

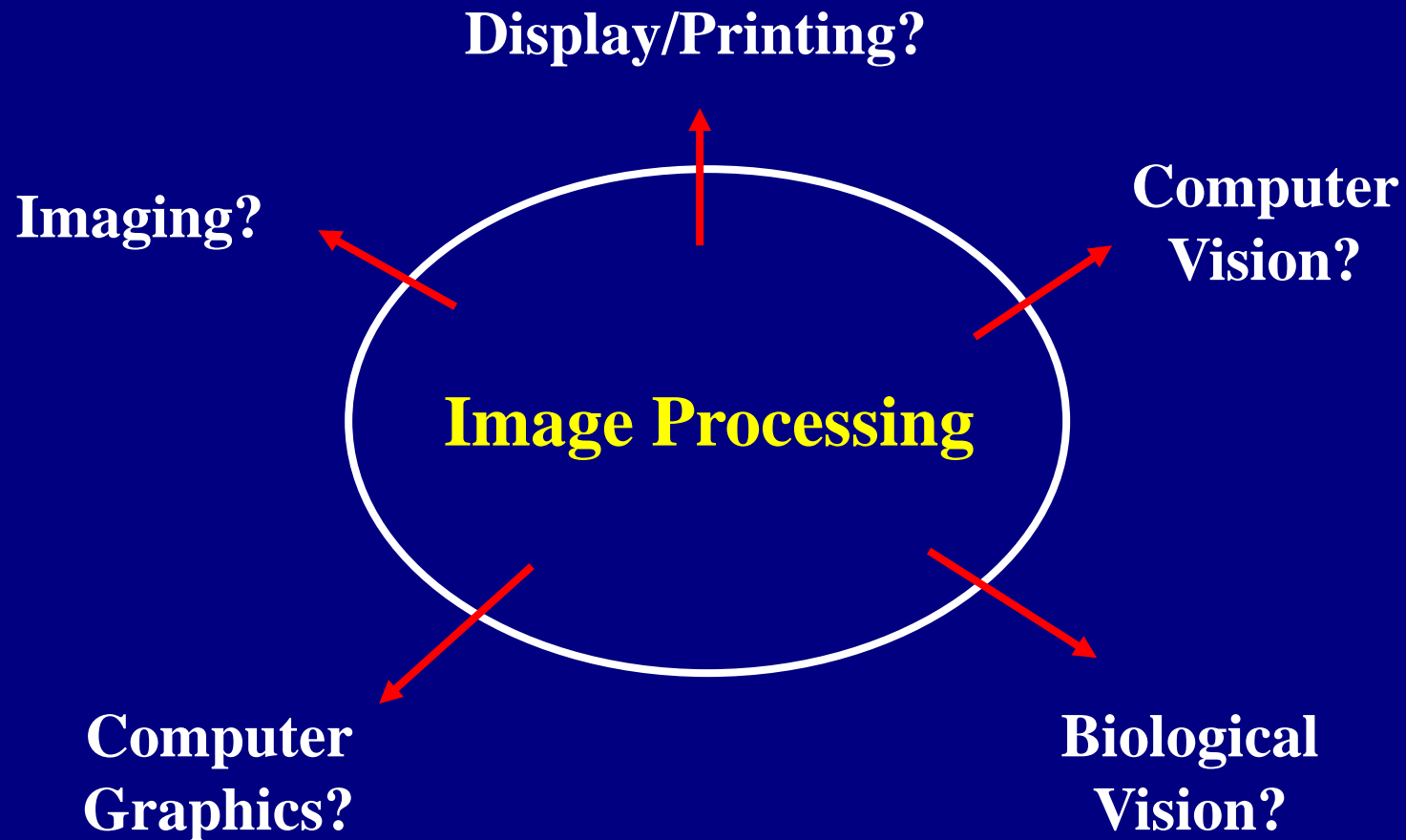
Image Processing and Visual Communications

