SUNDAY April 21, 2024

| 4:00pm – 5:30pm | Optional walking tour of Sarah B Duke Gardens and the West Campus
Meeting point at entrance Sarah B Duke Gardens |
| 6:00pm – 8:00pm | Optional ice breaker event @JB Duke |

MONDAY April 22, 2024

7:00am	Registration opens
7:00am - 8:00am	Breakfast
8:00am - 8:15am	**Welcome** – Ehsan Samei
8:15am - 9:00am	**Invited talk** – Alex Frangi & Ehsan Samei
	Revolutionizing healthcare: Virtual trials and digital twins in modern medicine, Mitchel Schnall (University of Pennsylvania)
9:00am - 9:40am	**Foundations and case examples** – Ioannis Sechopoulos & Andrew Maidment
	A Road to VITM: **Previous workshops and symposia on virtual trials in breast imaging,** Predrag Bakic (Lund University)
	Streamlined large-scale construction of virtual twins of aortic root complexes for in-silico trials of cardiac valve implants, Benjamin AC Matheson (University of Leeds)
	Assessment of the Relative Value of Different Body Size Measurands to Inform the Needed Radiation Dose in CT Imaging: A Virtual Trial Study, Njood Alsaihati (Duke University)
9:40am - 10:20am	**Applications of virtual trials** – Ioannis Sechopoulos & Andrew Maidment
	In silico clinical trial to assess the influence of orientation on the primary stability of a cementless acetabular cup, Mark Taylor (Flinders University)
	Illustrations of potential virtual imaging trial applications in dental CBCT imaging, Karen Merken (KU Leuven)
	The use of phantoms in virtual imaging trials for microcalcification detection optimization in digital breast tomosynthesis, Lesley Cockmartin (UZ Leuven)
10:20am - 10:50am	Coffee break
10:50am - 11:30am	**Computational patient specific modeling** – Ann-Katherine Carton & Paul Kinahan
	Finite element modeling of patient- and disease-specific lung respiration for the assessment of lung function, Amar Kavuri (Duke University)
	Generation of digital breast phantoms with patient-based internal structures from breast CT images, Martina Nassi (Radboud University Medical Center)
	A deep learning approach for generating patient-specific phantoms, Lavsen Dahal (Duke University)
11:30am - 12:10pm	**Computational organ modeling** – Ann-Katherine Carton & Paul Kinahan
	Library of realistic, image-based 4D beating heart models, Ethan J Malin (Duke University)
	New features to improve realism in Perlin Noise-based digital breast phantoms, Magnus Dustler (Lund University)
	The Virtual Kidney, David Cox (Duke University)
12:10pm - 12:30pm	**Poster minute digest 1** – Liesbeth Vancoillie & Francesco Ria

12:30pm - 2:00pm	Lunch and poster viewing digest 1
2:00pm - 2:45pm	**Invited talk** – Kristina Bliznakova & Joseph Lo
	Breaking boundaries in medical imaging and therapy: Image-based digital twins in oncology to realize personalized medicine, Thomas Yankeelov and David Hormuth (University of Texas at Austin)
2:45pm - 3:25pm	**Computational models of diseases** – Kristina Bliznakova & Joseph Lo
	Subject-specific airway modeling for patients with chronic bronchitis and small airways disease, Fong Chi Ho (Duke University)
	In silico modeling of growing spiculated breast mass lesions, Miguel Lago (FDA)
	Biologically informed in-silico models of tumor growth dynamics, Jack Stevens (Duke University)
3:25pm - 4:00pm	Coffee break in poster area
4:00pm - 4:45pm	**Discussion session 1: Real plus Virtual** – Andrew Maidment & Francesco Ria
	Bridging real and virtual trials: How can we maximize complementary evaluation of medical product? *What is the synergy between real, in-silico, virtual/phantom, and hybrid trials? What are the pros and cons of each, and how can each play a complementary role in advancing the validation and evaluation of medical products? What strategies propel innovation and efficiency in the evolving landscape of clinical trials, optimizing the development and assessment of cutting-edge medical solutions?*
5:00pm - 5:45pm	**Discussion session 2: Physics plus Biology** – Predrag Bakic & Paul Segars
	How does the intersection of simulation and basic science impact our understanding of metabolism, treatment, and disease progression? *What aspects should be considered in a scholarly exploration of the convergence between simulation and basic science in metabolism, treatment, and disease progression? What critical considerations surround issues such as biological realism and the precise definition of ground truth? Is there only one ground truth? How we can integrate fundamental scientific processes with sophisticated simulation methods?*
7:00pm - 9:30pm	A North Carolina experience *The Blue Note Grill, 709 Washington St, Durham, NC 27701*

