

BioMedical Engineering and Imaging Institute

bmeiisnai.org



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Message from the Director

Our faculty, trainees, and staff continue to impress with their many accomplishments, awards, and innovative, boundary-pushing research. We are excited to continue expanding our facilities and operations this year through a new Siemens MAGNETOM Prisma 3T MRI and through key hires to broaden our research scope in neuroimaging and wearable devices.

We look forward to convening in April for

the 10th Annual BMEII Symposium, the first time since 2019, and the first symposium under our new name. With renowned speakers ranging from nanomedicine to cancer imaging to healthcare leadership, this event will be an exciting chance to reconnect and exchange ideas with colleagues in the metropolitan area.

We wish all of our readers a happy and healthy 2022.

BMEII News & Updates

Congratulations Corner

Please join us in congratulating the following BMEII members on their well-deserved achievements:

Award Recipients: BMEII Faculty and Affiliated Faculty received pilot grant awards from the Friedman Brain Institute, which were also named Mount Sinai Alzheimer's Disease Research Center (ADRC) Scholarship. Lazar Fleisher, PhD aims to develop and apply novel ultrahigh field (7T) sodium brain imaging to detect cell distress at an earlier stage of Alzheimer's Disease. Xiang Xu, PhD and Trey Hedden, PhD will apply saturation transfer based MRI methods to study pathological aggregates related to Alzheimer's Disease.

ANRP Pilot Grant Awardees Selected: The Advanced Neuroimaging Research Program (ANRP) awarded pilot grants to the following individuals: Erin Beck, MD, Ho Wing Chan, MD, Xiang Xu, PhD, Nilsson Holguin, PhD, Benjamin Rapoport, MD PhD, and Shams

Rashid, PhD.

New Grants: Li Feng, PhD recently received a new NIH/NIBIB R21 grant for his study "3D Free-Breathing Fat and Iron Corrected T1 Mapping." Xiang Xu, PhD was awarded an R21 from NINDS for her study "Structural and metabolic neuroimaging of ME/CFS occurring with and without COVID-19 infection."

Promotions: Li Feng, PhD has been promoted to Associate Professor. Octavia Bane, PhD has been promoted to Assistant Professor.

Educational Milestones: Mandy van Leent, MD PhD successfully defended her PhD thesis (cum laude) "Employing nanomedicine in inflammatory diseases" from the University of Amsterdam. Xueyan Mei, PhD earned her PhD after defending her dissertation "Cats to CATs with RadImageNet: A Transformative Platform for Medical Imaging AI Research," and will stay at BMEII as a post-doctoral

BMEII is hiring!

We are looking for innovative, motivated faculty, postdocs, researchers, and support staff to join our team. Visit our [website](http://bmeiisnai.org) for all open positions and instructions on how to apply.

fellow to continue her important research in AI and imaging. Mackenzie Langan, a current MS student, has been accepted to the PhD program at the Graduate School of Biomedical Sciences at Mount Sinai.

Expanding BMEII Family: On December 10, 2021, Shams Rashid and his wife welcomed their daughter Naba. Li Feng and his wife welcomed a new baby girl, Scarlett, on December 24, 2021. On January 12, 2022, Dewey Chu and his wife welcomed baby Adrian.

Media Spotlight

Researchers across Mount Sinai, including Dr. Zahi Fayad and several of our collaborators, were featured in a recent supplement to *Science* magazine entitled "The Frontiers of Medical Research". To read the supplement, click [here](http://bmeiisnai.org).

New podcast episodes! Tune in to our podcast "ImagingNation" to catch up on the latest research in kidney imaging (Dr. Octavia Bane and Dr. Sara Lewis) and MRI applications to neuroimaging (Dr. Gaurav Verma) on Apple or Spotify.