Overview I

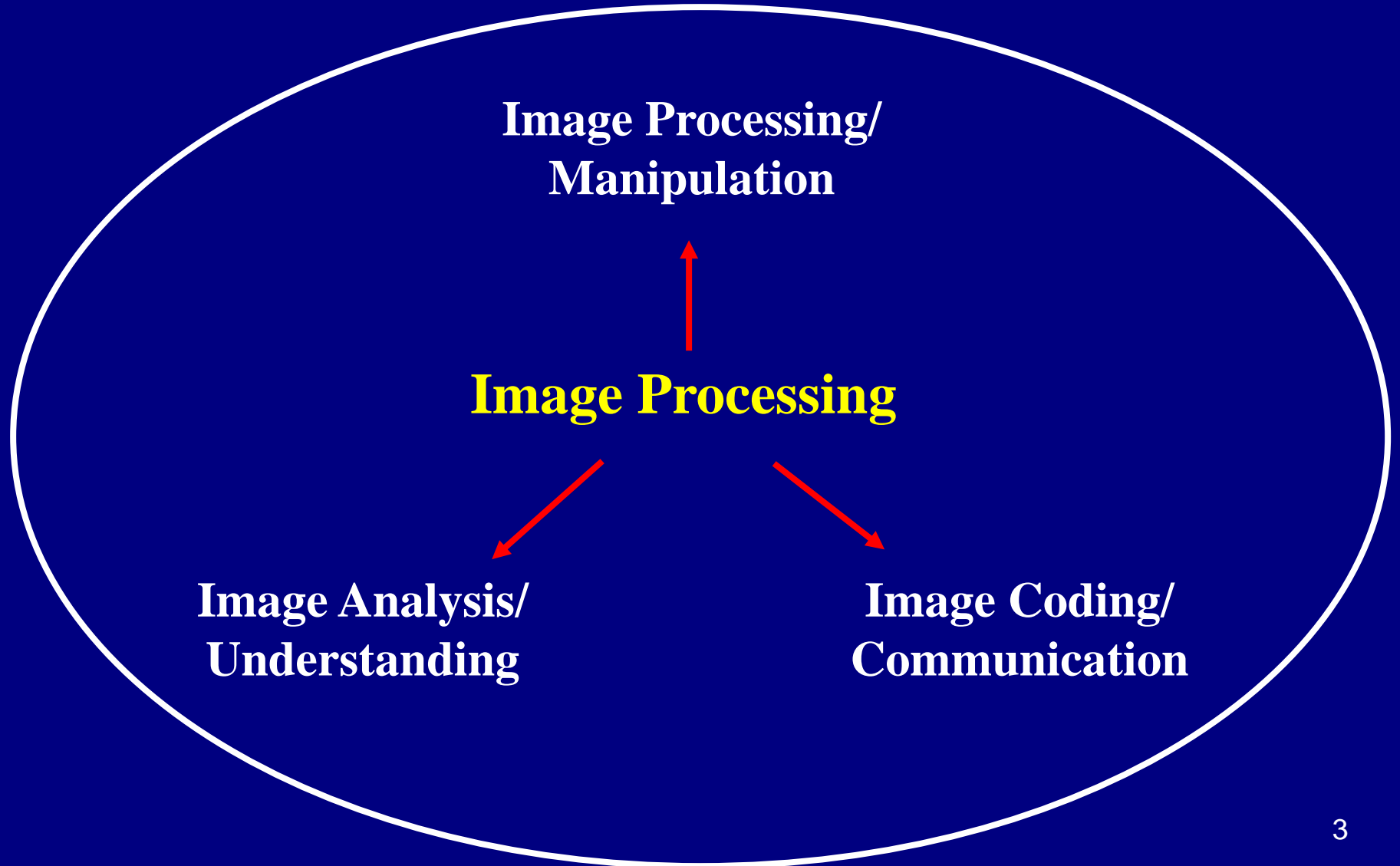
Zhou Wang

Dept. of Electrical and Computer Engineering
University of Waterloo

Where Are We?



What Do We Do?



