MICRO-512  Image processing II
Unser Michaël, Van De Ville Dimitri Nestor Alice

Cursus | Sem. | Type
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Bioingénierie | MA2, MA4 | Opt.
Humanités digitales | MA2 | Opt.
Informatique | MA2 | Opt.
Microtechnique | MA2, MA4 | Opt.
Mineur en Biocomputing | E | Opt.
Mineur en Neuroprosthtiques | E | Opt.
Mineur en Neurosciences computationnelles | E | Opt.
SC master EPFL | MA2, MA4 | Opt.
Science et ing. computationnelles | MA2, MA4 | Opt.
Sciences du vivant | MA2, MA4 | Opt.

Language | English
Credits | 3
Session | Summer
Semester | Spring
Exam | Written
Workload | 90h
Weeks | 14
Hours | 3 weekly
Lecture | 3 weekly

Summary
Study of advanced image processing; mathematical imaging. Development of image-processing software and prototyping in JAVA; application to real-world examples in industrial vision and biomedical imaging.

Content
• **Continuous representation of discrete data.** Splines. Interpolation. Geometric transformations. Multi-scale decomposition (pyramids and wavelets).
• **Deconvolution.** Inverse and Wiener filtering. Matrix formulations. Iterative techniques (ART).
• **Image analysis.** Pixel classification. Contour extraction and representation. Shape. Texture. Snakes and active contours.

Learning Prerequisites
**Required courses**
Image Processing I

**Recommended courses**
Signals and Systems I & II, linear algebra, analysis

**Important concepts to start the course**
Basic image processing and related analytical tools (Fourier transform, z-transform, etc.)

Learning Outcomes
By the end of the course, the student must be able to:
• Construct interpolation models and continuous-discrete representations
• Analyze image transforms
• Design image-reconstruction algorithms
• Formalize multiresolution representations using wavelets
• Design deconvolution algorithms
• Perform image analysis and feature extraction
• Design image-processing software (plugins)
• Synthesize steerable filters

Transversal skills

• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Manage priorities.
• Access and evaluate appropriate sources of information.
• Use both general and domain specific IT resources and tools