Shape Analysis for Orthopedics
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What is shape?
Shape = Object – Location – Orientation - Scale

How do we model them?
- Compact Model (in Shape Space)
- Accurate Representation (in Configuration Space)

Q: How much to 'shave off'? And from where?

How do we use this model?
- Preprocessing
- Optimization
- Visualization

CAM-FAI Characterization w/ Michael Harris, Andrew Anderson
CAM-FAI = 'cam' type Femoro Acetabular Impingement
Treatment: surgical debridement

Data:
Segmented femurs – controls (33), CAM-FAI patients (15)

Q: How much to 'shave off'? And from where?

Mouse model of osteochondroma w/ Dr. Kevin Jones
Multiple osteochondroma: Causes shortening of bones in humans
Studied using mice models

Data:
Segmented femurs – controls (12), young-dox (14), mid-dox (14), old-dox (10)
Segmented tibiae – controls (8), young-dox (12), mid-dox (10), old-dox (6)

Q: Can we characterize the effects of disease progression?

Average shape differences (treatment planning)
Group mean differences (indicate shortening of bone)

Shape variability (understand morphological variability and improve mechanical models of CAM-FAI)

z-scores to correlate volume and length (indicate clear separation between control and disease groups)