Algorithms for Fast / Automatic Anatomical Measurement in Cone-Beam CT

Project description:
Develop algorithms to speed-up / assist / automate anatomical measurements of anatomical alignment in cone-beam CT – (viz., foot and ankle joints for orthopedics).

Manual measurement:
Time consuming
User variability (training-dependent)

Unmet clinical need:
Software to simplify / assist / automate the measurement of key metrics

Extremity Cone-Beam CT (CBCT)

New capabilities:
High resolution 3D
Weight-bearing

Various measurements of joint alignment are used for diagnosis and to plan surgery.
JMAT is software that supports anatomical measurements in CBCT data. You will extend JMAT to the metrics of foot and ankle. JMAT is semi-automated: needs user input to select anatomical landmarks. We want to develop a fully automated method. You will help to develop, apply and validate it in the foot and ankle.

**What Students Will Do / Deliverables:**
- Research and document existing anatomical measurements in the foot and ankle
- **Minimum 1:** Implement *semi-automatic* (JMAT workflow) for CBCT of the foot and ankle.
- **Minimum 2:** Interact with clinicians to learn about the anatomical metrics, refine user interface and validate the software
- **Expected:** Data to develop and validate of the metrics: segment CBCT images, annotate anatomical landmarks. (Atlas of 15-20 CBCT datasets)
- **Maximum:** Implement *fully automatic* (atlas-based / active shape model) anatomical measurements in CBCT of the foot and ankle.
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- **Size group:** 2
- **Skills:**
  - Programming in C/C++ (basic/intermediate)
  - Programming in Matlab
  - Basic understanding of image segmentation

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