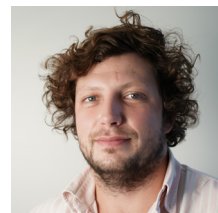


Welcome, New BMEII Staff

Barbara (Babs) Chacon is a Program Coordinator II for Dr. Taouli's lab. She graduated from Rutgers University with Bachelor's degree in Psychology. Her focus in the lab is coordinating research related meetings and events, assisting with the completion of RECIST (Response Evaluation Criteria in Solid Tumors) requests from various research teams, and handling any administrative tasks necessary to keep the lab running smoothly.



Rodolphe LeForestier is a Postdoctoral Fellow in the Neuroimaging Lab at BMEII. He obtained a PhD in Physics and MS in Medical Physics at the University of Rennes 1, France. He works with Dr. Xiang Xu to develop and improve MRI techniques in CEST imaging, and is particularly interested in the possible use of glucose as a contrast agent at 7T.



Raina Ghai-Mehta, MSN, RN, CRN is a registered nurse with 10 years of experience and joined BMEII as a Licensed Clinical Research Manager. She previously worked at Memorial Sloan Kettering Cancer Center as Clinical Research Nurse IV in Diagnostic Radiology. Over her career there, she transitioned into research nursing and worked with interdisciplinary teams in the development of clinical trials/research, data collection, safety, and medical information programs.



Judit Morla-Folch is a post-doctoral fellow in the Nanomedicine Lab, where she works on the development and characterization of novel nanoimmunotherapeutics. Prior to joining Mount Sinai, she trained as a postdoctoral scholar at the University Autònoma de Barcelona (UAB) and New Jersey Institute of Technology (NJIT), working on the development of fluorescent nanoparticles for bioimaging and theragnostic. Her current research in the Nanomedicine Lab focuses on fighting cancer using photodynamic and targeted radiotherapies combined with immunotherapies.



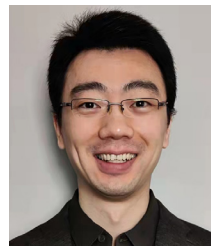
Anthony Kaplan RT (N) (CT), LNMT graduated from Molloy College and has been working as a Nuclear Medicine Technologist since 2009, specializing in nuclear cardiology and PET/CT. He joined the BMEII PET/MR team in late 2021. Anthony earned his CT license in 2017 and is currently earning his MRI license through Molloy College. He lives on Long Island with his wife, 9-year-old son and 6-year-old daughter. When not at work, Anthony enjoys playing the drums and going on bike rides with the family's golden retriever.



Efe Ozkaya is a post-doctoral fellow in Dr. Taouli's Cancer and Body Imaging lab, where he works on the assessment of liver stiffness through Magnetic Resonance Elastography. He completed his PhD studies in the Mechanical Engineering Department at Stevens Institute of Technology, Hoboken, NJ.



As a Senior Research Scientist, **Ding Xia** works with Dr. Li Feng and Dr. Xiang Xu on developing advanced MRI sequences and image reconstruction methods for rapid quantitative MRI and CEST MRI. Ding came to BMEII with experience in pulse sequence programming and quantitative imaging. He previously worked as a Research Scientist at the Center for Biomedical Imaging at the NYU School of Medicine, where he specialized in MR fingerprinting, quantitative imaging, multi-nuclear imaging and CEST MRI.



Postdoc Spotlight

Chendi Cao, PhD

Dr. Chendi Cao received his PhD in computer science from Kansas State University in 2021. He joined BMEII as a post-doctoral fellow in Dr. Yang's cardiovascular imaging group and focuses on novel imaging techniques for comprehensive CMR imaging using non-Cartesian trajectories and motion-correction techniques and deep learning image classification methods. His research mainly focuses on two aspects: (1) Constructing novel image reconstruction methods using Matlab by sorting self-extracted signal and ECG-gated cardiac signal; and (2) Developing deep learning image classification framework for interstitial lung disease (ILD) disease.

