Imaging Informatics and PACS

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Consultant body MRI

and

Imaging Informaticist

IMAGING INFORMATICS

- the study and application of processes of information and communications technology for the acquisition, manipulation, analysis, and distribution of image data.

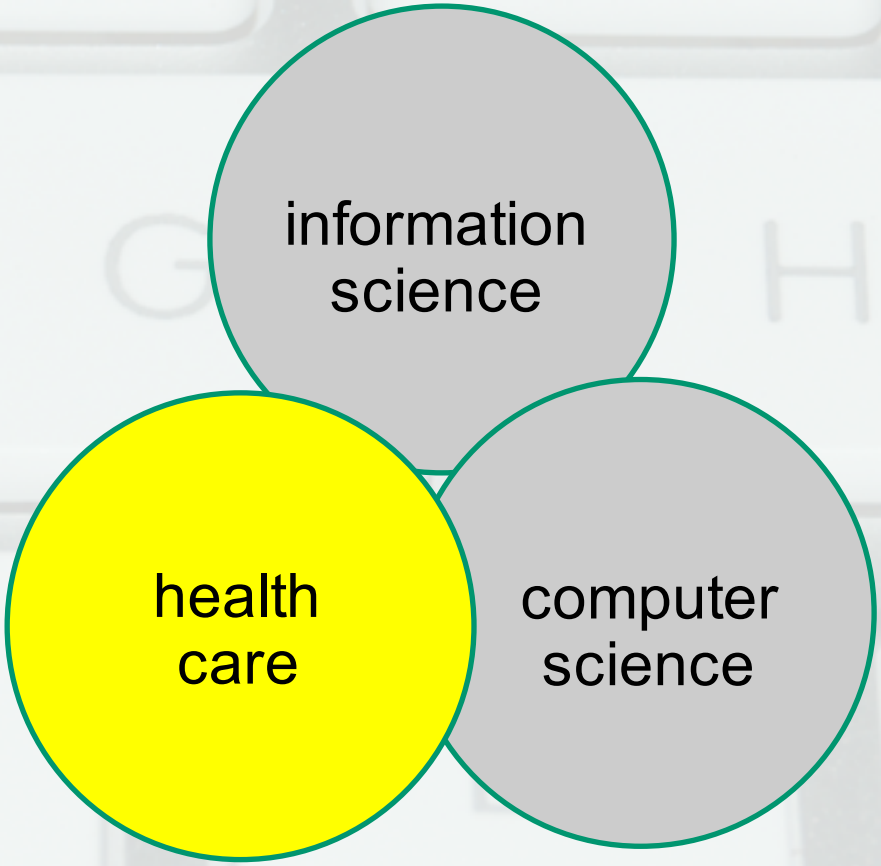
IMAGING INFORMATICS

- Imaging informatics has become a distinct subspecialty of radiology, with its own fellowship training and a formal curriculum for residents and fellows

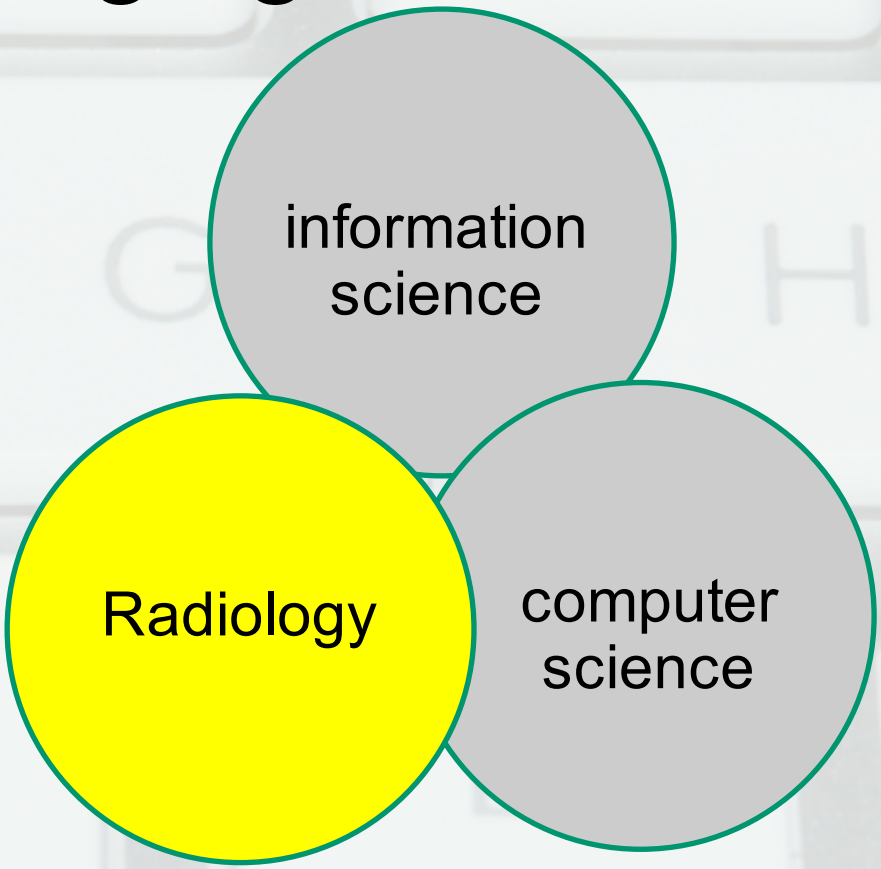
Subdomains of health informatics

- Clinical informatics
- Medical informatics
- Nursing informatics
- Public health informatics
- Bioinformatics
- Imaging informatics
- Pharmacy informatics
- Dental informatics
- Veterinary informatics
- Consumer health informatics
- eHealth
- Clinical research informatics
- Translational research informatics
- etc.

