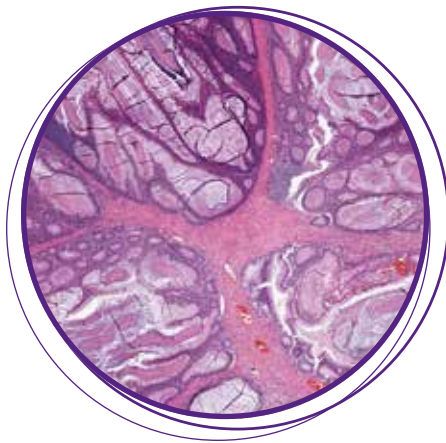


# 5<sup>TH</sup> DIGITAL PATHOLOGY & AI CONGRESS: ASIA

TOKYO, JAPAN  
2-3 April 2019



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Medical Imaging Technology



Japanese Society  
of Digital Pathology



Global Engage is pleased to announce that the **5<sup>th</sup> Digital Pathology & AI Congress Asia 2019** will be taking place in Tokyo, Japan on the 2<sup>nd</sup> & 3<sup>rd</sup> of April 2019.

This highly respected event is a part of our Digital Pathology series with over 200 yearly attendees. The 5<sup>th</sup> Digital Pathology & AI Congress Asia 2019 aims to bring together professionals from the field of pathology to present on digital pathology and all its current topics and advancements, as well as to foster learning and provoke conversations in all matters related to the subject area.

This year our congress will have a special focus on artificial intelligence and its use in pathology together with presentations on medical image analysis and computational pathology among others. To complement the excellent speaker line up, we will also have over 5 hours of networking sessions, panel discussions that will explore the new aspects of this field as well as a diverse exhibition room filled with solution providers showcasing their latest technologies.

EXPERT SPEAKERS  
INCLUDE



**SYLVIA ASA**  
Professor, University  
of Toronto, Canada



**ICHIRO MORI**  
Professor, University of  
Health & Welfare, Japan



**BRIAN LOVELL**  
Professor, The University  
of Queensland, Australia



**SAROJ MISHRA**  
Professor, Sanjay Gandhi  
Postgraduate Institute of Medical  
Science, India



**YUKAKO YAGI**  
Director of Pathology,  
Memorial Sloan Kettering  
Cancer Center, USA



**LEE HWEE KUAN**  
Senior Principal Investigator,  
A-STAR, Singapore



**JUAN ANTONIO  
RETAMERO DÍAZ**  
Pathologist, Granada University  
Hospital, Spain



**NEELAM DOSHI**  
Associate Professor, Bond  
University, Australia

DAY 1

STREAM 1

**Trends 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
- Digital Pathology: Benefits, Barriers and Future Implication

STREAM 2

**Computational Pathology & Artificial Intelligence**

- 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

DAY 2

STREAM 1

**Digital Image Analysis**

- Challenges and Solutions
- Latest Development in DIA
  - 3D Imaging
  - Lens - Free Scanning
  - Holographic Imaging
- User Interfaces
- Pattern Recognition & Annotation Tools
- Algorithm Development
- Image Analysis Algorithms
- Image Processing, Quality & Scanning Speed

STREAM 2

**Digital Pathology Applications & Research Case Studies**

- User Experience
- Telepathology
- Diagnostic Studies
- Tissue-Based Research
- Digital Biobanking
- Technological Advances

**BOOK NOW**



# 5<sup>TH</sup> DIGITAL PATHOLOGY & AI CONGRESS: USA

**UNDERSTANDING & UTILIZING DIGITAL PATHOLOGY AS A TOOL FOR ADVANCING PATHOLOGY PRACTICE & ENABLING ENHANCED PATIENT CARE**

**35 Presentations** from Industry and Academic Leaders

**Poster Presentations** and Competition

**300 Attendees**

A **Buzzing Exhibition** Hall Featuring Key Technology and Solution Providers in the Field

**25 Exhibitors**

**6 Roundtable Sessions**  
An **Executive Panel Discussion** on Implementing AI

**Pre-Event Workshop**



Sponsored by **Akoya Biosciences**  
Wednesday June 12<sup>th</sup> 2019, 12pm-4pm

**Pre-Event Workshop**



Sponsored by **Aiforia**  
Wednesday June 12<sup>th</sup> 2019, 5pm-9pm

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POSTER PRESENTATIONS

**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 USD 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.

## CONFIRMED SPEAKERS



**WAEAL AL-ZOUGHBI**  
Physician – Scientist, Medical  
University of Graz, Austria



**YUKAKO YAGI**  
Director of Pathology,  
Memorial Sloan Kettering  
Cancer Center, USA



**LEE HWEE KUAN**  
Senior Principal Investigator,  
A-STAR, Singapore



**JUN XU**  
Professor, Nanjing University  
of Information Science and  
Technology, China



**HANRY YU**  
Professor, Department of  
Physiology, Yong Loo Lin  
School of Medicine, National  
University of Singapore,  
Singapore



