Medical imaging: a collaborative paradigm

picture from Atam P. Dhawan: *Medical Imaging*
Medical imaging pipeline

- **Patient/subject**
- **Physical property**
- **Imaging device**
- **Raw data**
- **Preprocessing**
- **Improved data**
- **Reconstruction**
- **Images/volumes**
- **Interpretation**
- **Quantitative/qualitative inf.**
- **Physician**
- **Decision**
Medical imaging pipeline

- **Patient/subject**
  - Physical property
  - Imaging device
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    - Quantitative/qualitative info.
    - Physician
      - Decision
Medical imaging pipeline

1. Patient/subject
2. Physical property
   - Imaging device
3. Raw data
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4. Improved data
   - Reconstruction
5. Images/volumes
   - Interpretation
6. Quantitative/qualitative inf.
   - Statistical processing
   - Physician
   - Decision
Classification of medical modalities

- What information do we need?
  - anatomical, physiological, functional
Classification of medical modalities

- What information do we need?
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- What is the energy source?
  - external, internal, combined
Classification of medical modalities

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- How good is the image?
  - resolution, noise
Classification of medical modalities

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- What is the energy source?
  - external, internal, combined
- How good is the image?
  - resolution, noise
- How much does it cost?
Energy source

Medical Imaging Modalities

Source of Energy Used for Imaging

External
- X-Ray Radiographs
- X-Ray Mammography
- X-Ray Computed Tomography
- Ultrasound Imaging and Tomography
- Optical Transmission and Transillumination Imaging

Internal
- Nuclear Medicine: Single Photon Emission Tomography (SPECT)
- Nuclear Medicine: Positron Emission Tomography (PET)

Combination: External and Internal
- Magnetic Resonance Imaging: MRI, PMRI, FMRI
- Optical Fluorescence Imaging
- Electrical Impedance Imaging
Electromagnetic spectrum

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<th>Microwaves</th>
<th>Infrared Rays</th>
<th>Visible Light</th>
<th>Ultraviolet Rays</th>
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**Wavelength in meters**

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**Frequency in Hz**

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<th>MRI</th>
<th>X-ray Imaging</th>
<th>Gamma-ray Imaging</th>
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**Energy in eV**