Dr. Yang and Dr. Cao are developing a multidimensional dual-echo free-breathing MRI for the cardiac exam with the ability for simultaneous assessment of lung structure in the same scan for patients who have

recovered from COVID-19. The research group has been at the forefront of using non-Cartesian pulse sequence acquisitions and advanced image reconstruction for fast motion-robust MRI. Based on these prior developments, they are developing and evaluating a free-breathing lung and heart MRI framework that will enable one-stop-shop characterization of whole lung and heart function together. Their dual-echo MRI techniques can provide comprehensive assessments of heart function and tissue with simultaneous evaluation of lung structure with sufficient diagnostic performance.

Dr. Yang and Dr. Cao are also working on an ongoing deep learning project on image classification for ILD, a disease that consists of a diverse group of conditions categorized by alveolar inflammation and interstitial fibrosis. The diagnosis of ILD requires holistic reviews of clinical,

radiological, and pathological results. In addition, it usually takes years to train a specialist to recognize this disease and the level of clinical experience also plays a significant role in making decisions. The lack of experienced physicians and accurate diagnoses for ILD might limit the availability of credible medical resources to patients. To expand the accessibility of ILD diagnosis, we are developing an artificial intelligence (AI) approach to learning from definitive ILD cases diagnosed by experienced experts with their consensus to classify 5 types of fibrosing idiopathic interstitial pneumonia (IIPs) based on chest CT images and patient clinical history.

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Expanding Multiparametric Kidney Imaging

Octavia Bane, PhD

Dr. Octavia Bane was recently appointed to the position of Assistant Professor of Radiology, after having worked as an Instructor in BMEII for the past three years. Dr. Bane initially joined the Body/Cancer MRI lab of Professor Bachir Taouli as a postdoctoral research fellow in Spring 2013. After successfully defending her PhD on quantification of myocardial blood volume with blood pool contrast agents in the departments of Biomedical Engineering and Radiology at Northwestern University, she was recruited to work on multiparametric MRI of hepatocellular carcinoma. Dr. Bane

Multiparametric (mp)MRI has the unique potential to identify intrinsic causes of renal transplant dysfunction. Previous work has shown that functional MRI can provide insight into renal function using DCE-MRI (with low dose gadolinium contrast agent, to estimate single kidney filtration rate and perfusion), intravoxel incoherent motion diffusion-weighted imaging (IVIM-DWI, to provide information on flow and diffusion), diffusion tensor imaging (DTI), T1 (which has been shown to reflect tissue inflammation and edema), T1 rho (which reflects the interactions of protons with macromolecules such as

DWI parameters in the kidney correlated with inflammatory proteomic markers from urine with differential expression between ccRCC and non-ccRCC tumors. Their collaboration with the groups of Dr. Ketan Badani in Urology, and Dr. Amir Horowitz in Oncological Sciences/ Human Immune Monitoring Center on this project has led to the development of the multidisciplinary Kidney Cancer Research Group within Mount Sinai.

Outside of kidney imaging, Dr. Bane studies 4D flow MRI and relaxometry (T1, T2, T1rho) applications in portal hypertension