TUESDAY April 23, 2024

7:00am	Registration opens
7:00am - 8:00am	Breakfast
8:00am - 8:15am	**Wrap up of lessons learned from Day 1** – Ehsan Samei
8:15am - 9:00am	**Invited talk** – Rie Tanaka & Ehsan Samei
	On trials and tribulations: Safer, faster, and more sustainable medical devices for better and more equitable patient care, Alejandro Frangi (University of Manchester)
9:00am - 9:40am	**Modeling of current imaging systems** – Paul Kinahan & Ehsan Abadi
	The effect of misalignment between mechanical and x-ray breast images in simultaneous digital breast tomosynthesis and mechanical imaging, Predrag Bakic (Lund University) **System-specific simulation of mammography "for processing" images,** Franziska Mauter (Physikalisch-Technische Bundesanstalt) **Implementing detailed antiscatter grid modelling for Virtual Imaging Trials applications,** Rodrigo T Massera (KU Leuven)
9:40am - 10:20am	**Modeling of emerging imaging systems** – Paul Kinahan & Ehsan Abadi
	Modeling propagation-based x-ray phase-contrast imaging: validity of the projection approximation, Giavanna L Jadick (University of Chicago) **Simulation tools to optimize the scanning motion for Next-Generation Tomosynthesis,** Raymond Acciavatti (University of Pennsylvania) **Installing photon-counting CT in DukeSim – A validated and computationally efficient simulation framework accounting for scanner-specific physics and acquisition geometry,** Cindy M McCabe (Duke University)

10:20am - 10:50am	Coffee break
10:50am - 11:30am	**Late-breaking demonstrations** – Kristina Bliznakova & Stephen Glick
	CT Performance in Quantifying Small Airway Disease using Paired Inspiratory-expiratory Scans: A Virtual Imaging Study, Fong Chi Ho (Duke University)
	PyAnsys-heart: a python library for LS-DYNA multi-physics heart simulation, Karim El Houari (Ansys)
	The Setup of Porous Media Valve Model with ANSYS LS-DYNA ICFD using Patient Specific Heart Models from Synopsys Simpleware, Chien-Jung Huang (Ansys)
	Towards a validated digital twin using computational physiology via the Pulse Physiology Engine, Rachel Clipp (Kitware Inc.)
	FAST (Fast Analytical Simulator of Tracer)-PET: an accurate and efficient PET analytical simulation tool, Suya Li (Wahington University in St. Louis)
	The AIFM Italian National Working Group on Virtual Clinical Trials, Lidia Strigari (University Hospital Bologna)
11:30am - 12:10pm	**Stochastic modeling** – Joseph Lo & Ann-Katherine Carton
	Organs volumetric measurement by deep learning automated segmentation of CT images, Mobina Ghojoghnejad (Duke University)
	Stochastic numerical phantoms to enable optoacoustic tomography virtual imaging studies, Umberto Villa (University of Texas at Austin)
	MC-GPU v2.0: upgraded GPU-accelerated x-ray imaging device simulator, Andreu Badal (FDA)
12:10pm - 12:30pm	**Poster minute digest 2** – Liesbeth Vancoillie & Francesco Ria
12:30pm - 2:00pm	Lunch and poster viewing digest 2
2:00pm - 2:45pm	**Invited talk** – Stephen Glick & Predrag Bakic
	In silico trials and digital twins: A regulatory science roadmap, Tina Morisson (FDA)
2:45pm - 3:25pm	**Regulatory science and validation** – Stephen Glick & Predrag Bakic
	Towards consensus recommendations on reliable development and use of Virtual Imaging Trials, Ehsan Abadi (Duke University)
	CT phantom image dataset for VCT validation, Dimitar Petrov (UZ Leuven)
	Comparative evaluation of ray-tracing and Monte Carlo Virtual Clinical Trials pipelines for lesion detection in digital breast tomosynthesis, Chloe Choi (University of Pennsylvania)
3:25pm - 4:00pm	Coffee break in poster area
4:00pm - 4:45pm	**Discussion session 3: Virtual meets Reality** – Ehsan Abadi & Hilde Bosmans
	Democratizing virtual trials: How can barriers to accessibility and widespread implementation be overcome? *What challenges hinder the universal adoption of virtual trials? How does the persistent role of traditional clinical trials, gaps in modeling for diverse imaging modalities, and the qualification and justification of tools in the virtual trial landscape contribute to these obstacles? In exploring key considerations and strategies for democratizing virtual trials, how can we pave the way for their broader integration and accessibility in medical research?*
5:00pm - 5:45pm	**Discussion session 4: Virtual meets Diversity** – Ioannis Sechopoulos & Rie Tanaka
	What strategies can be employed to generate digital patient representations and enhance diversity in virtual clinical trials? *How can virtual trials be utilized to address diversity gaps in clinical trials? What nuances are involved in generating digital representations of individual patients? How does such individualization relate to the diversity requirements of AI evaluations and training? Why is stochastic realism crucial in developing AI-centric approaches towards more inclusive and robust clinical trial methodologies?*
7:00pm - 9:00pm	Conference reception and dinner @ Samei Residence *707 Greenwood Road, Chapel Hill, NC 27514*