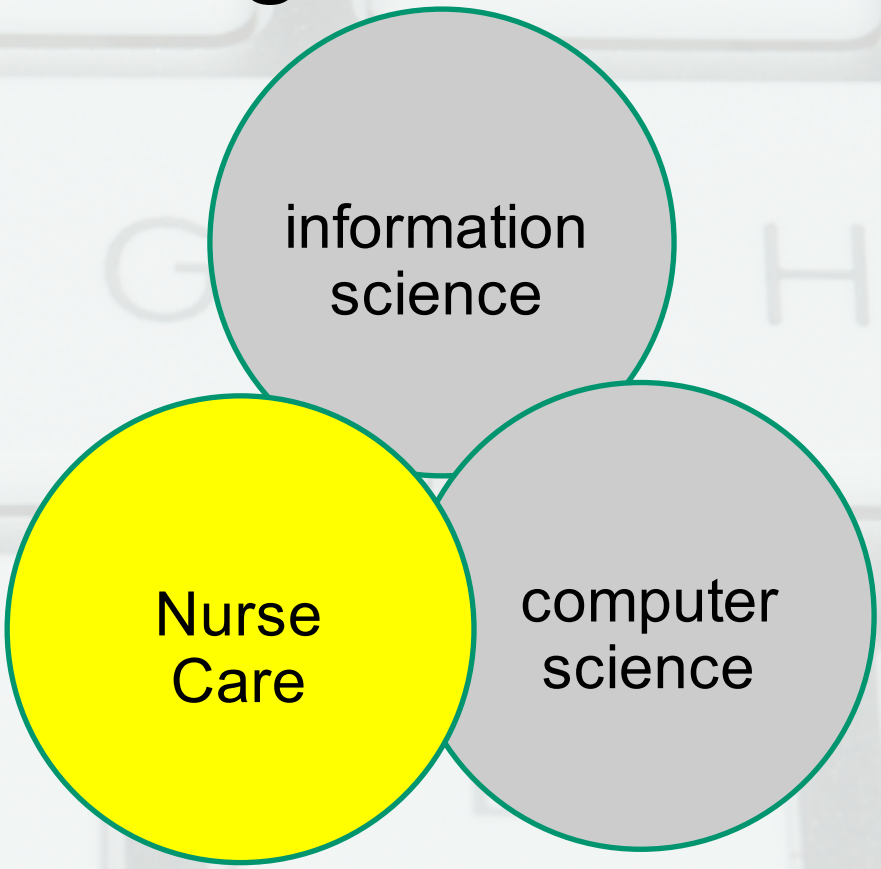
Health Informatics



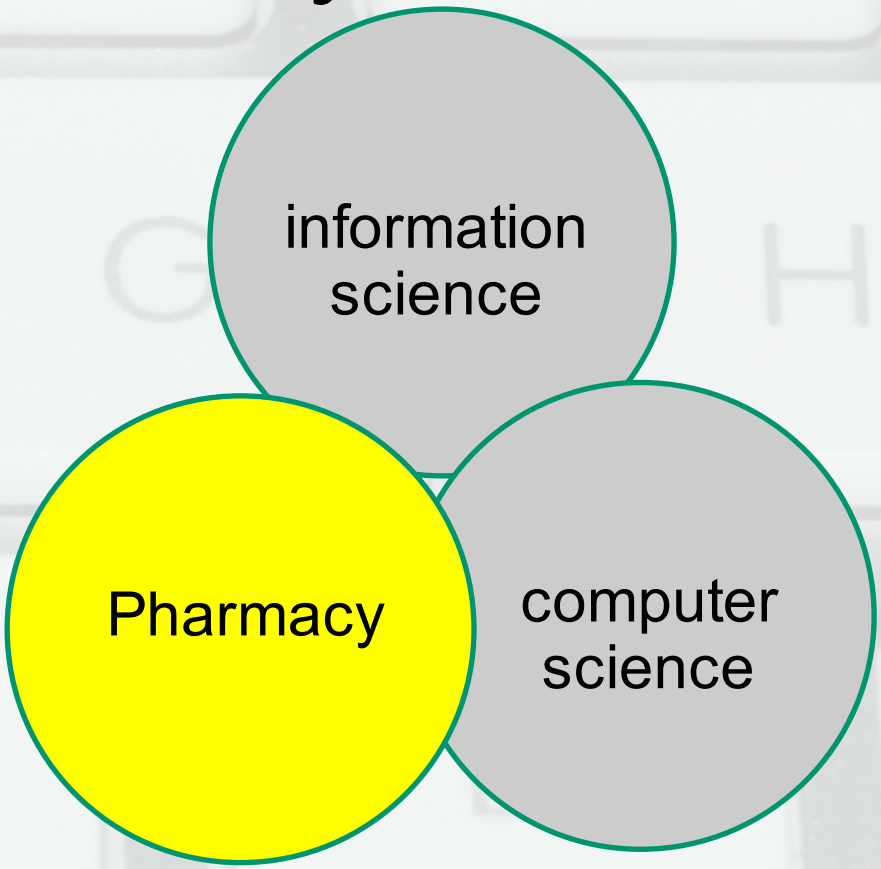
Imaging Informatics



Nursing Informatics



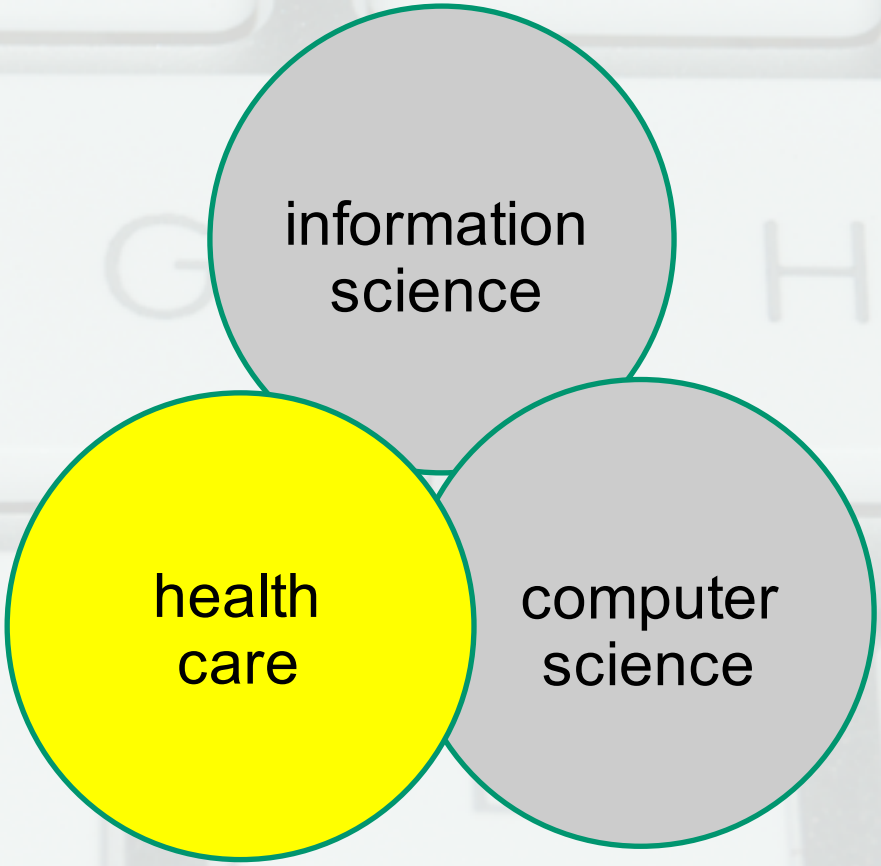
Pharmacy Informatics



Informatics

- Network structure(wired, wireless)
- Storage type, CD, RAID ,

Health Informatics



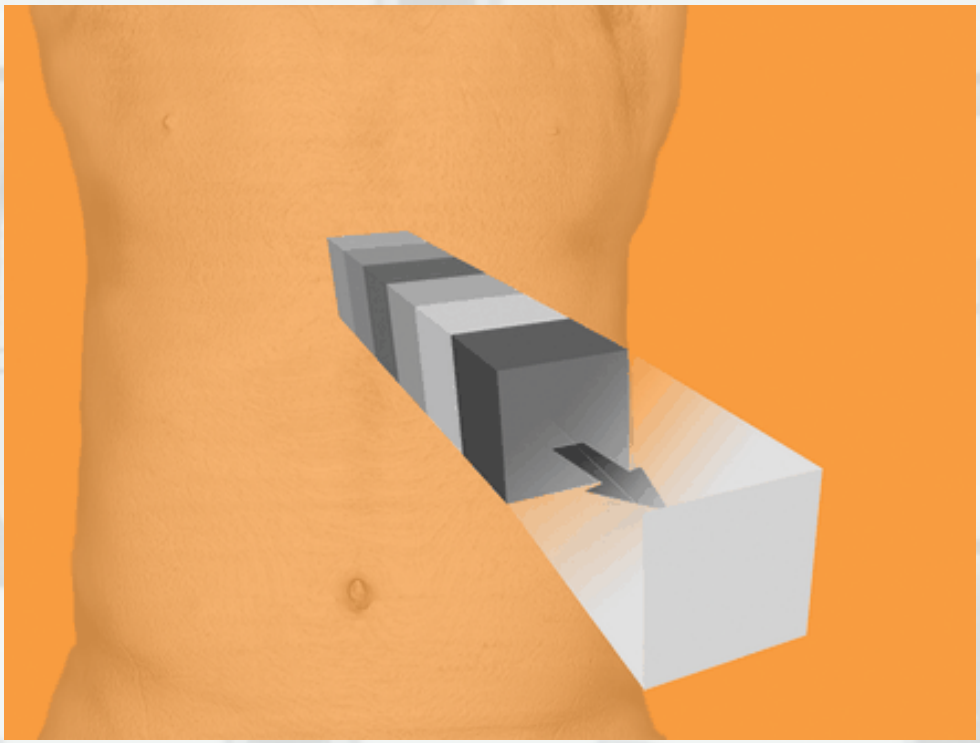
Informatics

- Statistics
- Database design
- Data structure design

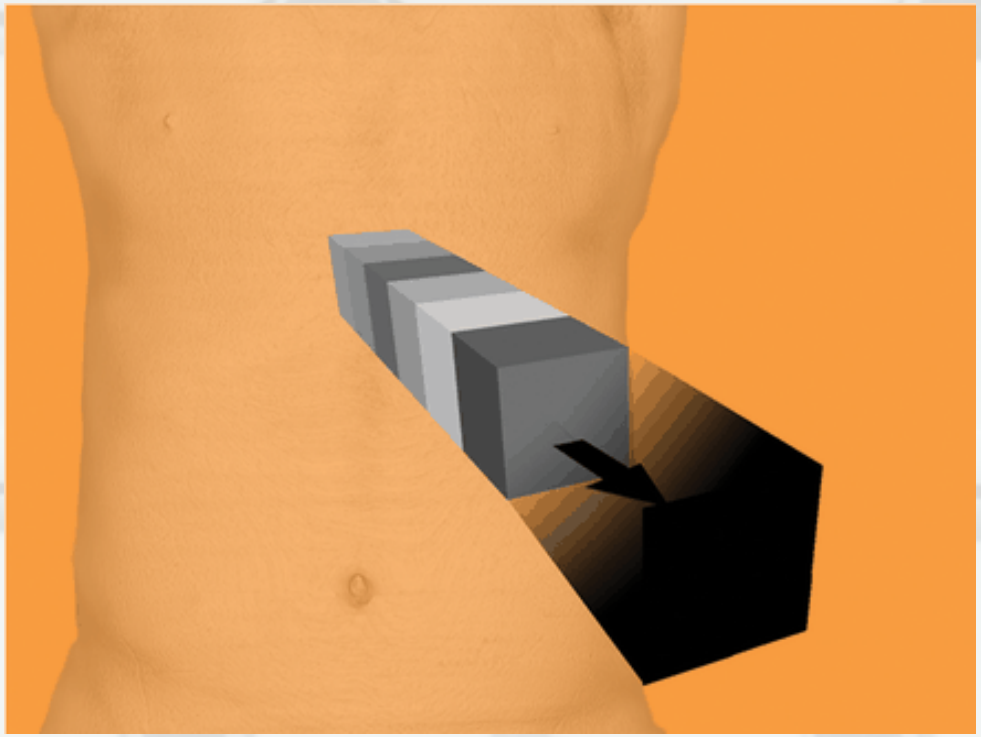
- PACS and component systems
- Imaging informatics for the enterprise
- Image-enabled electronic medical records
- Integrating mobile technologies
- RIS, HIS and other clinical information systems
- Digital image acquisition, transmission, storage display and interpretation
- 3D (e.g. printing, modeling, display)
- SIIM Workflow Initiative in Medicine (SWIM™)