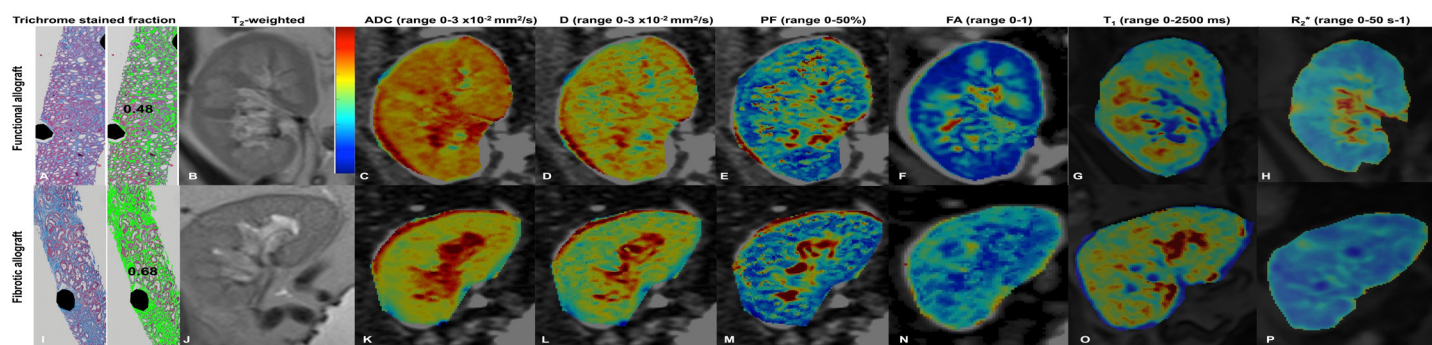


Fig.1. Advanced diffusion maps show overall lower values, and T1 maps show elevated values in a patient with moderate renal allograft fibrosis (I-P) compared to a patient with functional allograft (A-H).

held an NCI T32 Institutional Training Grant fellowship from the Department of Oncology at Mount Sinai in 2014-2015.

Dr. Bane's current research focuses on the development of multiparametric MRI protocols and techniques for assessment of renal dysfunction in transplanted and native kidneys, as well as in renal cancer. With mentors Dr. Taouli and Dr. Sara Lewis, Dr. Bane advanced the Body MRI's lab expansion into renal imaging, helping to successfully obtain initial funding in the form of an NRSA F32 individual postdoctoral fellowship (2016-2018) with the National Institute of Diabetes, Digestive and Kidney Diseases (NIDDK). Dr. Lewis and Dr. Bane are the recent recipients of an R01 from the NIDDK (2021-2026) that will fund a bi-center study at Mount Sinai and Weill Cornell Medical Center of renal transplant dysfunction and outcomes in patients with renal transplantation using mpMRI and urinary biomarkers.

collagen) and T2* relaxometry (influenced by the BOLD effect, which reflects oxygen bioavailability). Dr. Bane's preliminary results in 28 initial patients (Fig. 1) with renal transplantation studied with mpMRI show that IVIM-DWI, T1 and T1rho parameters are sensitive to the presence of allograft fibrosis. To advance mpMRI in the kidney, Dr. Bane has co-authored several consensus review papers and has served as a panelist and panel co-chair (2018-2019) with the EU COST Action PARENCHIMA, an international collaboration which aims to develop non-invasive renal MRI biomarkers that are sensitive to chronic kidney disease (CKD) pathophysiology, can predict CKD progression or response to treatment.

During the last three years, Dr. Bane and Dr. Lewis have expanded their renal mpMRI research efforts to study renal cancer, and progressive and de novo CKD in patients undergoing partial nephrectomy (PN). They found that IVIM-

and mpMRI in Crohn's disease. Dr. Bane looks forward to strengthening her existing collaborations and to establishing new collaborations in BMEII, within Mount Sinai and with external academic centers and medical technology companies.

Outside of research, Dr. Bane enjoys traveling, socializing with friends, gardening and spending time with her young family (husband Max, daughter Livia, 5 years old, son Edward, 1 year old, and pet cat Annie, 15 years old).

Octavia Bane, PhD
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Engineering & Medicine Seminar Series

For an updated schedule of lectures, check out our [webpage](#). The series will take place on Zoom for the remainder of the year. Interested in presenting? Contact Mallory Stellato at mallory.stellato@mssm.edu.

Neuroimaging Stars on the Rise

Last summer, two students from Staten Island Technical High School reached out to the neuroimaging team at BMEII, expressing interest in our research on major depression and other neuropsychiatric diseases. The students, Tara Lago and Mariella Reynoso, contacted Priti Balchandani, PhD and Gaurav Verma, PhD hoping to collaborate on their student research project after discovering their studies on 7T MRI applications in epilepsy and depression. "This was the first time we encountered the idea of using neuroimaging to better understand and diagnose neurological diseases, and right away, we were intrigued," say Mariella and Tara.

