Sim4Life User Workshop @ ISMRM 2023

ZMT Zurich MedTech AG

Welcome to the Sim4Life User Workshop @ ISMRM 2023

Visit us at ISMRM 2023 Booth #G11

Cutting-Edge Solutions for Medical Technology

Sim4Life User Workshop @ ISMRM 2023

Tuesday, June 6, 18:30 – 22:00 hrs

Venue: Kensington Junior Ballroom, Delta Hotels by Marriott Toronto,
75 Lower Simcoe St, Toronto, ON M5J 3A6, Canada

Agenda

18:30 – 18:40	Novelties Unraveled – Features in Sim4Life that Advance your R&D *Melina Bouldi & Habib Bousleiman, ZMT Zurich MedTech AG, Switzerland*
18:40 – 19:00	Peripheral Nerve Stimulation Analysis of MRI Head Gradient Coils with Human Body Models *Yihe Hua, GE Global Research, USA*
19:00 – 19:20	Applications of Gradient Array Coils *Ergin Atalar, Bilkent University, Turkey*
19:20 – 19:40	Parallel Transmit RF Simulation Workflows *Joseph Rispoli, Purdue University, USA*
19:40 – 19:55	Break

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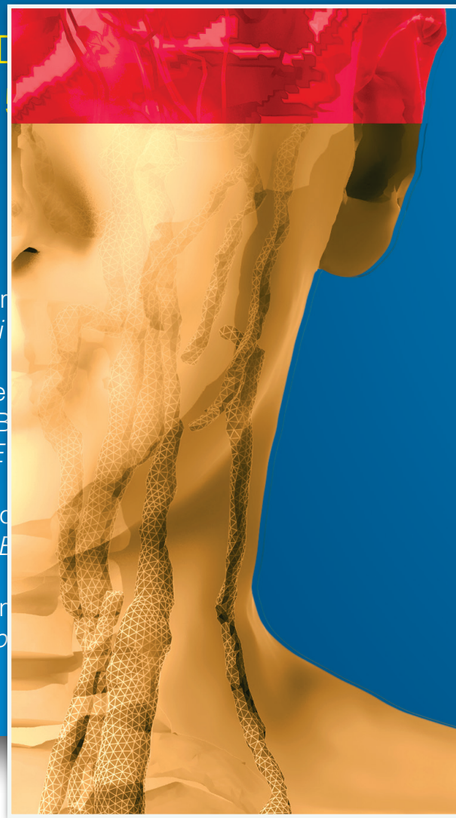

19:55 – 20:15	Are We There Already or Can We Do Better? A Slightly Different Angle on Safe Implant Scanning *Bernd Ittermann, Physikalisch-Technische Bundesanstalt (PTB), Germany*
20:15 – 20:35	RF Heating of Epicardial Lead and Abandoned Lead *Kagayaki Kuroda, Tokai University, Japan*
20:35 – 20:55	Heart Failure Monitoring with Radiofrequency Sensing *Nico van den Berg, UMC Utrecht, The Netherlands*
20:55 – 21:00	Next in Sim4Life! *Michael Oberle, ZMT Zurich MedTech AG, Switzerland*
21:00 – 22:00	Networking Reception

To register, please send an email to s4l-sales@zmt.swiss

Directions to the Delta Hotels by Marriott Toronto

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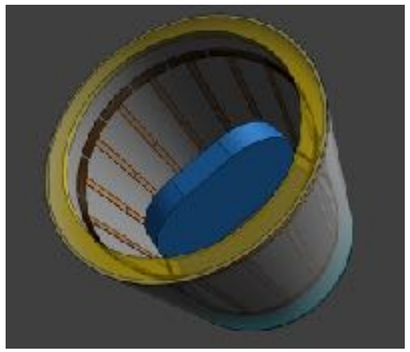
Thank you for being with us tonight!

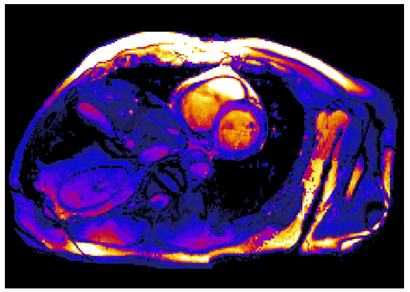
ZMT Zurich MedTech AG

Sim4Life - What's Next?

