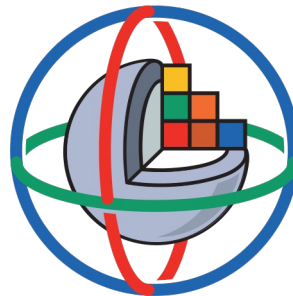


Workshop 3

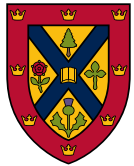
# **Rigid body registration and kinematic calculations in dynamic radiographic datasets using SlicerAutoscooper<sup>M</sup> (SAM)**



# The Teams + Funding



Beatriz Paniagua *et al.*

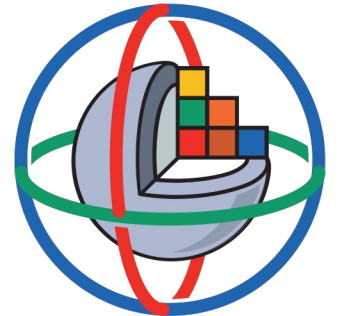


Michael Rainbow *et al.*



Kristin Zhao *et al.*

+ NIH R01AR078924 =



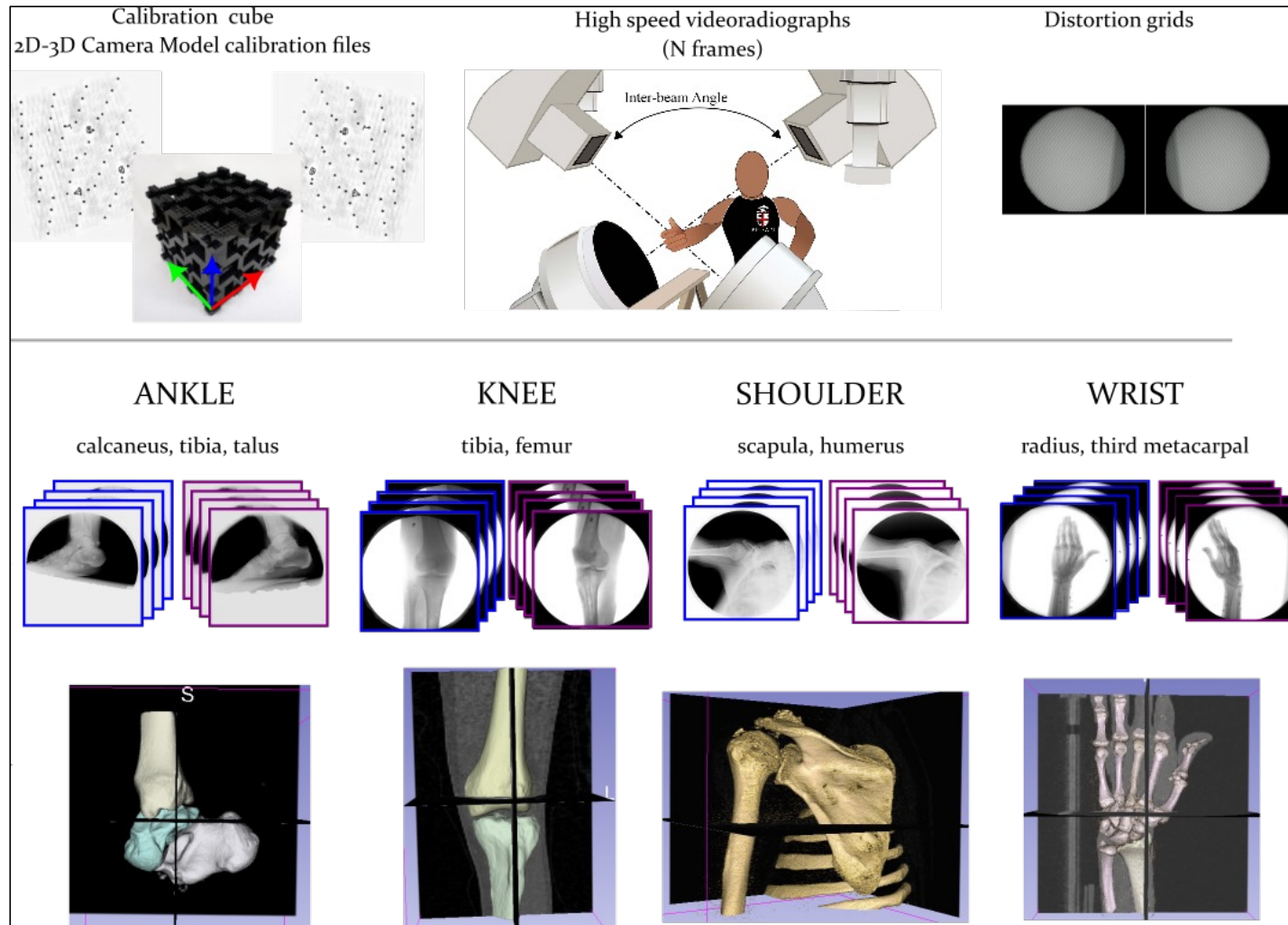
Trey Crisco, Jill Beveridge *et al.*

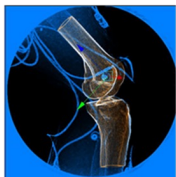


Letters of Support

# Publications

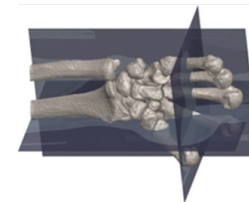
- Morton et al., J. Biomechanics, 2025
- 3DH (3DCT & 4DCT) *In progress*





3D Slicer

Open-source desktop application for image analysis & visualization



**Inputs**

nVideoRadiography  
Calibration  
Bone/implant models

**Inputs**

4DCT  
3DCT  
Bone/implant models



3D Slicer extension

**SlicerAutoscooper<sup>M</sup>**

Autoscooper  
Pre-Processing

### Autoscooper

#### Tracking Algorithm

Particle swarm optimization (PSO) with a  
normalized cross correlation heuristic

[videoradiography space]

### Hierarchical 3D Registration (3DH)

#### Tracking Algorithm

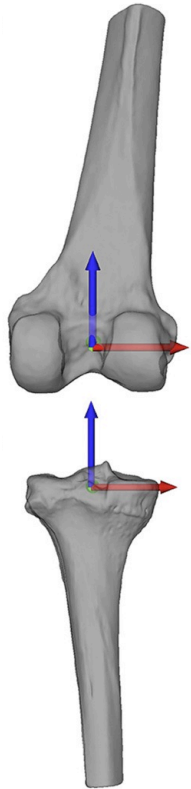
Automated model subvolume ROI  
Elastix Registration Method (itk)

[CT space]

