4TH DIGITAL PATHOLOGY CONGRESS: ASIA

Development of Healthcare Through DP and AI for Improved Patient Management & Outcomes

TOKYO, JAPAN — 9-10 May 2018 —

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We at Global Engage are pleased to invite you to the 4th Digital Pathology Congress Asia which will be held in Tokyo, Japan on the 9th-10th May 2018. This globally respected event is a part of our international Digital Pathology series and attracts over 200 attendees to Asia every year.

The goal of this congress is to bring together the brightest minds to give talks on digital pathology in all its applications and latest advances. With extensive opportunities to network and time for interaction with the speakers we aim to foster not only learning but also to provoke conversations on all matters related to this rapidly advancing technology. Digital Pathology is now being recognised as an essential tool for pathologists to improve the healthcare system. Applications such as computational pathology, whole slide imaging and artificial intelligence enable them to reduce their reliance on conventional methods of disease diagnosis such as microscopy. As such, it is important for this subject matter to be widely debated to create awareness and to enable its successful introduction into traditional pathology laboratories.

We have successfully attracted world class experts who will use this meeting to examine the latest computational and digital image technologies used in research and medical based pathology. Development in areas such as digital image processing and diagnosis, pattern recognition, telemedicine and virtual pathology are covered at length. We also take a comprehensive look at artificial intelligence and its implications for healthcare and well-rounded patient management systems. By the end of the meeting you will be full versed in the strategies you need to exploit digital pathology which is revolutionising healthcare.

Should you be either an expert using Digital Pathology with a desire to extend your knowledge on the latest development in this field, or a researcher looking to invest on the latest top notch digital pathology devices that are currently in the market- this conference is the place to be.
**DAY 1 - TRACK 1**

**Current Trends and Movement in Digital Pathology**
- Contemporary issues and barriers of adopting digital pathology
- Emerging technology revolving digital pathology
- Regulatory overview in digital pathology
- Quality assurance, control and improvement
- Implementation of digital pathology in training and research
- Artificial Intelligence (AI) in digital pathology
- Digital pathology: benefits, barriers and future implications

**DAY 1 - TRACK 2**

**Computational Pathology: Applications, Technologies and Prospects**
- Computational methodologies in digital pathology
- Approaches and scientific challenges in computational pathology
- Development of tools in computational pathology
- AI and machine learning
- Whole slide imaging: acquisition, processing, archiving and retrieval
- Cloud computing / storage solutions

**CASE STUDIES**

**Digital Pathology Application and Research Case Studies**
- Diagnostic studies
- Clinical studies
- Personalised targeted therapy
- Tissue based research
- Artificial intelligence
- Machine learning
- Deep learning

**DAY 2 - TRACK 1**

**Digital Image Analysis**
- Overcoming challenges in image analysis
- Computer aided diagnoses
- User interfaces and image registration
- Image quality and scanning speed
- Quantitative image analysis research
- Visualisation methods for diagnosis and prognosis
- Image processing
- Pattern recognition and annotation tools
- Algorithm development / Image analysis algorithms

**DAY 2 - TRACK 2**

**Transitioning to Telepathology for Accurate Diagnosis**
- Current status and future trends in telepathology
- Workflow integration
- Teleconsultation
- Legal and regulatory issues in telepathology
- Challenges in implementation
- E-learning and e-training
- Telemedicine and consultation
- Virtual pathology
Paving the road from research to the clinic

How to quickly move from an idea to a clinical application? Researchers need freedom to pursue idea, efficient automation to speed up their test program, and a clear path into the clinical environment so patients can benefit from new discoveries sooner. This presentation shows how Leica Biosystems Advanced Staining Research Platforms are paving the way to successful clinical applications.

Digital Pathology – How can Leica Biosystems Digitize my Assay?