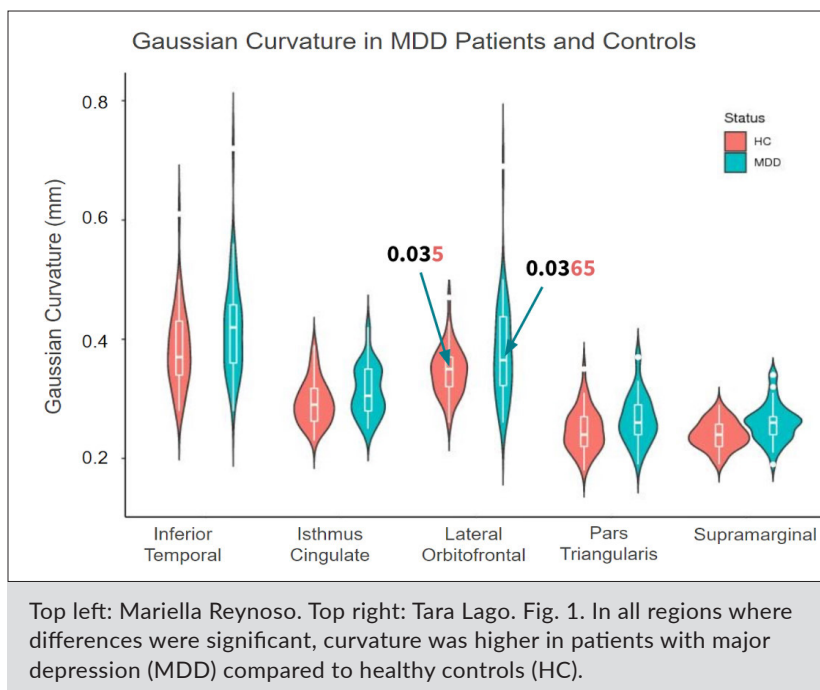
After an initial virtual meeting, the student team and BMEII research collaborators began a project investigating differences in cortical curvature among major depression patients compared to healthy controls. The students received training on data handling and research ethics, and were provided de-identified data to investigate these differences. The BMEII team has developed image processing pipelines for data anonymization to facilitate this type of collaborative research.

comparisons. The results of the study were compiled and submitted to the Terra NYC STEM Fair, where Tara and Mariella were selected as finalists, and written up and



growing interest in genetics, including mosaicism and epigenetics. Mariella plans to get involved in undergraduate research and pursue a PhD to become a biologist, and Tara plans to study neuroscience and become a physician-scientist.

Of their experience, Tara and Mariella shared, "While working with BMEII, we gained many unexpected but wonderful opportunities. We presented our findings to a research team and submitted an abstract to a conference! We improved our statistical analysis and background research skills. Before this project, we were unaware about what working at a lab entailed. We realized that research is an intensely collaborative process that involves a diverse group of professionals contributing their expertise. We also learned that research takes time and dedication, and that insignificant results are still important because they enhance our knowledge about a topic."



Throughout the fall, the team performed literature review and presentations, investigated appropriate statistical methods and performed this analysis using a general linear model in the statistical software R. With help from collaborator Yael Jacob, PhD, the students performed covariance for age and gender, and corrections for multiple

prepared as a scientific paper. The student team recently learned that their abstract was accepted for an online pitch at the 2022 meeting of the International Society for Magnetic Resonance in Medicine (ISMRM).

Mariella and Tara plan to continue exploring their curiosity about the brain and their

Dr. Verma and Dr. Balchandani have been highly impressed with Tara and Mariella's initiative and enthusiasm throughout the collaboration, and are pleased to have opportunities to work with motivated students in the community doing incredible work.