ZMT Zurich MedTech AG

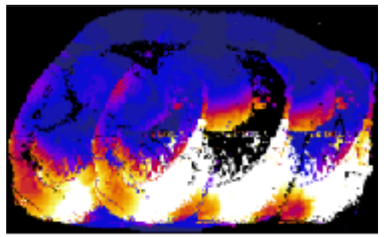
Sim4Life - Delivering a Comprehensive MRI Simulation Platform

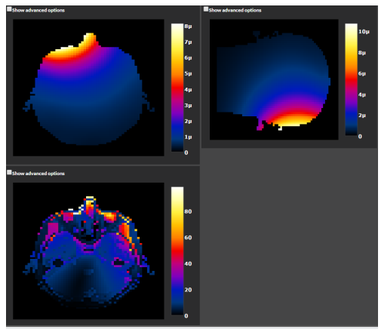




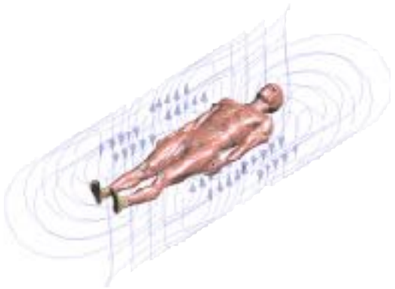
RF Transmit Technology Design & Optimization

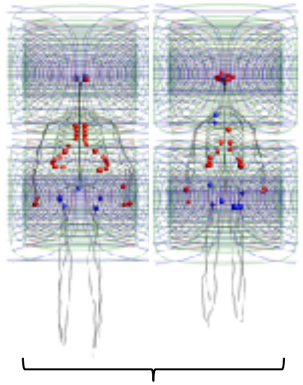
Safety Evaluation





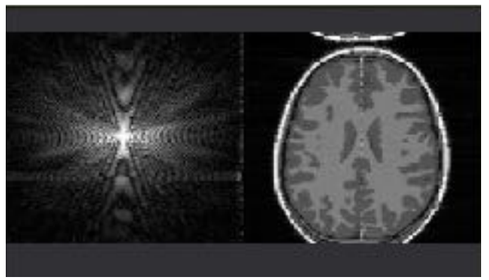
RF Receive Technology Design & Optimization

