Motivation

- Static medical imaging alone may not help the radiologist and surgeon to provide a well-informed pre-surgical diagnosis of dynamic hip pathologies.
- Combining real-world motion data with medical imaging provides a comprehensive approach to improve diagnostic accuracy and interventional efficacy.

Goals

Create a robust software to:
- Show interference (bone on bone contact) location and depth
- Simulate the gait of the patient
- Classify the pathology through machine learning
- Provide recommendations for diagnosis and intervention

Design Features

Hip Kinematic Simulation
- Real-time rotation & interference
- FADIR and other clinical tests
- Driven by human biomechanics
- Subtract interference volume and reevaluate simulation
- Depth of interference on femur

Classification Tool
- Machine learning using Linear Discriminate Analysis (LDA)
- Configurable with prospective patients
- Forward selection of discriminating features

Biomechanical Markers
- Allows providers to correlate interference with movement

Results

- Quantifies interference volume with 0.5 mm^3 accuracy
- Processing time of less than 30 seconds
- < 1 second classification training

Future Development

- Provide flexibility in program so any body joint can be viewed
- Integrate wearable of live motion for on-the-spot clinical intervention
- Add library of common motions such as golf swing, yoga, swimming, etc.