**ICHIRO MORI**  
Professor, International  
University of Health &  
Welfare, Japan



**BRIAN LOVELL**  
Professor, The University of  
Queensland, Australia



**JUAN ANTONIO  
RETAMERO DÍAZ**  
Pathologist, Granada  
University Hospital, Spain



**ZHONGXI ZHENG**  
Professor, Pathology  
Laboratory, West China  
Hospital, China



**ANDREY BYCHKOV**  
Director of Digital Pathology,  
Kameda Medical Center, Japan



**SYLVIA L. ASA**  
Professor, Laboratory of  
Medicine and Pathobiology,  
University of Toronto, Canada



**SAROJ MISHRA**  
Professor, Sanjay Gandhi  
Postgraduate Institute of  
Medical Science, India



**MASATAKA KAWAI**  
Researcher, University of  
Yamanashi, Japan



**RAJENDRA SINGH**  
Professor, Department of  
Pathology & Dermatology,  
Icahn School of Medicine,  
Mt.Sinai, USA



**ERDENETSOGT  
DUNGUBAT**  
Associate Professor,  
International University of  
Health and Welfare, Japan



**MOHAMMAD FAIZAL  
AHMAD FAUZI**  
Associate Professor, Faculty  
of Engineering, Multimedia  
University, Malaysia



**WENYIH LIANG**  
Director of General Pathology,  
Department of Pathology &  
Laboratory Medicine, Taipei  
veterans General Hospital,  
Taiwan



**NEELAM DOSHI**  
Associate Professor, Bond  
University, Australia



**MATTIAS  
RANTALAINEN**  
Head of Group, Predictive  
Medicine Research Group,  
Karolinska University, Sweden



**TETSUYA  
TSUKAMOTO**  
Professor, Fujita University,  
Japan



**ARNOLD WILIEM**  
Advance Queensland  
Research Fellow, The  
University of Queensland,  
Australia



**YU WEIMIAO**  
Head of Unit, Computational  
Bioimage Analysis Institute,  
A-STAR, Singapore



**REEM EL BAHTIMI**  
Medical Director International  
Dermopath Consult, United  
Arab Emirates



**KISHIO KURODA**  
Assistant Professor, Nagasaki  
University, Japan



**LEE COOPER**  
Assistant Professor, Emory  
University of Medicine-  
Georgia Institute of  
Technology, USA



**DONGFENG TAN**  
Professor of Pathology and GI  
Medical Oncology, University  
of Texas MD Anderson Cancer  
Center, Houston, USA



**JUNYA FUKUOKA**  
Department of Pathology,  
Nagasaki University Graduate  
School of Biomedical  
Sciences & Kameda Medical  
Center, Japan



**ULYSSES G.J. BALIS**  
Professor of Pathology,  
University of Michigan, USA



**MICHAEL J. NATAN**  
President and CEO, Ultivue  
Inc, USA




**SENIOR  
REPRESENTATIVE**  
PRs

08:00-08:50 Registration & Refreshments

08:50-09:00 **Global Engage Welcome Address and Morning Chair's Opening Remarks: Wael Al-Zoughbi**, Physician – Scientist, Medical University of Graz, Austria

09:00-09:30



**KEYNOTE ADDRESS:  
YUKAKO YAGI**  
Director of Pathology, Memorial Sloan Kettering Cancer Center, USA  
**Future Direction of Digital & Computational Pathology**  
Pathology imaging involves conversion of tumor tissue samples from glass slides to digital images to improve diagnosis while providing an infrastructure for Computational Pathology. The move to a fully digital workflow will allow this enhancement of diagnosis through computer-augmented diagnostic algorithms. Once pathology slides are digitized, morphometric analysis allows the application of mathematical modeling to analyze the histologic features. Machine learning can then be applied to derive more data from the slides, and computational analysis allows the development of algorithms to improve efficiency of slide review, calculate numerical data, and merge pathology data with molecular, clinical or other large data sets. The criteria for diagnosis can thus be made more objective, based on the use of deep learning. AI as a digital assistant will revolutionize diagnostic pathology and research. It will enable pathologists to be faster, more efficient, and more accurate by supplanting subjective with objective criteria. New technologies and testing the newest technologies for enhanced digital microscopy, such as three-dimensional histology, micro-computed tomography imaging, and rapid ex vivo whole tissue microscopy will take important role in Digital and Computational Pathology in future.

