SinaInnovations 2019: A Close-up Look at Artificial Intelligence

What is the role of artificial intelligence (AI) in medicine, and how is it changing the practice of health care as we know it? That was the subject of the eighth annual SinaInnovations Conference, held Tuesday, October 15, and Wednesday, October 16, in Stern Auditorium. The event featured leading physicians and scientists from academia and industry who spoke about their work in deploying AI—the most powerful technology under development—to augment discovery and clinical use. Experts shared their experiences in using AI in a variety of ways, from medical imaging, to predicting disease, to keeping people healthy, and highlighted the massive transformation taking place in health care and medicine, where software is driving innovation.

Michael Snyder, PhD, Chair of the Department of Genetics, and Director of the Center for Genomics and Personalized Medicine at Stanford University, a keynote speaker,

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Researcher Is Elected to National Academy of Medicine

Rachel Yehuda, PhD, a world-renowned researcher whose pioneering discoveries have revolutionized the study and treatment of post-traumatic stress disorder (PTSD), has been elected to the National Academy of Medicine. Dr. Yehuda is Professor and Vice Chair for Veterans Affairs for the Department of Psychiatry, Professor of Neuroscience, and Director of the Traumatic Stress Studies Division at the Icahn School of Medicine at Mount Sinai. This Division also includes the PTSD Clinical Research Program and the Neurochemistry, Neuroendocrinology, and Molecular Biology Lab at the James J. Peters Veterans Affairs Medical Center in the Bronx.

The National Academy of Medicine is a nonprofit, nongovernmental organization that provides independent, objective analysis and advice on health issues. Its members are elected through a selective process, and election is considered one of the highest honors in health and medicine. With this election, Mount Sinai has 23 faculty members in the Academy.
discussed the role of AI in advancing personalized medicine. “I see a world where, with genome sequencing and continuous monitoring using wearable devices, we can better manage people’s health and hopefully do this at an individual level, and have personal machine-learning algorithms that follow people and their health state,” Dr. Snyder said. “We’re very capable of measuring more things, and here’s an area where AI can make a big impact.”

Melissa A. Haendel, PhD, Director of Translational Data Science at Oregon State University, spoke about her work in leading the federally funded Monarch Initiative, which is building sophisticated algorithms that integrate a multitude of data about rare diseases in order to improve research and clinical care. “No one group is actually annotating a disease model that has all the same attributes,” Dr. Haendel said. “We can’t even count the number of rare diseases.” Her team’s goal, she said, is to pull all of the data together and use it to build models that help physicians make earlier diagnoses, identify biomarkers of disease, and find better treatments.

David Sontag, PhD, Associate Professor of Electrical Engineering and Computer Science at Massachusetts Institute of Technology, discussed how AI can be used to redesign electronic medical records so they can yield more reliable information on the patient’s risk for various diseases. In one case, he said, his team developed a machine-learning algorithm to help an infectious disease clinician at Massachusetts General Hospital and Brigham and Women’s Hospital reduce the number of unnecessary prescriptions for antibiotics.

AI is already playing a role in augmenting radiology. Keith J. Dreyer, DO, PhD, Vice Chairman, Radiology, at Massachusetts General Hospital and Chief Science Officer of the American College of Radiology, told the audience that “AI has huge value” and will be increasingly useful over time as the field matures.

In his keynote address, Pieter Abbeel, PhD, an entrepreneur and Professor of Electrical Engineering and Computer Science at the University of California, Berkeley, showed how deep machine learning takes place through constant repetition. In one example, he illustrated how a robot learns to run. After 2,000 iterations, it will become proficient. By comparison, a healthy human child would learn to run proficiently after roughly two weeks of practice. In many cases, he said, machines have achieved human-level error rates.

Among the many algorithms Stanford University is working on is one that recognizes the photo of a radiological image taken with a mobile phone, according to Curtis Langlotz, MD, PhD, Director of Stanford’s Center for Artificial Intelligence in Medicine and Imaging. This technology would allow general practitioners and other health care professionals in remote areas to use their mobile phones to access an algorithm that would assist them in making medical decisions when a radiologist is not available. For example, they would be able to determine whether a patient with, say, tuberculosis, should be discharged from the hospital.