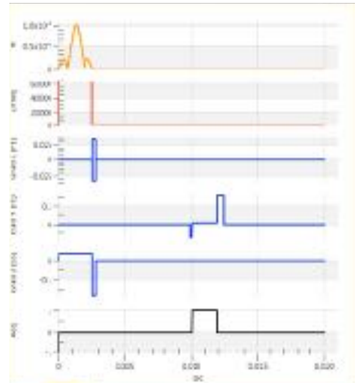




EPI

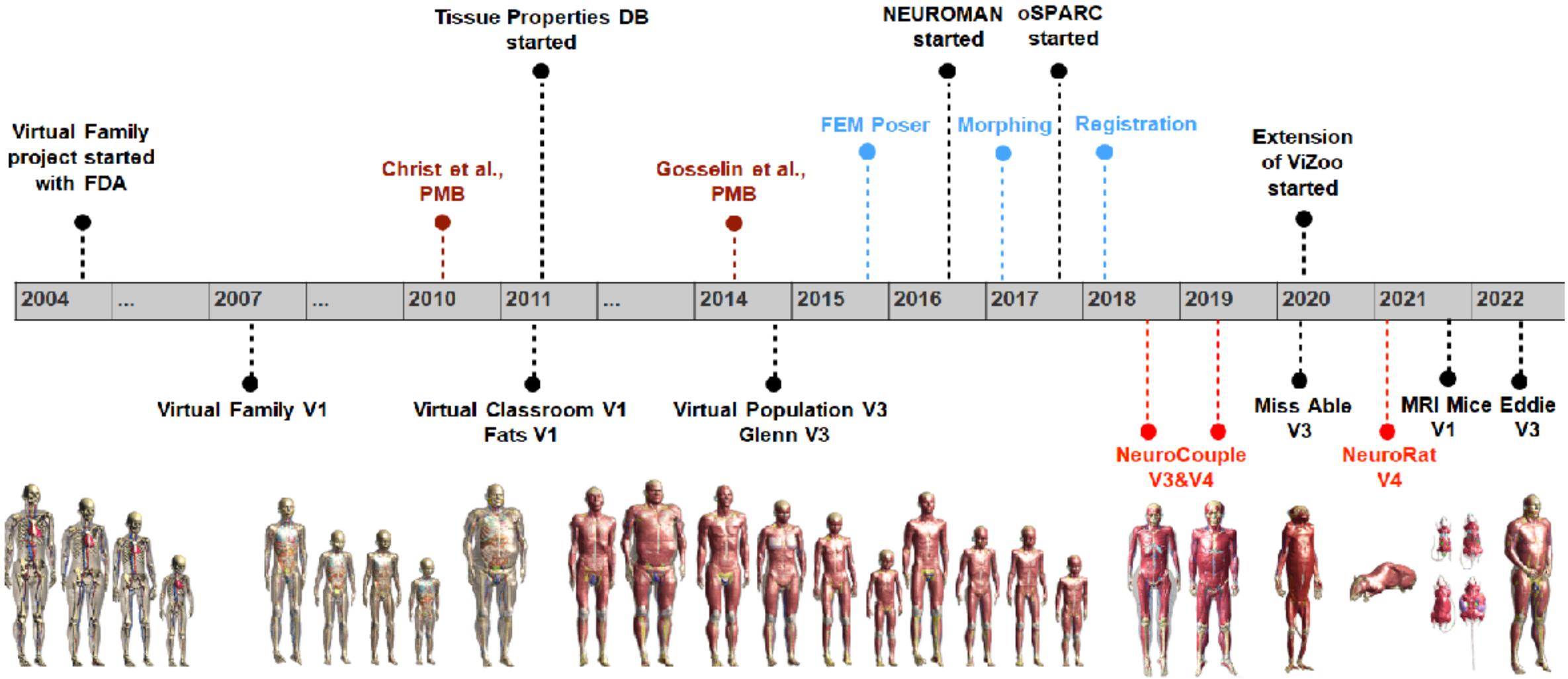
Gradient Technology - PNS



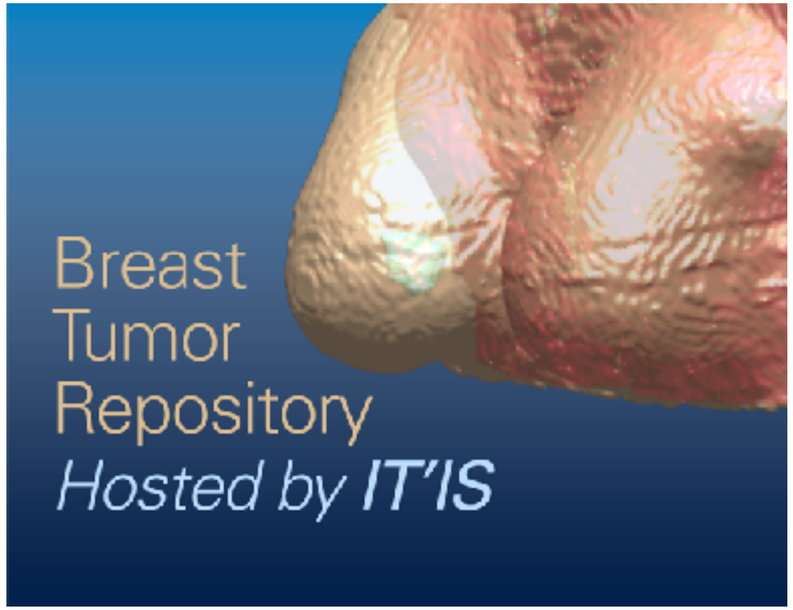


Imaging Technology

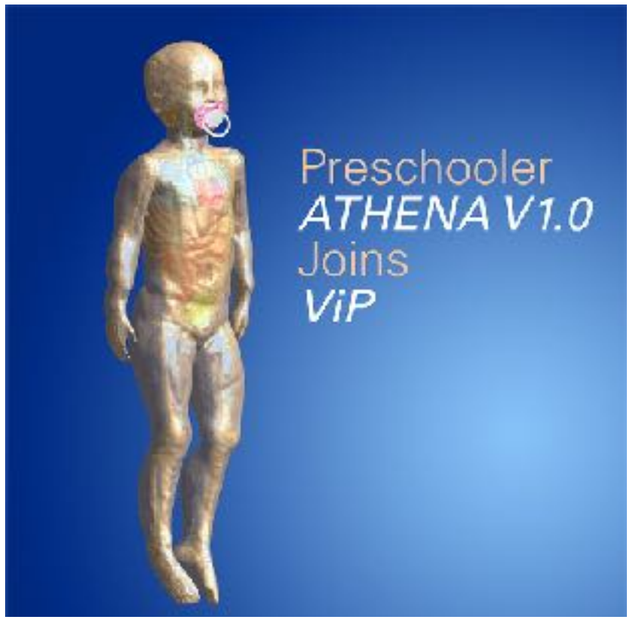
Virtual Family / Virtual Population - The Benchmark in MedTech