09:30-10:00



**KEYNOTE ADDRESS:  
LEE HWEE KUAN**  
Senior Principal Investigator, A-STAR, Singapore  
**Machine Learning Applications in Digital Pathology**  
Machine Learning and Deep Learning methodologies have been successfully used in digital pathology. Especially in the Deep Learning domain, algorithmic developments is very active. Indeed many algorithm developed for applications outside of digital pathology have been used successfully in digital pathology and hence there is little demand for computer vision methodologies development for digital pathology alone. However, factors affecting the success of applying Machine Learning and Deep Learning on digital pathology goes much beyond the advanced algorithm. In another word, data agnostic approach almost surely lead to failure. In this talk, I will discuss and share some of our experiences in working together with clinicians, learning the domain and how we prepare the data for successful applications of advanced machine learning and deep learning application.

10:00-10:30



**SENIOR REPRESENTATIVE**  
PRS  
Title TBC

10:30-11:30 Morning Refreshments / One-to-One Meetings / Poster Presentations

11:30-12:00

**PANEL DISCUSSION:  
Recognising Significance and Barriers of AI Usage in Pathology**  
The possibilities of artificial intelligence revolutionising the field of pathology is irrefutable, as it makes workflow more efficient and increases productivity in disease diagnosis. However, the implementation of AI has become an issue with limitations in technology in terms of data insufficiency, image quality, standardisation of imaging, data synchronising process and much more. AI is still in its stage of infancy with simple digitised image analysis of using algorithms, data mining, structuring and other menial use. For this reason, the true extent of AI and its benefits have not been fully recognised among pathologists. In this session, the potential of AI and its implications in DP will be discussed.



**JUN XU** (Moderator)  
Professor, Nanjing University of Information Science and Technology, China



**KISHIO KURODA**  
Assistant Professor, Nagasaki University, Japan




**WAEAL AL-ZOUGHBI**  
Physician – Scientist, Medical University of Graz, Austria

**TRENDS IN DIGITAL PATHOLOGY**

**Track Chair: Wael Al-Zoughbi**, Physician – Scientist, Medical University of Graz, Austria

12:00-12:25




**MOHAMMAD FAIZAL FAUZI**  
Associate Professor, Faculty of Engineering, Multimedia University, Malaysia  
**Automated Diagnosis & Prognosis in Breast Cancer**  
Digital pathology incorporates the acquisition, management, sharing and interpretation of pathology information in a digital environment. With the advent of whole slide imaging, the field of digital pathology has gained considerable attention, and is currently regarded as one of the most promising avenues of diagnostic medicine. Deep learning, or more specifically, deep

**COMPUTATIONAL PATHOLOGY & ARTIFICIAL INTELLIGENCE**

**Track Chair: Jun Xu**, Professor, Nanjing University of Information Science and Technology, China

12:00-12:25



**HANRY YU**  
Professor, Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore  
**Development of AI - Based Robust Digital Pathology Approached for Liver Diseases Classification**  
Accurate assessment of liver diseases such as fibrosis and NASH suffer from the data variations of the sampling error, staining and imaging heterogeneity in variable clinical lab settings. Experienced pathologists deal with such variations by comparing with other

12:00-12:25

convolutional neural network, is a machine learning algorithm that has also gained a lot of attention recently due to their ability to achieve state-of-the-art accuracy. In this talk we will present our work in utilising deep learning in the diagnosis and prognosis of breast carcinoma. For diagnosis, we employ the deep convolutional neural network to detect and localize tumor regions in Hematoxylin and Eosin (H&E) images of breast carcinoma, which will provide reliable platform for tumor grading. For prognosis, we utilised the network to classify cells according to their staining strength in Estrogen Receptor (ER) image, which is one of the hormone receptor positive factors recognized as a marker for which women with breast cancer would respond to hormonal treatment. Our proposed network is able to provide good and reliable performances despite a limited training dataset.

12:00-12:25

scoring samples in their memory to generate predictive decisions by selecting useful features and neglecting noises. Accordingly, we have developed machine-/deep-learning algorithms on variable quality and imaging conditions of standard light microscopes, commonly available collagen-stains and variable sizes and quality of biopsy samples. We could accurately detect various stages of liver fibrosis and NASH, even intra-stage cirrhotic changes, and applicable for liver fibrosis caused by different etiologies. Using only conventional collagen and H&E stained liver samples, our approaches makes it possible to quantitatively score liver diseases in fully automated manner and partially correct the sampling error in less sophisticated clinical or laboratory settings and applicable for multi-center collaborations and clinical trials.

