

## 1. Ray Tracing (1 day)

- a. Review of the x-ray image acquisition process
- b. Overview of Siddon's algorithm
- c. Exercise: implement Siddon's algorithm

## 2. The image acquisition chain (1 day)

- a. Explanation of the image formation process, from the x-ray source until the detector.
- b. X-ray production
- c. Attenuation/scatter
- d. Direct and indirect detectors
- e. Sources of noise
- f. Exercise: X-ray spectrum modeling
- g. Exercise: Generate an ideal image

## 3. Serial cascaded modeling (1 day)

- a. MTF
- b. NPS
- c. DQE
- d. Exercise: Develop a serial cascade model of a system. Vary system design parameters to see how resulting image changes.

## 4. Realistic imaging system simulation (1 day)

- a. Review of Saunders method
- b. Exercise: Generate realistic images for varying system properties
- c. [Unsupervised image segmentation \(Lecture + Exercise\)](#)

## 5. Image data analysis (1 day)

- a. [Neural networks \(2 hours lecture + 2 hours lab\)](#)
- b. [Exercise: addressing a problem with data analysis](#)
- c. [Convolutional neural networks](#)
- d. [Exercise: noise reduction or image classification](#)