Applications of DIP

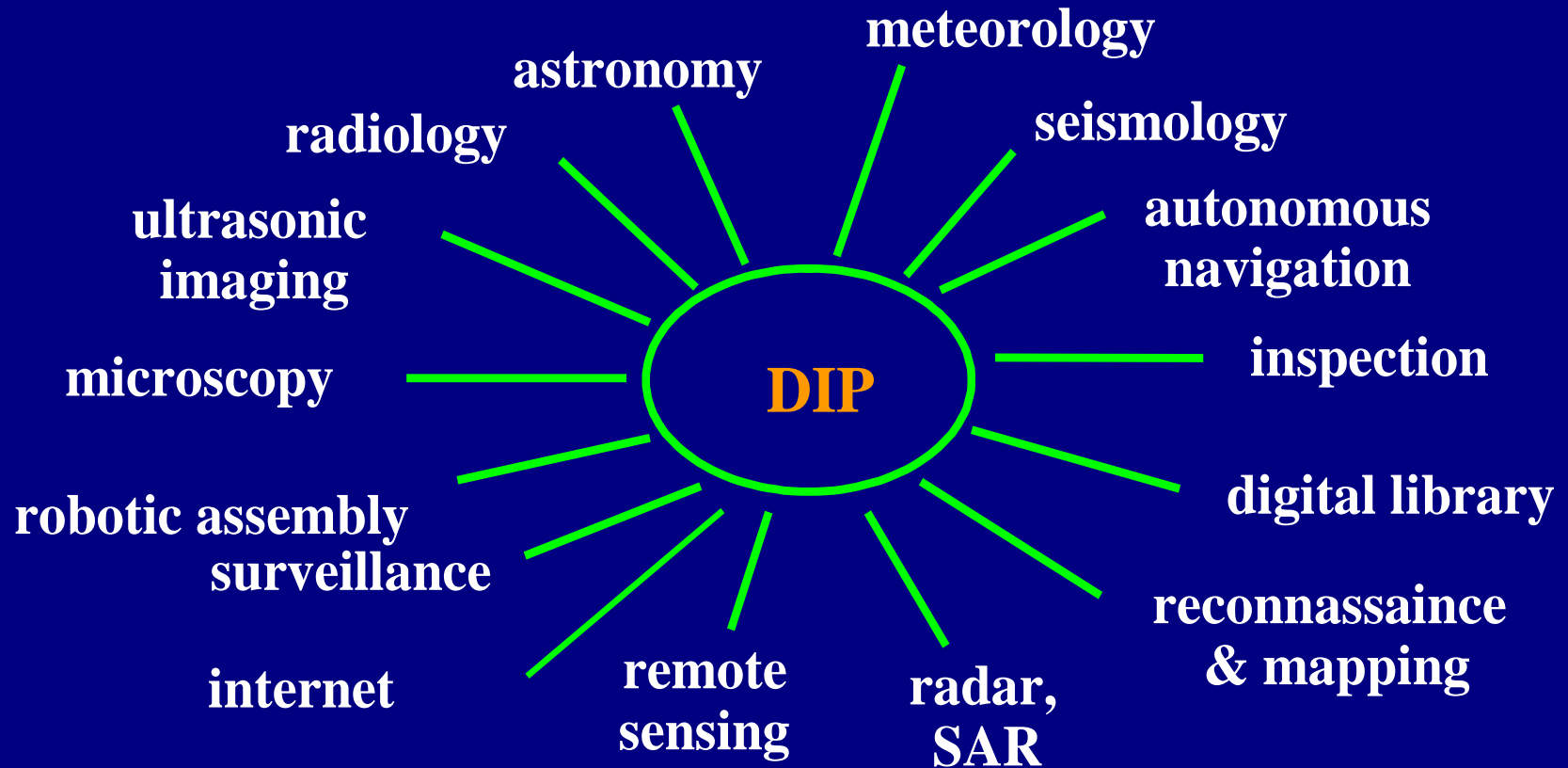


Image Processing/Manipulation

Image Processing: Image Enhancement

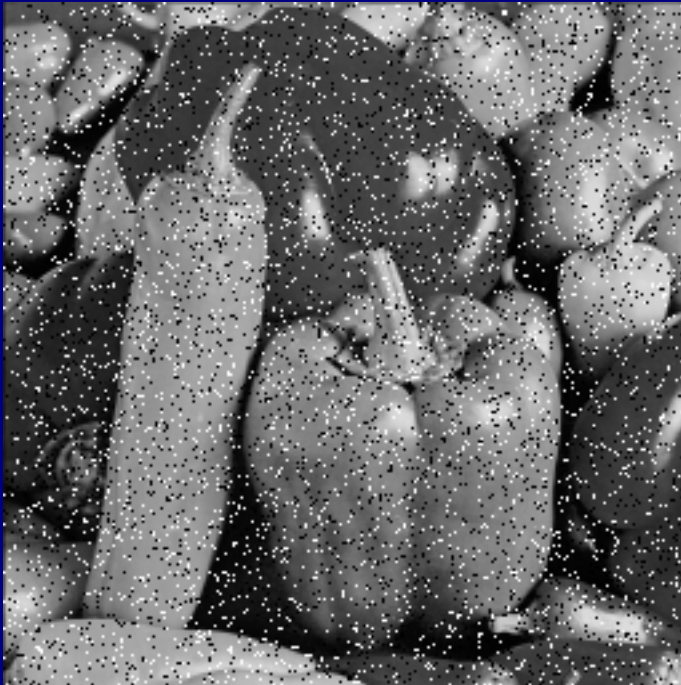


Enhance



From [Gonzalez & Woods]