Translational research requires a diverse and open approach to discovery on Pathology tissue slides. A key requirement being not to limit the range of approaches open to today’s scientists. In this talk we will explain how Leica Biosystems and their evolving digital pathology platforms, are designed to grow with the research, from scanning, managing and finally extracting data from experimental slides (analysis will be explored more fully in the accompanying talk). As research transitions to the clinical laboratory, the requirements change as do the demands on the solutions and a different approach is required. Here we explain how Leica Biosystems portfolio is being developed to align with this chain of discovery, from bench to Clinic.
HALO AI – Deep Learning Workflow for Pathology

If you’ve attended any digital pathology or medical imaging meetings over the past couple of years, you have heard artificial intelligence or deep learning mentioned at least once. If you are not a computer scientist, algorithm engineer or image analyst, you might be wondering how these tools differ from all the other image analysis and pattern recognition tools that have been used in digital pathology for years. In this webinar, we will demystify this emerging technology with a bit of background, explain its current and potential applications in pathology and discuss how Indica Labs’ HALO-AI platform is making this powerful technology accessible to the pathology community.
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<td>Professor &amp; President, Tottori University Hospital &amp; JTTA</td>
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<td><strong>ICHIRO MORI</strong></td>
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<td>Professor, University of Health &amp; Welfare, Japan</td>
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<td><strong>ACHYUT BATTACHARYA</strong></td>
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<td>Professor &amp; Chair, University of Arizona, USA</td>
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<td><strong>ZOYA VOLYNSKAYA</strong></td>
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<td>Director, University of Health Network, Canada</td>
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<td><strong>ESSAM AYAD</strong></td>
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<td><strong>KLAUS KAYSER</strong></td>
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<td>Director, Institute of Pathology, Charité Germany</td>
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<td><strong>ANANT MADABHUSHI</strong></td>
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<td>Director, Case Western Reserve University, USA</td>
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<td>Associate Professor, Kyushu University Hospital, Japan</td>
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<td>Professor, National Taiwan University of Science and Technology, Taiwan</td>
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<td><strong>LEE HWEE KUAN</strong></td>
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<td>Senior Principal Investigator, Agency for Science Technology and Research, Singapore</td>
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<td><strong>ALEXI BAIDOVSHILI</strong></td>
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<td>Clinical Pathologist, LabPON, Europe</td>
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<td><strong>KATE LILLARD TURNSTALL</strong></td>
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### Keynote Address:

**Zoya Volynskaya**  
Director, University of Health Network, Canada  

**Pathology in Digital World: Why and How to Make a Successful Transition from Glass**  
In the 21st century, digital technology is overtaking analog in many areas, including medicine. Anatomical pathology can move from paper and glass to electronic records and digital images by introducing robust whole slide imaging (WSI) and laboratory information systems (LIS). We developed a pathology informatics platform for a highly sub-specialized surgical pathology program supporting multiple geographically dispersed hospitals. The platform leverages LIS interface with a WSI solution for histology/immunohistochemistry, as well as flow cytometry and molecular diagnostics, outputting consolidated diagnostic reports. The use of digital pathology interfaced with the LIS provides patients from different geographic locations access to subspecialty pathology. The system enables collection of structured data that can be analyzed and mined. Adoption of digital pathology paves the way for quantitative objective analysis in anatomical pathology and builds the foundation for accurate big data collection and interpretation.

**Ichiro Mori**  
Professor, University of Health and Welfare, Japan  

**Issues in International WSI Full Double-Check System, from the Experience of Health Evaluation and Prevention Center Preparation in Vietnam**  
- We are planning to open Health Evaluation Center in Vietnam with full double check of pathology diagnosis from Japan using WSI.  
- One of the biggest issues is language. We are planning to establish an English base HIS and pathology LIS as we cannot find Japanese company who has running pathology LIS in English.  
- We are going to check cytology, so how to make cytology remote double check is big issue.

### Solution Provider Presentation:

**Senior Representative**  
Philips

**Title – TBC**

### Current Trends and Movement in DP

**Track Chair:** Essam Ayad  
Professor & Director of the Digital Pathology Program, Faculty of Medicine, Cairo University, Egypt

**Shashidhar Venkatesh Murthy**  
Professor & HOD, Department of Pathology, School of Medicine, James Cook University, Australia  

**Technology Enhanced Cognitive Scaffolding:**  
Innovative Pathology Teaching in a Rural Medical School in Australia - One-Man Army!  
Globally Pathology education is deteriorating due to intense resource requirements. At James Cook University Australia, a rural medical school we have revamped pathology teaching using several innovative technology and improved curriculum integrated with clinical sciences in the senior years of undergraduate medical course. As a single academic pathologist at the medical school, challenges were many including how to teach Pathology knowledge & laboratory skills effectively to over 200 senior medical students distributed in remote rural clinical placements. This presentation summarises successful technological innovations & digital pathology tools developed over a decade which have improved student participation & learning but also allowed monitoring to identify & support students in need. My colleagues call me “One Man Army” of pathology!