12:25-12:55

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12:25-12:55

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12:55-13:55 Networking Lunch / One-to-One Meetings / Poster Presentations

13:55-14:20



**ICHIRO MORI**

Professor, International University of Health & Welfare, Japan

**Building Health Evaluation Center in Vietnam, One Business Model of Medical Support of Foreign Countries with WSI Telepathology**

- Our University opened Health Evaluation Center in Ho-Chi-Minh City, Vietnam on September 2018, with full double check of pathology diagnosis from Japan using WSI telepathology. Until late December, we performed telepathology diagnosis about 50 biopsy and 70 cytology specimens.
- Primary diagnosis was made by Vietnamese pathologists followed by pathology double check from Japan in English. Final report is translated in Vietnamese.
- This can provide a new business model of medical support of foreign countries with WSI telepathology.

13:55-14:20



**BRIAN LOVELL**

Professor, The University of Queensland, Australia

**Automated Digital Pathology and Detecting Glomeruli on Renal Direct Immunofluorescence**

This talk will summarise the outcomes of our 8-year collaboration with Sullivan and Nicolaides Pathology on the commercial automation of several major tests — soon to be deployed globally. I describe the scanning system and the huge benefits achieved by this approach. In the second half of the talk I focus on the use of Artificial Intelligence (AI) and Deep Learning. There is high demand to develop computer aided diagnostic techniques for this new digitized pathology data. The ability to extract effective information from digital slides, which serves as fundamental representations of the prognostic data patterns or structures, provides promising opportunities to improve the accuracy of automatic disease diagnosis. AI can be used to analyze images by providing a better interpretation of the detailed information in digital pathology. We introduce a new benchmark dataset for Detecting Glomeruli on renal Direct Immunofluorescence (DGI) to advance this field of research.

14:20-14:45



**JUAN ANTONIO RETAMERO DÍAZ**

Pathologist, Granada University Hospital, Spain

**Complete Digital Pathology for Primary Diagnosis, Two Years on: The Experience at Granada University Hospitals, Spain**

Complete digital pathology and whole slide imaging (WSI) for primary histopathology diagnosis is currently in use in few laboratories across the world. We describe the methodology adopted and resulting experience at Granada University Hospitals (GUH), Spain, which comprises two teaching and two peripheral district general hospitals. Digital pathology was implemented, creating a fully digital multisite network. All histopathology glass slides generated for routine diagnosis were digitized at x40 using the Philips IntelliSite Pathology Solution, that includes an Ultra-Fast Scanner (UFS) and an Image Management System (IMS). All hematoxylin and eosin (H&E) stained preparations, as well as immunohistochemistry (IHC) and histochemistry slides were digitized. The existing sample tracking software and IMS were integrated to allow data interchange by means of Health Level 7 (HL7) protocol. A total of over 115,000 specimens have been signed out using digital pathology as primary means of diagnosis. This comprises in excess of 500,000 digitized glass slides. The scanning error rate during the implementation phase was below 1.5%, and subsequent slide production optimization rendered this rate negligible. Since implementation, GUH pathologists signed out 21% more cases per year on average. Digital pathology is an adequate medium for primary histopathology diagnosis. Successful complete caseload digitization relies on existing sample tracking and integration

14:20-14:45



**RAJENDRA SINGH**

Professor, Department of Pathology & Dermatology, Icahn School of Medicine, Mt. Sinai, USA

**Reliability and Authentication of Data: Key for Building AI Based Tools and Algorithms**

There is a lot of hype about artificial intelligence (AI) and deep learning. There are significant anticipated outcomes and possibilities of changing the present workflows in all areas of medicine. Many organizations are attempting to gather open access data or participate in grand challenges in order to supply their armamentarium of machine learning tools. The key to building true clinically relevant models and algorithms that can predict patient outcomes, management, or prognosis is having access to a large amount of patient data. Big data movements are being amassed at many institutions and conglomerate networks. The only hope of building large data sets is when multiple institutions and organizations find a way to share their data as no single institution would have enough diverse data that would help build tools that can be used worldwide. The innate variation of each institution by itself could cause modeling failures when isolated models are built and transferred to other institution data. Gaining access to high quality big data sources, especially open access, will need to have shared data governance, accuracy, and dependability. Open access platforms with deidentification or anonymization will need to provide these principles to support such deliverables. Web based platforms will allow for collaborative annotations made on the data, which will also need to be verified; in order to produce viable models for real clinical practice. Developed algorithms for an

14:20-14:45

of the information technology infrastructure. Rapid and reliable scanning at 40x equivalent has made possible the transition to a fully digital workflow. Digital pathology associated to efficiency gains in the pre- and analytical phases and creates the foundation for the adoption of computational pathology.



