HIMA: Histopathological Image Analysis Workshop at Pathology Informatics 2019

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Notice of Faculty Disclosure

In accordance with ACCME guidelines, any individual in a position to influence and/or control the content of this ASCP CME activity has disclosed all relevant financial relationships within the past 12 months with commercial interests that provide products and/or services related to the content of this CME activity.

The individual below has disclosed the following financial relationship(s) with commercial interest(s):

Metin Gurcan, PhD

None.
HIMA Organizing Committee

Metin Gurcan, PhD, The Ohio State University
Mike Feldman, MD, PhD, University of Pennsylvania
Anant Madabhushi, PhD, Case Western Reserve University
Nasir Rajpoot, PhD, University of Warwick, England
John Tomaszewski, MD, University of Buffalo
HIMA: 2007-2019
HIMA 2007-2019

8/15-16/2007  Drexel University, Philadelphia, PA
5/15/2008  ISBI, Paris, France
9/6/2008  MICCAI, New York, NY
7/6-7/2009  OSU, Columbus, OH
9/20/2009  MICCAI, London, UK
8/23/2010  ICPR, Istanbul, Turkey
9/19/2010  Pathology Informatics, Boston, MA
10/4/2011  Pathology Informatics, Pittsburgh, PA
8/18/2011  MICCAI, Toronto, Canada
2/9/2012  SPIE MI, San Diego, CA
10/5/2012  MICCAI, Nice, France
10/9/2012  Pathology Informatics, Chicago, IL
05/13/2014  Pathology Informatics, Pittsburgh, PA
05/05/2015  Pathology Informatics, Pittsburgh, PA
5/23/2016  Pathology Informatics, Pittsburgh, PA
5/22/2017  Pathology Informatics, Pittsburgh, PA
5/21/2018  Pathology Informatics, Pittsburgh, PA
5/6/2019  Pathology Informatics, Pittsburgh, PA
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
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<tbody>
<tr>
<td>7:00 am - 8:00 am</td>
<td>BREAKFAST</td>
<td>BALLROOM LOBBY - 2ND FLOOR</td>
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<tr>
<td>8:00 am - 8:05 am</td>
<td>Introduction to HIMA</td>
<td>Metin Gurcan, PhD - Moderator</td>
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<tr>
<td>8:05 am - 8:55 am</td>
<td>Exploring the Future of Digital Pathology in Immuno-Oncology and Companion Diagnostics</td>
<td>George Lee, PhD</td>
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<tr>
<td>8:55 am - 9:50 am</td>
<td>Opportunities for Standardization and Collaboration in Developing Histopathology Image Analysis Algorithms</td>
<td>Steven Hart, PhD</td>
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<tr>
<td>9:50 am - 10:10 am</td>
<td>REFRESHMENT BREAK</td>
<td>Ballroom Lobby - 2nd floor</td>
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<tr>
<td>10:10 am - 11:05 am</td>
<td>Breaking the Barriers of Conventional Optics: Computational Photography in the Clinical Workflow</td>
<td>Itai Hayut, PhD</td>
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<td>11:05 am - 12:00 pm</td>
<td>AI and Pathology in Training: Building and Explaining Algorithms to Medical Students</td>
<td>Scott Doyle, PhD</td>
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<td>12:00 pm - 1:00 pm</td>
<td>LUNCH</td>
<td>Ballroom Lobby - 2nd floor</td>
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<tr>
<td>1:00 pm - 1:55 pm</td>
<td>Digital Pathology &amp; Artificial Intelligence, the Third Revolution in Pathology</td>
<td>Manuel Salto-Tellez, MD</td>
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<td>1:55 pm - 2:50 pm</td>
<td>KINet: Single-stage Nuclear Recognition and Classification for Measuring Ki-67 Proliferation Index (PI) in Pancreatic Neuroendocrine Tumors</td>
<td>Toby Cornish, MD, PhD</td>
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<td>2:50 pm - 3:10 pm</td>
<td>REFRESHMENT BREAK</td>
<td>Ballroom Lobby - 2nd floor</td>
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<td>3:10 pm - 4:05 pm</td>
<td>Models for Implementing Artificial Intelligence in Pathology Practice</td>
<td>Douglas Hartman, MD</td>
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<td>4:05 pm - 5:00 pm</td>
<td>Panel Discussion</td>
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Exploring the future of digital pathology in immuno-oncology and companion diagnostics

• How does our understanding of the tumor microenvironment drive immunotherapy treatment and patient selection strategies?
• Highlight challenges in immuno-therapy and companion diagnostics space with respect to PD-L1 testing
• Overview of emerging technologies and biomarkers (H&E, IHC, and OPAL multiplexing) where robust image analysis solutions are needed
Opportunities for Standardization and Collaboration in Developing Histopathology Image Analysis Algorithms

- How many different ways are there to extract patches?
- Anyone got an OpenSlide patch to read iSyntax?
- What is the standard segmentation XML?
- How will we share AI models and test them prior to publication and implementation?
- How do we as a community level-set our expectations in academia and industry?
Digital pathology is currently limited by hardware cost and imaging capabilities (brightfield, 20X-40X objective lens magnification).