Core Spotlight

New State-of-the-Art Prisma 3T Coming Later this Year

BMEII is excited to announce to our imaging community that we will be installing a new Siemens Prisma 3 Tesla MRI later this spring/summer 2022. This multimillion-dollar investment, jointly funded by a NYFIRST state grant, the Icahn School of Medicine, and the Department of Radiology, will provide BMEII with this state-of-the-art MRI to significantly expand the capabilities of our imaging institute.

With an 80 mT/m @ 200 T/m/s XR gradients, the Prisma will have the ability, amongst many other capabilities, to acquire high-resolution isotropic DTI up to 256 directions and unparalleled angiography with the sensitivity to detect small vessels without contrast.

The Prisma is the preferred, and often sole, imaging system approved for many multi-site neuroimaging studies. Additionally, BMEII and Mount Sinai will now be equipped

to better align with many standardized neuroimaging protocols such as The Human Connectome Project.

The system will come with the Numaris X software platform which hosts features and benefits that will improve workflow. Along with a suite of coils (64 channel head/neck coil, 15 ch knee, and 18 ch and 30 ch body array coils), the system will have the software and hardware wear to perform MR

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International Society for Magnetic Resonance in Medicine (ISMRM) Accepted Abstracts

Name	Session Day	Session Type	Session Time	Group/Affiliation
Akbar Alipour	5/11/22	Digital Poster	14:30-15:30	Neuroimaging
Akbar Alipour	5/9/22	Power Pitch	17:00-18:00	Neuroimaging
Octavia Bane	5/11/22	Digital Poster	9:15-10:15	Cancer/Body Imaging
Octavia Bane	5/11/22	Digital Poster	10:15-11:15	Cancer/Body Imaging
Ki Sueng Choi	5/11/22	Digital Poster	14:30-15:30	Neuroimaging
Valentin Fauveau	5/10/22	Digital Poster	14:30-15:30	AI & Imaging
Yael Jacob	5/12/22	Oral	17:00-19:00	Neuroimaging
Yael Jacob	5/11/22	Digital Poster	14:30-15:30	Neuroimaging
Mackenzie Langan	5/11/22	Digital Poster	9:15-10:15	Neuroimaging (student)
Mackenzie Langan	5/11/22	Power Pitch	14:30-16:30	Neuroimaging (student)
Lily McCarthy	5/12/22	Oral	17:00-19:00	Neuroimaging (student)
Shams Rashid	5/11/22	Digital Poster	15:30-16:30	Neuroimaging
Alan Seifert	5/10/22	Digital Poster	10:15-11:15	Neuroimaging
Gaurav Verma	5/9/22	Digital Poster	15:45-16:45	Neuroimaging
Gaurav Verma	5/10/22	Digital Poster	10:15-11:15	Neuroimaging
Ding Xia	5/11/22	Online Pitch	14:30-16:30	Cardiovascular Imaging
Xiang Xu	5/9/22	Power Pitch	14:45-15:45	Neuroimaging
Tara Lago & Mariella Reynoso	5/10/22	Online Pitch	16:45-18:45	Neuroimaging (high school students)
Emily Triolo	5/11/22	Digital Poster	9:15-10:15	Stevens Institute, BMEII affiliated
Enamul Bhuiyan	5/11/22	Digital Poster	9:15-10:15	Cancer/Body Imaging
Enamul Bhuiyan	5/11/22	Digital Poster	9:15-10:15	Cancer/Body Imaging
Jennifer Watchmaker, Ding Xia, Li Feng, et al.	5/10/22	Digital Poster	15:30-16:20	Cardiovascular Imaging

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Elastography of the abdomen.

