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Notes from Digital Image Processing

- Computer vision is divided into low, mid and high level vision, evolving from pixel processing to semantic understanding. Despite over 50 years of research, it remains complex, with recent advances mainly driven by CNNs.
- Human vision evolved from simple eye spots to complex refractive eyes. The fovea enables sharp central vision, while the brain naturally compensates for the natural blind spot
- The visual system compresses data from about 120 million photo receptors to around 1 million nerve signals and involuntary eye movements like microsaccades help prevent visual fading and improve perception. Vision is processed through ventral and dorsal pathways
- Although sRGB cannot represent all colours visible to humans, human trichromic vision is inspired by RGB
- The HSV colour space is more user friendly than RGB for colour adjustments. Image resizing uses interpolation where bilinear interpolation balances speed and quality, while bicubic interpolation gives smoother results.

Types of healthcare reports and medical imaging reports

Types of Healthcare Reports:

1. **Clinical Report:** Includes doctor consultation notes(consultation report), diagnosis summaries and treatment plans
2. **Laboratory reports:** Reports created by laboratory technicians and reviewed by physicians that examine bodily fluids like blood tests, urine tests, pathology examinations and contain numerical values with reference ranges, providing important information about blood counts, chemical levels, and overall health.
3. **Surgical Reports/Operative reports:** Detailed records of surgical procedure that includes technique used, pre-operation and post-operative findings
4. **Radiology Reports:** Detailed descriptions written by a radiologist of what they see in X-rays, CT scans, or MRIs (Medical Imaging Reports)
5. **Preventive and Screening Reports:** Reports from routine checkups, cancer screenings and health assessments.
6. **Pathology Reports:** It is a specialized subset of laboratory reports that provide detailed information about cell types and tumour grades and are the definitive source for a serious diagnosis like cancer, created when a pathologist examines tissue samples from a biopsy under a microscope.
7. **History and Physical Report**: Created by an admitting physician that serves as the foundational document for your hospital stay as it summarises your medical history and physical examination findings.

Medical Imaging Reports:

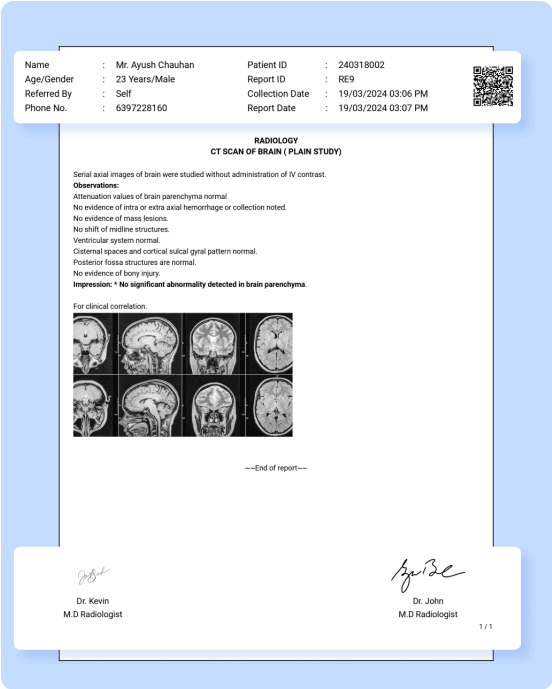
Medical Imaging reports are structured clinical documents created after analyzing the images of the human body obtained by using different imaging technologies. Types of medical imaging are:
a. X-Ray- used to detect fractures, infections, lung-related conditions,
b. CT Scan- detailed cross-sectional images of organs and tissues,
c. MRI- high resolution images of soft tissues like the brain, muscles, spinal cord,
d. Ultrasound- visualize internal organs using sound waves, widely used during pregnancy and abdominal examinations.
e. PET Scan**-** detects metabolic activity and is used in cancer diagnosis staging, treatment monitoring.

These reports play a critical role in healthcare helping doctors diagnose diseases, monitor treatment progress, stage conditions and plan further medical care. It basically translates complex visual data into clear interpretable medical information. With the integration of artificial intelligence and deep learning, imaging analysis is becoming faster, more reliable, and increasingly automated. Medical imaging reports serve as the primary communication tool between radiologists and clinicians.Radiologists use precise medical terminology to describe abnormalities accurately.

Structure of a Medical Imaging Report includes

a. Patient information like name, age, gender, clinical history,
b. Type of scan performed and technical details
c. Description of findings including normal and abnormal observations
d. Impression summarizing key diagnostic interpretations
e. Suggestions for further tests , follow-up imaging or treatment (if necessary)

Example of an radiology report based on a CT scan as imaging modality



Name	:	Mr. Ayush Chauhan	Patient ID	:	240318002
Age/Gender	:	23 Years/Male	Report ID	:	RE9
Referred By	:	Self	Collection Date	:	19/03/2024 03:06 PM
Phone No.	:	6397228160	Report Date	:	19/03/2024 03:07 PM

RADIOLOGY
CT SCAN OF BRAIN (PLAIN STUDY)

Serial axial images of brain were studied without administration of IV contrast.
Observations:
Attenuation values of brain parenchyma normal
No evidence of intra or extra axial hemorrhage or collection noted.
No evidence of mass lesions.
No shift of midline structures.
Ventricular system normal.
Cisternal spaces and cortical sulcal gyral pattern normal.
Posterior fossa structures are normal.
No evidence of bony injury.
Impression: * No significant abnormality detected in brain parenchyma.

For clinical correlation.

~~End of report~~

Dr. Kevin
M.D Radiologist

Dr. John
M.D Radiologist

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