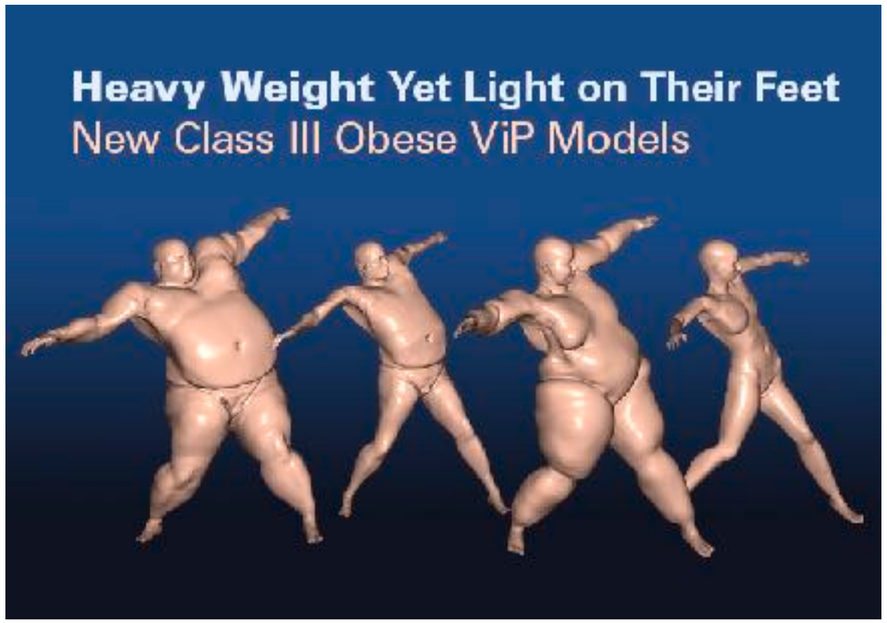
Continued Expansion of Virtual Population



- Erasmus Medical Center, NL
- 22 breast models with tumors
- for hyperthermia simulations