WEDNESDAY April 24, 2024

7:00am	Registration opens
7:00am - 8:00am	Breakfast
8:00am - 8:15am	**Wrap up of lessons learned from Day 2** – Ehsan Samei
8:15am - 8:55am	**Virtual trials and processing methods** – Joseph Lo & Alex Frangi
	Addressing the multiplicity challenge of spectral CT through physics-regulated estimation of composition in spectral energy CT (PRECISE CT), Mojtaba Zarei (Duke University)
	Development of organ-specific suppression technique for dynamic chest radiography using virtual patients, Futa Goshima (Kanazawa University)
	Deep physics-informed super-resolution of cardiac 4D-flow MRI: a synthetic study in patient-specific geometries, Fergus Shone (University of Leeds)
8:55am - 9:35am	**Virtual trials and artificial intelligence** – Joseph Lo & Alex Frangi
	Evaluating breast density classification by sparse approximation classifiers and deep networks using simulated digital mammograms, Chelsea Harris (Delaware State University)
	Development of deep learning-based lung volume estimation with dynamic chest radiography using virtual patients, Nozomi Ishihara (Kanazawa University)
	Point-cloud based segmentation of prostate for adaptive radiation therapy treatment, Jianxin Zhou (University of Illinois at Urbana Champaign)
9:35am – 10:15am	**Perspective of medical industry on in silico trials** – Stephen Glick & Liesbeth Vancoillie
	The role of system simulation for product design of deep-silicon photon counting CT, Erik Fredenberg (GE Healthcare)
	Artificial Intelligence for healthcare: from patient twinning to precision therapy, Matt Holbrook (Siemens Healthineers)
	VCT for breast x-ray imaging in GE HealthCare, Ann-Katherine Carton (GE Healthcare)
10:15am - 10:45am	Coffee break
10:50am - 11:30am	**Observer evaluation and image quality** – Francesco Ria & Hilde Bosmans
	Virtual validation of novel 4D noise reduction filter in abdominal dynamic CT perfusion, Sjoerd AM Tunissen (Radboud University Medical Center)
	Exploring how observer task impacts FFDM VCT performance, Dan Li (FDA)
	Ideal observer approximation in virtual imaging trials, Mark Anastasio (University of Illinois at Urbana Champaign)
11:30am - 12:10pm	**Future prospects and applications** – Francesco Ria & Hilde Bosmans
	Virtual Imaging Trial can unveil the relationship between intravascular diffusivity and intravoxel incoherent motion in MRI, Mojtaba Lashgari (University of Oxford)
	Accelerated container applications for the development and integration of Virtual Imaging Platforms, Bruno Barufaldi (University of Pennsylvania)
	Towards personalized imaging: a pilot virtual imaging evaluation of interpatient variability in chest CT, Jayasai R Rajagopal (Oak Ridge National Labs)
12:10pm - 12:30pm	**Conference conclusions and actions ahead** – Ehsan Samei
12:30pm	Lunch
2:00pm – 5:00pm	**In-Silico Roundtable**
	This exclusive roundtable event is by invitation only. However, for those interested in following the discussion, we are pleased to offer the opportunity to join online.