**Anant Madabhushi**  
Professor, Department of Biomedical Engineering & Director, Centre of Computational & Personalised Diagnostics, Case Western Reserve University, USA  

**Radio-Patho-Genomics: Integrating Information Across Length Scales for Precision Medicine**  
At the Centre for Computational Imaging and Personalised Diagnostics (CCIPD) at Case Western Reserve University, we have been developing computerised knowledge alignment, representation, and fusion tools for integrating and correlating heterogeneous biological data spanning different spatial and temporal scales, modalities, and functionalities. These tools include computerised feature analysis methods for extracting subvisual attributes for characterising disease appearance and behavior on radiographic (radiomics) and digitised pathology images (pathomics). In this talk I will discuss the development work in CCIPD on new radiomic and pathomic approaches for capturing intra-tumoral heterogeneity and modelling tumour appearance. I will also focus my talk on how these radiomic and pathomic approaches can be applied to predicting disease outcome, recurrence, progression and response to therapy in the context of prostate, brain, rectal, oropharyngeal, and lung cancers. Additionally, I will also discuss some recent work on looking at use of pathomics in the context of racial health disparity and creation of more precise and tailored prognostic and response prediction models.
Networking Lunch / One-to-One Meetings

12:50-13:50

TOMOO ITOH
Professor, Department of Diagnostic Pathology, Kobe University Hospital, Japan

Validation Study on Lymphoma Diagnosis Using WSI

The digital pathology is an emerging technology, and its usage on routine practices is spreading worldwide rapidly. Very recently, FDA allowed marketing of first whole slide imaging (WSI) system for digital pathology, which enables us to use the system even for primary diagnosis. This epoch-making achievement owes a lot to scientific evidences indicated that WSI is eligible for making accurate pathological diagnoses. However, those studies typically targeting small specimens alone and the cases requiring immunohistochemistry or special staining, such as malignant lymphoma, were excluded in many studies. This study was done to provide an evidence of usability of WSI diagnosis for primary diagnosis of malignant lymphoma compared to conventional glass slide diagnosis and optical microscope. As a conclusion, we were able to decide that WSI is applicable for primary diagnosis of malignant lymphoma, if we make diagnoses with combination of adequate clinical information, H&E morphology, and immunohistochemistries.

ESSAM AYAD
Professor & Director of the Digital Pathology Program, Faculty of Medicine, Cairo University, Egypt

The Progress of Digital Pathology in the Middle East

The trials for applying telepathology systems in the Middle East began in 1994 but all trials were markedly limited. The actual practical Egyptian trial began in 2002 by applying both static & dynamic techniques in a pilot project between the Italian Hospital in Cairo (NPO) and the Civico Hospital in Palermo. During the period from 2003 till 2008, we consulted on many problematic pathological cases with these different specialised pathological centers in Italy, UK & USA. We concluded from our experience that telepathology is a very useful and applicable tool for additional consulting on difficult pathological cases especially for emerging countries with limited resources. In view of this success we have already established our Digital Pathology Unit (DPU) in the pathology department, Cairo University in 2010. The application of WSI technique in teaching [for under- & post-graduate candidates] was greatly successful and encouraged us to create a huge digital pathology library which will expand our Digital Pathology & E-learning programs to cover our staff and students both in Egypt and in the longer term in the wider Eastern Mediterranean. Furthermore, we successfully used the WSI technique in telepathology for consulting a lot of cases and in many research related to the practical applications of Digital Pathology.