- DICOM and other standards
- IHE
- Imaging vocabularies and ontologies
- Analytics
- Workflow and process modeling and simulation
- Protocolling and appropriateness
- Structured reporting
- Speech recognition
- Content-based image retrieval
- Meaningful use and legislative issues
- Decision support
- Radiation dose management
- Teleradiology
- Archiving and information lifecycle management
- Network integrity and data security
- Multimedia
- Facilities design
- Project Management
- Quality assurance
- Online learning
- Imaging informatics education

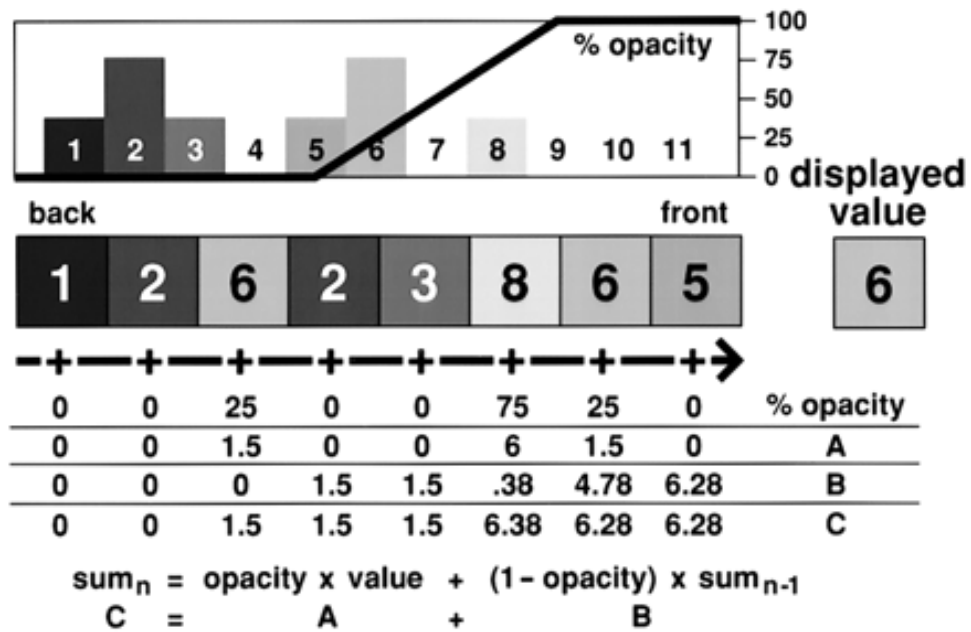
Advanced Visualization

MIP



Minimum IP



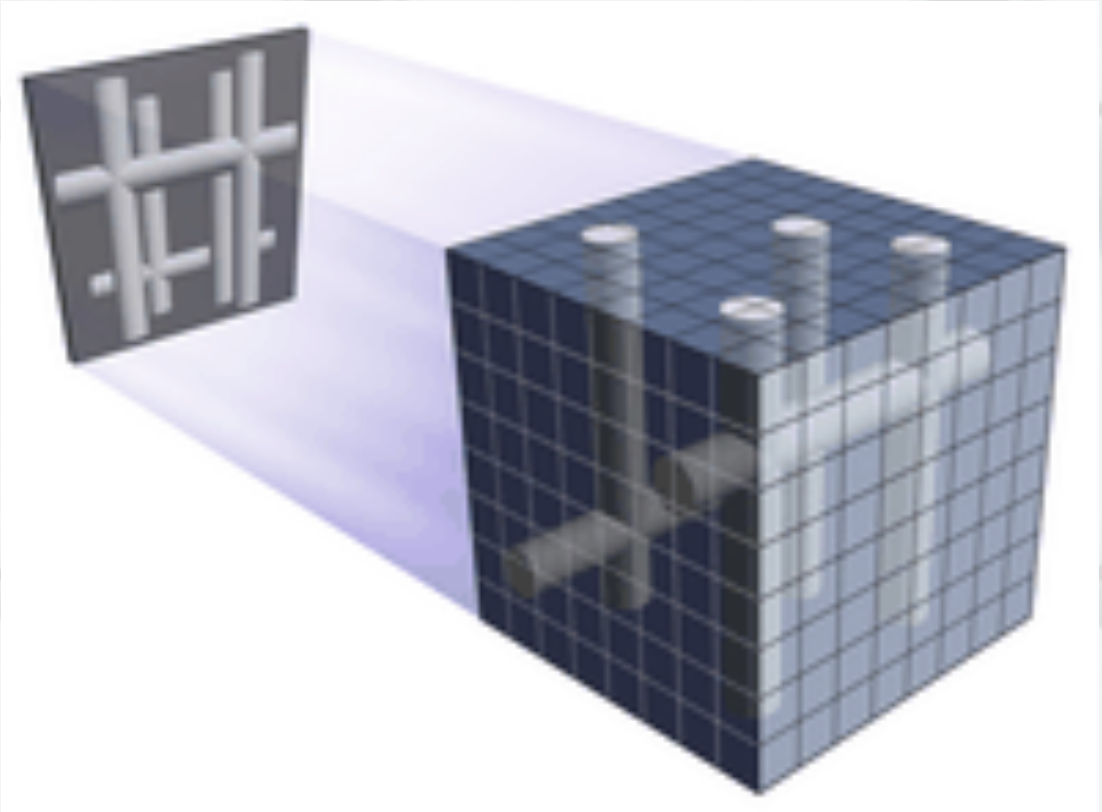


0	0	25	0	0	75	25	0	% opacity
0	0	1.5	0	0	6	1.5	0	A
0	0	0	1.5	1.5	.38	4.78	6.28	B
0	0	1.5	1.5	1.5	6.38	6.28	6.28	C

