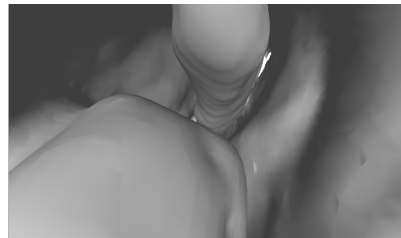## Auto-initialization using Deep Learning

- **Problem Statement**:
  - Registration algorithms require an initial F_{guess}. Algorithms can be very sensitive to this initialization, and manual initializations can be time consuming.

- **Project Statement**:
  - Automatically initialize registrations intelligently using deep learning for scene matching in medical images of different modalities (video frames and CT rendering)

Simulated video frame

Corresponding camera view in CT rendering

Auto-initialization using Deep Learning

- **What Students Will Do:**
  - Work with simulation data (with known truth)
  - Figure out what kind of neural network is best for this application
  - Train a neural network to learn camera transformations that produce a CT rendering that matches the video scene
  - Test the neural network on simulation data to see if that correct transformation can be recovered

- **Deliverables:**
  - Trained and tested neural network
  - Can it produce an F_{guess} that matches the truth in simulation?
  - Perform registration starting from the predicted F_{guess} using at least one established registration algorithm (e.g., ICP)
  - Perform registration using multiple established registration algorithms to assess the quality of the initialization using different methods

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Auto-initialization using Deep Learning

- **Size group:**
  - No more than 3, if more split into sub-projects

- **Skills:**
  - Deep learning (at least some understanding, can learn more as you go)
  - Python (preferably, but Matlab/C++ also work)

- **Mentors:**
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  - Austin Reiter; areiter@cs.jhu.edu

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