SOLUTION PROVIDER PRESENTATION:
SENIOR REPRESENTATIVE
Indica Labs
Title – TBC

12:50-13:50 Networking Lunch / One-to-One Meetings

PANEL DISCUSSION:
Recognising Barriers and Significance of AI Usage in Pathology

The possibilities of artificial intelligence revolutionising the field of pathology is irrefutable. It can make workflow more efficient and increase productivity in disease diagnosis. However, in the field of pathology, implementation of AI was an issue with limitations in technology in terms of data insufficiency, image quality, standardisation of imaging, data synchronising process and much more. Artificial Intelligence is also considered to still be in its stage of infancy with simple digitised image analysis of using algorithms, data mining as well as structuring and other menial use. Even among pathologists, the true extent of AI and its benefits are not fully recognised. In this session, approaches to remove barriers of AI implementation and the implication of using AI to its full potential in the field of pathology will be discussed.

CHING-WEI WANG (Chair)
Professor/Director, NTUST Centre of Computer Vision & Medical Imaging, National Taiwan University of Science and Technology, Taiwan

LEE HWEE KUAN
Senior Principal Investigator, Agency for Science Technology and Research, Singapore

Afternoon Refreshments

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Digital pathology is a relatively new tool with significant promise for the future. Digital pathology systems are commonly described as being composed of digital slide scanners, digital slide repositories, and viewers. While these components define a minimum system for replacing the desktop optical microscope, they do not, in and of themselves, deliver on the full potential of our digital future, especially in settings where telepathology is not a primary driver of adoption? What then is the true value proposition of digital pathology? The future of digital pathology depends heavily on integration with the laboratory information system (LIS), non-lab sources of patient data, pre- and post-diagnostic digital image analysis algorithms, computational pathology techniques, "smart" digital storage and retention, and protocols for sharing data across and between organizations. Integration must focus on reducing costs, increasing efficiency, and improving patient care, all of which will drive adoption of digital pathology.

In recent years, with the advent of digital pathological imaging, digital pathology has not only rapidly and objectively but also reduces the need for data storage space significantly. Digitization of sliced images has become a trend of development. However, the high resolution of pathological images in the cloud is still a problem due to technical bottlenecks that make it prone to time delay and image blurriness. At present, high-resolution pathological image analysis technology, which is expensive and lack of functionality, is still not mature in the market, especially high-resolution pathological image processing speed is quite slow. Existing state of the art techniques such as Microsoft HDview and Leica Aperio WebScope suffer from this problem. We have developed a virtual microscopy method enabling real time interactive analysis of large-scale microscopic images through wireless or wired internet on standard desktops, laptops and mobile devices. Different from the commonly adopted pyramid data structure for large-scale images, a highly efficient quad-tree based data storage and accessing strategy is built in Virtual Microscopy, enabling interactively accessing ultra-high resolution gigapixel or terapixel microscopic images, accessing gigapixel or terapixel data over internet in real time and interaction over internet with limited bandwidth in real time. The core idea behind the proposed framework is to access the regions of interest directly and the neighboring tile units are saved in the neighboring physical address. Use the index table strategy and specific storage to access data quickly. Two state of the art systems, including Microsoft HDview and Leica Aperio WebScope, were adopted as benchmark techniques for comparison. The results show that the proposed method is 117 times faster than Microsoft HDview and 24 times faster than Leica Aperio webscope. Statistical analysis was performed using SPSS software10, and the quantitative results were analyzed with the Tukey’s Honestly Significant Difference test and the Fisher’s Least Square Difference test with the significance level 0.001. The proposed Virtual Microscopy enables analysis of super high resolution microscopic image across sites and time and allows multi-person analysis at the same time, which greatly speed up data analysis process and reduces miscommunication among scientists and doctors.
Standardisation of medical information includes code standardization, file format standardization, and model standardization. Regarding codes, there are ICD-10, medicines, examinations, etc. Regarding files, HL7 and DICOM are famous. In the model IHE is expanding worldwide. Because these standardizations became popular, medical information became available from intra-hospital to inter-hospitals. It has also become available for large-scale epidemiological studies. Meanwhile, recent advances in IT technology are seen in cloud technology, which is not exactly visible to the general in the cloud, but has high redundancy, such as virtual server, virtual storage, virtual network, inexpensive and high functions. It also makes it easy to develop large system agilely and is suitable for machine learning etc. We developed high-speed EMR (electronic medical record) sharing system brought by standardization and cloud technology. In future, it will become large scale research infrastructure. For machine learning using images, patient medical information is necessary, so data accumulation like EMR sharing system is necessary. And the standardization of image itself is also necessary like QIBA (quantitative imaging biomarker Alliance) movement in the field of radiology.