Poster minute digest 1

1. Measurement of scapulohumeral rhythm in shoulder dynamic digital radiography: A virtual imaging trial, Yu Homareda (Kanazawa University)
2. In-silico flow diverter performance assessment in posterior communicating artery aneurysms, Michael MacRaild (University of Leeds)
3. Development of deep-learning-based cardiac phase estimation in dynamic chest radiography using virtual patients, Saho Matsuo (Kanazawa University)
4. In-silico investigation of an innovative cone-beam CT configuration for quantitative imaging, Antonio Sarno (Università di Napoli "Federico II" & INFN Napoli)
5. The regulatory landscape of virtual tools in diagnostic imaging, Francesco Ria (Duke University)
6. Optimization and validation of a compression model for realistic digital breast phantoms in mammography and digital breast tomosynthesis simulations, Gustavo Pacheco (Radboud University Medical Center)
7. Simulation of ultrasound optical tomography for characterizing breast tumors, Adam Kinos (Deep Light Vision AB)
8. Modeling different body composition within a computational phantom library, Cornelio Salvador H Salinas (Duke University)
9. Harnessing the power of high-performance computing for virtual imaging trials, Jayasai R Rajagopal (Oak Ridge National Labs)
10. ISIT-DaT: An in-silico imaging trial to objectively evaluate the performance of a scatter-window projection and deep learning-based transmission-less attenuation compensation method for dopamine transporter SPECT, Zitong Yu (Washington University in St. Louis)
11. Generation of a representative synthetic phantom dataset for the training of neural networks in personalized CT dosimetry, Marie-Luise Kuhlmann (Physikalisch-Technische Bundestanstalt)
12. Pileup simulation for deep silicon photon-counting CT, Erik Fredenberg (Royal Institute of Technology (KTH) / GE HealthCare)
13. Comparison of lesion segmentation methods using simulated DBT images, Zhikai Yang (KTH Royal Institute of Technology)
14. Tube current modulation effects on dose and image quality in computed tomography: a Monte Carlo simulation study, Zakaria Aboulbanine (Oak Ridge National Labs)
15. Hemodynamics of thrombus formation in intracranial aneurysms: an in silico observational study, Qiongyao Liu (University of Leeds)
16. Beyond Detection: Bridging the Gap Between Virtual Imaging Trials and Clinical Impact, Fakrul Islam Tushar (Duke University)

Poster minute digest 2

17. Hybrid (real and virtual) imaging trials in dynamic chest radiography: A feasibility study, Rie Tanaka (Kanazawa University)
18. Development of deep learning-based left-right lung separation technique for lateral dynamic chest radiography using virtual patients, Riku Yokoyama (Kanazawa University)
19. Development of breast suppression techniques for dynamic chest radiography using virtual patient datasets, Yuuna Yamawaki (Kanazawa University)
20. Generation of synthetic brain vasculature using shape/anatomy guided latent diffusion models, Yash Deo (University of Leeds)
21. Realistic phantoms for evaluation of SPECT motion correction, Maximilian P. Reymann (Friedrich - Alexander Universität Erlangen - Nürnberg)
22. Phantom for training in breast imaging techniques, Nikolay Dukov (Medical University of Varna)
23. Advancing in the physical fabrication of anthropomorphic breast phantoms, Kristina Bliznakova (Medical University of Varna)
24. Creating a realistic virtual cohort from historical data, Wesley Gohn (Siemens Medical Solutions, USA)
25. Reconstruction kernel matching for end-to-end virtual imaging trials in X-ray CT, Darin Clark (Duke University)
26. The implementation of the DukeSim software in the medical physicist training curriculum, Allan F Alves (Sao Paulo State University)
27. Sex-specific cardiac motion behavior analysis based on XCAT simulated X-ray angiography, Fariba Azizmohammadi (Ecole de technologie superieure)
28. Simulating PET Imaging with NURBS-based objects, Darrin Byrd (University of Washington)
29. Simulation platform for 2D and 3D mammography: Impact of focal spot sampling number on system MTF accuracy, Ruben Sanchez de la Rosa (GE Healthcare)
30. Generalized Methodologies for Assessing the similarity and dissimilarity between two datasets, Dhrubajyoti Ghosh (Duke University)
31. Oxygen Effect on Tumor Response to Irradiation: Insights from GATE Simulation Studies, Zakaria Ait Elcadi (Texas A&M University at Qatar)
32. Microcalcification cluster modelling for mammographic imaging: an automated toolbox with image-specific simulations, Astrid Van Camp (Maastricht University)