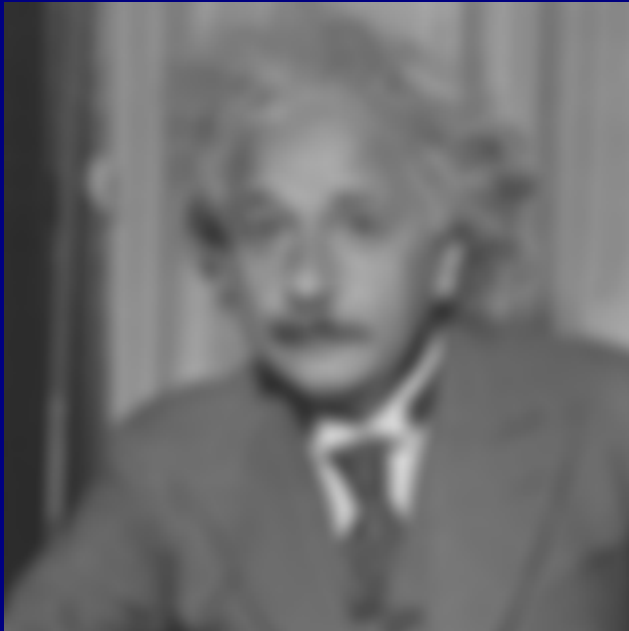
Image Processing: Image Denoising



Denoise



Image Processing: Image Deblurring



Deblur
→

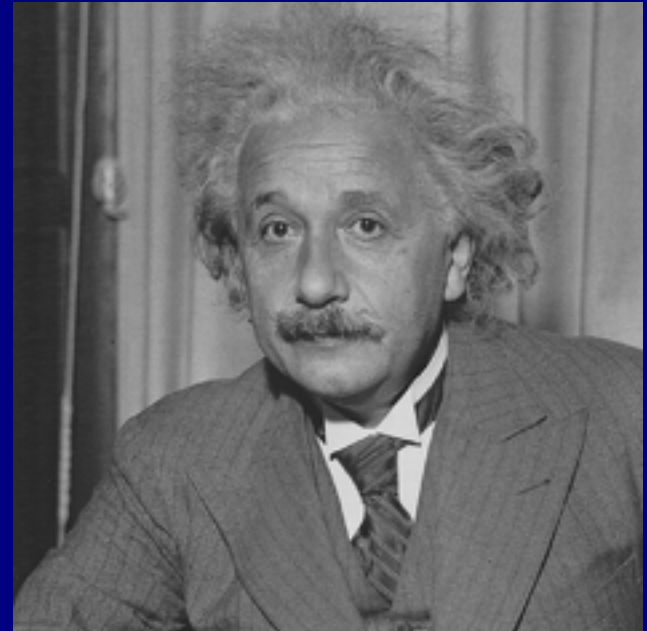


Image Processing: Image Deblocking/Deringing



Blocking artifacts



