

Athens Week

Image Processing

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Image Processing



IMAGE PROCESSING IS UBIQUITOUS IN OUR LIVES:

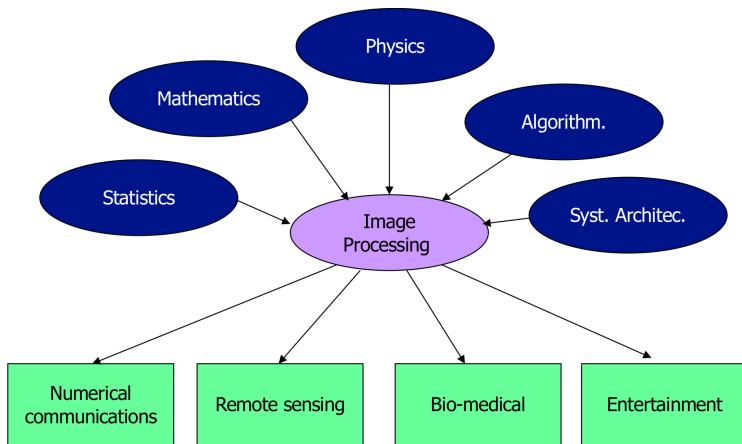
- Computational Photography
- Computer Graphics
- Medical Imaging
- Satellite Imaging



A brief Historical Overview

- 1950: Images of bubble chamber in physics
- 1960: Printed character recognition
- 1970-80: Medical imaging, remote sensing, television
- 1990: Advent of numerical cameras
- 2000-10: Soaring use of smartphones (with small cameras)
- 2014-....: Deep learning and Artificial Intelligence for Imaging

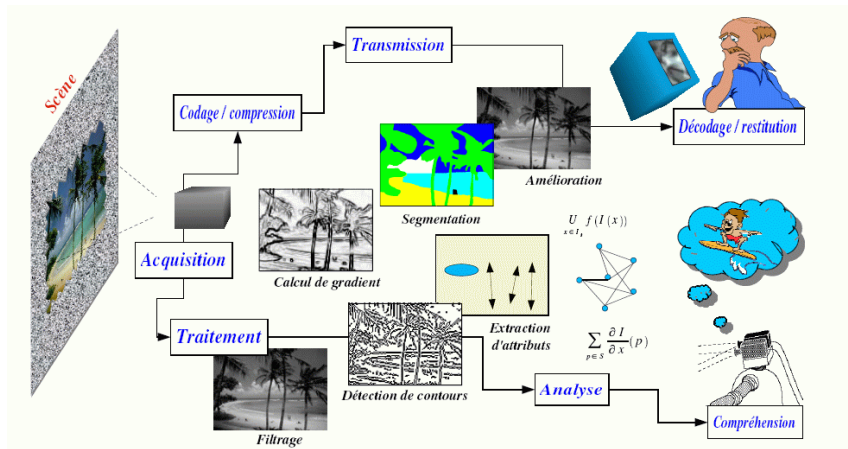
Interactions with other Fields



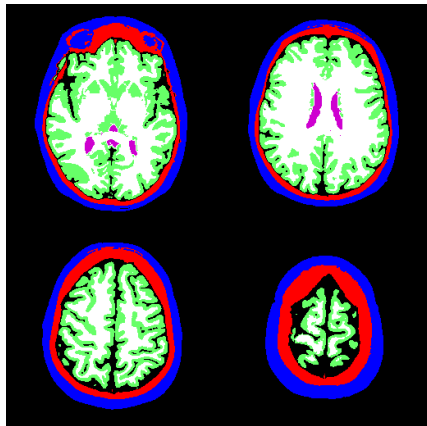
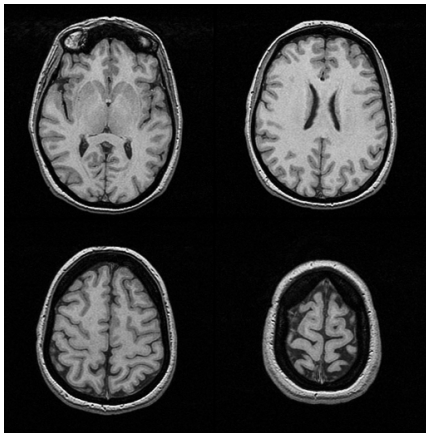
Some Image Processing Tasks

- **Image correction and improvement** (remove noise, blur, improve color aspect)
- **Image compression**
- **Image analysis** (detection of edges, interest points)
- **3D reconstruction** (e.g. stereovision)
- **Object detection, object recognition**
- **Image understanding** (image $\longleftrightarrow$ caption)
- **Image generation** (texture/object synthesis, synthesis from prompt)

An Image Processing Pipeline



Medical Image: Magnetic Resonance Imaging



Fingerprint Analysis



Arch



Loop

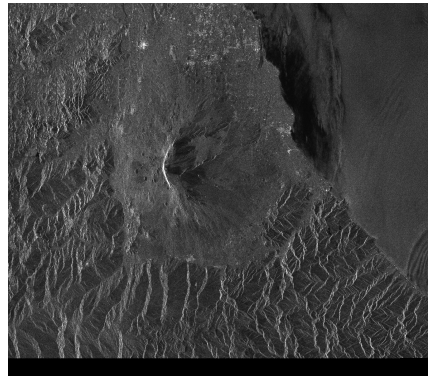


Whorl

Remote Sensing

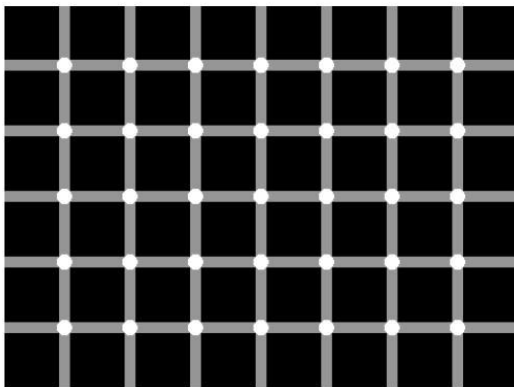


Satellite image (SPOT)