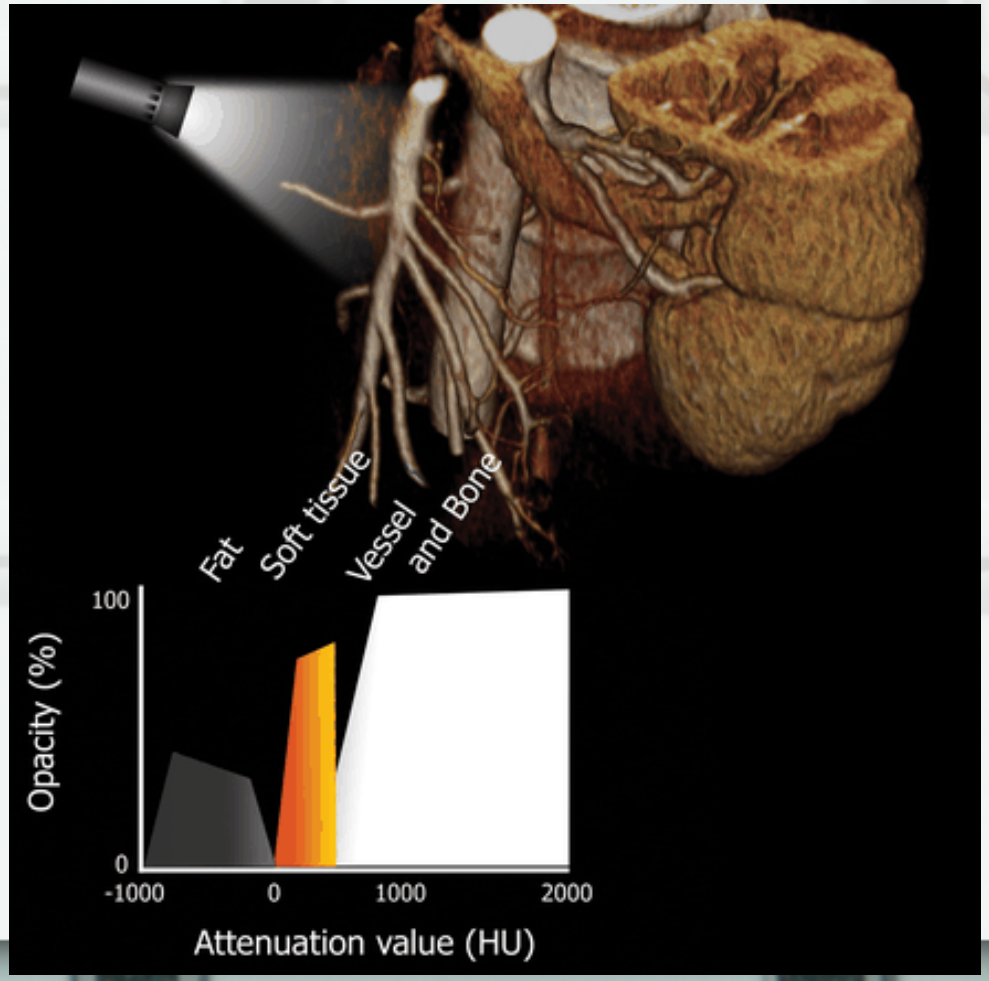
$$sum_n = opacity \times value + (1 - opacity) \times sum_{n-1}$$

$$C = A + B$$

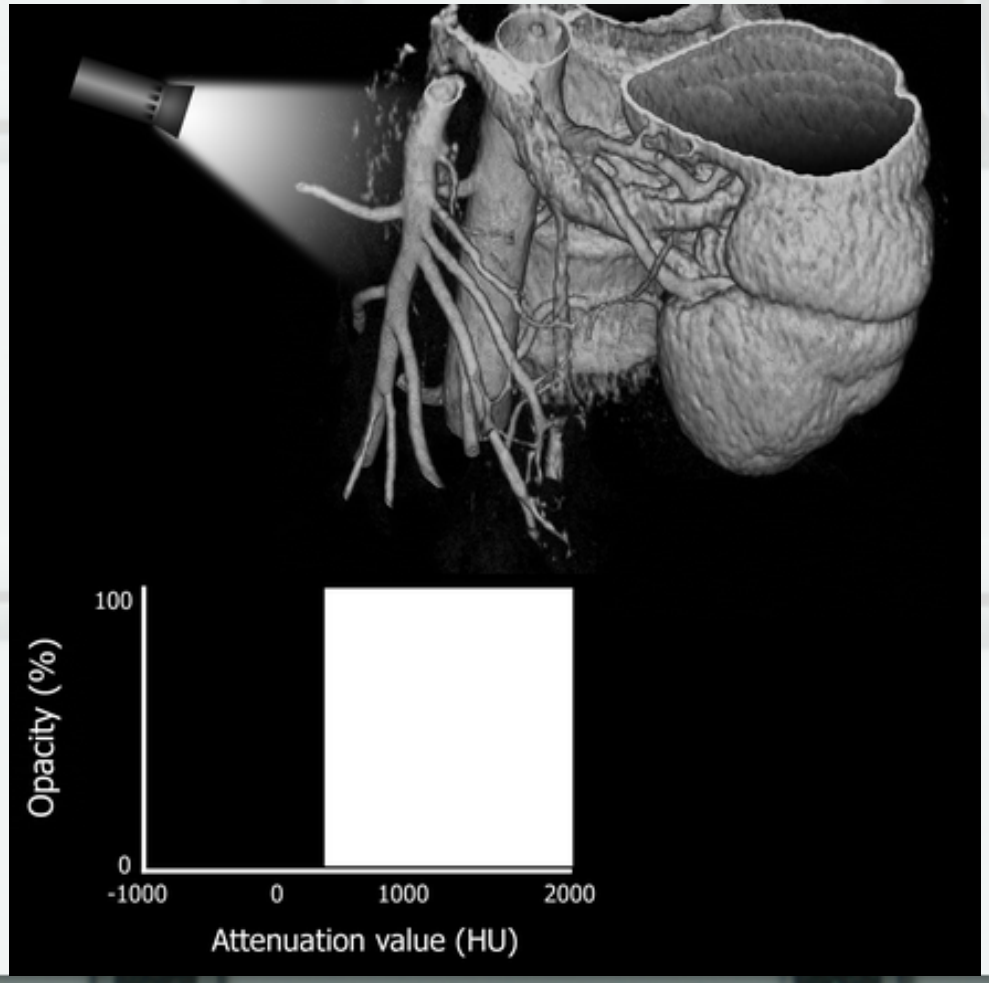
VR



VR


Fat
Soft tissue
Vessel and Bone
100
0
Opacity (%)
-1000
0
1000
2000
Attenuation value (HU)

