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Q = 1

Ans **Preprocessing feature:**

It is an important step in the data mining process. The phrase "garbage in, garbage out" is particularly applicable to data mining and machine learning projects. Data-gathering methods are often loosely controlled, resulting in out-of-range values, impossible data combinations, missing values etc. Analyzing data that has not been carefully screened for such problems can produce misleading results. Thus the representation and quality of data is first and foremost

before running an analysis. Often, data processing is the most important phase of a machine learning project, especially in computational biology.

If there is much irrelevant and redundant information present or noisy and unreliable data, then knowledge discovery during the training phase is more difficult. Data preparation and filtering steps can take considerable amount of processing time. Data processing include cleaning, instance selection, normalization, transformation etc. The product of data processing is the final training set.

Data pre-processing may affect the way in which outcomes of the final data processing can be interpreted. This aspect

should be carefully considered when interpretation of the results is a key point, such as in the multivariate processing of chemical data.

Tasks of data pre-processing:

- Data cleaning
- Data editing
- Data reduction
- Data wrangling

Data mining:

The origin of data preprocessing are located in data mining. The idea is to aggregate existing information and search in the content table. It was recognized that for machine learning and natural networks a data pre-processing step is needed too. So it has become to a universal technique which is used in computing in general.

The reason why a user transforms existing files into a new one is because of many reasons. Data preprocessing has the objective to add missing values, aggregate information, label data with its categories and smooth a trajectory. More advanced techniques like principal components analysis and feature selection are working with the statistical formulas and are applied to complex datasets which are recorded by GPS trackers and motion capture devices.

Video post-processing:

This term is used in the video business for quality improvement. Image processing method used in video playback devices and video player software and

transcoding software. It is also commonly used in real time 3D rendering to add additional effects.

Use in video production:

Video post processing is the process of changing the perceived quality of a video on playback. Image scaling routines such as linear interpolation, bilinear interpolation or cubic interpolation can for example be performed when increasing the size of image; this involves either subsampling or zooming. This helps reduce or hide image artifacts and flaws in the original film material. It is important to understand that post-processing always involves a trade-off btw speed, smoothness and sharpness.

- Image scaling and multivariate interpolation.
- Nearest neighbor interpolation
- linear interpolation
- bilinear interpolation
  cubic interpolation
  bicubic interpolation
  Bezier surface
  Lanczos resampling
  trilinear interpolation
  tricubic interpolation
- SPP (statistical post-Processing)
- Deblocking
- Deringing
- Sharpen / Unsharpen
- Requantization
- Luminance alteration
- Blurring / Denoising

Deinterlacing

weave deinterlace method
bob deinterlace method
linear deinterlace method

Deflicking:

2:3 pull down ivtc for conversion from 24 frames/s and 23.976 frames/s and 29.97 frames/s.

3:2 pull-up for conversion from 30 frames/s and 29.97 frames/s to 24 frames/s and 23.976 frames/s.

Uses in 3D rendering:

Additionally, post-processing is commonly used in 3D rendering, especially for video games. Instead of rendering 3D objects directly to the display, the scene is first rendered to a buffer in the memory of the video card. Pixel shaders and optionally vertex shaders are then used to apply post processing filters to the image buffer before displaying it to the screen.

- Ambient occlusion.
- Anaglyph

- Anti-aliasing
- Bloom
- Blur
- Blood lust
- Bokeh
- Bump mapping
- Cel shading
- Chromatic abberation
- Color correction
- Color grading
- Contrast adjustment
- Crepuscular rays
- Digital camera light compensation
- Dithering
- Eye Adaptation
- Film grin
- Filmic Scene tone mapping
- Fog/mist
- Gamma correction
- Global illumination
- Glow
- Grayscale

- Haze
- High dynamic range rendering
- Image distortion
- Infrared
- lense flare
- light scattering
- Negative
- Outlines
- Particle effects
- Pixel vibrance
- Point light attenuation
- Posterization
- Scanline
- Screen borders
- Screen rotation
- Shading
- Shadow mapping
- Sepia tone
- Sharpen/unsharpen
- Sobel operator
- Split screen
- Upscalling
- texture filtering
- Vignette

Ans:2 Contrast resolution

It is the ability of an imaging system to distinguish between multiple densities in the radiographic image. In the case of digital imaging it depends on the bit-depth of the systems. As noted earlier, an 8 bit systems can show only 256 gray values as opposed to a 12 bit system which shows 4096 gray values. The 8 bit systems shows less gray values and is a low contrast system than the 12 bit system that shows more gray values and is a low contrast systems. However, if the 12 bit systems can clearly show 2 nearby gray value densities the system will have a high contrast resolution.