Ringing artifacts

Image Processing: Image Inpainting

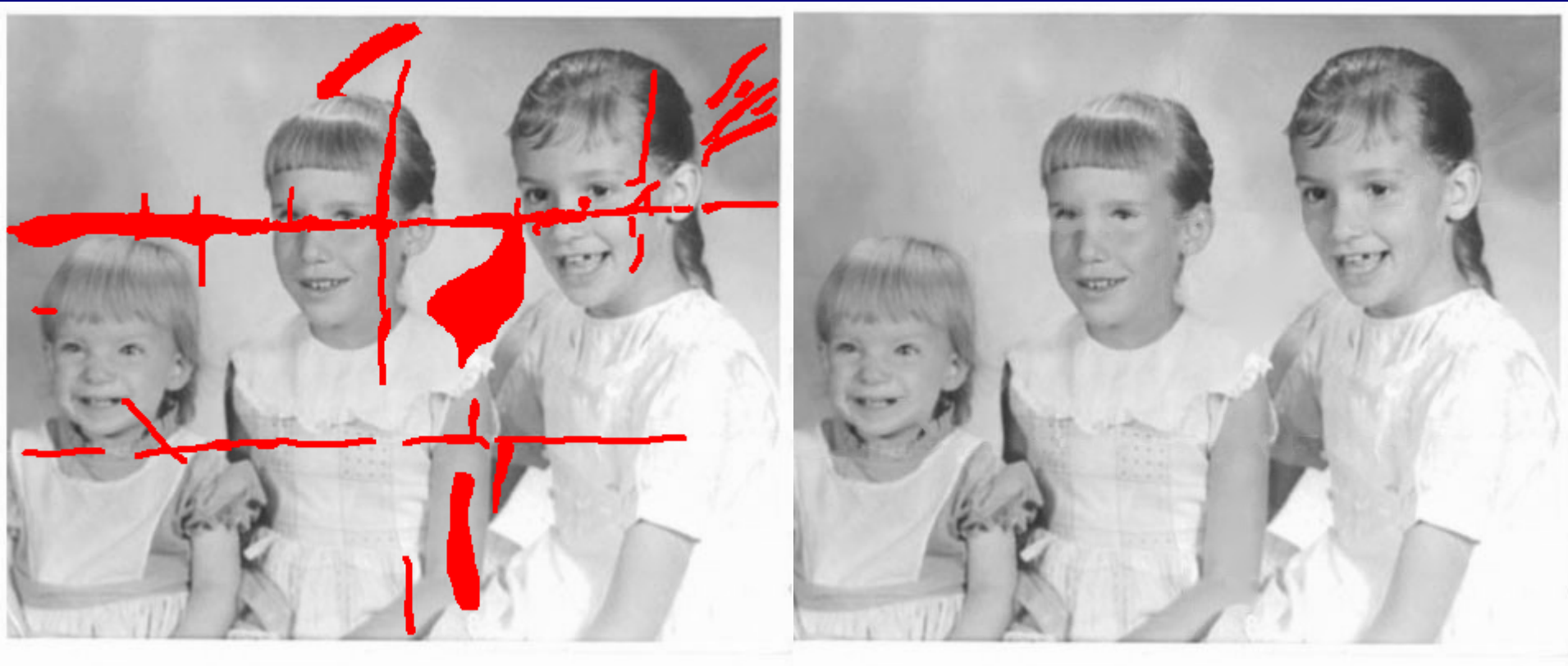


Image Processing: Error Concealment



Block loss
by channel errors

Courtesy: Dr. Xin Li

Image Manipulation: Image Interpolation (Zooming)