SSD



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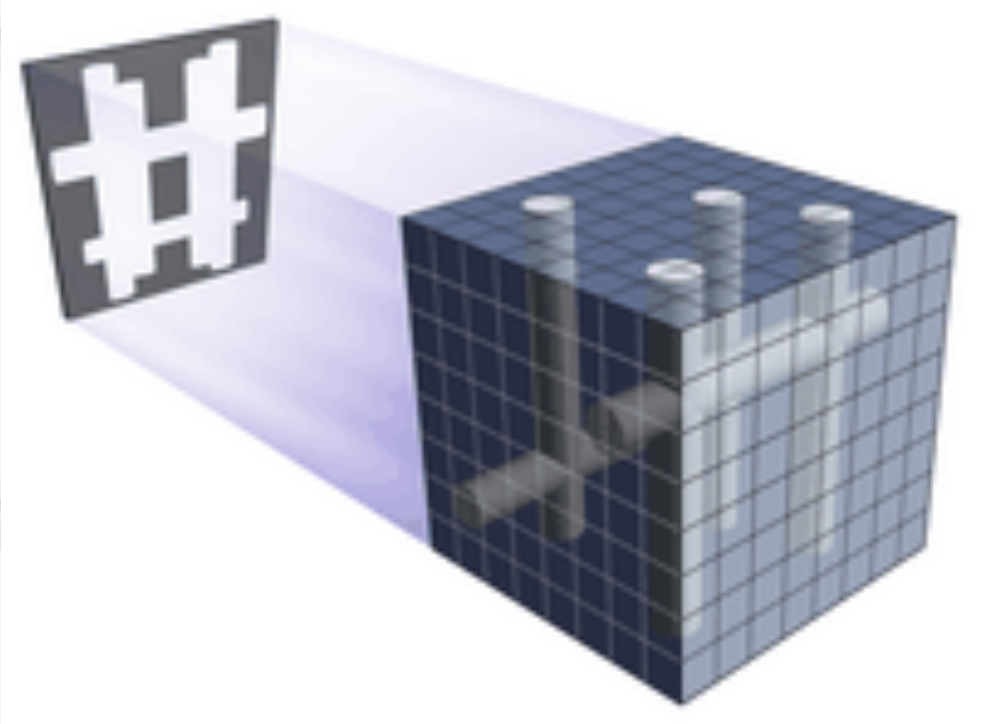

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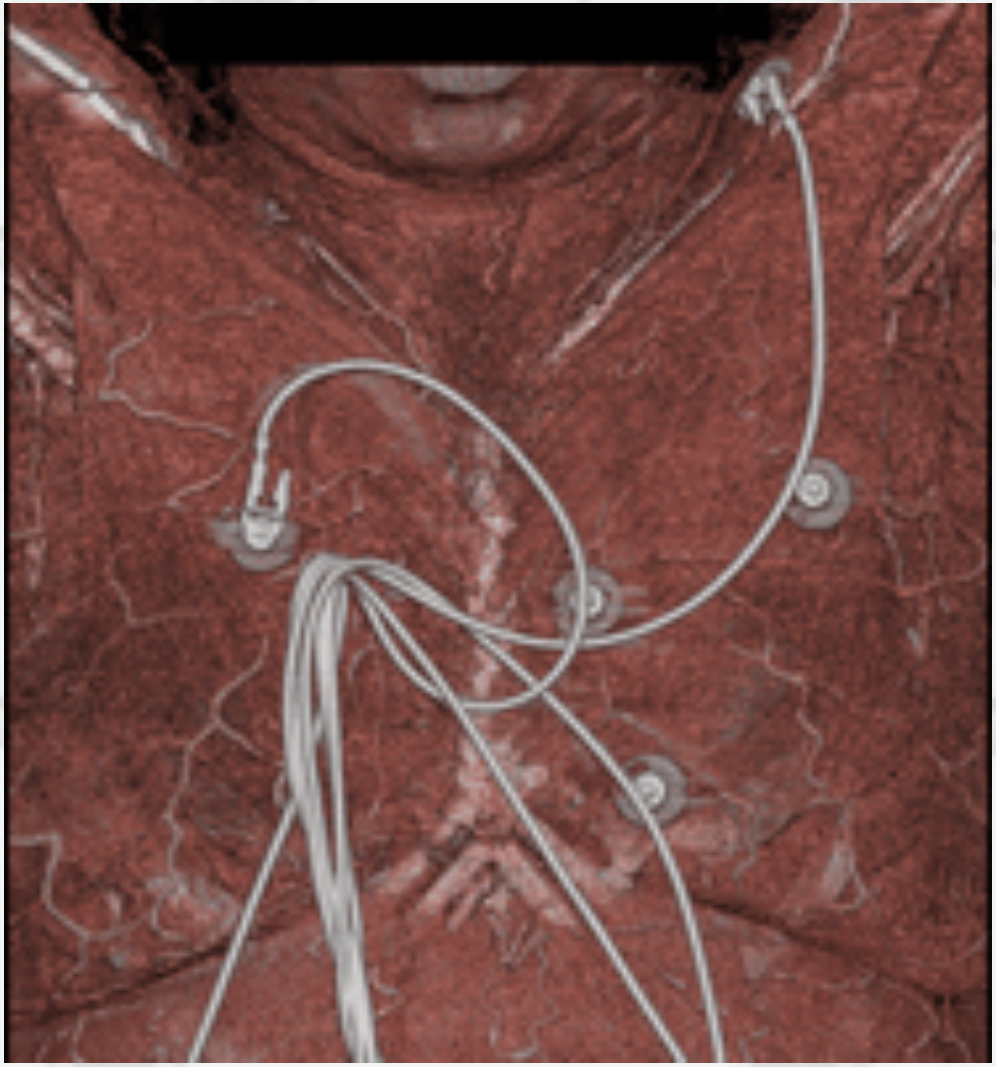
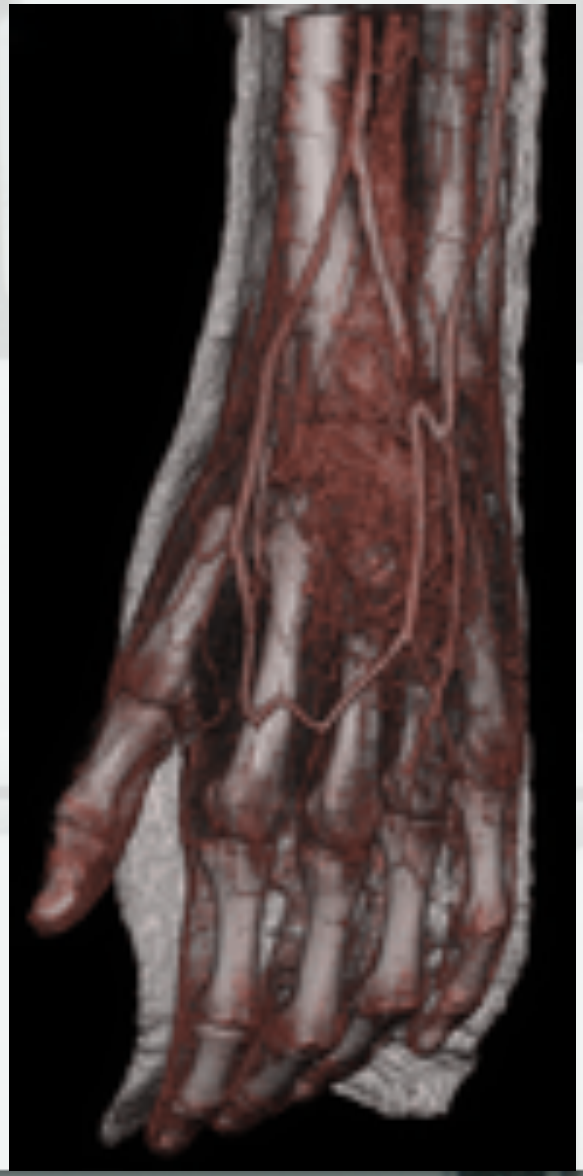
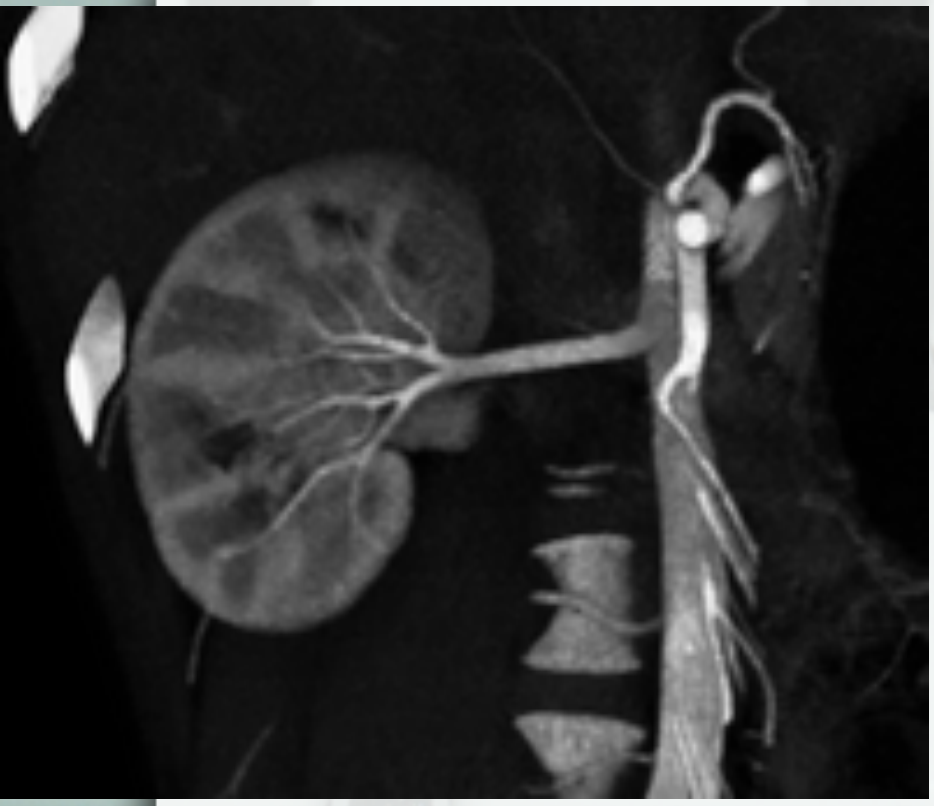
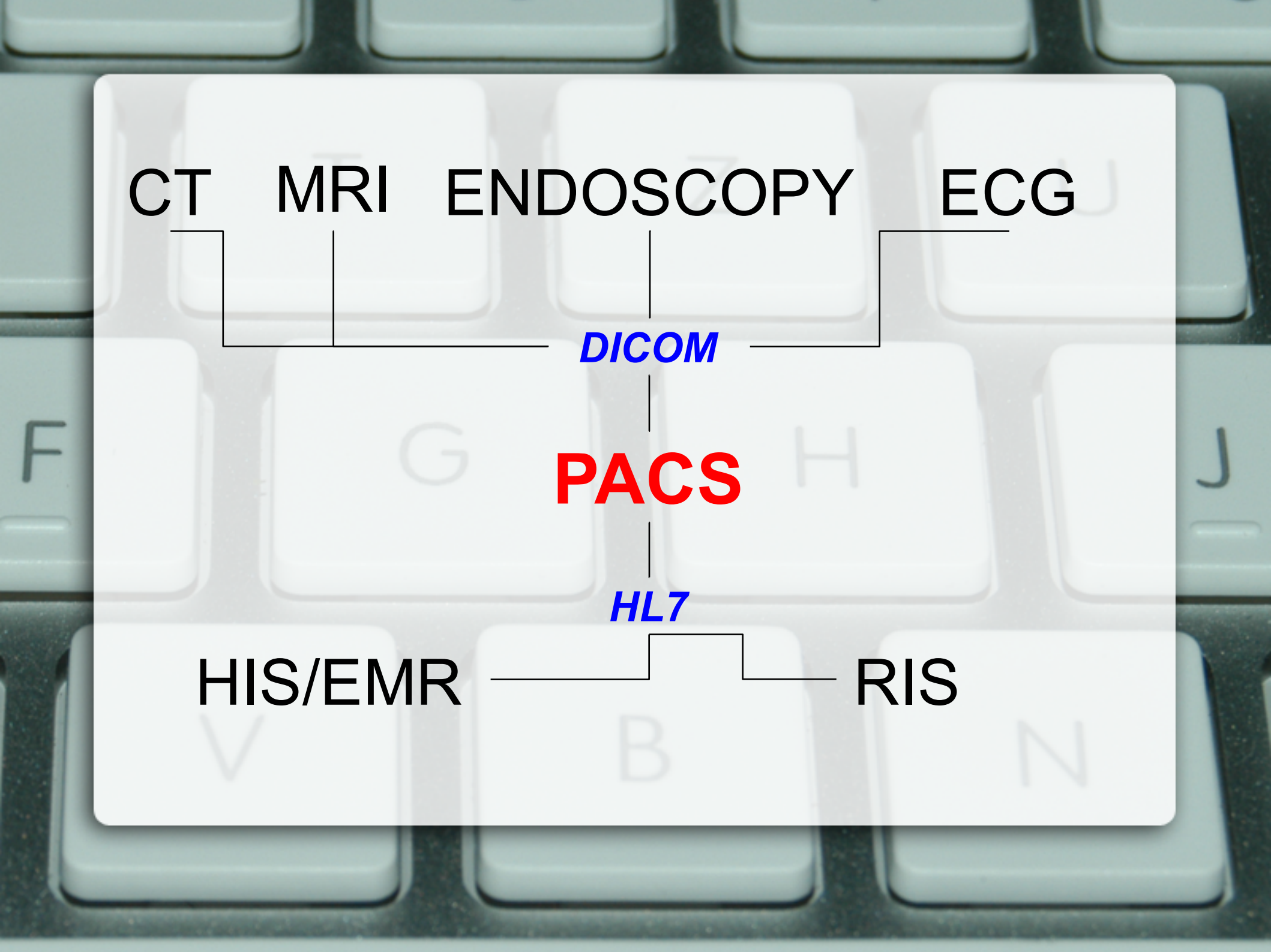