**MICHAEL J. NATAN**

President and CEO, Ultivue Inc, USA  
**High-Throughput, Multiplexed IHC: Catalyst For Digital Pathology**

Ultivue Inc. (Cambridge, MA, USA) develops proprietary, reagent-based solutions for high-speed, multiplexed immunohistochemistry (IHC) via whole-slide tissue imaging. Our InSituPlex™ technology has many advantages over current approaches for clinical immuno-phenotyping:

- The ability to rapidly detect 5, 10, or more targets simultaneously via whole-slide imaging, with no loss in antigenicity;
- The ability to leverage existing auto-stainers and existing fluorescent microscopes with Ultivue's reagent kits to carry out high-throughput analyses of multiple cancer biomarkers; and
- The ability to design and deliver custom biomarker panels that leverage Ultivue's unique barcoding technology.

This presentation will (i) describe the InSituPlex technology and the improvements in workflow available with UltiMapper™ reagents, (ii) review benchmarking data and two case studies on tumor tissue, and (iii) illustrate how this this technology is ushering in the transition from analog to digital pathology.



14:45-15:15

14:20-14:45

atomic pathology practice, research, or education can be shared, trained, and validated in crowd sourced datasets with high variance for reliable modeling. Building such an innovative, interactive, and intuitive workflow will be the first step in fulfilling the role of pathology becoming the center of personalized medicine.

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14:45-15:15

15:15-16:15

Afternoon Refreshments / One-to-One Meetings / Poster Presentations

16:15-16:40



**ERDENETSOGT DUNGUBAT**

Lecturer, International University of Health and Welfare, Japan

**Telepathology - In Mongolia and It's New Direction**

Past (History): In the late 2000s we started an International static Telepathology project in Mongolia at very first time (about 580 cases) along with a consultation service with Pathology Institute at Basel University Hospital in Switzerland (total of 390 cases). This was through simple standardized digital camera-microscope set (by DEZA Project) and store and forward technology (SST & UNFPA Mongolia project). This is the foundation of our current Tele-Pathology practice model. Present: Just like many academic institutions worldwide we are tending to use whole slide imaging for remote diagnosis, utilising by Japanese investigators at the National Pathology center of Mongolia. The most recent experience we have now to exchange digital scanned slides by using the Global remote-control software between National pathology centre of Mongolia and Narita campus - IUHW in Japan for diagnostic reason. Mongolian e-Medicine Center NGO, The center's aim is to contribute with: Development and implementation of E-Health solutions and services that realize the potential in Mongolian health sector. (Hip US-Tele screening project of newborns; Millennium Challenge Corporation project in Mongolia for cervical and breast cancer screening; Master service providing under USRAD agreement.

16:15-16:40



**JUNYA FUKUOKA**

Professor, Nagasaki University Graduate School of Biomedical Sciences & Kameda University, Japan

**Approaches and Challenges of AI in Computational Pathology**

Recent progress of digitization and computational applications brought a high potential of revolution in pathology. AI is one of the promising tools to improve pathology workflow and further contribute to clinical medicine and healthcare. However, to be there, there are several hurdles to overcome. First is the implementation of a digital diagnosis. Although FDA/CE marks did approve the use of digital devices for pathology diagnosis, due to the lack of clear reimbursement plans and motivations, many pathologists are still hesitating to install them. Second is a difficulty to collect good quality data and annotations. To create good platforms giving enough quality for diagnosis, preparing high cost IT infrastructures along with millions of high-quality images and accurate annotations are needed. Due to such limitations, an approach to create AI platform is still challenging. In this session, several other challenges will be pointed out and discussed along with possible solutions.

16:40-17:05



**WENYIH LIANG**

Director of General Pathology, Department of Pathology & Laboratory Medicine, Taipei Veterans General Hospital, Taiwan

**Digital Pathology in Routine Daily Practice**

Nearly one year after the FDA cleared the Philips IntelliSite Pathology Solution for primary diagnosis, there are getting more and more innovative pathology labs are working 100 percent with digital pathology for their current pathology workload. But large-scale adoption in the world may await a few remaining solutions and steps, among them next-generation scanning systems, improved viewing software, solid infrastructure, and an open versus a closed system approach. Full acceptance of the power of artificial intelligence could well be the biggest push of all. In this section, we will discuss the pros and cons of transforming primary diagnosis using traditional microscopic diagnosis into digital whole slide images, share our experience and considerations in planning for the implementation of digital whole slide system and the AI application developing in our department. Finally, we hope all attendant can find the best way and process to their future digital pathology practice.