Speakers and attendees at the conference agreed that AI is both promising and challenging. Suresh Venkatasubramanian, PhD, Professor of Computing at the University of Utah, cautioned that inherent bias in the data will create bias in the algorithms. “Models are fragile,” he said. “The Achilles heel is that the more sophisticated a system gets, especially with deep learning, the more sensitive it gets to small perturbations, and this could wreak havoc on the system.”

Greg Zaharchuk, MD, PhD, Professor of Radiology (Neuroimaging and Neurointervention) at Stanford University, concluded his talk with a nod to the future. “I think we’re only scratching the surface. This is a moment of extreme creativity, and it’s a very exciting time to be in the field.” Rather than replacing radiologists and other medical specialists, he added, AI “is really going to extend our abilities as physicians.”

New Gift Supports Young Entrepreneurs at Mount Sinai

This year, for the first time, a nonprofit biotech accelerator company founded by five former postdocs at the Icahn School of Medicine at Mount Sinai presented the school with a five-year, $50,000 gift to support young entrepreneurs in the New York City area whose science is being used to create therapies, devices, and diagnostics that support human health. The gift from The Keystone for Incubating Innovation in Life Sciences (KiiLN) went to Raymond A. Alvarez, PhD, Assistant Professor of Medicine (Infectious Diseases) at the Icahn School of Medicine at Mount Sinai, who is working on a platform that identifies and studies the antibodies of individuals who are immune to hantaviruses, which are spread by rodents and have a 38 percent mortality rate. Currently, there are no vaccines or treatments for hantaviruses.
The Diversity Innovation Hub (DIH), a groundbreaking initiative of the Icahn School of Medicine at Mount Sinai, was launched on Monday, October 14, at Davis Auditorium. The mission of DIH is “to connect the dots between innovation work and diversity and inclusion,” said Gary C. Butts, MD, Chief Diversity and Inclusion Officer, Mount Sinai Health System, and Dean for Diversity Programs, Policy, and Community Affairs, Icahn School of Medicine at Mount Sinai, who founded the group with a team of Mount Sinai students, faculty, and staff.

The keynote speaker, Dhaval Bhanusali, MD, exemplifies the goals of DIH. During his residency in dermatology at the Icahn School of Medicine, Dr. Bhanusali created a digital health start-up. Later, as a clinician, he created a platform that allows physicians to prescribe personalized therapies at a low cost to patients. “If it doesn’t exist, build it. Sometimes there is no blueprint, so you must create it,” he told the nearly 200 attendees, who included faculty, staff, and community members.

On Wednesday, January 22, 2020, DIH will hold its first Pitch Day, in which participants will be invited to develop solutions addressing social determinants of health. In the spring, DIH will launch a fellowship in entrepreneurship and technology for Mount Sinai medical and graduate students who are women or from underrepresented minority groups.

Diversity Innovation Hub Launches With a Mission

2019 Mount Sinai Health Hackathon Winners

One hundred eighty medical and graduate students, and others, formed 19 teams to participate in the fourth annual Mount Sinai Health Hackathon in October. The 48-hour competition, held over the weekend leading up to the SinaInnovations Conference, challenged the participants to create novel health care solutions that would expand the limits of human performance. Three teams each received checks totaling $2,500 and will have the opportunity to pitch their ideas again in 2020 at Mount Sinai’s Innovation Showcase before a group of entrepreneurs and venture capitalists. They will be joined by a fourth wild-card team chosen from the non-finalists.

Scott L. Friedman, MD, Dean for Therapeutic Discovery, and Chief of the Division of Liver Diseases at the Icahn School of Medicine at Mount Sinai, told the participants, “We started this event four years ago as part of a larger effort to spur innovation. This is really the embodiment of our values about teamwork and doing great things.”

