



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Image acquisition pipelines: embedded processing and post processing

2223-87R-02

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#### Title

Image acquisition pipelines: embedded processing and post processing

#### Teacher(s)

Simone Bianco, Marco Buzzelli, Luigi Celona, Flavio Piccoli, Raimondo Schettini

#### Language

English

#### Short description

The course provides the theoretical and practical foundations of image processing pipelines for different scenarios and applications.

The student will acquire specific skills that will allow him/her to understand the imaging processing pipelines of digital cameras, to design and implement image processing and image analysis algorithms, and to evaluate the algorithms effectiveness. The student will also acquire the skills needed to design (also using deep learning approaches), post-processing algorithms for adaptive image enhancement, methods for the subjective and

objective evaluation of image quality, object and scene recognition and classification.

**Program:**

- Background on human visual perception
- Camera processing pipelines
  - RAW/Bayer processing
  - Sensor characterization
  - Main modules of image processing pipelines (Automatic White Balance, noise reduction, ...)
  - JPEG and output color spaces
- Image quality and aesthetics
- Image content recognition
  - Saliency and semantic segmentation
  - Image tagging
- Post processing image enhancement
  - Super resolution
  - De-hazing
  - Tone mapping / contrast enhancement
  - Autocropping

**Assessment:**

Each student will select a unique paper/topic from a pool provided by the teachers. The student will study the topic, present it to the class, and submit a short report.

**Pre-requisites:**

Background notions on digital imaging will be provided at the beginning of the course. Some basic knowledge on deep learning and convolutional neural networks is advised in order to follow the more advanced topics that will be presented. A good starting place is <http://cs231n.stanford.edu/>.

**CFU / Hours**

20 hours

**Teaching period**

February-March 2023

**Sustainable Development Goals**

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