Automatic Generation of Personalized Skeletal Models of the Lower Limb using the STAPLE toolbox

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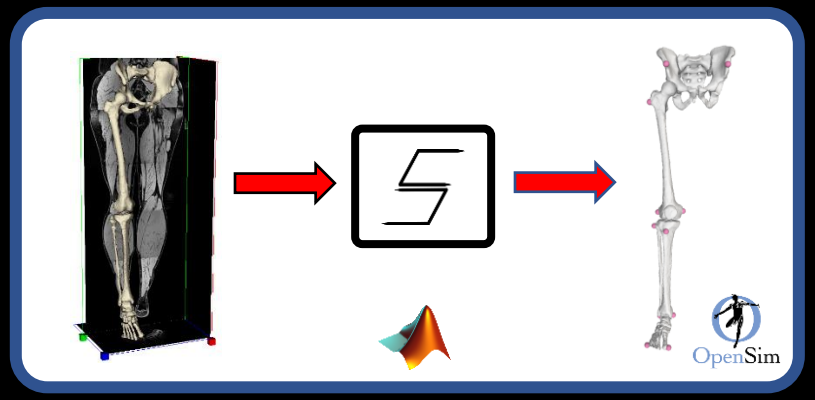
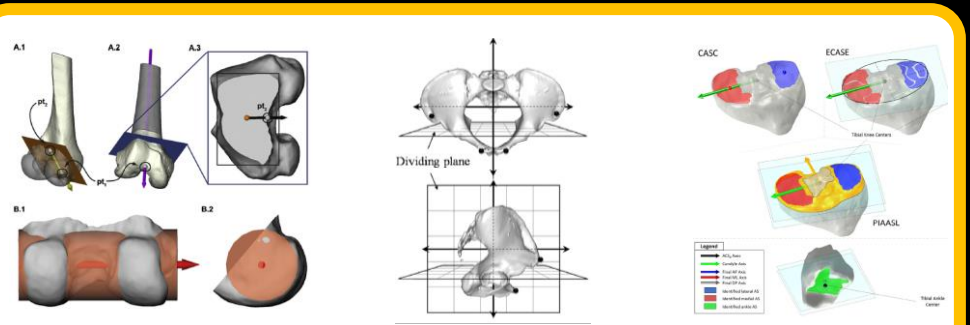
What is STAPLE?

- **S**hared **T**ools for **A**utomatic **P**ersonalised **L**ower **E**xtremity modeling.
- Open source MATLAB toolbox to **AUTOMATICALLY** generate skeletal models from bone geometries (CC-BY-NC license) described in [1].



How does STAPLE work?

- Bone geometries are processed through morphological analyses.
- Segment mass properties and joint reference systems are computed.
- Biomechanical models are generated using the OpenSim [2] API.

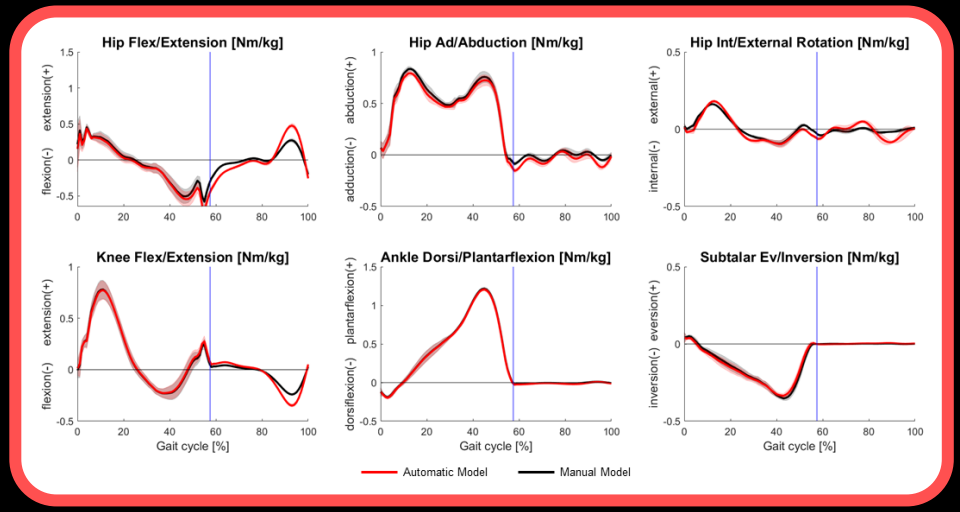


Miranda et al. JBiomech 2010 *Kai et al. JBiomech, 2014* *Renault et al. JBiomech, 2018*

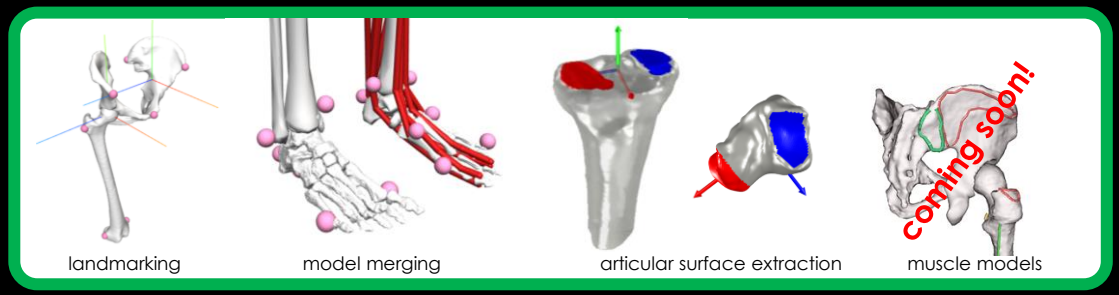
STAPLE PAPER

How good are the STAPLE automatic models?

- STAPLE vs operator-built models compared for 4 datasets and 6 walking simulations.
- STAPLE joint parameters within inter-operator variability for hip, knee and ankle joints.
- In walking simulations, hip flexion angles presented a 3.4° offset originating from pelvis.
- Joint moments differed in swing phase due to 25% difference in shank estimated mass.



What else can I do with STAPLE?



References [1] Modenese and Renault (2021) J Biomech. 116 110186. [2] Delp et al. (2007) IEEE Trans Biomed Eng. 54:1940-50.