The three team finalists were (in photo below): Deliberate: Improving the quality of care in psychotherapy through confidential recording and analysis. Team members: Marc Aafjes, Michael Balangue, Do Hyung Kwon, Hansaim Lim, and Paulo Serodio.

George: An artificial intelligence application that allows dialysis providers to optimize scheduling and improve a clinic’s efficiency. Team members: Katie Depue, David Koellhofer, and Brendan Reilly.

Deep Brain Precision: An app that would allow physicians to monitor a patient’s progress after receiving deep brain stimulation for Parkinson’s disease and other motor disorders. Team members: John Di Capua, Taylor Miller, Ashley So, and Danielle Soldin.

Sponsors and partners: Accenture; Altice Business; Cisco; Farmer’s Fridge; Kitware; PepsiCo; Persistent Systems; the National Center for Advancing Translational Sciences, National Institutes of Health; and the Christopher & Dana Reeve Foundation.

For more information or to get involved, please visit dihub.co.
Annual Gala Champions Prostate Cancer Research

The Milton and Carroll Petrie Department of Urology at the Icahn School of Medicine at Mount Sinai raised more than $1 million at its Fourth Annual Prostate Cancer Research Gala on Wednesday, November 6, to support patient care, research, prevention, and education. Roger Goodell, Commissioner of the National Football League (NFL), and Don Garber, Commissioner of Major League Soccer (MLS), were Co-Chairs of the event, held at Cipriani 42nd Street. Television host Seth Meyers was the emcee.

The gala honored Arthur Blank, owner of the NFL's Atlanta Falcons and MLS's Atlanta United; and Nina Bhardwaj, MD, PhD, Professor of Medicine (Hematology and Medical Oncology) and Director of Immunotherapy at The Tisch Cancer Institute at the Icahn School of Medicine, who spearheaded the gala.

"We're grateful to Mr. Blank and Dr. Bhardwaj for their support in advancing our understanding of prostate cancer," said Ash Tewari, MBBS, MCh, Chair of the Department of Urology at the Mount Sinai Health System and the Kyung Hyun Kim, MD Professor of Urology at the Icahn School of Medicine at Mount Sinai.

Mr. Blank, owner and Chairman of the Blank Family Businesses and a member of The Milton and Carroll Petrie Department of Urology Chairman's Board, said, "The work being done by Mount Sinai has forever changed the course of research and medicine. I feel beyond fortunate to have been one of the lives saved because of their work and will continue to be a champion for their efforts."

The gala kicked off the three-day 2019 International Prostate Cancer and Urology Symposium at The Mount Sinai Hospital, which featured in-depth training and lectures from more than 100 urologists, surgeons, oncologists, and other providers. Guest speaker Deepak Chopra, MD, FACP, a renowned pioneer in integrative medicine and personal transformation, discussed the mind/body cancer connection.

Researchers Is Elected to National Academy of Medicine

Traumatic stress first interested Dr. Yehuda when she was a postdoctoral fellow in biological psychology at Yale Medical School in 1987. She and colleagues observed that Vietnam War combat veterans with PTSD had significantly lower levels of cortisol, a steroid hormone that helps regulate physiological responses to stress, compared to those without PTSD. It was a provocative discovery because elevated cortisol levels are typically associated with stress. The work led to a new understanding: In response to acute stress, ample cortisol levels are critical to mobilizing—and then containing—numerous stress-related mediators, such that those who have lower cortisol levels at the time of trauma exposure are at elevated risk for PTSD.

As Dr. Yehuda was concluding her fellowship and about to join the Icahn School of Medicine at Mount Sinai in 1991, she wondered if lower cortisol levels would also be present in other groups of trauma survivors, and initiated biological studies in Holocaust survivors. A pilot study of 100 survivors revealed that half had PTSD, and that they, too, had lower cortisol levels. To continue her work, she established a specialized treatment program for Holocaust survivors and their families at The Mount Sinai Hospital. After years of study, Dr. Yehuda and her team of researchers had new revelations: that many Holocaust survivors and their adult offspring had epigenetic changes on the same region of a gene known as FKBP5 that is related to stress, demonstrating—for the first time in people—an epigenetic link between parental trauma and offspring effects.