17:05-17:30

**ZHONGXI ZHENG**

Professor, Pathology Laboratory, West China Hospital, China

**AI for Pathology: Towards Automated Biomarkers Analysis in Breast Cancer**

The biological characteristics of the tumor are used to estimate prognosis and select appropriate therapy for patients with breast cancer. The advent of molecular technology has incorporated new Biomarkers along with immunohistochemical and serum Biomarkers. Immunohistochemical markers are often used to guide treatment decisions, to classify breast cancer into subtypes that are biologically distinct and behave differently. In this paper we will describe a novel deep learning system developed for automatically analyzing four major IHC markers: KI-67, ER, PR, and HER2, we will also provide the information of utilizing this system into clinical practice.

17:30-18:30

Chair's Closing Remarks / Networking Drinks Reception

08:00-08:50 Refreshments

08:50-09:00 **Track Chair: Andrey Bychkov**, Director of Digital Pathology, Kameda Medical Center, Japan

09:00-09:30



**KEYNOTE ADDRESS:  
SYLVIA L. ASA**

Professor, Laboratory of Medicine and Pathobiology, University of Toronto, Canada

**When Digital Pathology Becomes Pathology: Vision 2020**

Pathology is being transformed by the disruptive technology of digital scanning that creates whole slide images. While slow to be adopted, the reality of this new digital pathology world was already in play for primary diagnosis in Toronto in 2011.

Over the last few years, the workflow of a world without glass slides and microscopes has been the focus of many studies. The requirements for clinical use include either recreating or integrating the many advances that have been made by laboratory information systems to facilitate case handling, prioritization, data collection and reporting. Artificial intelligence algorithms using image analysis provide quality assurance as well as quantitative results and ultimately will assist in interpretation but must be incorporated in a way that enhances quality and expedites case completion in a cost-effective way. This presentation will imagine "A day in the life of a pathologist" in the 2020 world of digital pathology.

09:30-10:00



**KEYNOTE ADDRESS:  
SAROJ MISHRA**

Professor, Sanjay Gandhi Postgraduate Institute of Medical Science, India

**Development of Digital Pathology Infrastructure over National Medical College Network (NMCN) Opportunity & Challenges**

Advances and rapid adoption of technologies in medical diagnostics and care pathways like computing and digital image capture, visualization, storage and distribution across enterprise has led to diagnostic assistance and improving

teaching besides facilitating archival system and access to material for research. Recent addition of artificial intelligence and machine learning tools has further refined diagnostics accuracy, filled the gap of skilled pathologists where none exist. Ministry of Health & Family Welfare, Government of India is now linking medical colleges to select medical education institutions of eminence over the national high speed internet network ([www.nkn.in](http://www.nkn.in)) to facilitate knowledge and skill exchange for all category of health professionals ([www.nmcn.in](http://www.nmcn.in)). This opportunity will be used to develop digital pathology network system. Whole Slide Imaging system would be in place in few selected resource centers in order to prepare high quality content which will be stored centrally in a Cloud and can be accessed to authorized users.

10:00-10:30

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10:30-11:30 Morning Refreshments / One-to-One Meetings / Poster Presentations

11:30-12:00

**PANEL DISCUSSION:**

**Implementation of Open Source Software for Enhanced Image Analysis**

A number of commercial and open-source platforms for digital pathology have emerged in recent years. This panel discussion will contrast commercial and open-source solutions from the perspective of adopters. While commercial platforms provide robust functionality and support, their cost can be prohibitive for some users, and they may not address specialized use cases. Open-source solutions are free and can be readily extended to address user-specific needs, but often require significant technical expertise to deploy, and may not have extensive documentation or support. The panel will discuss how these strengths and weaknesses come into play in various digital pathology applications and showcase examples of platforms that have been built using these open source solutions.



**LEE COOPER** (Chair)

Assistant Professor, Emory University of Medicine- Georgia Institute of Technology, USA



**RAJENDRA SINGH**

Professor, Department of Pathology & Dermatology, Icahn School of Medicine, Mt.Sinai, USA

**DIGITAL IMAGE ANALYSIS**

**Track Chair: Andrey Bychkov**, Director of Digital Pathology, Kameda Medical Center, Japan

12:00-12:25



**MASATAKA KAWAI**

Researcher, University of Yamanashi, Japan

**Applied Artificial Intelligence from a Pathological and Engineering Point of View and Data Management in the Next Generation Digital Pathology**

Pathology confronts one of the greatest paradigm shifts in these several years; Digital pathology and associated artificial intelligence (AI). First, I introduce the past, present and future of Digital pathology and AI application in pathology from a pathological and engineering point of view. Subsequently, I present progress of deep learning-based AI system for histology and cytology at my facility. Second, I propose problems associated with data management in relation to digital pathology and AI