**Outputs**

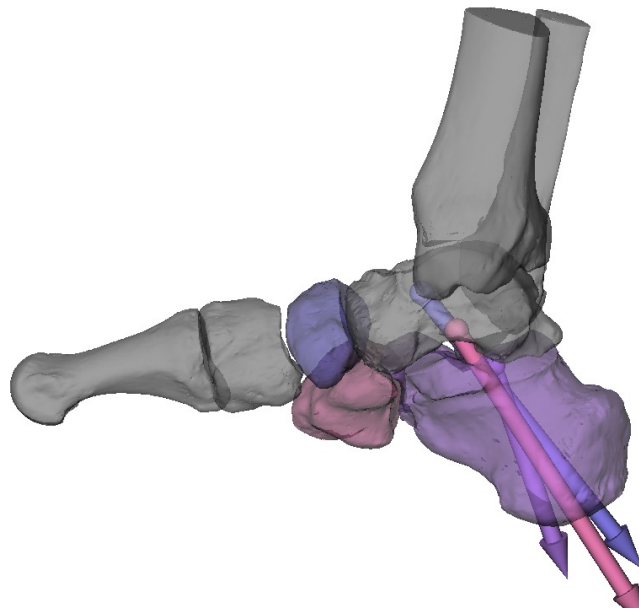
Multibody Registrations

**Outputs**  
Multibody Registration



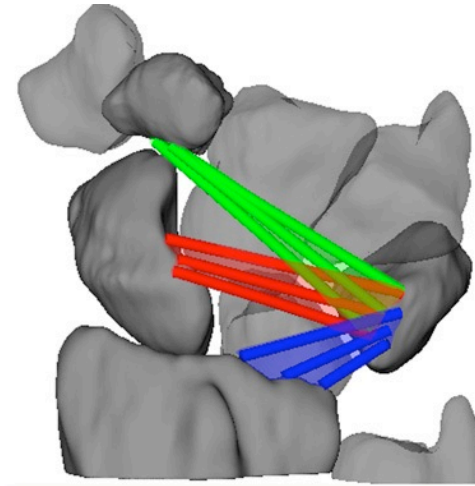
**Anatomical Coordinate systems**

(Miranda et al., 2010)



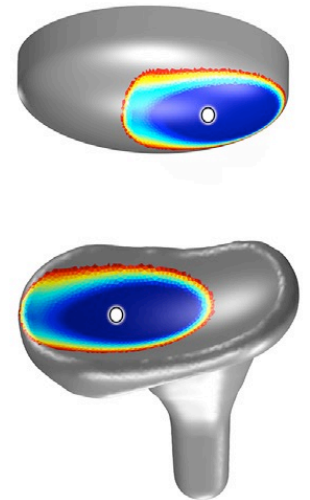
**Relative tarsal kinematics**

(Behling et al., 2024)



**Ligament function**

(Rainbow et al., 2012)



**Implant contact areas**

(Akhbari et al., 2021)



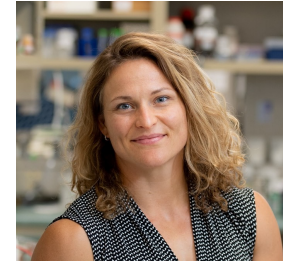
# SlicerAutoscooper<sup>M</sup> Competition

- *Most creative use of SAM and highest data throughput*
- Letter of Intent (LOI) by **October 1** to [joseph\\_crisco@brown.edu](mailto:joseph_crisco@brown.edu)
  - 1-page LOI
    - Motivation & Rationale
    - Research Question
    - Data Acquisition
    - Sample Size
    - Primary Outcome Metric
- Up to \$2,500 in awards for students and labs
- Project report due **December 19**



# Agenda

- **Installation of Slicer & SlicerAutoscooper<sup>M</sup>**
  - Amy Morton (*recording*)
- **Biplane Videoradiography (BVR) Workflow Demonstration**
  - John Holtgrewe
- **Socket Control of SlicerAutoscooper<sup>M</sup> for Automated Processing**
  - David Williams (*recording*)
- **4DCT Processing in SlicerAutoscooper<sup>M</sup>**
  - Cesar Lopez
- **Benefits of SlicerAutoscooper<sup>M</sup> Hierarchical 3D Registration Module over Traditional Research Methods**
  - Jennifer Villeneuve
- **Discussions and Questions**



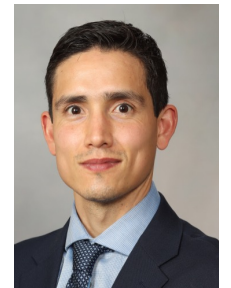
Amy



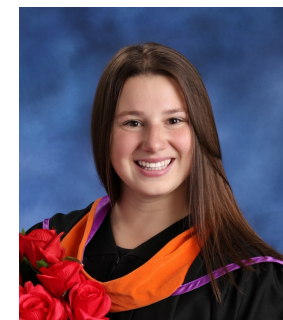
John



David



Cesar



Jennifer