Introduction to Medical Imaging

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History of medicine

- **Humours**: Until 19th century western medicine was based on Galen’s theory of humours, or principal fluids: black bile, yellow bile, phlegm (strange liquid related to tumors), and blood
  - Healing included physical and spiritual therapeutics like herbs, healthy diet, cleaning, meditation, prayers, music
  - It was understood that environment influenced the humours
  - However they also used leeches (*sangsue*)...

- **De Humani Corporis Fabrica - 1543**: series of books of Andreas Vesalius on human anatomy (University of Padova). Great and clear illustrations of the human anatomy.

- **19th century**: advances in technology and science make more systematic the analysis of symptoms for diagnosis (e.g. stethoscope invented in 1816 by René Laennec at the Necker-Enfants Malades Hospital in Paris.)
History of medicine

- **Before 19th century:** anatomical and functional study of human body is based on the strategy *open, examine, report.*

- **During 19th-20th century:** external tools are used to probe the human body (non invasive). For instance, neurosurgeon Penfield stimulated the brain of conscious patients with electrical probes and observed their responses → **cortical homunculus**

*Figure 1: Image taken from Wikipedia.*
History of medicine

- **During 20th century**: Medical imaging transforms clinical practice and research! We can now see inside the human body in a non-invasive way!

- **1895**: first X-ray image (Rontgen)
- **1940-1950**: medical ultrasonography
- **1973**: first Magnetic Resonance imaging on a animal
- **1990**: development of nuclear medicine

Figure 2: Image taken from Wikipedia.
There are different medical imaging techniques

Each technique is based on different physical principles and can be used to analyze only specific tissues/organs/functions of the human body

Different techniques give different results → choice depends on what you want to do/analyze

You need to understand the physical principles behind the imaging modalities to correctly analyze/interpret the resulting images!
Medical Imaging

In this course, you will learn about:

- X-ray imaging
- Ultrasound imaging
- Magnetic Resonance imaging

and much more...
Complex and multi-disciplinary topic

- Physics
- Mathematics
- Computer Science
- Biology
- Medicine, Anatomy
- Neuroscience, Psychology
- Engineer - Doctor communication
- and the patient....
Research in medical imaging

- Reconstruction, Denoising
- Improve quality
- Segmentation, Detection, Classification
- Modeling
- Visualization
- Fusion of Information among modalities
- Computer-aided tools for clinicians
- ...

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