Briefly summarize different generations of at least two CT scanners and include the latest advances in the CT scanners which were not discussed in the lecture.

The initial CT consisted in X-ray tube to emit beams detected by a detector. The tube produced parallel X-ray beams, moving linearly along an axis, then rotating to repeat the same process to capture multiple projections of views.
The X-ray detector measured the attenuation of the X-rays as they passed through the body, moving in coordination with the -Xray tube. Over time this system went through many improvements and iterations.

In the fourth generation of CT scanners, the detectors are stationary; and arranged in a fixed full circle around the patient; covering the entire area to scan. The X-ray tube rotates around the patient.
In helical CT scanners, helical data is captured by the combination of the rotating X-ray tube in a spiral shaped form as the patient moves through the scanner. This method allows for the collection of more comprehensive data, making the scan 8 to 10 times faster than traditional CT. It also enhances image clarity and reduces the risk of missing small tumors or abnormalities.

In photon-counting CT, X-rays are detected directly using a semiconductor as photon-counting detector. This technology requires less time compared to conventional CT; has a better signal to noise ratio; improved contrast; and exposed patients to less radiation doses [1].

One recent advance is the development of portable CT Scanning system which allows quick deployment to the area of trauma. These systems are totally independent with their own power unit and internal drive, while being light enough to be easily transported. Example of such equipment are portable conebeam (CBCT) scanners which are smaller in size, are cheaper compared to conventional scanners [2].

Recent advancements include the impact of AI and deep learning reconstruction models, the use of refraction-based phase-contrast CT instead of traditional attenuation methods, increased spatial resolution, and faster processing times.

[1]: Lachance C, Horton J; Authors. Photon-Counting CT: High Resolution, Less Radiation: Emerging Health Technologies [Internet]. Ottawa (ON): Canadian Agency for Drugs and Technologies in Health; 2024 Feb. Available from: https://www.ncbi.nlm.nih.gov/books/NBK602525/

[2]: Rumboldt Z, Huda W, All JW. Review of portable CT with assessment of a dedicated head CT scanner. *AJNR Am J Neuroradiol*. 2009;30(9):1630-1636. doi:10.3174/ajnr.A1603