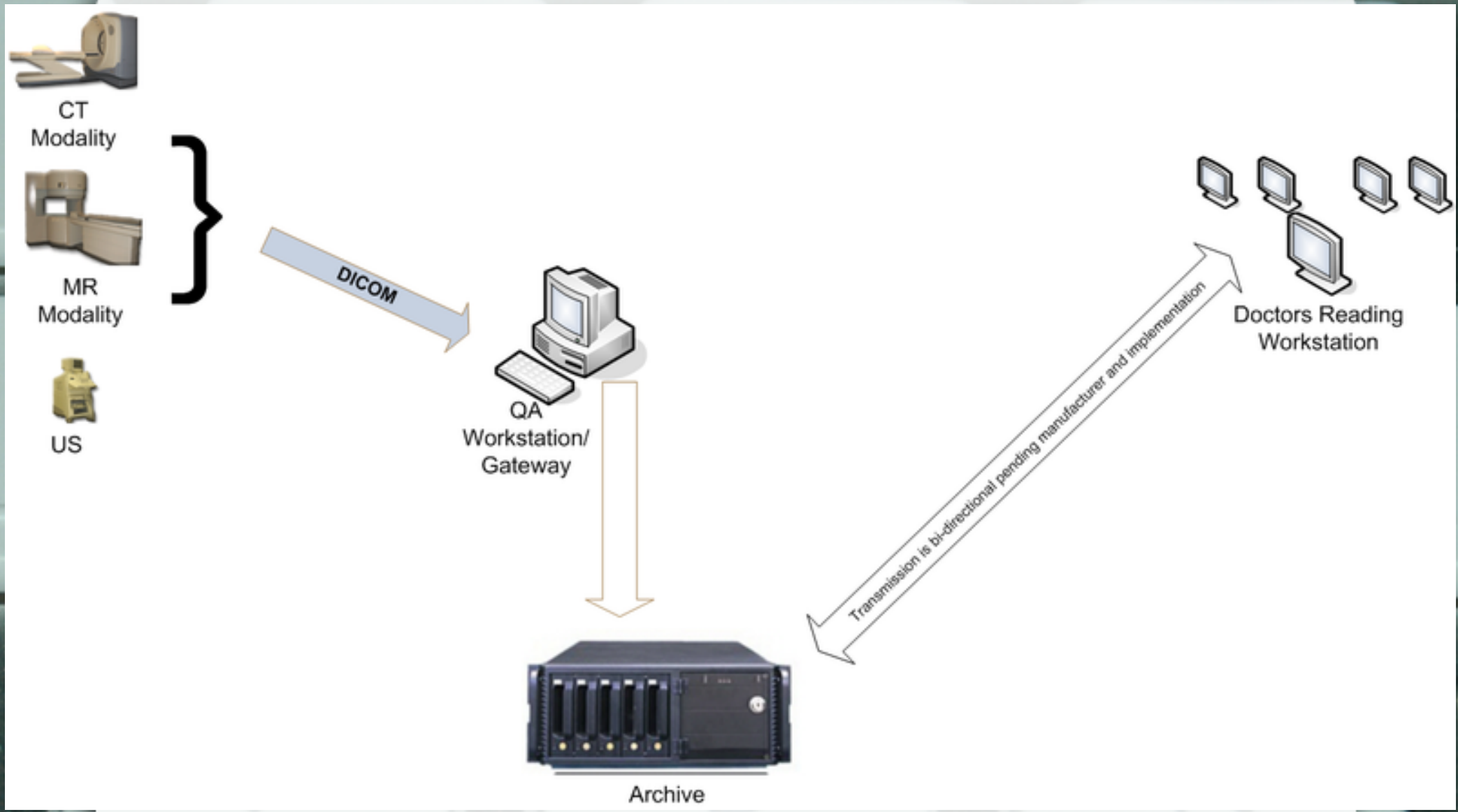
- IMAGING INFORMATICS

- One of the major components of imaging informatics is PACS (picture archiving and communication system).


