

Tomographic imaging refers to the non-invasive determination of the internal structure of an object from transmission, emission, or reflection data collected from different positions around the object. Tomographic imaging techniques have found a number of medical applications, ranging from X-ray CT to nuclear emission tomography to magnetic resonance imaging to ultrasonic diffraction tomography, and have had a revolutionary impact on diagnostic medicine.

The problem of image reconstruction from the collected data has been one of the most active and rapidly evolving areas of research in medical physics. A wide variety of reconstruction techniques have been developed to reconstruct images for different tomographic imaging modalities. The purpose of this paper is to provide a tutorial overview on the subject of tomographic image reconstruction.

We will describe and review in an intuitive way the general mathematical and physical principles and concepts involved in tomographic imaging. We will also provide a basic understanding of some most widely used reconstruction algorithms by focusing on the image reconstruction problem in X-ray CT. In addition, we will discuss the evaluation of image quality and analyze image artifacts that arise in tomographic imaging such as X-ray CT.