**DIGITAL PATHOLOGY APPLICATIONS & RESEARCH CASE STUDIES**

**Track Chair: Lee Cooper**, Assistant Professor, Emory University of Medicine- Georgia Institute of Technology, USA

12:00-12:25



**NEELAM DOSHI**

Associate Professor, Bond University, Australia  
**Digital Pathology Museum**

Pathology is a visual field with traditional didactic teaching and supervised student access to museum specimens. However, limited student access and the logistics to maintain museums impede students' learning. With advances in technology and internet, virtual methods can supplement pathology teaching. We present a cross over study to compare the effectiveness and student perception of a digital pathology museum versus real specimens. Ten digitalised specimens were compared to 10 real Perspex specimens by a spotter exam including clinical scenarios for second year medical students. The mean % test scores were

12:00-12:25

development. Although data availability, maintenance and transfer become more and more important, little attention has been paid in an academic context. I suggest solutions to those problems from technical and ethical aspects.

12:00-12:25

similar for both museum methods with p value of 0.737. The Pearson's correlation co-efficient of 0.52 indicated a moderate positive association between the two museums. Students did equally well with both museums. Approximately 11%, 52% and 37% of participants would prefer digital, real and both museum methods. Digital pathology museums have the potential to pave the future of pathology learning enabling 24-hour access.

12:25-12:55

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12:25-12:55

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12:55-13:55 Networking Lunch / One-to-One Meetings / Poster Presentations

13:55-14:20



**MATTIAS RANTALAINEN**

Head of Group, Predictive Medicine Research Group, Karolinska University, Sweden

**The Prostate Cancer Image Epidemiology Project: Towards Model - Based Histopathology**  
Histopathological assessment of prostate

biopsies is the main mode to detect presence of cancer and to identify clinically relevant cancer. However, there is a shortage of pathology expertise and assessments suffer from high inter-assessor variability, causing both over- and under-treatment that can have severe consequences for individual patients. In this project we develop models for histopathology image classification of prostate cancer biopsy slides using deep convolutional neural networks. We address two problems: (1) detection of cancer and (2) Gleason score classification. The study is based on a large population-based cohort, including >80,000 biopsies. Here we report preliminary results from 8,400 whole slide images (>4 million tiles). Our results indicate a high accuracy for detection of presence of cancer in biopsies (AUC=0.99, independent test set), and an ability to perform Gleason score classification with good accuracy. The results suggest that AI-based decision support may be of importance in future clinical cancer diagnostics.

13:55-14:20



**TETSUYA TSUKAMOTO**

Professor, Fujita University, Japan

**Comparison of Fine-Tuning Deep Convolutional Neural Networks for Classification of Lung Cancer Types from Cytological Images**

Accurate classification of lung cancer types

is indispensable to meet recent progress of chemotherapy. We have previously developed an automated classification scheme for lung cancers presented in microscopic images using a deep convolutional neural network (DCNN). In this study, we have evaluated the effect of fine-tuning using AlexNet, GoogLeNet, and VGG-16 DCNN architectures to improve accuracy of classification. AlexNet consists of 5 convolutional, 5 pooling, and 3 fully connected layers; the last layer was modified to classify 3 lung cancer types. Overall accuracy was 75.5%. GoogLeNet possesses 22 layers without fully connected layers with modification to output 3 cancer categories. Accuracy was as low as 70.8%. VGG-16 is constituted with 16 relatively simple layers and resulted in the best value of 76.8% in accuracy. Taking into account these data, fine-tuning, although depending on the architectures, could be useful for classification of lung cancer cytological images.

14:20-14:45



**ULYSSES G.J. BALIS**

Professor of Pathology, University of Michigan, USA

**Semi- and Fully Automated Image Segmentation and Classification using the SIVQ/VIPR Algorithm**

The recent availability of libraries of digital

whole slide images (WSI) as a component of routine surgical pathology workflow represents a significant opportunity for the implementation of multiple parallel and autonomous image segmentation and classification algorithms, which can assist in the diagnostic process of surgical pathology workflow by shifting primary effort away from screening-based activities towards directed review. This has the net effect of allowing individuals to practice at their highest credentialed level of expertise. Now in its fifth major design generation, utilizing a massively parallel computational GPU-based platform, the University of Michigan has deployed an enhanced version of the Spatially Invariant Vector Quantization algorithm, known as VIPR (Validated Image Pattern Recognition), which allows for real-time analysis of WSI data libraries with sufficient computational throughput that the platform holds promise for serving as a fully-autonomous pre-screening platform. This presentation will include both didactic content and interactive real-time content depicting the operation of the actual computational image platform, making use of real-world examples.

