

JOINT MIAR, AE-CAI & CARE WORKSHOP @ MICCAI 2019
Shenzhen, China, October 13th

7:00 **Registration, Speaker Check-in, and Poster Setup**

8:00 **Welcome & Opening Remarks**

Chairs: Cristian A. Linte, Elvis C. S. Chen & Xiongbiao Luo

8:15 **Long Oral Presentations: *Medical Image Processing and Virtual Applications [VR APPS LO]***

Chair: Elvis C. S. Chen, Western University, Canada

[VR APPS LO1] A Virtual Linear Measurement System for Accurate Quantification of Medical Images

Presenter: Gavin V. Wheeler

[VR APPS LO2] Deep segmentation leverages geometric pose estimation in computer-aided Total Knee Arthroplasty

Presenter: Pedro Rodrigues

[VR APPS LO3] Development and Face Validation of Ultrasound-Guided Renal Biopsy Virtual Trainer

Presenter: Andinet Enquobabrie

9:00 **Short Oral Presentations: *Medical Image Processing and Virtual Applications [VR APPS SO]***

Chair: Cristian A. Linte, Rochester Institute of Technology, United States

[VR APPS SO 1] Non-invasive reconstruction of dynamic myocardial transmembrane potential with graph based total variation constraints

Presenter: Shuting Xie

[VR APPS SO 2] Upper Gastrointestinal Anatomy Detection with Multi-Task Convolutional Neural Networks

Presenter: Jiquan Liu

[VR APPS SO 3] Morphological active contour without edge-based model for real-time and nonrigid uterine fibroid tracking in HIFU treatment

Presenter: Guochen Ning

[VR APPS SO 4] Probability Analysis of Axillary Lymph Node Metastasis in Breast Cancer Patients using Particle Space-time Distribution Model

Presenter: Fang Chen

[VR APPS SO 5] Determining blood flow direction from short neurovascular surgical microscope videos

Presenter: Reid Vassallo

[VR APPS SO 6] Automatic detection of calcium phosphate deposit plugs at the terminal ends of kidney tubules

Presenter: David R. Holmes III

9:30 **Coffee Break & Poster Viewing (30 minutes)**

10:00 **Long Oral Presentations: *Video-based Interventions and Surgival Instrument Detection [VIDEO LO]***

Chair: Elvis Chen, Western University, Canada & Xiongbiao Luo, Xi'an Medical University, China

[VIDEO LO1] Details Preserved Unsupervised Depth Estimation by Fusing Traditional Stereo Knowledge from Laparoscopic Images

Presenter: Fucang Jia

[VIDEO LO2] Learning the Representation of Instrument Images in Laparoscopy Videos

Presenter: Sabrina Kletz

[VIDEO LO3] Learning colon centerline from optical colonoscopy, a new way to generate a map of the internal colon surface

Presenter: Mohammad Ali Armin

[VIDEO LO4] Realistic Endoscopic Image Generation Method Using Virtual-to-real Image-domain Translation

Presenter: Masahiro Oda

[VIDEO LO5] A Marker-less Real Time Intra-Operative Camera and Hand-Eye Calibration Procedure for Surgical Augmented Reality

Presenter: Megha Kalra

[VIDEO LO6] Endoscopic Video Defogging Using Luminance Blending

Presenter: Xiongbiao Luo

11:30 Short Oral Presentations: *Video-based Interventions and Surgical Instrument Detection [VIDEO SO]*

Chair: David R. Holmes III, Mayo Clinic, United States

[VIDEO SO 1] Real-time Surgical Instrument Detection in Robot-Assisted Surgery using a Convolutional Neural Network Cascade

Presenter: Zijian Zhao

[VIDEO SO 2] Weakly Supervised Segmentation for Real-time Surgical Tool Tracking

Presenter: Eung-Joo Lee

[VIDEO SO 3] Simultaneous shape and camera-projector parameter estimation for 3D endoscopic system using CNN-based grid-oneshot scan

Presenter: Ryo Furukawa

[VIDEO SO 4] Stable Polyp-Scene Classification via Subsampling and Residual Learning from Imbalanced Large Dataset

Presenter: Hayato Itoh

[VIDEO SO 5] Real-time Surgical Instrument Tracking in Robot-Assisted Surgery Using Multi-Domain CNN

Presenter: Liang Qiu

[VIDEO SO 6] A deep learning approach for automatic out-of-plane needle localization for semi-automatic ultrasound probe calibration

Presenter: Leah Groves

12:00 **Lunch & Poster Viewing (120 minutes)**

14:00 **Keynote Lecture**

*Chair: Cristian A. Linte, Rochester Institute of Technology,
United States*

**Title: Artificial Intelligence for Endoscopic
Procedures**

Prof. Kensaku Mori, PhD
Nagoya University, Japan



14:45 **Long Oral Presentations: AR for Interventional
Planning and Guidance [AR P/G LO]**