CT
MRI
ENDOSCOPY
ECG
DICOM
PACS
HL7
HIS/EMR
RIS

PACS

- a network of computers used by radiology departments that replaces film with electronically stored and displayed digital images. It provides archives for storage of multimodality images, integrates images with patient database information, facilitates laser printing of images, and displays both images and patient information at work stations throughout the network. It also allows viewing of images in remote locations.


CT
Modality
MR
Modality
US
DICOM
QA
Workstation/
Gateway
Archive
Transmission is bi-directional pending manufacturer and implementation
Doctors Reading
Workstation

PACS main uses

- ***Hard copy replacement***: no more papers and printing radiology films. Digital images and text are used (soft copy)
- ***Remote access***: Teleradioogy. Telemedicine. Access from home
- ***Electronic image integration platform***: HIS, RIS, EMR
- ***Radiology Workflow Management***

PACS and ITS PARTS

1)Monitors

2)Network

3)Storage

4)Supporting software

PACS and ITS PARTS

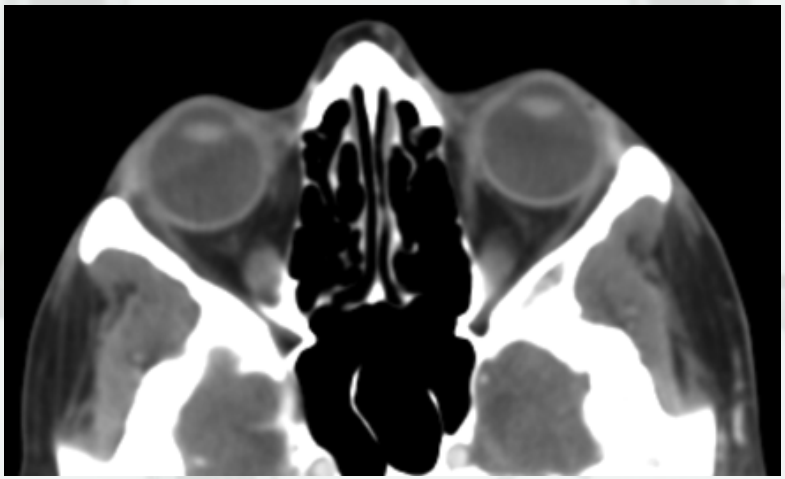
1)Monitors:

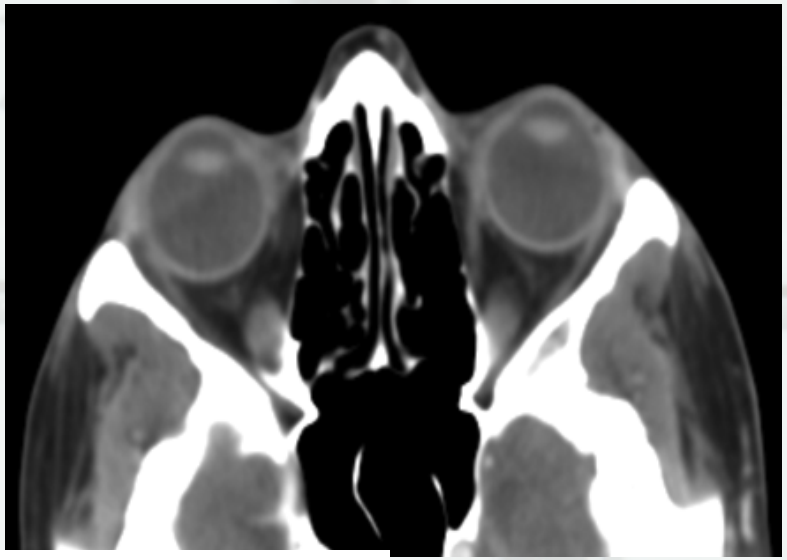
- CRTs and LCDs.
- Resoulution: how many mega pixel.

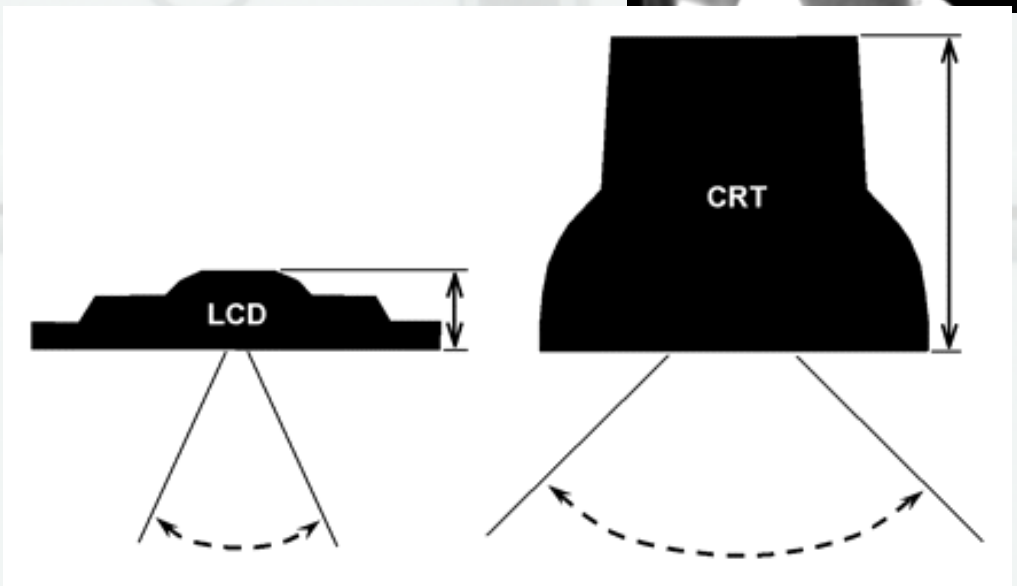
e.g viewing mammograms need at least 5 megapixel.

- Quality assurance: Gamma correction.