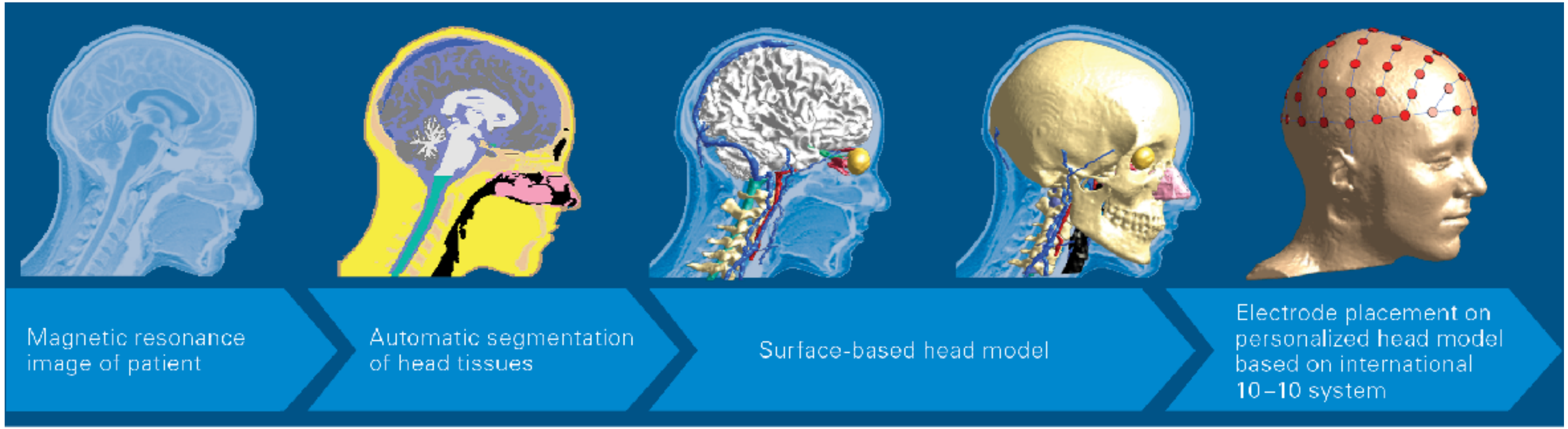


- 3.5-year-old girl
- 267 tissues
- from MRI and CT
- Martinos Center, Boston



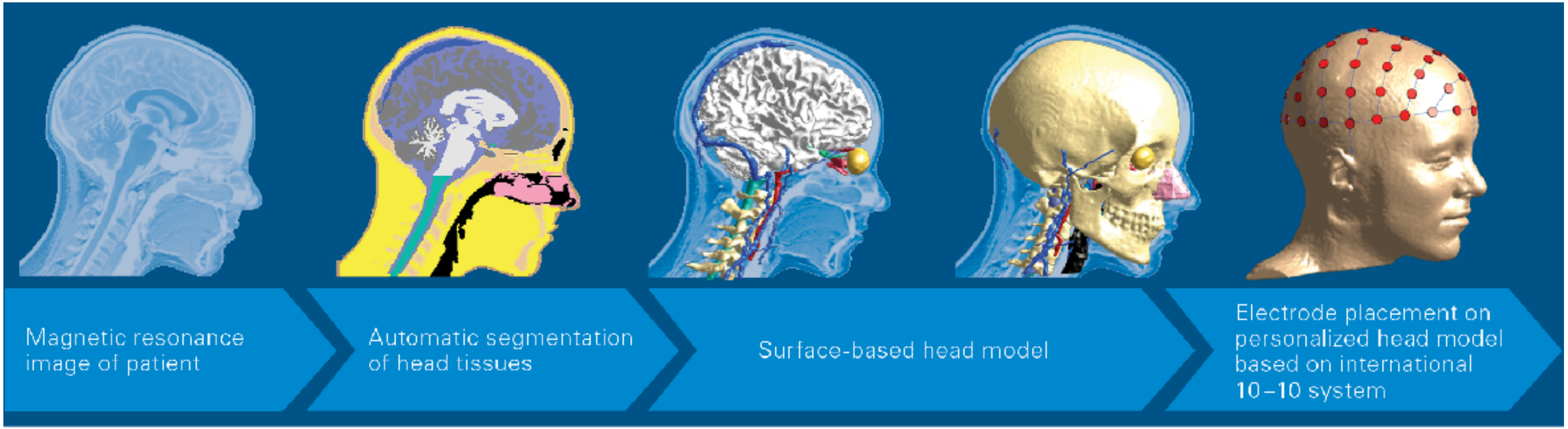
- morphed models with BMI > 65
- ca 320 tissues
- posable
- Validation: University Hospital Zurich

Personalisation of Brain Stimulation Applications



- personalized/precision medicine
  - treatment planning and optimization
  - “personalized” safety assessment
- registration approach
  - find transform that maps “template model” to new patient images
- machine learning approach
  - train network (e.g., UNet) to predict tissue segmentation in new patient images