small

1M pixels

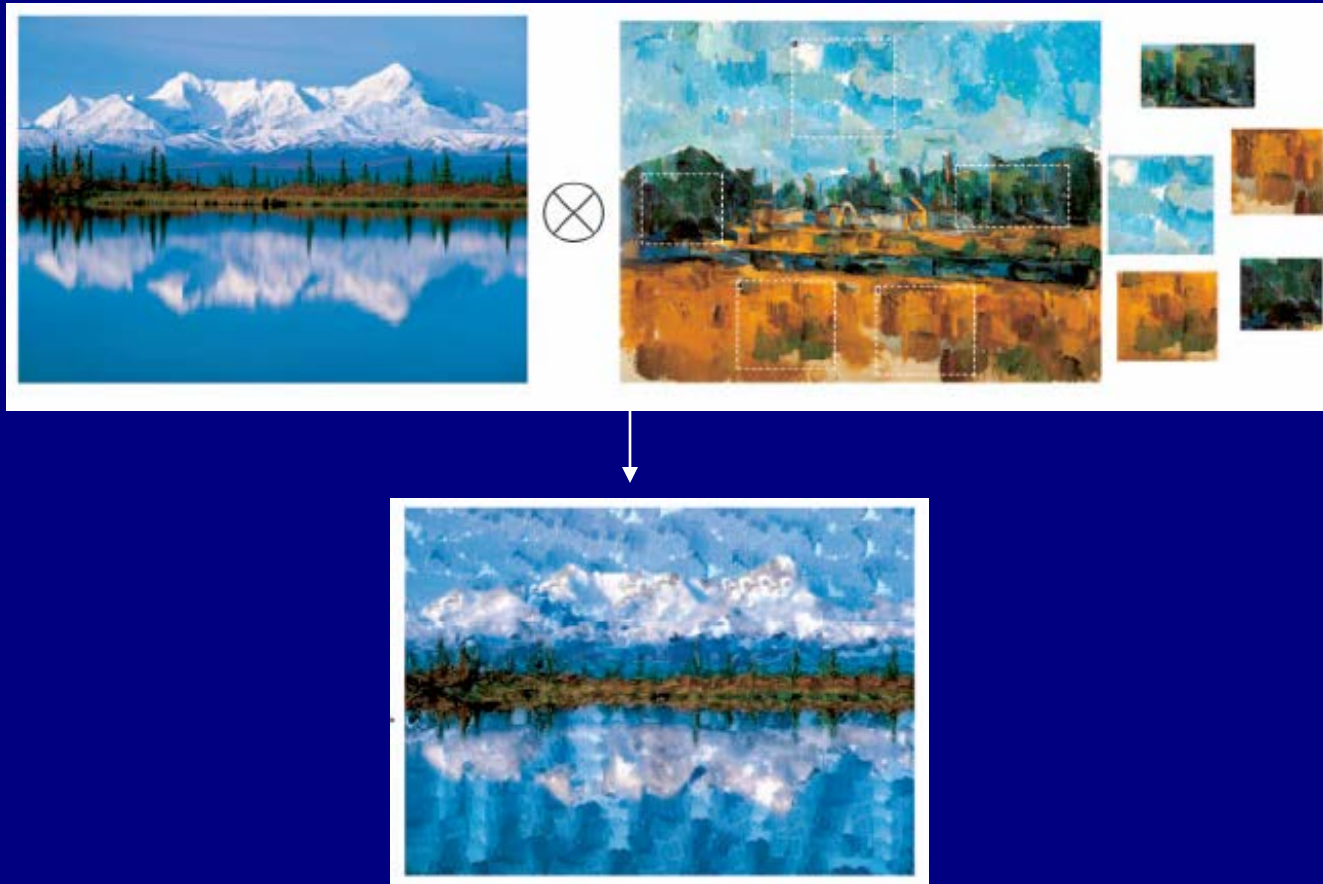
digital
zooming



large

4M pixels

Image Manipulation: Image Stylization



Courtesy: Dr. Xin Li

Image Manipulation: Image Fusion



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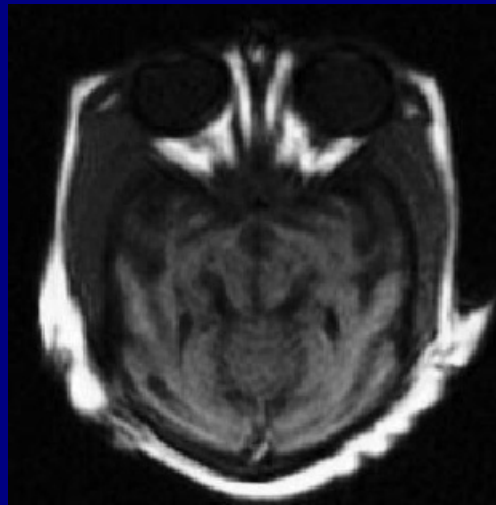
=



