

PRESTUS

An open-source toolbox for imaging-based ultrasound simulations

Julian Q. Kosciessa, Andrey Chetverikov, Kenneth van der Zee, Eleonora Carpino,
 Margely Cornelissen, Martin Wimmers, Lennart Verhagen

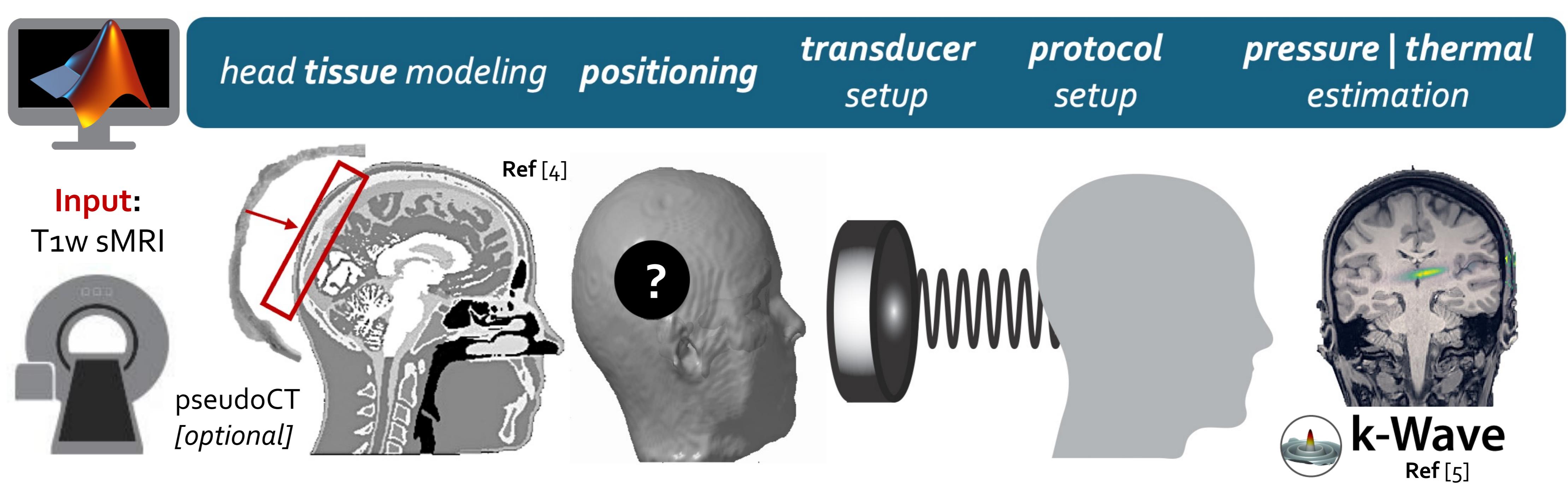
Donders Institute for Brain, Cognition, and Behaviour. Radboud University. The Netherlands

Assessment of TUS safety and efficacy increasingly depend on the **realistic simulation** of acoustic energy deposition and tissue heating in individual participants. Physics engines are available, but the community also requires **end-to-end workflows** that allow to flexibly setup and run simulations through heterogeneous 3D head anatomy.