Spatial Resolution:

Spatial resolution in radiology refers to the ability of an imaging system to differentiate btw two nearby objects. In digital imaging system it depends on the size of the pixel used. A large pixel size will be unable to resolves two near by structures as compared to a small pixel size. This Resolution is measured in line pairs per millimeters.

Q7

Ans Patient Radiation Dose Consideration:

Perhaps the principal favourable characteristics of digital imaging is the opportunity for patient radiation dose reduction. This occurs because of the linear nature in which

the image receptor responds to x-ray and because of the greater DQE of the digital image receptor

+ Image Receptor Response:

Because digital image receptor response is linearly related to radiation dose, image contrast does not change with dose. One can not over expose or underexpose a digital image receptor. However, poor technical factor selection may result in over exposure of the patient. Contrast resolution is preserved in digital imaging, regardless of dose.

Radiographic Technique for screen film imaging requires

1- That an appropriate kvp be selected on the basis of the anatomy that is being imaged

2- that the proper mAs be selected to produce proper optical density on the finished image. For screen-film imaging, kVp controls contrast and mAs controls OD.

Dose Reduction with Digital Radiography:

- Exposures should not be repeated in digital radiography because of brightness or contrast concerns.
- DR systems cannot compensate for excessive noise caused by quantum mottle.
- Over exposed images do not have to be repeated and should not become a habit.
- Digital imaging technique must be approached differently. Instead of "dose creep", "technique creep" should be used at each of the various digital imaging systems. The results will be patient radiation dose reduction.

the result will be adequate contrast resolution, constant spatial resolution and reduced patient radiation dose.

- the patient radiation dose reduction that is possible is limited.
- the problem with very low technique for digital imaging is low SNR. noise can predominate and compromise the interpretation of soft tissue anatomy.

Active Matrix Liquid crystal display:

- Matter takes the form of gas, liquid or solid. A liquid state is a material state b/w that of a liquid & a solid.
- A liquid crystal has the property of a highly ordered

molecular structure - a crystal
- d the property of viscosity -
a fluid.
- Liquid crystal materials are
linear organic molecules dipole
That are electrically charged
forming a naturally molecular
: dipole. Consequently, the liquid
crystals can be aligned through
the action of an external
electric field.

AMLCD:

- Display characteristics:

Active matrix liquid crystal displays are defined pixel by pixel. The AMLCD has a very intense white backlight that illuminates each pixel.
- Each pixel contains light polarizing filters and films to control the intensity and

nd colour of light transmitted through the pixel.

- Color AMLCDs have have a red- green- blue filters within each pixel. Pixel is divided into sub-pixels, each with one of these three filters.

AMLCD: Display characteristics:

- Medical flate panel digital display devices are monochrome AMLCDs.
- Spatial resolution improve with the use of higher megapixel digital display devices
- Medical flat panel digital display devices are identified by the number of pixels in the AMLCDs.
- A 1- megapixel display will have a 1000 - × 1000 - pixel arrangement

AMLCD: Image luminance:

- The AMLCD is a very inefficient device. Only approximately 10% of the backlight is transmitted through a monochrome monitor and half of that through a color monitor.
- The portion of the pixel face that is available to transmit light is the "aperture ratio". It is to a digital display device as "fill factor" is to a digital radiographic detector.
- Aperture ratios of 50% to 80% are characteristic of medical AMLCDs.
- Aperture ratio is a measure of image luminance of AMLCDs.
- The term "Active" in AMLCD refers to the ability to control individually each pixel of the digital display device

- AMLCDs are rapidly replacing CRTs in digital radiography because most of these characteristics favor the AMLCDs.
- Active matrix liquid crystal displays have the better gray-scale definition than CRTs.
- The ~~distinct~~ intrinsic noise of an AMLCDs is less than of a CRT; this also results in better contrast solution.