Many will notice that the construction for the system has already begun on the SC-2

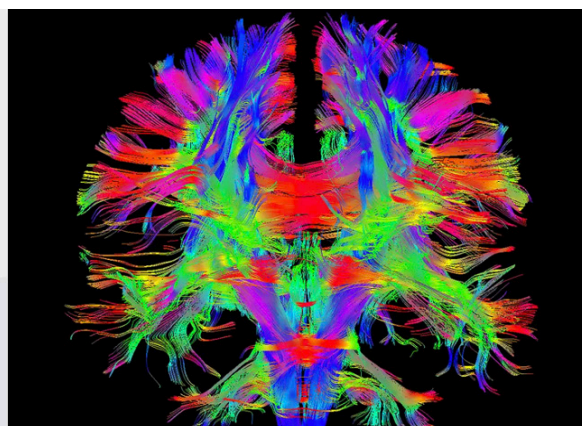
level of the Hess Center for Science and Medicine. Along with the Prisma, Radiology Associates will install a new Siemens Biograph Vision PET/CT in the adjacent bay. While the Vision will be prioritized to clinical care, time will be available to continue and grow our PET research program.

We expect both systems to be installed



in the spring and be available for use in the summer of 2022. Please feel free to reach out to us with any questions or details necessary for future grant submissions.

The Icahn School of Medicine at Mount Sinai gratefully acknowledges Empire State Development, which helped support this project.



Mark Your Calendars

BMEII Symposium & Radiology Retreat

The BioMedical Engineering and Imaging Institute (BMEII) invites you to join us at our 10th annual Symposium

BMEII SYMPOSIUM

Advancing Healthcare Through Biomedical Engineering, A.I., Imaging, and Nanomedicine

April 27-28, 2022

Davis Conference Center
Icahn School of Medicine at Mount Sinai
New York, NY

Speakers



Toby Cosgrove, MD
Cleveland Clinic



James Dahlman, PhD
Georgia Institute of Technology



Tim Leiner, MD PhD
Mayo Clinic



William Morris, MD MBA
Google Cloud



Stephanie Fraley, PhD
University of California San Diego



Karla Miller, PhD
University of Oxford



Tessa Cook, MD PhD FSIIM FCP
University of Pennsylvania



Penny Gowland, PhD
University of Nottingham



Nitish Thakor, PhD
Johns Hopkins University



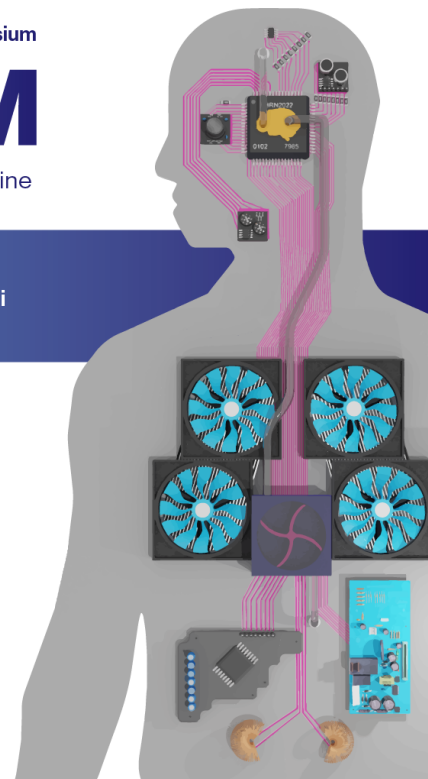
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To Register



<https://tinyurl.com/BMEII2022>
#BMEII2022



Mount Sinai Radiology Research Retreat

Wednesday, April 27th 2022
1:00 PM - 5:00 PM

KEYNOTE
SPEAKERS



NICOLE SEIBERLICH, PhD
CO-DIRECTOR, INSTITUTE OF IMAGING
UNIVERSITY OF MICHIGAN



NEIL ROFSKY, MD
PROFESSOR AND CHAIR, DEPARTMENT
RADIOLOGY, UT SOUTHWESTERN

PAPER
PRESENTATIONS

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