Statistical Methods in Image Processing

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Personal Details

• **Background**
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Inverse Problems in Image Processing

Debluring
Inverse Problems in Image Processing

Super Resolution
Inverse Problems in Image Processing

Dehazing
Inverse Problems in Image Processing

CT Reconstruction
MRI, Ultrasound,...
Inverse Problems in Image Processing

Blind Inverse Problem
Image Models

Prior knowledge $p(x)$

High $p(x)$  Medium $p(x)$  Low $p(x)$
Image Models

Prior knowledge $p(x)$

Nonparametric model

- Models for whole images
  - Markov random fields
  - Optimization methods
  - Drawing samples (MCMC)

- Parametric models for patches
  - Mixture models, product models
  - EM, contrastive divergence

- From patches to whole images
  - EPLL

- Nonparametric density estimation
  - KDE

- Recent research?
Not Only for Images...

Stereo vision

Prior on depth maps
(disparity maps)
Not Only for Images...

Background Subtraction

Prior on binary maps
Not Only for Images...

Grab Cut

Prior on binary maps
Not Only for Images...

Shift-map Image Editing

Prior on (multi-valued) discrete maps
Course Requirements

• **Grade**
  • Final Project (60%) – Implementing & extending a paper
  • Homework Assignments (40%)

• **Reading**
  • Books:
    • “*Computer vision: Models, learning and inference*” by Simon J. D. Prince
    • “*Model Based Image Processing*” by Charles A. Bouman
  • Papers...