Artificial Intelligence (AI) in Medical Imaging Workshop

"Fostering innovative collaborations in applications for diagnostic medical imaging."

Thursday, August 23rd - Friday, August 24th

NIH Main Campus

Sponsored by: National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering (NIH/NIBIB), Radiological Society of North America (RSNA), American College of Radiology (ACR), and The Academy for Radiology & Biomedical Imaging Research (The Academy)

Dr. Steven Seltzer, Chair of CIBR, presents during a session called "The Human Machine". Dr. Seltzer's presentation was called "The Diagnostic Cockpit".

Bethesda, MD – The Academy is very pleased to have co-sponsored another important workshop, this time with a focus on the future of artificial intelligence (AI) in medical imaging. Taking place on the NIH's Main Campus in the Masur Auditorium, this event featured four presentation "blocks" with themes ranging from *Foundational Research in Machine Learning* to *A View of the Future,* where Dr. Steven Seltzer, Chair Emeritus Brigham and Women's, detailed the Academy initiative the "Diagnostic Cockpit of the Future."

Along this theme, the Academy has continued to advocate for implementation of the research investment recommendations of the Interagency Working Group on Medical Imaging that was commissioned by the White House in 2015 and rendered its report in the Fall of 2016. Towards this goal, the Academy has sponsored 3 interdisciplinary Workshops over the past 9 months, including: a Symposium on the creation of the Diagnostic Cockpit of the Future, a Symposium with the National Institute of Standards and Technology (NIST) about the needs and challenges facing development of inter-operable data standards for digital diagnostic data generated by imaging, pathology and several 'omics' fields, and finally this most recent NIBIB Workshop regarding the role of AI in imaging diagnostics. The below timeline reflects a progression of noteworthy events that have helped lead to the successful execution of these events.

Throughout this two-day workshop, attendees were able to participate in six open sessions , including; *An Overview of AI in Medical Imaging,* led by Kris Kandarpa (NIH/NIBIB), *Gaps in Foundational Research in Machine Learning,* led by Brad Erickson (Mayo Clinic), *Data Needs for Machine Learning in Clinical Imaging,* led by Adam Flanders (Jefferson University Hospitals), *Examples of Machine Learning in the Imaging Life Cycle,* led by Ge Wang (RPI), *Artificial Intelligence Implementation Issues: The Last Mile,* led by Bibb Allen (ACR), and finally *The Human Machine,* led by Steven Seltzer (Brigham & Women's, CIBR). These six collaborative sessions each featured a panel discussion led by the presenters from the session. These groups of experts were able to lead dynamic Q&A discussions and facilitate meaningful and productive conversation.

A panel of presenters from "Examples of Machine Learning in the Imaging Life Cycle" in session. This panel included two members of the Academy's Council of Early Career Investigators in Imaging, Dr. Matt Lungren (Stanford) and Dr. Luciano Prevedello (Ohio State University).

Academy leaders Dr. Pamela Woodard, Washington University & Dr. Steven Seltzer, Harvard.

This workshop engaged a multitude of imaging and AI stakeholders including; NIH, National Institute of Standards and Technology (NIST), U.S. Food and Drug Administration (FDA), Stanford University, Harvard University, and the Rensselaer Polytechnic Institute (RPI), as well as a range of Academy leadership and members. Dr. Steven Seltzer, Chair of the Academy's Coalition for Imaging and Bioengineering Research, was instrumental in the workshop's creation and chaired one its sessions. Two members of the Academy's Council of Early Career Investigators in Imaging were asked to present; Dr. Luciano Prevedello from Ohio State University spoke on detection, as it relates to examples of machine learning in the imaging life cycle, while Dr. Matthew Lungren from Stanford University gave his thoughts on classification for this same topic.

Members of the Academy who participated in the workshop providing positive feedback:

"The workshop was an incredible opportunity to gather the leaders in the radiology AI field from multiple societies together with the NIH to discuss the state-of-the-field in all aspects of the medical imaging enterprise from image reconstruction to diagnostic decision support. We heard from leading AI groups from both large and small institutions as well as industry who covered latest research directions, challenges, and controversies. One of the most exciting parts of the workshop was the participation by active and engaged attendees who, during the discussion panels, raised many important questions and topics that spurred outstanding interactions between the researchers. Hope to continue the dialogue from this meeting at other gatherings such as upcoming RSNA and ACR meetings and hope to continue to support the NIH efforts to engage with the research community in this exciting and very active area of research." – **Matthew Lungren, MD, MPH, Member of the Academy Council for Early Career Investigators in Imaging**, Associate Director, Stanford Center for Artificial Intelligence in Medicine and Imaging, Assistant Professor of Radiology, Stanford University School of Medicine.

"This meeting demonstrated the potential of AI as a paradigm changer in imaging. AI has the potential not only to improve efficiency in quality assurance and diagnostic imaging, but also – in the long term – to move the role of the radiologist from diagnostician to prognostician, coupling genetic and outcomes information with imaging parameters to allow radiologists, as consultants, to directly inform the therapeutic pathway." – **Pamela Woodard, MD, Academy Executive Committee Member**, Professor of Radiology & Biomedical Engineering, Mallinkrodt Institute of Radiology, Washington University.

"The AI in Imaging Workshop was a great success in that it brought together the entire spectrum of the AI in medicine 'intelligence' at one place at one time. Many exciting ideas and perspectives were shared. The meeting boosted enthusiasm for finding practical ways to introduce AI tools and solutions into the 21st century clinical workflow." – **Steven Seltzer, MD, Chair, Coalition for Imaging & Bioengineering,** Chairman Emeritus, Brigham and Women's Hospital, Department of Radiology.

"I am very happy to see the Academy join forces with ACR, RSNA and NIH to set the right trajectory for Artificial Intelligence in Medical Imaging so we can continue improving care and the lives of our patients"- **Luciano Prevedello, MD, MPH, Member of the Academy's Council of Early Career Investigators in Imaging,** Associate Professor, Ohio State Wexner Medical Center.

The topic of AI has become vitally important when discussing the future of medical imaging. With the engagement of multiple stakeholders from industry, academia, and clinical settings, this workshop's outcomes will help to answer the important questions surrounding this subject. In addition, the Academy was pleased that its initiative to build a prototype 'diagnostic cockpit of the future' was so well received and supported by meeting attendees. The Academy will continue to seek ways to advance the goals and initiatives recommended by the IWGMI, as well as to find ways and means to build a prototype diagnostic cockpit that can provide a proof of concept that interdisciplinary diagnostics are the way of the future. The Academy has no doubt that AI will be playing a significant role.

The Academy's broad membership is comprised of over 200 members including; academic radiology research departments, imaging societies, industry partners and patient advocacy groups. This workshop was able to bring together a wide range of these members including; *University of Minnesota, GE Healthcare, Vanderbilt University, American College of Radiology, University of Pennsylvania, Massachusetts General Hospital, The Ohio State University Wexner Medical Center, Johns Hopkins University, University of Iowa, Washington University in St. Louis, UT Southwestern Medical Center, Thomas Jefferson University Hospital, Stanford University, Memorial Sloan Kettering Cancer Center, University of Pittsburgh, Mayo Clinic, Cleveland Clinic, Siemens Healthineers, Brigham and Women's Hospital, Canon Medical Research USA, Radiological Societies of North America, University of Texas MD Anderson Cancer Center, University of California, San Francisco, and Case Western Reserve University.*

Please note that a video recording of the entire two-day workshop is available on the NIBIB website for those who were not able to attend or watch live.