DKFZ)

Klaus Maier-Hein is full professor at Heidelberg University and Managing Director of Data Science and Digital Oncology at the German Cancer Research Center (DKFZ). He heads the Division of Medical Image Computing at the DKFZ and the Pattern Analysis and Learning Group at Heidelberg University Hospital. His research is focused on deep learning methodology in the context of medical imaging and the development of research software infrastructure for efficient translation of results.

Title: Machine Learning in Medical Imaging: Current Challenges

Abstract:

Despite its vast potential, the actual practice-changing clinical impact of machine learning in medical imaging has so far been rather modest. Why is that? The talk covers several major challenges that I consider essential in unlocking the full potential of machine learning in medical imaging, and I present current examples of our ongoing research that address them.

Hongen Liao

Tsinghua University, China

Prof. Hongen Liao is currently a Full Professor and Vice Dean in the School of Medicine, and the Department of Biomedical Engineering, Tsinghua University, China. He has been selected as a National Distinguished Professor of China since 2010. He made a great success and numerous major achievements in the 3D autostereoscopic medical image processing and display, spatial see-through surgical navigation, solved the long-existing "hand-eye discoordination problem" suffered by medical doctors. He has also been involved in long viewing distance autostereoscopic display and 3D visualization. He is the author and co-author of more than 320 peer-reviewed articles and proceedings papers, including publication in IEEE Transactions, Nature Photonics, Theranostics, Medical Image Analysis, as well as 80 international invited lectures, over 60 patents and 340 conference abstracts.

Title: 3D Medical Imaging and Visualization for Intelligent Minimally Invasive Surgery

Keynote Speakers (in chronological order)

Keynote Session 4

Sotirios A Tsaftaris

University of Edinburgh, UK
Canon Medical/Royal Academy of Engineering Research Chair in Healthcare AI

Prof. Sotirios A. Tsaftaris, or Sotos, (https://vios.science; @STsaftaris), is currently the Canon Medical/Royal Academy of Engineering Research Chair in Healthcare AI, and Chair (Full Professor) in Machine Learning and Computer Vision at the University of Edinburgh (UK). He is also a Turing Fellow with the Alan Turing Institute and an ELLIS Fellow. Previously he held faculty positions with IMT Institute for Advanced Studies Lucca (Italy) and Northwestern University (USA).

He has published extensively, particularly in interdisciplinary fields, with more than 180 journal and conference papers in his active record. His research interests are machine learning, computer vision, and image analysis.

Title: Diffusion Models in Medical Imaging and Analysis. Hype or Hope?

Abstract:

Generative models, such as VAEs, GANs, Normalising Flows, have been extremely useful in medical imaging and analysis for finding useful representation spaces, creating additional unseen examples, or simply acting as regularisers within a multitask learning setting. A new breed of models is now receiving considerable attention in AI and Computer Vision. Diffusion models are now empowering famous examples of massive multimodal (text/image) generative models such as Stable Diffusion (Stability.AI), ImageGen (Google), Dall-E (OpenAI). But are they full of hype or hope? And what is their role in medical imaging and analysis? In this talk we will briefly recap the theory of diffusion models, summarise recent papers that use diffusion models in medical imaging and analysis, and offer inspiring papers from computer vision to help guide future directions in the use of these models in our field. We conclude that such models are far from being …!

Keynote Speakers (in chronological order)

Adrian Barbu

Florida State University, United States

Adrian Barbu received a Ph.D. in Mathematics in 2000 from Ohio State University and a Ph.D. in Computer Science in 2005 from the University of California, Los Angeles. From 2005 to 2007, he was a research scientist and later a project manager in Siemens Corporate Research, working on medical imaging problems. He received the 2011 Thomas A. Edison Patent Award with his Siemens coauthors for their work on Marginal Space Learning. In 2007, he joined the Statistics Department at Florida State University as an assistant professor and since 2019 as a professor. He has published more than 70 papers in computer vision, machine learning, and medical imaging and has more than 25 patents related to medical imaging and image denoising. He also wrote a book with his Ph.D. advisor Song-Chun Zhu. The book is titled "Monte Carlo Methods" and was published in Springer in 2020.

Title: Organ Segmentation: A Journey from Level Sets to Shape Denoising

Abstract:

This talk starts by introducing a current approach we took for 2D or 3D organ segmentation that generalizes the Chan-Vese level set method in multiple ways. Chan-Vese is a low-level segmentation method that simultaneously evolves a level set while fitting locally constant intensity models for the interior and exterior regions. Our approach replaces its simple length-based regularization with a shape model based on a U-Net CNN, which needs to be trained using examples. We show how to train this CNN and what type of data augmentation methods can be used to avoid overfitting. The obtained Chan-Vese Neural Network (CVNN) has very good segmentation accuracy while having a small number of parameters compared to other CNN based models. From here, focusing on the data augmentation part, we stumble on a segmentation problem that has not received much attention in the literature, which we call Shape Denoising. Representing shapes as binary images, the problem is to recover the shape of an object (e.g. a liver or a horse) after it was perturbed by some deformations (noise). We study different kinds of noise that perturb the shape in different ways, and empirically compare multiple methods that can recover the original shape from the noisy one. The methods include different CNN models such as Deep Bolzman Machine (DBM), Centered Convolutional DBM, Energy Based Models, U-Net and Masked Autoencoder. We observe that some noises are more difficult than others and the U-Net and Masked Autoencoder consistently outperform the other methods on all types of noise. In the future we plan to study shape denoising in the wild where the shapes are not aligned, making the problem more difficult and overfitting more severe.

Thanks again for your great support to MICAD2022!