



Title of special session:

Advanced Concepts in Endoscopic Imaging and Engineering

Aim and objectives:

Endoscopy empowers clinicians to access and assess the interior surfaces of organs. Its importance in preventative medicine has motivated significant developments in biomedical imaging and engineering. Conventional fiber optic endoscopes have evolved into magnifying optical or confocal laser devices enabling real-time optical histological diagnosis, whereas they are progressively giving their place to miniature robotic devices wirelessly traveling within internal organs, or even virtual endoscopes based on computed tomography (CT) and magnetic resonance (MR) imaging. In this process, intelligent computational models aim to provide cost-efficient, early and accurate diagnosis, hence improving both patient comfort and safety.

This special session aims to:

- a) bring together scientists from various disciplines related to this research field;
- b) present advanced concepts in endoscopic imaging and engineering, including state of the art methods for intelligent processing and analysis of endoscopic data, sensors, robotic systems, hardware and software architectures;
- c) discuss open issues and research perspectives.

Topics of this session include (but are not limited to):

- Image/Video acquisition, processing and analysis
- Generation of data for model construction, validation and application
- Semantic content understanding and modeling
- Information fusion from multiple modalities from molecular to environmental level
- Computer-aided diagnosis and measurements
- Medical decision support
- Wireless energy transmission
- Energy-efficient data processing and transmission
- Low radiation techniques
- Robotics and autonomous agents
- Wireless miniature endoscopes
- Wireless diagnosis based on integrated modalities, autofluorescence etc
- Endoscopic follow up and treatment approaches
- Virtual endoscopy and in silico medicine

Substantially extended articles of this special session will be invited to journal special issues that will be announced by the session organizers.

Background: The organizers are members of a recently formed international consortium for endoscopy research and innovation. They have a considerable publication record on the topics of this session, with pioneering contributions in endoscopy and software/hardware endoscopic data acquisition and analysis systems. The special session will build on

experiences, technological and scientific developments stemming from flagship projects funded by the EU, US, and Japan.

Short CV of the organizers:

Dimitris K. Iakovidis is Assistant Professor in the Dept. Informatics and Computer Technology, Technological Educational Institute of Central Greece, Head of the Institute of Information Technology, and Vice Director of Center for Technological Research of Central Greece. He was awarded a BSc, MSc and PhD from the University of Athens, Greece, where he continued his research on endoscopic data analysis at a postdoctoral level. Since then he has been involved in several EU and nationally funded research projects. He has published over 100 research papers, and he is editorial board member and regular reviewer in several international journals. His research interests include signal/image analysis and mining, uncertainty-aware intelligent/cognitive systems, knowledge and feature fusion, and parallel hardware-software architectures, with applications in biomedicine.

Anastastios Koulaouzidis is an Associate Specialist/Gastroenteologist in the Royal Infirmary of Edinburgh. He qualified in Medicine in Greece and completed his postgraduate and specialist training in Greece and England. He is a GI clinician with a focus on luminal Gastroenterology. His subspecialty interest is capsule endoscopy, minimally-invasive diagnosis and device assisted enteroscopy. He is Editor-in-Chief of the Global Journal of Gastroenterology & Hepatology, and of the under development Journal of Contemporary Digestive Research. He is also member of the editorial board of several other specialty journals, and he has presented and published several articles in the fields of capsule endoscopy. Current research projects in capsule endoscopy include 3D reconstruction, lesion localisation hardware development for capsule endoscopy, artificial neural networks and computer-aided diagnosis.

Alexandros Karargyris is with the National Library of Medicine at National Institutes of Health in Bethesda, Maryland. He earned a Master's degree from the National Technological University of Athens, Greece in Electrical Engineering, and a PhD from Wright State University, Dayton, Ohio on designing a diagnostic software system for capsule endoscopy. His research interests include medical image analysis, computer vision and pattern recognition.

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