While digital pathology is constantly churning out new technologies and development in areas such as but not limited to computational technology, telepathology and digital image analysis, many pathologists are still reluctant to cross- over the technological border from conventional microscopy to virtual microscopy. Digital Pathology is still considered to be not ready for mass use as most still believe that the trained eye of pathologists are the best method of analysis and diagnosis. In addition to that, hesitancy in routine change and adoption of new technology as well as workflow can also be considered a reason for naysaying. In the session, we will discuss why digital pathology implementation challenges are no longer considered relevant.

The Anatomical Pathology laboratory at Granada University Hospitals has been fully digital for primary diagnosis since summer 2016. We are a multi-site operation comprising two teaching hospitals and two general district hospitals with a volume of circa 60,000 cases per year. We report on the strategy we followed for implementing digital pathology in our hospitals, the challenges we faced and the advantages it has brought about. We also discuss what the future will hold for the fully digital laboratory.

At our Department we have now 10 years of experience in virtual pathology education. Daily routine work with students gave us possibility to implement virtual pathology and promote it as an example of early technology adopters’ community. I will share our experience of introduction of this system, also point out its benefits in education. We achieved definitely more balanced yet equal basis for morphology learning. In the same time, we ensured quality of learning material. When teaching we are devoted to top functionality with possibility of combining old classical mode of microscopy within histology/pathology even biology/microbiology courses. How to adjust pathology residents training
program to produce competent EU certificate fit candidates and is it a relevant issue? Due to economic fluctuation labor forces are migrating and the highly educated workforce among which are pathologists are highly flowable. Improved working conditions and economical security are demanded. Therefore, those of us who can offer the harmonization of training in pathology; incorporating minimal standards for training institutions and for those who are in charge of training must ensure digital pathology training as integrated part of residence training. Aim should be to provide interactive, dynamic experience comfortable for teacher as well as for students. Finally, we promote remote learning, virtual and digital pathology since it requires more proactive and thorough preparation of student/resident.

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SOLUTION PROVIDER PRESENTATION

ATSUSHI TERAMOTO
Associate Professor, Faculty of Radiological Technology, Fujita Health University, Japan

Deep Learning
Due to the personalised and precision medicine, pathological examination plays an important role in the diagnosis. Recently, we can obtain the high-quality digital images from microscope based on the development of whole slide scanner; digital pathology is today widely used in the clinical practice. Many methods for automated analysis of pathological images using artificial intelligence have been developed, and it has been reported that better results than the conventional image analysis techniques can be obtained. In this talk, I will explain the fundamentals of artificial intelligence including deep learning and introduce some applications of artificial intelligence to pathological image processing.

HUMAIRA NISAR
Associate Professor, Faculty of Engineering and Green Technology, Universiti Tunku Abdul Rahman, Malaysia

Segmentation of Eczema Skin Lesions
Atopic eczema is a chronic skin condition that significantly affects the quality of life of the patients. Diagnosis of the severity and extent of eczema is done subjectively, which may introduce inter-rater and intra-rater variability. In this research our aim is to develop a fully automated eczema skin lesion classification method. We have studied different supervised learning methods for classification of lesions. Different color spaces are studied for segmentation of lesions. The performance of the proposed method is assessed by comparing the segmented lesions with the ground truth segmented image. Support Vector Machine classifier shows an accuracy of 84.43% for segmentation.

ACHYUT BATTACCHARYA
Professor & Chair, Department of Pathology, University of Arizona, USA

Telepathology- Yesterday, Today and Tomorrow; A university of Arizona Perspective

Yesterday
In the early 1990s we started a quality control program in Arizona (about 600 cases) along with a consultation service with Hermosillo General Hospital in Mexico (total of 495 cases). This was through robotic telemicroscopy (Arizona Project) and store and forward technology (Mexico Project). This is the foundation of our current practice model.

