Spatially tracked ultrasound   
for scoliosis quantification

Ben Church

# Introduction

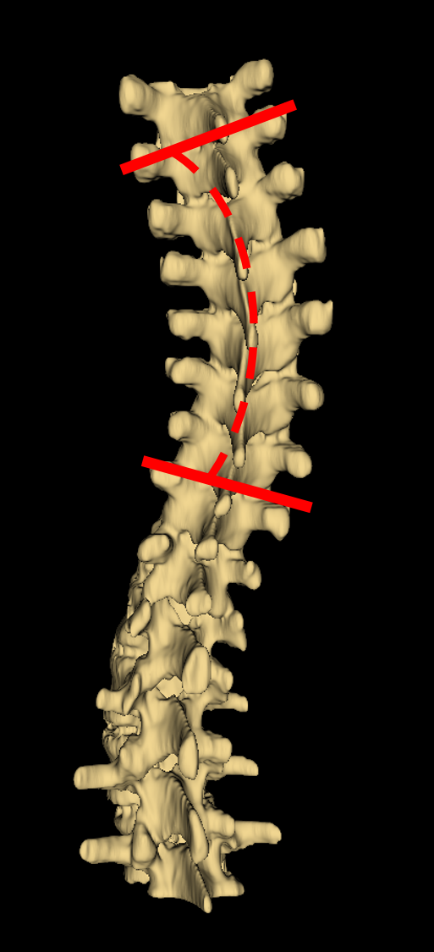


Figure : CT derived model with Cobb angle illustrated.

## Scoliosis

Scoliosis is a pathological curvature of the spine which typically manifests in adolescence and develops during growth. The disease can be quantified in terms of the Cobb angle, that is, the maximum angle between the end plates of any two vertebrae, as shown in Figure 1. The Cobb angle is of interest to clinicians because it provides an objective indication of how severe the scoliosis is. As such, it is used to decide which treatment plan to proceed with. Cases with Cobb angles less than 20o are typically monitored so the deformation does not progress to the point of causing other health problems. Patients with Cobb angles between 20o and 40o often have braces prescribed to support the spine and slow further deformation. Cobb angles greater than 40o may require surgical vertebral fusing to halt deformation. When possible, bracing is a preferable treatment to surgery. Surgical vertebral fusing results in permanent mobility loss and entails greater risks and financial costs than bracing. Therefore, with the curvature progressing during growth, regular assessment of the disease is important to ensure treatment risks and costs are minimized.

The current gold-standard method for assessment of scoliosis is to measure the Cobb angle directly from an X-ray of the patient’s back. Repetitive exposure to the ionizing radiation of X-ray for scoliosis monitoring has been shown to increase [\*\*\*certain\*\*\*] cancer risks. This has motivated research into other methods for assessment of the disease, typically involving estimating the Cobb angle through a proxy measurement.

## Tracked ultrasound