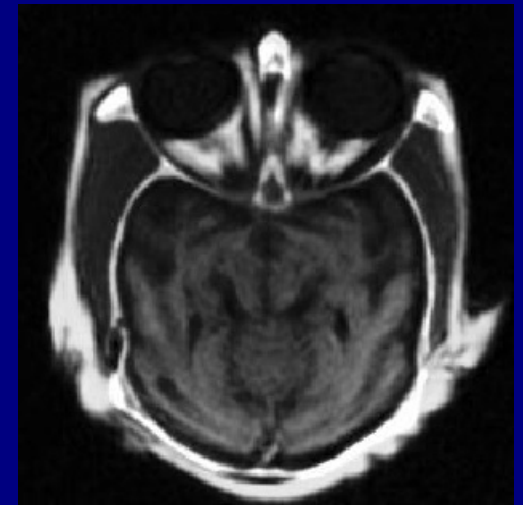
Courtesy: Dr. Xin Li



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CT image

MR image

fused image

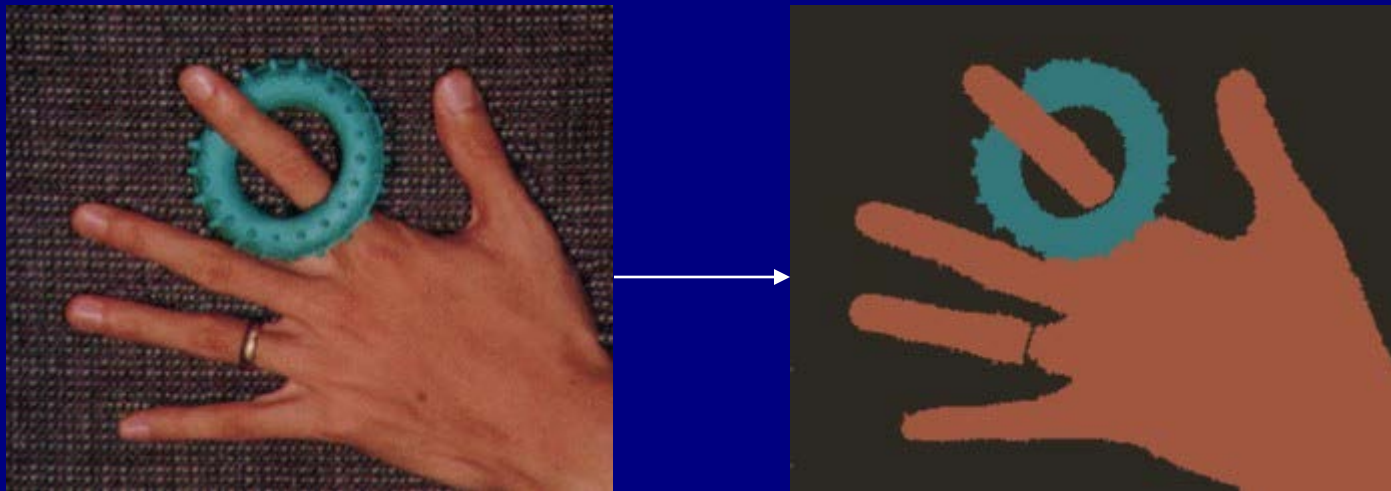
Image Analysis/Understanding

Image Analysis: Edge Detection



From [Gonzalez & Woods]

Image Analysis: Image Segmentation



Courtesy: Dr. Xin Li

Image Analysis: Face Detection

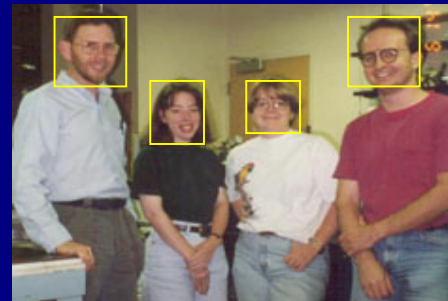
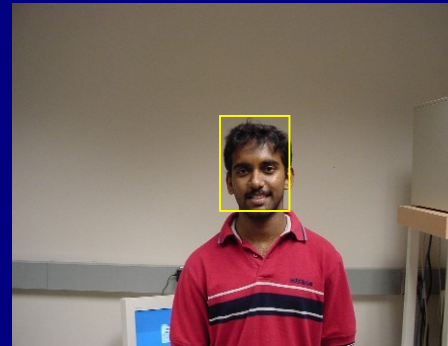