AMLCD: Ambient Light

- Active matrix liquid crystal displays are designed to better reduced the influence of ambient light on image contrast.
- The principal disadvantage of an AMLCD is the angular dependence of viewing.

Picture archiving and communication system:

A picture archiving and communication is a medical imaging technology which provides economical storages and convent excess to images from multiple modalites. Electric images and reports are transmitted digitally via PACS. this eliminates need to manually fire retrative or transport film jacket. the folder used to store and protect X-Ray film. The universal format for PACS image storege and transferis DICOM (Digital imaging and communication in Medicine) Non image date such as scanned documents. may be incorporated using consumer industry standard forma

(PDP) one encapsulated in Dicom. A PACS consist of four major component. The imaging modilities, such is X-ray pain film, computed tomography and magnetic resonance imaging. a secured network for the transmission of patient information, workstation for interpreting and reviewing images and archives for the storage and retrieval of image and reports. unpined with available and everging web technology, PACS has the ability to; delivel timely and efficient access to images, interpretations and related data. PACS reduces the physical and time barriers associated with traditional film-based image retrieval, distribution and display.

Q-6

Ans Three Types of Digital radiographic Imaging Artifacts:

1- Image receptor artifacts:
2- Software Artifacts
3- Pre-processing Artifacts (Dust, dirt or scratches)

Image Receptor Artifacts

Dust or dirt: usually removed easily by cleaning by technologists.

Scratches: appear as an image of lucency Improper storage rough handling.

FR Artifacts: Pixel malfunction.

scratches of malfunctions of individual pixels is possible to cause artifact.

IR Artifact: Ghost Images.

occur because of incomplete erasure of a previous image

image plate should be erased after each exposure automatically.

Software Artifacts:

- Digital radiography graphic images are obtained as raw data sets.
- As such, these image are ready for processing.
- For processing images are mapped into "for presentation" images that the radiologic technologists can use for QC and for interpretation by the radiologists.

Preprocessing Artifacts:

Preprocessing: The step before for processing interpolation would be used for pre-processing in case of defective pixels. Flat fielding is used to equalize the response of each pixel to a uniform

X-ray beam

Q-7

Ans Basis for the Data compression

- Needed as most of the real world data is redundant.

Importance:

- Saves disk space
- Saves connection bandwidth
- Reduces processing time
- Reduces communication time
- Enables fast storage & retrieval

The process of reducing the volume of data by applying a compression technique is called compression.

The resulting data is called compression data.

Lossless compression:

The lossless compression method is capab

of reconstituting the original form of the data. The quality of the data is not compromised. This technique allows a file to restore its original form. It can be applied to any file formate can improve the performance of the compression ratio.

- Run length Encoding:

This technique reduces the frequency of repeating symbols in string by using a special marker at the begining of the symbol.

key diffrition of lossy compression:

It is an irreversable compression is the class of data encoding method that uses inexact approximation and partial data discarding to represent the content. This

techniques are used to reduce data size for storing, modeling, transmitting content.

Key difference between lossy and lossless compression:

1- Lossy compression removes non useful part of the data that is undetectable while lossless compression reconstructs that exact data

2- lossless compression can reduce the size of data at low extent.

3- The quality of the data degrades in case of lossy compression where as lossless does not.

4- In the lossy technique, the channel accumulates more data conversely, channels hold a smaller amount of data in case of lossless

technique:

D-8 Ans Difference b/w Processing image and presentation image:-

Image processing is one of the greatest advantages of Digital radiography.

Image processing is a critical part of obtaining high quality digital radiography. It allows one to change overall optical density of an image and to change its contrast. Spatial frequency processing allows an image to be sharpened, improving its appearance.

Image Presentation:-

Digital radiographic images are obtained as raw data sets. As such, these

images are ready "for processing". For processing images are manipulated into for presentation". images that are the radiologic technologist can use for QC and for interpretation by the radiologist.

Q-9

Ans Radiographic image over image artifacts occur because of improper collimation.

Digital Imaging Artifacts:

Many errors can occur with improper collimation because the detection of a collimation line can be missed or confused with analogy.

All to often, technologists are "opening wide" to expose the entire plate because they believe this will improve their image. This is a poor standard of practice.