Today
Just like many academic institutions we are utilising whole slide imaging. This is mostly utilised for consultation services, and quality control measures as well as for storage. We routinely integrated cloud based Philips scanner to incorporate radiology and pathology images for tumor boards. Current (June-July 2017) approval of Philips scanner and digital telemicroscopy is going to take us to a state-wide expanded practice.

Tomorrow
• Integration of the Banner Hospital (29 in Arizona covering 40% of hospital beds and present in 85% of rural Arizona). Existing Broad Band access throughout the state is the backbone of our growth.
• Primary diagnostic services as it is becoming a common practice.
• Quality control measures
• Consultation services
• Digital computing and diagnostic algorithms
• Virtual storage of digitised slides
• Artificial intelligence

ALEXI BAIDOSHVILI
Clinical Pathologist, Laboratory of Pathology, East Netherlands, Europe

Improvements and Challenges in a Pathology Laboratory after Digitalisation and Use of Computational Pathology in Diagnostics

LabPON made the transition to digital diagnosis in July 2015. We believe we are one of the first laboratories to do this, whereby all histological slides are scanned and most of the diagnoses are made digitally. After the transition to digital diagnostics we faced some challenges, but we also found that the quality of our diagnostics and, especially, the logistics in LabPON had improved in many aspects. After the transition of our diagnostic facility to fully digital we began setting up a new, more accurate flow analysis. I have used the results of the current flow analysis, together with all the gained experience, to get a good overview of the challenges and have noted real quality and logistics improvements in digital diagnostics in our laboratory. We have found that
This fee is waived for those representing academic institutions and not for profit organisations. Industry delegates to present, that goes towards the shared cost of providing the poster presentation area and display boards, guides etc. Poster space is assigned on a first come first served basis (subject to checks and successful registration). We charge an admin fee of $50 to join the heart of this congress. Funding, employment opportunities or simply wanting to share your work with a like-minded and focused group, these are an excellent way to all attendees with your full abstract in and can share your poster as a PDF after the meeting if you desire (optional). Whether looking for be displayed in a dedicated area, with the other accepted posters from industry and academic presenters. We also issue a poster eBook to perform automatic grading of ccRCC histopathological images. From the histopathological images, we extract features describing the nuclear structure and prominence of nucleoli. Following on from our work on nucleoli detection, we have developed new machine learning methodologies to perform automatic grading of ccRCC histopathological images. From the histopathological images, we extract features describing the properties of multiple nucleoli concurrently. This enables us to train classifiers that can distinguish the level of pleomorphism of the nuclei in the tissue sample, resulting in a higher accuracy in the automated grading. The Fuhrman grading system for clear cell Renal Cell Carcinoma (ccRCC) was developed around these observed changes in the nuclei. It provides rules to classify the different stages of disease progression. Early stage ccRCC tumors typically have small, round nuclei with inconspicuous nucleoli, while late stage tumors have enlarged and irregularly-shaped nuclei with prominent nucleoli. Following on from our work on nucleoli detection, we have developed new machine learning methodologies to perform automatic grading of ccRCC histopathological images. From the histopathological images, we extract features describing the properties of multiple nucleoli concurrently. This enables us to train classifiers that can distinguish the level of pleomorphism of the nuclei in the tissue sample, resulting in a higher accuracy in the automated grading.

MAKING A POSTER PRESENTATION

Poster presentation sessions will take place in breaks and alongside the other breakout sessions of the conference. Your presentation will be displayed in a dedicated area, with the other accepted posters from industry and academic presenters. We also issue a poster eBook to all attendees with your full abstract in and can share your poster as a PDF after the meeting if you desire (optional). Whether looking for funding, employment opportunities or simply wanting to share your work with a like-minded and focused group, these are an excellent way to join the heart of this congress.

In order to present a poster at the congress you need to be registered as a delegate. Please note that there is limited space available and poster space is assigned on a first come first served basis (subject to checks and successful registration). We charge an admin fee of $50 to industry delegates to present, that goes towards the shared cost of providing the poster presentation area and display boards, guides etc. This fee is waived for those representing academic institutions and not for profit organisations.
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