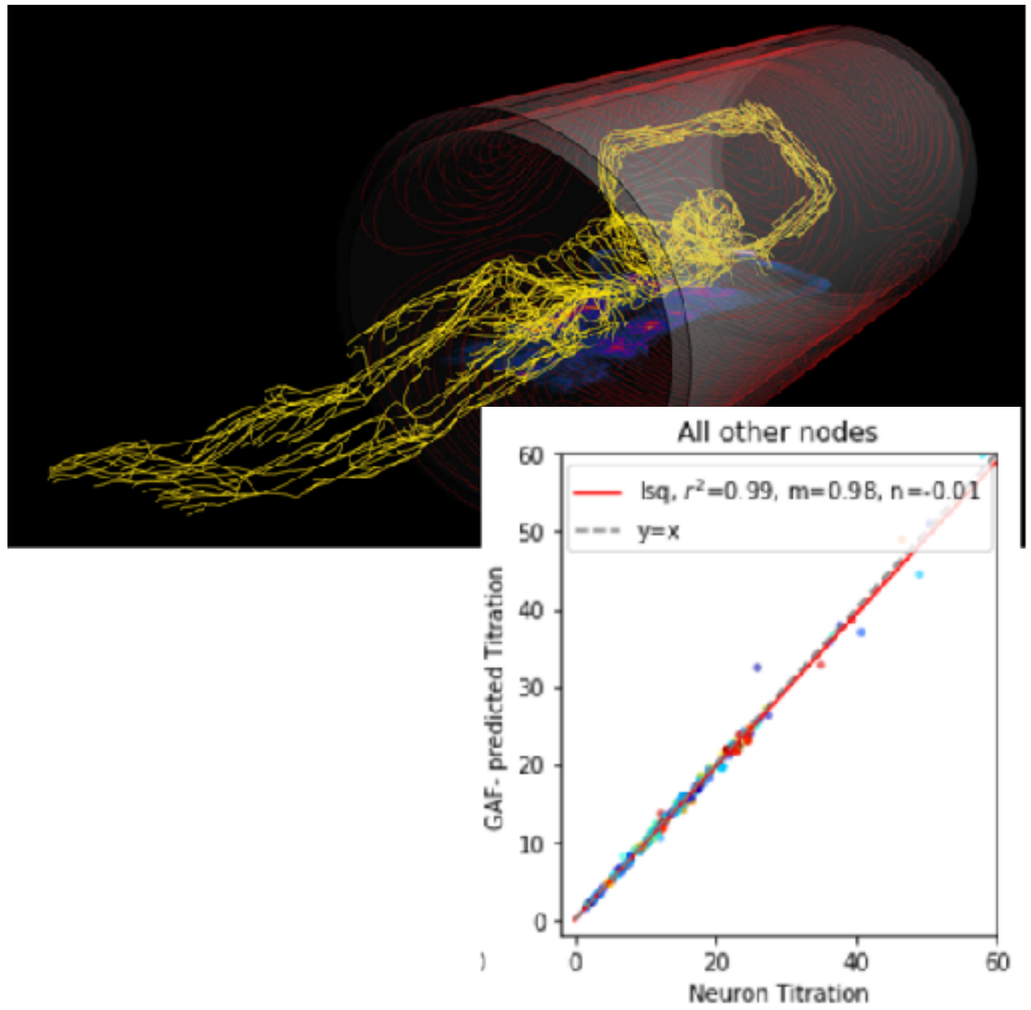
AI-Based Anatomical Model Generation



- next version will include additional tissues
  - tongue, muscle, glands
  - deep brain structures
  - and improved blood vessels
  - target: 26+ tissue classes

Generalized Activation Function - Instant & Accurate Prediction

- prediction of PNS thresholds and site of activation for fast switching MRI gradients
  - investigation related to MRI safety & MRI gradient coil design & optimization
- 2500 whole body axons