Computational photography is the key to make digital pathology accessible, and to overcome the limits of conventional optics.

This technology enables rapid scanning of entire slides at image resolution comparable to oil-immersion microscopy, while recording both phase and intensity information.

First applications combining high-quality imaging and computer vision tools are currently undergoing clinical trials.
Scott Doyle

HIMA Workshop 2019

AI and Pathology in Training: Building and Explaining Algorithms to Medical Students

- Discuss the challenges in developing a medical school curriculum focused on computational cell biology, anatomy, and pathology
- Present the idea of AI systems training as a pedagogical problem, treating the classifiers as learners and asking questions
- Expanding the Active Learning idea to include human-in-the-loop annotation, training, and knowledge discovery
Digital Pathology & Artificial Intelligence, the Third Revolution in Pathology

- Digital Pathology and Artificial Intelligence are transforming the way we practice pathology at many levels (see graphic)
- This revolution is supported by an unprecedented plethora of new tool development (we will present our experience with QuPath and others)
- This is generating new tools that are transforming our approach to patients (we will present our experience in lung and colon cancer, among others)
KiNet: Single-stage Nuclear Recognition and Classification for Measuring Ki-67 PI in Pancreatic Neuroendocrine Tumors

• Ki-67 IHC proliferation index (PI) is central to grading pancreatic neuroendocrine tumors (PanNETs) per WHO criteria
• Manual scoring is the “gold standard” for measuring Ki-67 PI, widely used clinically, yet not well standardized
• To address this issue we have developed KiNet, which uses deep learning to perform single pass detection and classification of nuclei in Ki67-stained tissue
There is lots of excitement about the potential of artificial intelligence in diagnostic pathology. Published uses of artificial intelligence will be discussed.

The current problems that are in need of solving by artificial intelligence will be discussed.

The regulation in this field is emerging and the early rules will be discussed.

Real-world use of artificial intelligence within the surgical pathology workflow will be described.
HIMA - Resources

Keep in touch
• Email list
HIMA - Resources

Keep in touch

- Twitter: Himaweb
Histopathological Image Analysis (HIMA) is an unofficial group with the goal to promote and advance histopathological image analysis by organizing a series of meetings, workshops, seminars, by publishing relevant papers, opinion pieces, giving presentations, by creating and supporting a community of interested parties and facilitating better communication in this community.

Drs. Gurcan, Madabhushi, Feldman and Tomaszewski organized the first Histopathological Image Analysis (HIMA) workshop in 2007, which was attended by 12 people. Since that workshop, they organized 14 more meetings at different venues (IBIRIS, ISBI, MICCAI, ICPR, XIPR meetings) and locations (Paris, New York, Toronto, Nice). Currently one.
Histopathological Image Analysis: A Review

Metin N. Gurcan, Senior Member, IEEE, Laura E. Boucheron, Member, IEEE, Ali Can, Anant Madabhushi, Senior Member, IEEE, Nasir M. Rajpoot, Member, IEEE, and Bulent Yener, Senior Member, IEEE

Methodological Review
## Papers and Special Issues

<table>
<thead>
<tr>
<th>Year</th>
<th>Special Issue Description</th>
<th>Papers</th>
<th>Journal</th>
<th>Editors</th>
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<tr>
<td>2009</td>
<td>Special Issue on Multivariate histology</td>
<td>4</td>
<td>IEEE Trans on Medical Imaging</td>
<td>Editors: Gurcan, Dhawan</td>
</tr>
<tr>
<td>2012</td>
<td>Special Issue on 3rd HIMA workshop proceedings</td>
<td>12</td>
<td>Journal of Pathology Informatics</td>
<td>Editors: Gurcan, Madabhushi, Rajpoot</td>
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<tr>
<td>2013</td>
<td>Special Issue on 4th HIMA workshop proceedings</td>
<td>12</td>
<td>Journal of Pathology Informatics</td>
<td>Editors: Gurcan, Madabhushi, Rajpoot</td>
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- Cytometry A: Special Issue, 2016
- Journal of Medical Imaging: Special Issue, 2016
HIMA - Resources

Journal

• Journal of Pathology Informatics
Research Article

Barriers and facilitators to adoption of soft copy interpretation from the user perspective: Lessons learned from filmless radiology for slideless pathology

Emily S. Patterson, Mike Rayo, Carolina Gill¹, Metin N. Gurcan²
Special Thanks to

Mark Tuthill, MD
Ul Balis, MD
Anil Parwani, MD, PhD, MBA
and
Beth Gibson