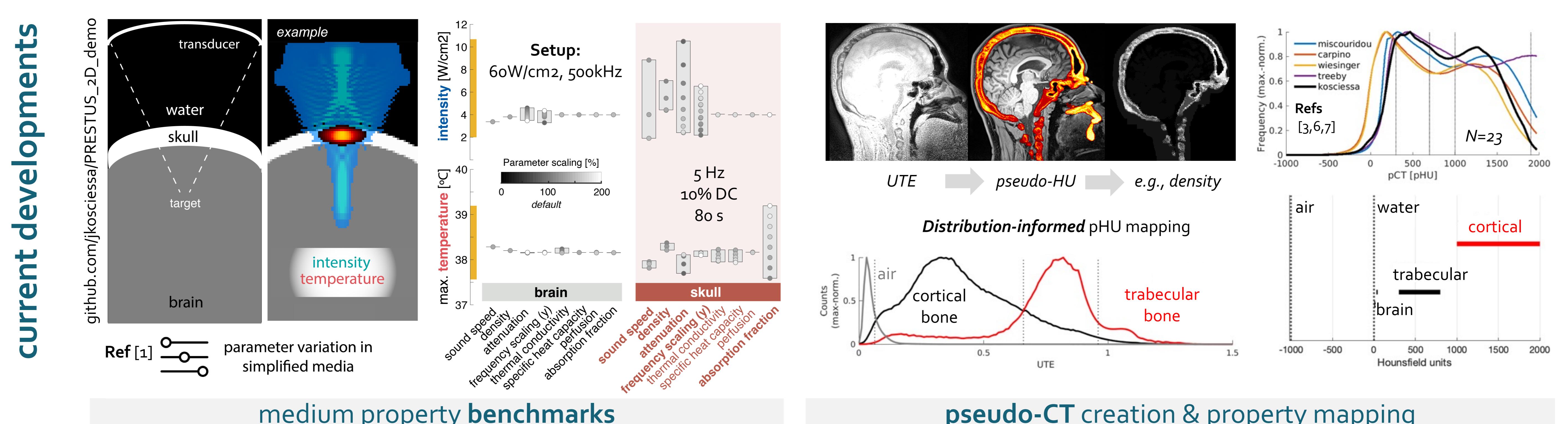
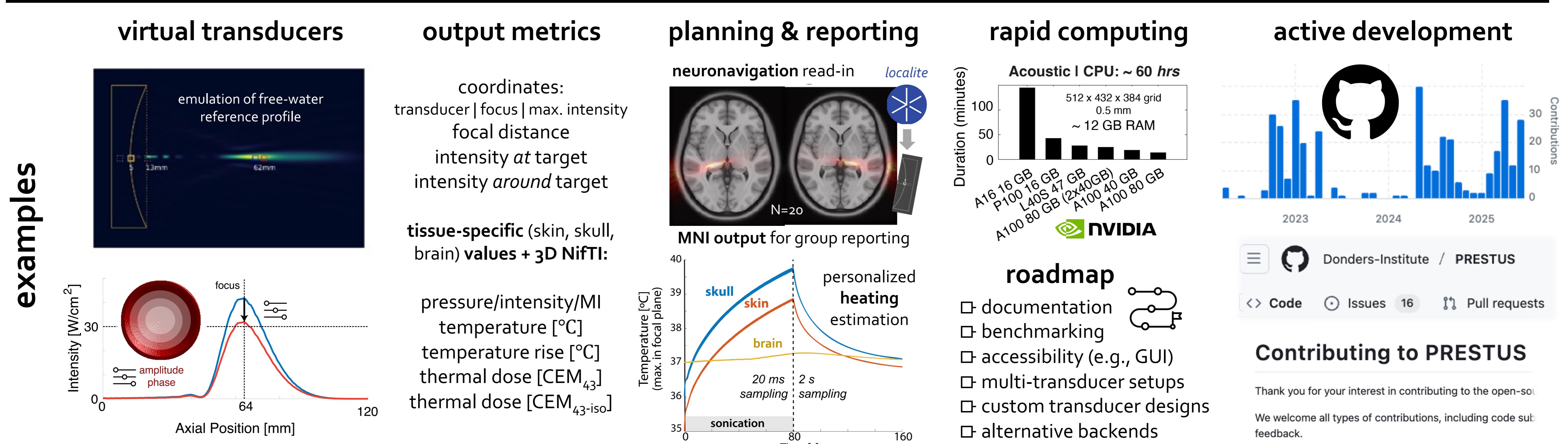
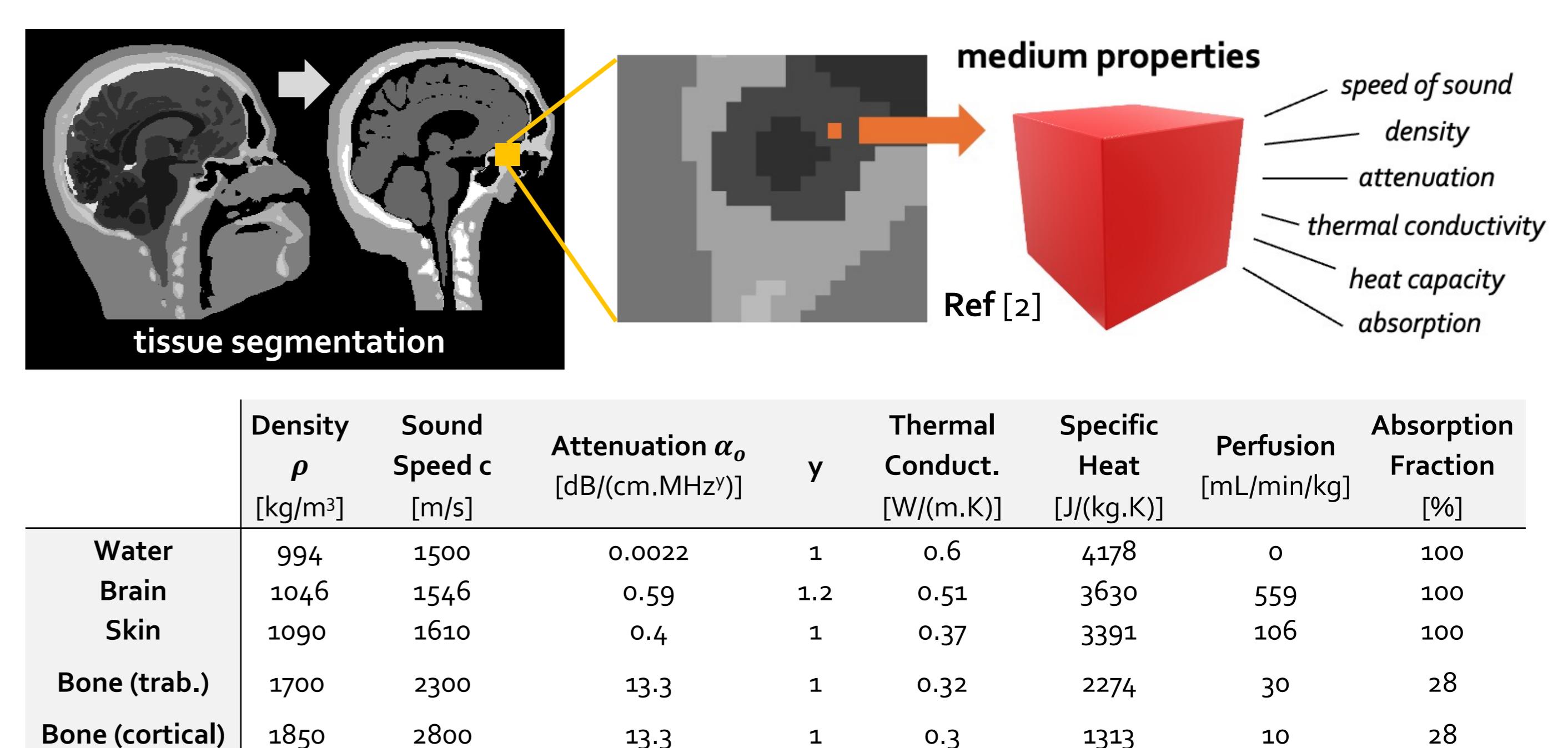
Goal: Reproducibly plan, validate, and report estimated bioeffects of stimulation protocols.



DOI 10.5281/zenodo.15095860
github.com/Donders-Institute/PRESTUS

**Features:**

- MRI **segmentation** (SimNIBS 4 charm) & preprocessing.
- 2D / 3D **grid** specification.
- Multi-layer medium **property mapping**.
- pseudo-CT for **continuous skull mapping**.
- Virtual multi-element **transducer emulation**.
- Estimation of **entry-target** coordinates.
- Flexible **temporal protocol** specification (e.g., breaks).
- Support for high-performance (**HPC**) and **GPU** computing.
- 3D NifTI maps for **reporting** (subject- & MNI-space).



References

[1] Aubry et al. (2022). J. Acoust. Soc. Am | [2] IT'IS Tissue property database v4.2. | [3] Mouscouriou et al. (2022). IEEE TUFFC | [4] Puonti et. al. (2020). NeuroImage | [5] Treeby & Cox (2010). J Biomed Opt. | [6] Treeby (2024). GitHub | [7] Wiesinger et al. (2018). MRM