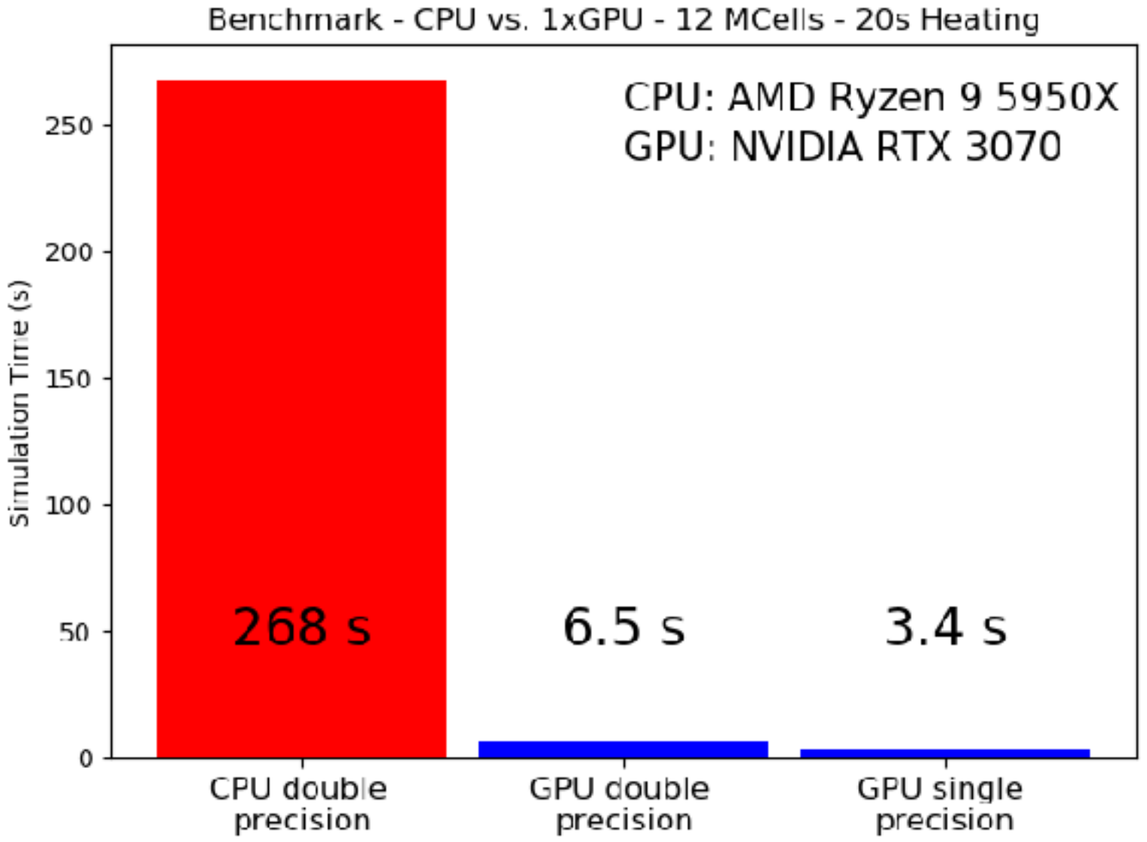
Results

- electrophysiological simulations required ~6h using MPI acceleration, with 64 cores
- GAF calculation and prediction ~seconds, single CPU
- enables large scale investigations: multiple anatomical models, scanning positions, body postures, pulse shapes

Thermal Solver for GPU Acceleration - Multiple GPU Next

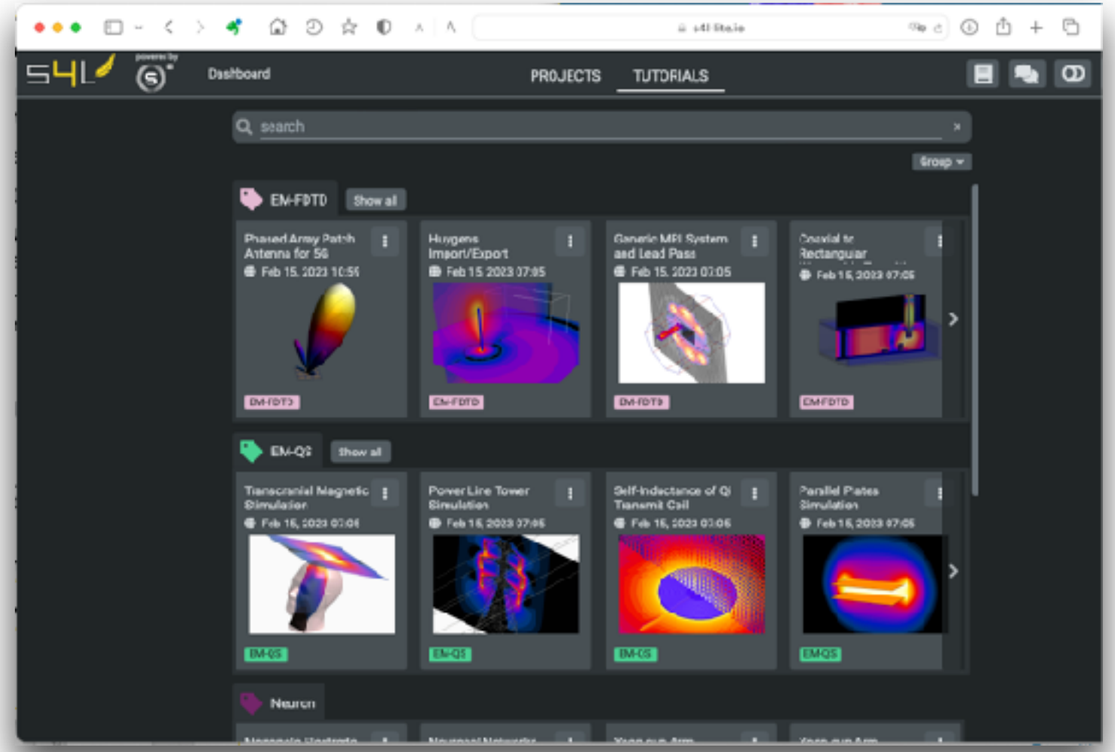
- **enabling thermal solver to run on modern graphical processing units (GPUs)**
- wide range of NVIDIA GPU architectures and models supported
- **substantial speed-up** of simulations
- higher simulation throughput, ideal for iterative and optimization processes

- massively cutting down development time and cost



S4L lite

- online student edition of Sim4Life **https://s4l-lite.io/**
- allows students to easily access, run, and share simulations in the cloud from any web browser
- free of charge
- flexible, maintenance-free
- does not require powerful in-house computational resources: it relies on scalable cloud-computing infrastructure.
- simulation of modeling projects up to 20 million grid cells
  - far more than provided in any other competitor “student” version