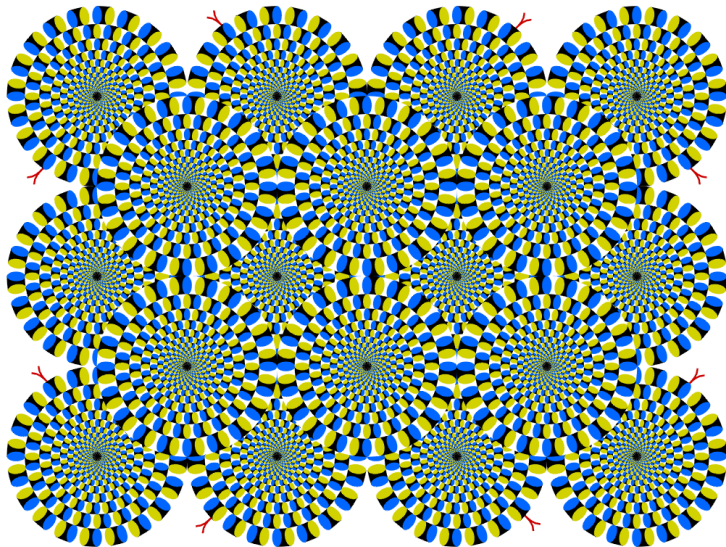
Radar image (ERS)

Understanding the Human Visual System (HVS)

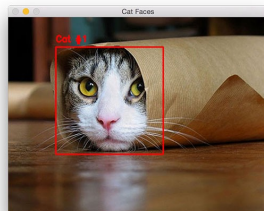
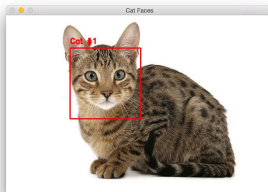
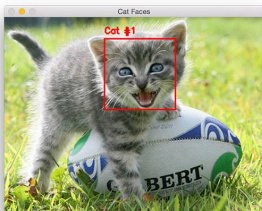


Count the black dots! :o)

Understanding the Human Visual System (HVS)



Object Detection

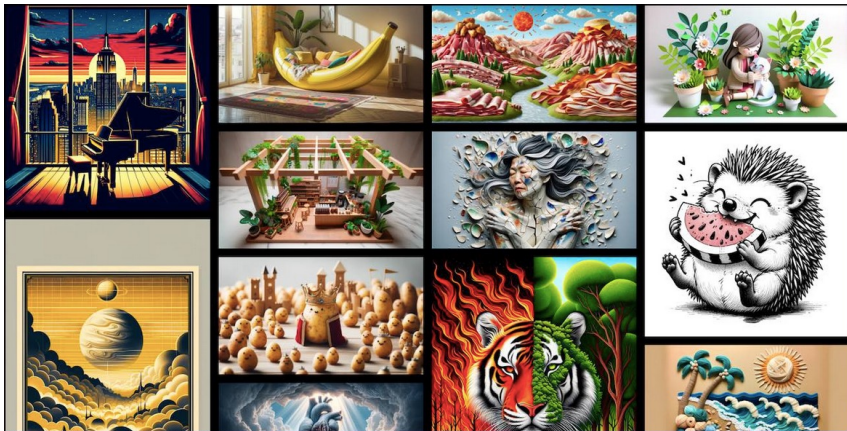


Object Classification

Chihuahua or Muffin?



Generative AI



Generate an image from a text prompt

Your Athens Week

- Intensive course on image processing
- Overview of several topics in the domain
- Course sessions
- Practical work sessions (PW)
- Team projects
- 2 demos from researches of the IMAGES group
(on computer graphics and medical imaging)

Week Schedule (in Room 1A226)

Monday 17.11

- 10.00 Introduction
- 10.30-12.00 Image representation and sampling
- 1.30-3.00 Radiometry, Colorimetry
- 3.15-5.30 **PW:** Radiometry, Colorimetry

Tuesday 18.11

- 9.00-10.30 Linear and non-linear filtering
- 10.45-12.30 **PW:** Filtering
- 1.45 Demo on Computer Graphics
- 2.15-3.45 Image Restoration
- 4.00-5.00 **PW:** Image Restoration 1

Wednesday 19.11

- 9.00-10.30 **PW:** Image Restoration 2
- 10.45-12.00 Image Segmentation
- 2.00-3.00 Image Classification
- 3.00-4.30 **PW:** Image Classification
- 4.30-5.00 Presentation of projects

Thursday 20.11

- 9.00-12.00 Work on Project
- 1.30-5.00 Work on Project
- 3.30 Demo on medical imaging

Friday 21.11

- 9.00-12.00 Prepare project presentations
- 1.30-2.30 Written Exam
- 2.30-4.30 Project Oral Presentations

Week Validation

- 50% : Written exam
- 50% : Project work and presentation