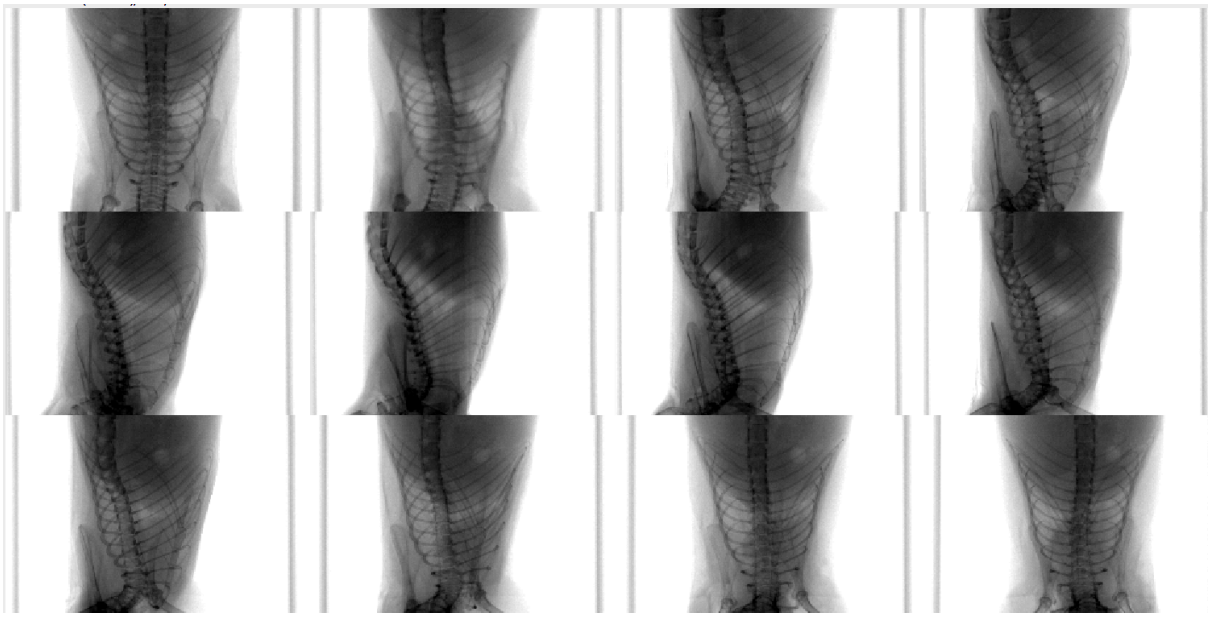
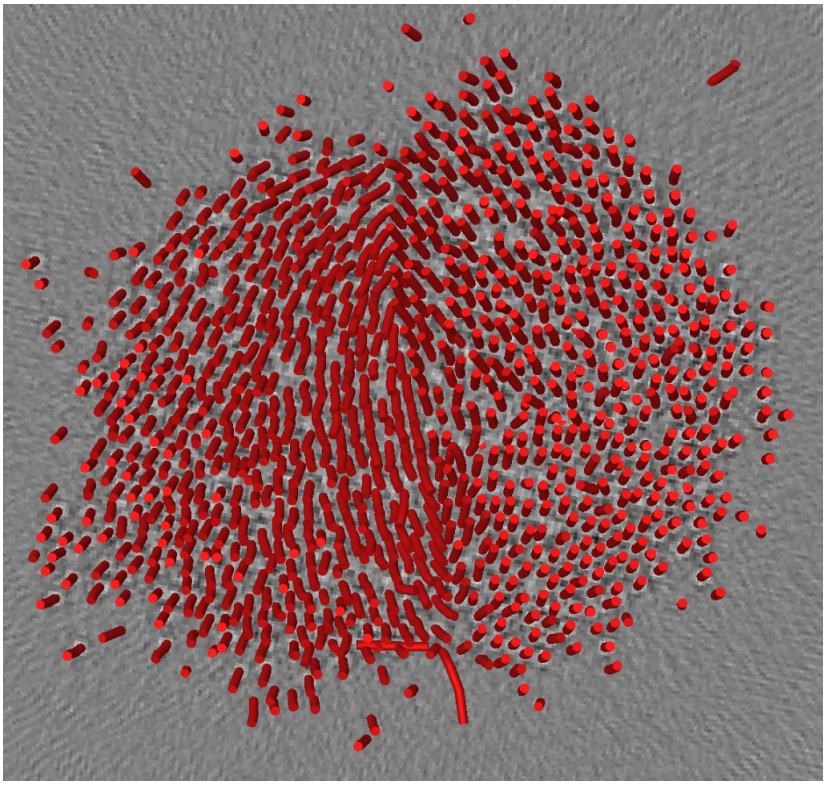
Semester Project: X-ray reconstruction corrections for mechanics and biology

X-ray reconstruction from a number of radiographies is an extremely important volume measurement technique in medicine, mechanics and beyond. When there is mechanical drift during imaging, there are reconstruction artefacts.



Radiographies of a mouse breathing



Tomography of fiber reinforcement thread for formula one tyres

We propose to work with the ASTRA open-source toolkit (https://astra-toolbox.com/) for x-ray reconstruction and apply corrections to the geometry with different techniques:

1. When there is an external measurement of the drift to apply this correction to the geometry to improve the reconstruction (e.g., with a “reference” scan)

2. Without an external measurement, a few parameters can be varied automatically to obtain the sharpest image (e.g., autofocus)

3. With a fully differentiable pipeline, all geometry parameters can be optimised

Although this is a completely general problem, we will focus on x-ray data from experimental mechanics (fiber reinforcement for formula one tyres) as well as biomedical imaging (tomographies with of mice breathing for tumour detection)