Her current research interests include studying PTSD biomarkers, and other innovative PTSD prevention strategies and treatment, including the use of psychedelic medications. Today, the Icahn School of Medicine at Mount Sinai has one of the largest programs in the nation for the study of PTSD biomarkers.

In April, Dr. Yehuda was named principal investigator of a nearly $6 million grant from the United States Department of Defense through its U.S. Army Medical Research program to test whether a one-time dose of a drug—oral hydrocortisone—can prevent PTSD and related mental health disturbances in both civilians and military personnel. Oral hydrocortisone is a synthetic glucocorticoid similar to the body's own cortisol. The double-blind, randomized, placebo-controlled trial will be conducted on 220 recently traumatized patients presenting to the Emergency Department of The Mount Sinai Hospital and Chaim Sheba Medical Center in Israel, an academic research center.

"It has been a privilege to learn from trauma survivors and lead a first-rate research team that is devoted to developing strategies for treating PTSD,” says Dr. Yehuda. “The Icahn School of Medicine has provided the very best possible environment for fostering innovation in psychiatry research.”
Mount Sinai Physician Receives Lifetime Achievement Award for LGBTQ Health Equity

GLMA, a national organization committed to ensuring equity for LGBTQ patients and health professionals, presented a Lifetime Achievement Award to Stephen E. Goldstone, MD, Assistant Clinical Professor of Surgery, Icahn School of Medicine at Mount Sinai. The group, formerly the Gay and Lesbian Medical Association, honored Dr. Goldstone at its annual meeting in September in New Orleans. Dr. Goldstone is a respected mentor to LGBTQ medical students and was instrumental in starting the Icahn School of Medicine’s first LGBTQ student and faculty group. He is also nationally known for his groundbreaking research in HPV and anal cancer prevention and treatment for gay and bisexual men. “Dr. Goldstone’s work is truly remarkable,” says David L. Reich, MD, President, The Mount Sinai Hospital and Mount Sinai Queens. “He richly deserves this recognition for his dedication to student development and to LGBTQ health equity.”

Stephen E. Goldstone, MD, left, received the award from Gal Mayer, MD, President of GLMA.

Improving Health and Fitness, One Step at a Time

When Vanessa Rivera, Staff Accountant for New York Eye and Ear Infirmary of Mount Sinai, learned about the 2019 Reach Your Peak (RYP) 3.0 Walking Wellness Challenge earlier this year, she knew it would be the motivation she needed to commit to an exercise program.

So did many others. Approximately 4,000 faculty and staff throughout the Mount Sinai Health System—a record number for the third installment of the program—enrolled and aimed to walk 10,000 steps a day over a 12-week period. Ms. Rivera talked up the effort among her Department of Finance colleagues at the Mount Sinai Corporate Services Center. Ultimately, 15 of them formed “Team Turtle,” they appointed Ms. Rivera captain, and they started walking, each tracking steps through apps and logging them weekly.

They walked individually and, occasionally, as a group. “We were not alone,” says Ms. Rivera. “We definitely encouraged each other. I would send daily motivational emails.” On workdays, Team Turtle members, like other participants, walked during lunchtime, and for their commutes, they walked to more distant bus or train stops. Ms. Rivera gained extra steps playing soccer on the weekends, she says.

Providing motivation to all participants across the Health System were videos posted on the Mount Sinai Wellness website that featured stretches and exercises to improve strength. At the conclusion of the program in August, participants not only achieved their walking goals, but reported other improvements—weight reduction, healthier eating habits, and a desire to return to former active hobbies, for example. Says Ms. Rivera: “The trick is to keep walking. Find any excuse to walk. Every step you take adds up.” For Team Turtle, it surely did: they logged an average of 20,909 daily steps. “We all feel we are more fit and more energetic,” says Ms. Rivera.