Chair: Caroline Essert, INRLA Strasbourg, France

**[AR P/G LO1] Towards AR-assisted Visualization and Guidance for
Imaging of Dental Decay**

Presenter: Yaxuan Zhou

**[AR P/G LO2] HoloInjection: Augmented Reality Support for CT-
guided spinal Needle Injections**

Presenter: Florian Heinrich

**[AR P/G LO3] An Augmented Reality Mastectomy Surgical
Planning Prototype using the HoloLens**

Presenter: Sara M.S. Amini

15:30 **Coffee Break & Poster Viewing (30 minutes)**

18:30 **Awards Presentation & Closing Remarks**

Chairs: Cristian A. Linte, Elvis Chen, Xiongbiao Luo & Hongen Liao



Prof. Kensaku Mori, PhD

Professor, Graduate School of Informatics,
Directory, Information Technology Center, Nagoya
University, Japan



Title: Artificial Intelligence for Endoscopic
Procedures

Abstract: In this talk, we will introduce artificial intelligence (AI) applications in endoscopic procedures including endoscopic diagnosis assistance and endoscopic surgical procedures. Artificial intelligence, especially machine learning or deep learning, is obtaining great attention from various fields. Pattern recognition systems are actively used in many applications and are becoming parts of social infrastructure. Most popular pattern recognition systems are smart phones. Medical AI is also one of active research fields in this area. Its ancestor is computer assisted diagnosis of chest X-ray or experts system like as dialog system. Deep neural network boosted such researches with improvements of methodology and computing technology. Endoscopic procedure assistance is one of hot topics in medical AI. It includes real-time detection and diagnosis of endoscopic procedures (direct assistance) and workflow analysis (indirect assistance). AI will assist medical staff and patients directly way and indirectly way. As an example of direct assistance, we have recently developed AI-assistance system for super-magnified endoscope. It outputs pathological classification of a colonic polyp from super-magnified endoscopic views of the surface of a colonic polyp in real time. This system obtained governmental approval as a medical device. Real-time automated detection of colonic poly has been achieved. Autonomous control of endoscopic robot is also one of example. Anatomical structures are recognized by AI from endoscopic views and such information is forwarded to robot control. One of indirect assistance is surgical workflow analysis. Many researches have been conducted for surgical scene analysis from endoscopic surgery videos based on AI. Off-line analysis of endoscopic videos for surgical skill assessment is also the area of medical AI. This talk will show several examples of AI in endoscopic procedures and give the audience some perspectives of this field.

Bio: Prof. Kensaku Mori has received the B.S degree in electronics engineering, the M.S degree in Information Engineering, and the Ph.D in Information Engineering from Nagoya University, Japan, under the supervision of Prof. Jun-ichiro Toriwaki, in 1992, 1994 and 1996 respectively. He was a research fellow of the Japanese Society for the Promotion of Science (JSPS) from 1994 to 1997, Research Associate at Department of Computational Science and Engineering, Nagoya University from 1997 to 2000, an assistant professor in 2000. He was Associate Professor at the Research Center for Advance Waste and Emission Management of Nagoya University from 2001 to 2003. He was also Visiting Associate Professor at Department of Neurosurgery, Stanford University from 2001 to 2002. He was Associate Professor of the Graduate School of Information Science, Nagoya University from 2003 to 2009. He has been Professor of Information and Communications Headquarters, Nagoya University since 2009. In 2016, he started his services as the Directory of Information Technology Center, Nagoya University. In 2017, he was appointed as the Vice Chair of Information and Information and Communication, Nagoya University. He has been a Professor of Graduate School of Informatics, Nagoya University since 2017. His current research interests include three dimensional image processing, computer graphics, virtual reality and their applications to medical image. Computer aided diagnosis and surgery are his major active research fields. Recently AI-based colonoscope diagnosis system developed in his laboratory has obtained an official certificate as a medical device. He has received many awards from several institutes includes the Young Researcher Award, Ministry of Education, Culture, Sports, the best paper awards from the Japanese Society of Medical Imaging Technology. He served as the general chair of the 16th international conference of Medical Image Computing and Computer Assisted Intervention (MICCAI 2013). He was elected as the President of the International Society of Computer Aided Surgery (ISCAS) in 2018. He was the Chair of SPIE Medical Imaging CAD conference in 2018 and 2019. He is a member o Institute of Electronics, Information and Communication Engineering of Japan, Japanese Society of Biomedical Engineering, and Japanese Society of Medical Imaging Technology, MICCAI, IEEE, and SPIE.

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MIAR, AE-CAI & CARE 2019 Workshop Organizing Committee:

Elvis C. S. Chen – Western University, Canada

Marta Kersten – Concordia University, Canada

Cristian A. Linte – Rochester Institute of Technology, United States

Hongen Liao – Tsinghua University, China

Xiongbiao Luo – Xiamen University, China

Jonathan McLeod – Intuitive Surgical Inc., United States

Ziv Yaniv – National Library of Medicine, United States

Yuan Zhang – University of Jinan, China