14:20-14:45



**ARNOLD WILIEM**

Advance Queensland Research Fellow, The University of Queensland, Australia

**Transforming Australian Healthcare via Digital Pathology**

In this talk, I will discuss my fellowship research

project in digital pathology in Australia which is a collaboration between Sullivan Nicolaides Pathology and the University of Queensland. Implementing digital pathology systems require close collaborations between the research and industry sectors. The pathology laboratories provide information on areas where automation can make significant different in their workflow. Whereas, the research community can help addressing many open problems in developing the solutions. I will provide progresses and challenges on this journey. Several recent works will be presented

14:45-15:10



**YU WEIMIAO**

Head of Unit, Computational Bioimage Analysis Institute, A-STAR, Singapore

**Recognition of Mitotic Cell Nuclei in H&E Slides: How to Proceed with AI**

Breast cancer is the commonest malignancy

and the leading cause of cancer deaths in females. It can be broadly divided into non-invasive Ductal Carcinoma in situ (DCIS) and invasive malignancies with different subtyping. Cell proliferation is one of the key clinical pathology parameters

14:45-15:10



**WAEAL AL-ZOUGHBI**

Physician - Scientist, Medical University of Graz, Austria

**How Digital Pathology Solves Problems in Academic Research**

Tissue-based research in the era of

precision medicine should provide accurate information about Morphomolecular variables. Image analysis solutions can be applied to answer specific scientific questions. The ideal approach is that an expert with histopathological interpretation

for patient sample assessment, while it is a tedious and time-consuming step for visual investigation and manual counting. The rapid advancement of artificial intelligence and machine learning demonstrated a great potential in cancer patient diagnosis and treatment. In this talk, we will discuss how the AI and ML can help to improve this quantification.

14:45-15:10

translates a scientific question to a mathematical formula to be computed and applied to a patch of tissue sections. Our interest in quantitative image analysis rose as a problem-based approach through collaborative projects. The continuous request from our colleagues and scientific researchers to quantify pathological findings backed by critics from several reviewers to the subjective interpretation motivated us to explore the Digital Pathology field and, so to say, to attempt to replace the semi-quantitative methods. A number of image analysis solutions will be discussed including a comparison between three image analysis solutions: Aperio, Definiens, and a locally developed solution called IQM. Besides, we will share our experience with validating and operating Multiplex immunohistochemistry (cancer immunology panel) and multispectral imaging technologies to help in cancer patient stratification.

14:45-15:10



### REEM EL BAHTIMI

Medical Director International Dermatopath Consult, United Arab Emirates

#### **The Role of Digital Pathology in Dermatopathology**

For over a century, the microscope has been the greatest tool for pathologist. Although, many modifications and improvements have been added to make it more ergonomic, none has changed the work of pathologist like digital pathology. Digital pathology has provided a new era for pathologist.

With the improvements of digital cameras, more and more pathologist now depends on them for measurement and documenting pathological criteria. Digital images have become the standard in many Dermatopathology practices, to document the findings and margins. In addition, it allows for offsite evaluation and diagnosis. Dermatopathology, is an ideal specialty for Digital pathology, as most specimens are entirely submitted in one block, so the area for evaluation is small and limited to one slide. This talk will address the correlation between digital pathology and microscopy in the field of Dermatopathology.

15:10-15:35



### DONGFENG TAN

Professor of Pathology and GI Medical Oncology, University of Texas MD Anderson Cancer Center, Houston, USA

#### **The Status of Digital Pathology as Emerging Tool for Precision Medicine, and Its Use in Academic and Private Settings**

With the advent of whole-slide imaging, the field of digital pathology has exploded during the past decade. Digital pathology has been recently approved by the FDA for primary diagnosis. Now, it is emerging as one of the most promising avenues of precision medicine in order to achieve even better, faster and cheaper diagnosis, prognosis and prediction of cancer as well as other diseases. When those slides are digitized, they then have the potential to be shared as tele-pathology and could be numerically analyzed using computer algorithms. Algorithms can be used to automate the manual counting of structures, or for classifying the condition of tissue such as is used in grading tumors. With the "deep learning" solution offered by computer algorithms, or artificial intelligence, this could reduce human error and improve accuracy of diagnoses. Screening such as cytology screening for cervical neoplasm is emerging as a powerful tool for population-based screening. To fully use of digital pathology in daily practice, it has challenges and much time is need to integrate this methodology to diagnosis and electronic healthcare system.

15:35-16:00

16:00-16:10

Conference Close



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