To learn more about RYP, personal nutrition coaching services, exercise videos, and additional wellness offerings, visit www.mountsinai.org/about/ms-fit/wellness, and watch for announcements about registering for RYP 4.0 in 2020.
Individuals and teams from the Mount Sinai Health System were honored for significant advances in biomedical research, technology, and medicine at the fifth annual Mount Sinai Innovation Awards ceremony, which was held Monday, October 14, in conjunction with the SinaiInnovations conference.

Two faculty members from the Department of Genetics and Genomic Sciences at the Icahn School of Medicine at Mount Sinai, Edward Schuchman, PhD, Professor, and Calogera Simonaro, PhD, Research Professor, received the Mount Sinai Inventor of the Year Award for their discovery of the drug pentosane polysulfate sodium for the treatment of mucopolysaccharidosis (MPS), a rare and potentially fatal disease that affects the skeletal system, skin, heart, brain, and other organs. Their work has led to exclusive licenses with Paradigm Biopharmaceuticals, Ltd, and ReqMed Company, Ltd.

The Mount Sinai Deal of the Year Award for RenalytixAI was given to Barbara Murphy, MD, Murray M. Rosenberg Professor of Medicine and Dean for Clinical Integration and Population Health; Steven Coca, DO, Associate Professor of Medicine (Nephrology); and Girish Nadkarni, MD, Assistant Professor of Medicine (Nephrology). RenalytixAI is the first AI-enabled diagnostic for kidney disease to be publicly announced as a Breakthrough Device designation by the U.S. Food and Drug Administration.

Dirk Hubmacher, PhD, Assistant Professor of Orthopedics, and Tim Ahfeldt, PhD, Assistant Professor of Neuroscience, and Neurology, received the Faculty Idea Prize for their work with disorders that involve dysregulation of the extracellular matrix (ECM).

Seventeen innovators received the 4D Technology Development Program Award for four projects:

- Novel inhibitors via an unexplored epigenetic strategy in cancer treatment: Emily Bernstein, PhD; Robert DeVita, PhD; Chiara Vardabasso, PhD; and Roberto Sanchez, PhD.
- Detachable balloon-sheath microcatheter for improved flow control in transvenous and transarterial liquid embolization: Anthony Costa, PhD; Kurt Yaeger, MD; Thomas Oxley, MD, PhD; Alejandro Berenstein, MD; and Peter Backeris, ME.
- Novel phase-shifting retinal tamponade: Avnish Deobhakta, MD; Richard Rosen, MD; Sean Ianchulev, MD, MPH; and Christopher Frenz, PhD.
- Multitasking deep neural nets for improving breast cancer diagnosis from digital screening mammography: Li Shen, PhD; Weiva Sieh, MD, PhD; Laurie R. Margolies, MD; and Joseph H. Rothstein, MS.

The Annual Dean’s Healthcare System Award went to Laurie Keefer, PhD; Ksenia Gorbenko, PhD; Marla C. Dubinsky, MD; Stacy Tse, PharmD; Laura Manning, MPH, RD; and Jordyn Feingold, MAPP, on behalf of the GRITT-IBD Team (Gaining Resilience Through Transitions for patients with Inflammatory Bowel Diseases) and its interdisciplinary collaboration in service of optimal patient care.

Five individuals received Trainee Innovation Idea Awards:

- PhD student Arpit Dave: PatchAid, a possible treatment for vitiligo, a skin disease.
- Postdoctoral fellows Eugenie Martineau, PhD, and Enrica Piras, PhD: Vaginal Lactobacillus spray for infants delivered by C-section.
- House staff physician Kurt Yaeger, MD: Arteriovenous malformation microcatheter.

Jones Day was the premier sponsor.

Careers and Connections at SinaiInnovations

More than 100 students from the Icahn School of Medicine at Mount Sinai and other local medical schools convened on campus for an afternoon of panel discussions and networking with top life sciences professionals from the New York City area at Careers & Connections 2019, part of SinaiInnovations Week. Panel discussions included topics such as health care consulting, career transitions, and artificial intelligence.

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