

Image Quality

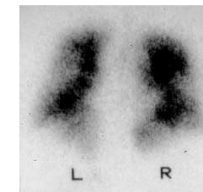


vs.



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Image Quality



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Image Quality

- In art and advertising, image quality can be entirely subjective
- For scientific and medical purposes, objective definitions of image quality are needed
- **Medical:** *Image quality must be assessed on the basis of average performance of some task of interest by some observer or decision maker*
- Image quality must be defined in terms of
 - **A Task**
 - What information do you want from an image?
 - **The Observer**
 - How will you extract information from the image?
 - Object and image statistics
 - What objects are being looked at and what is the measurement noise?

H. H. Barrett and K. J. Myers, *Foundations of Image Science*. Hoboken, NJ: Wiley, 2004.

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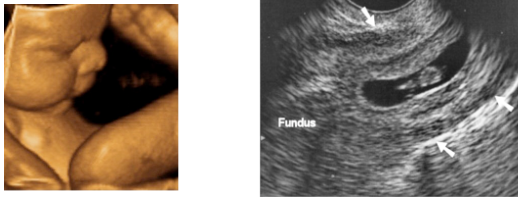
Image Quality



Task: detection of ventilation abnormalities
Observer: trained human reader
Image statistics: patient dependent, etc...

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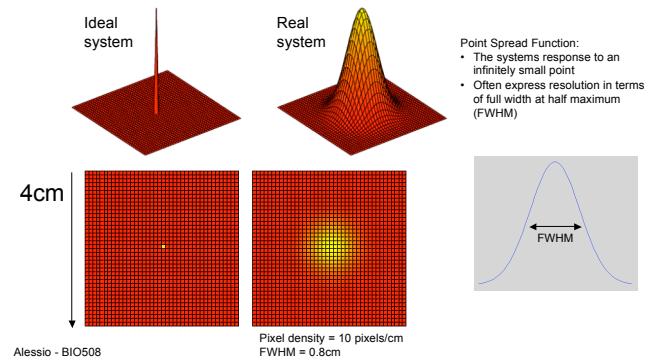
Image Quality



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Some Image Based Metrics for Image Quality

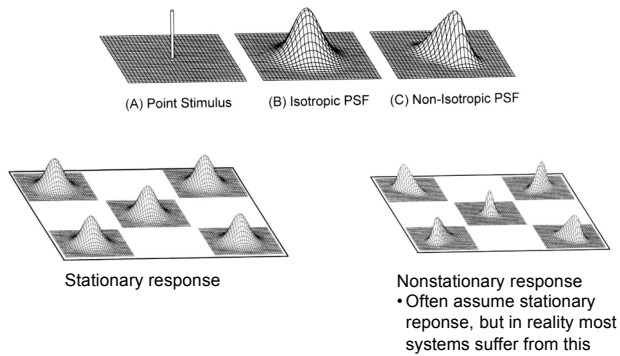
- Spatial Resolution
 - Depends on “pixel density” (dots per inch)
 - **ALSO Depends on resolution of imaging process**



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Some Image Based Metrics for Image Quality

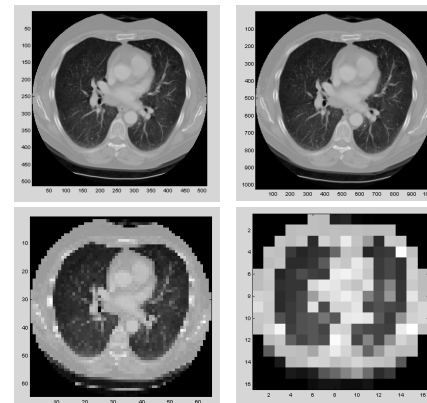
- Spatial Resolution - Variant/Non-Stationary



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Some Image Based Metrics for Image Quality

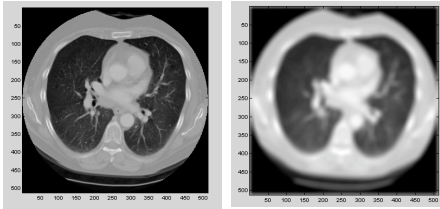
- Resolution?



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Some Image Based Metrics for Image Quality

- Resolution?



same dpi, different resolution

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Some Image Based Metrics for Image Quality

- Spatial Resolution
- Contrast: Measure of differences in brightness in adjacent regions of image
- Noise: Imaging process is a form of a random process**
 - information is random (photons, flux, etc.), collection device introduces random noise (electronic noise, etc.)
 - Therefore, noise is always present
 - Often quantify with signal-to-noise ratio(SNR) (strength of signal / strength of noise)
 - Or, contrast-to-noise ratio (CNR)
 - Possible inverse problem discussion
- Artifacts

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Artifacts

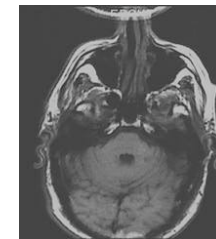
- Artificial image features
 - From a variety of sources: physics of imaging, problem with scanner, motion of patient, image generation/processing steps, etc



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Artifacts

- Artificial image features
 - From a variety of sources: physics of imaging, problem with scanner, motion of patient, image generation/processing steps, etc



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Assignment for Next Class

- Read chapters 1 and 4
- Find 2 medical images of abnormal anatomy or physiology (pathology) formed from the next lecture's modality (x-ray radiographs)
 - Place these images in a document
 - Write 1-2 brief sentences describing each image.
 - Write 1-2 brief sentences describing differences between the images