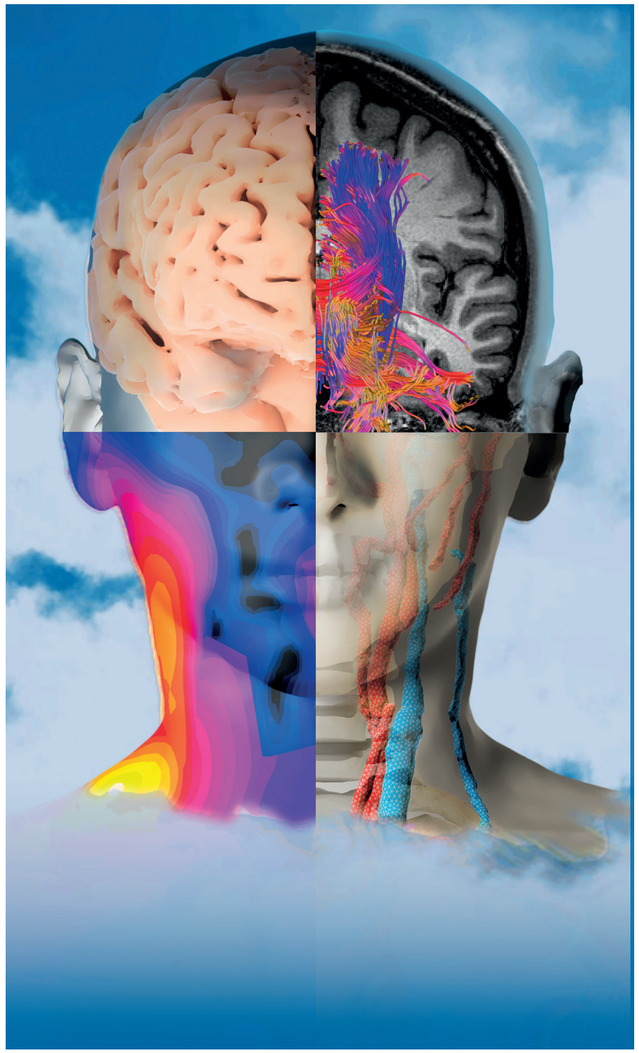


Specifications	
Platform	Online
Application	self-directed study
Number of Objects	unlimited
Grid Size	max. 20 Mio cells
Solvers	EM-FDTD, EM-QS, Thermal, Neuro, Acoustic
GPU Acceleration	no
ViP Human Models	Ycon-sun
Python	yes
3rd-Party Tools	no
Pricing	free-of-charge

S4L *lite* Student Competition 2023

For more information:
https://s4l-lite.io/

S4L web ....



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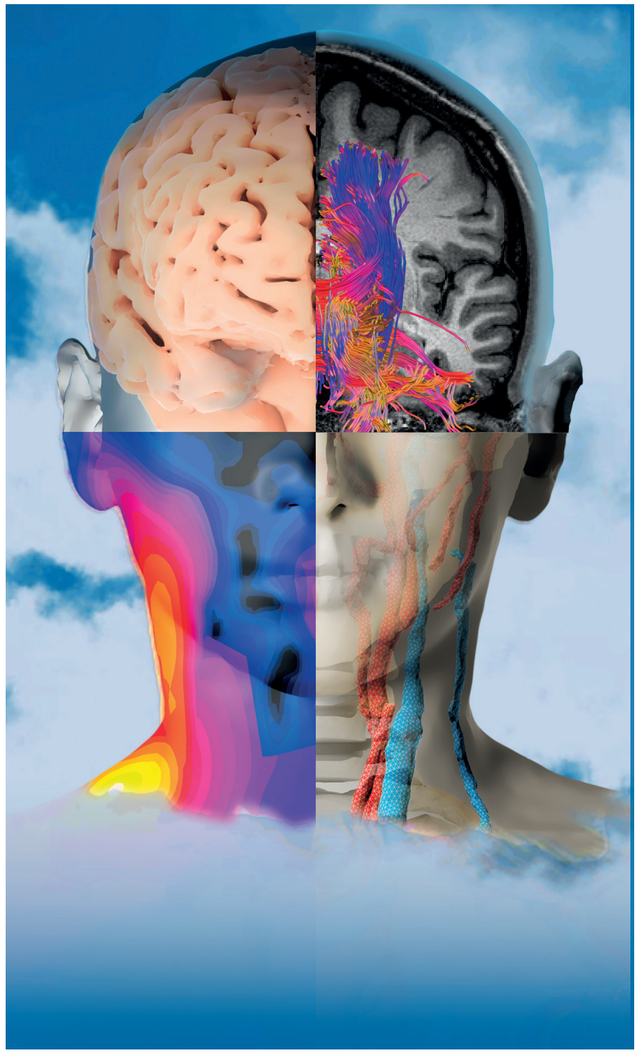

…. to be released November 2023!

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Thank You!

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