CRT and LCD



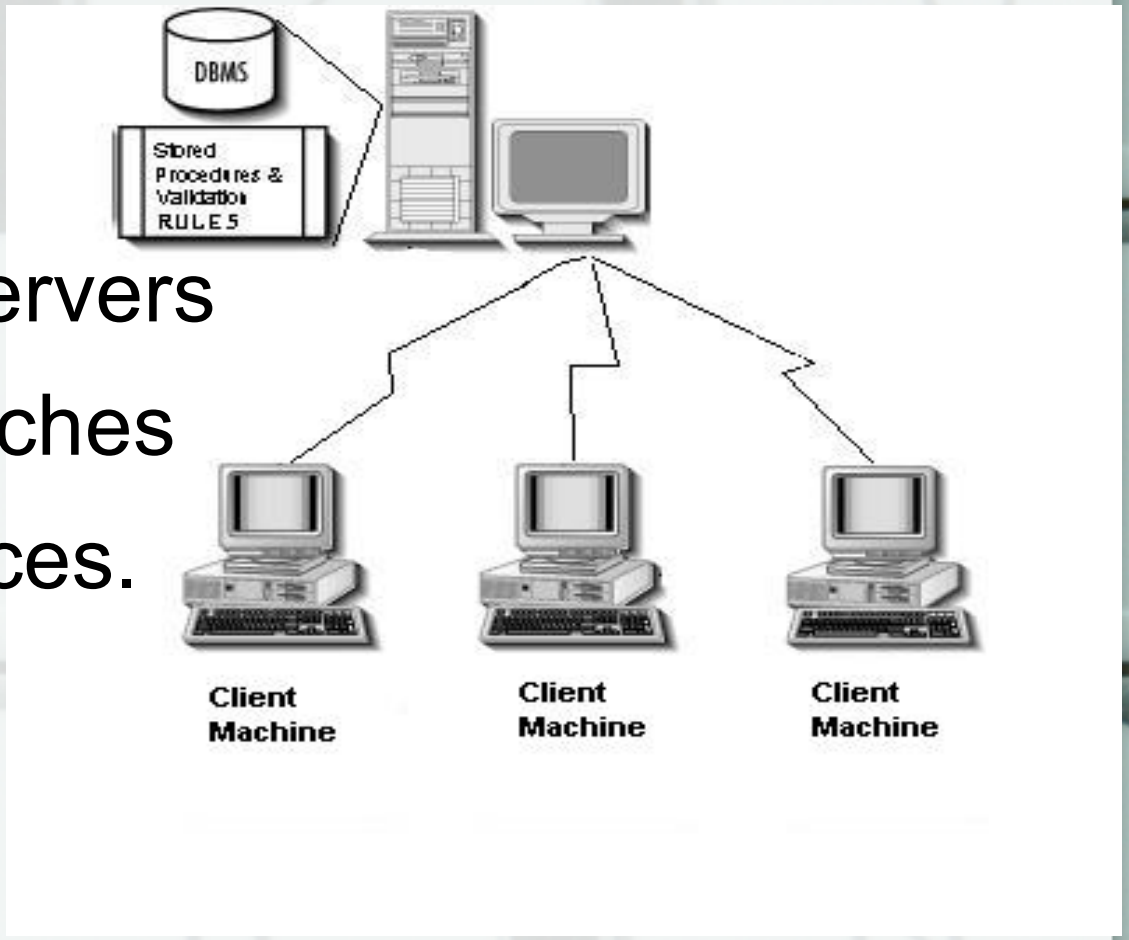




PACS and ITS PARTS

2)Networks

- Client and servers
- Routers, switches
- Storage devices.



Network

- Bandwidth: depends on medium of data transfer. Fiberoptic , cables, leased line
- Security.

3) Storage types:

- spinning disks (eg, hard drive)
- magnetic tape (eg, audio cassettes),
- optical media (eg, compact discs and digital video discs), and solid-state (eg, USB [universal serial bus] flash memory cards)
- Most pacs use combinations of these.

STORAGE

- Can be long term or short term.
- Most PACS use either magnetic tape or spinning disks(hard disk) for long-term storage.

	Magnetic Tape	Hard disk
Cost	Cheap	Expensive
Time Retrival	Long	short

STORAGE

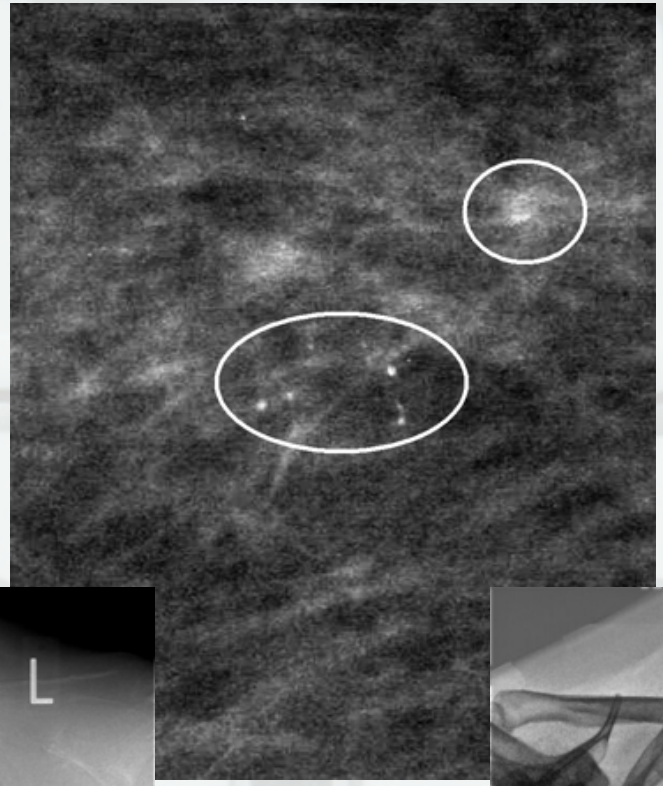
- Redundancy:

refers to storage of multiple copies of imaging data.

A redundant array of inexpensive disks (RAID) is the most frequently-used redundancy system in PACS storage

PACS supporting softwares

- Speech Recognition
- Digital Teaching Files . e.g The Medical Imaging Resource Center (MIRC)
- Image Processing: e.g CAD, 3d visualization, dual energy subtraction.
- Asynchronous Communication Tools. Emails, instant messaging, SMS

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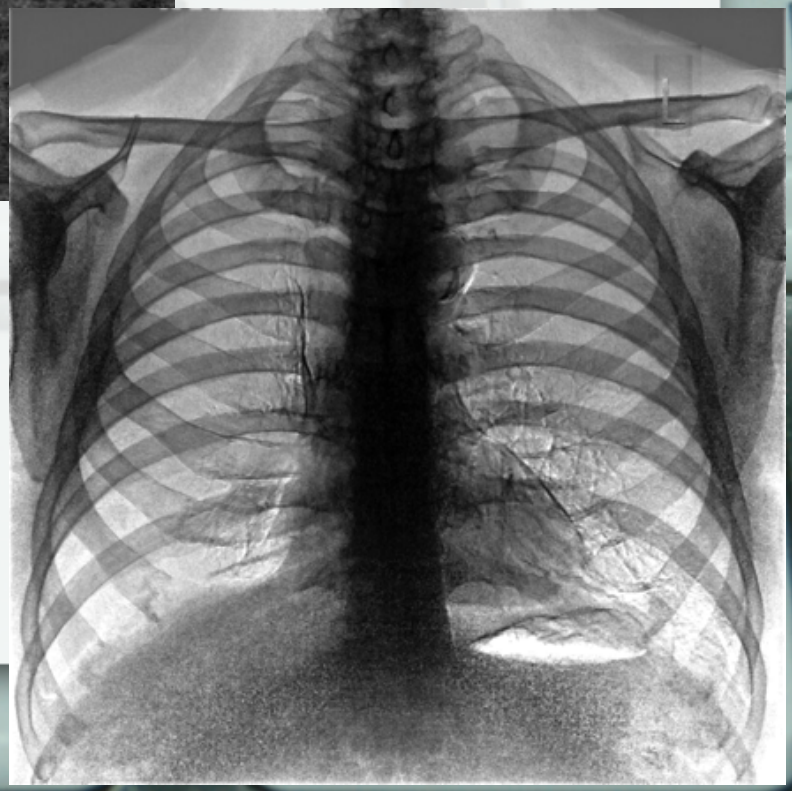

Besides PACS

- ***Radiology Information System (RIS)***: for scheduling patients, storing reports, and patient tracking;
- ***Hospital information system,(HIS)***, which keeps track of patient demographic data and locations.
- **Electronic Medical Record (EMR)**: to organize all medical data from an entire enterprise.

Workflow

- HIS/EMR→ RIS → PACS/MODALITIES
- Patient demograhic data/Complaint → RIS

(assign technologist, radiologist, location/modality)→ Images reviewd in PACS

PACS→ RIS → EMR/HIS

Images → dictated , write report → EMR/HIS