Image Analysis: Object Detection



Courtesy: Dr. Xin Li

Image Analysis: Change Detection

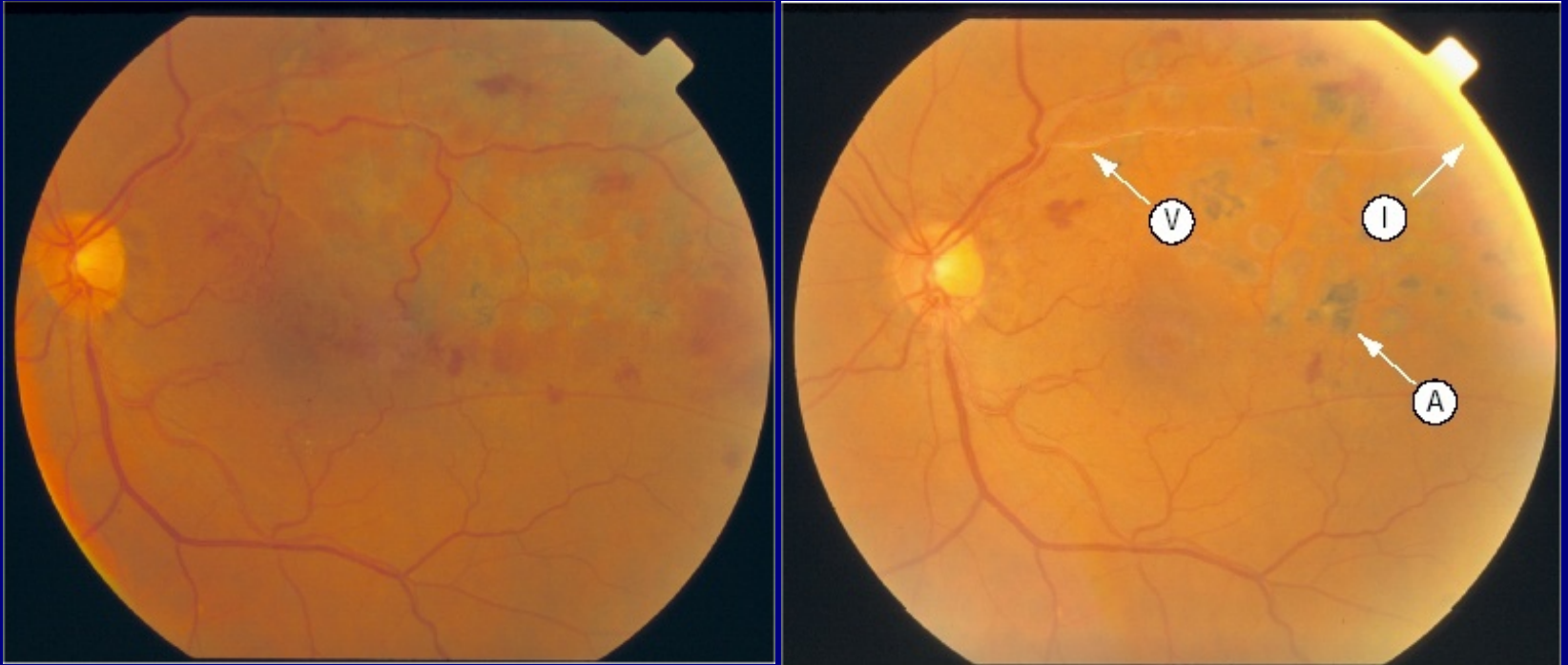
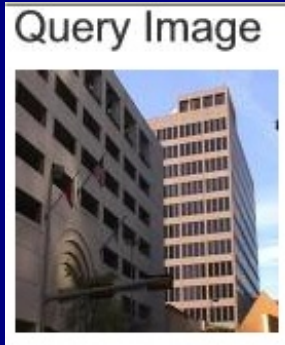


Image Analysis: Image Matching



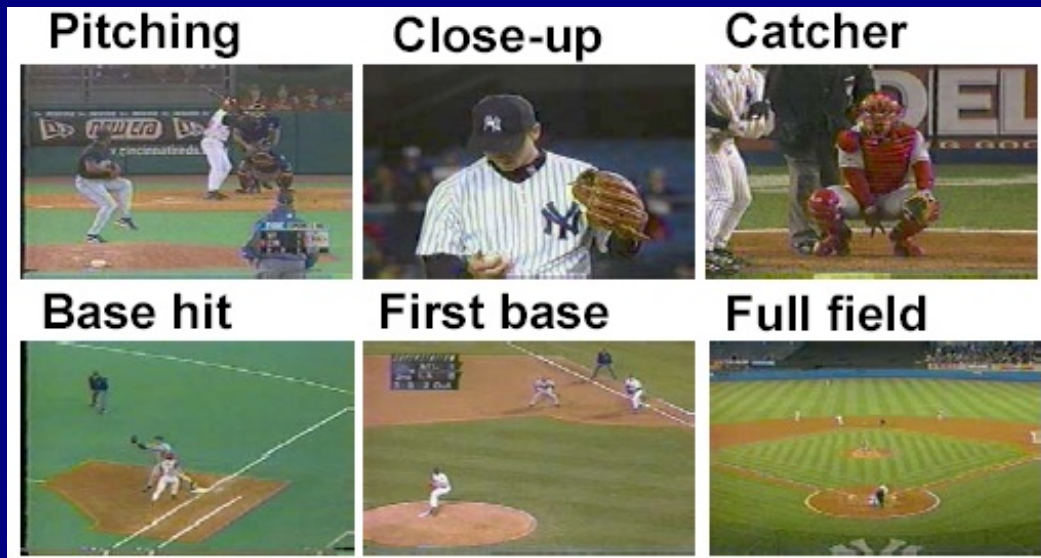
Two **deceptively** similar fingerprints of two different people

Image Analysis: Image Retrieval



retrieved building images

Image Analysis: Video Summarization



Only send out “important” motion pictures such as home-runs