Master in
Computer Vision
*Barcelona*

Module: 3D Vision
Project: 3D recovery of urban scenes
Session 1

Gloria Haro

# Project goals

**Main Goal:** Learn the basic concepts and techniques to reconstruct a real world scene given several images (points of view) of it.

**Scope:**

- Use of different image transformations. (week 1)
- Learn affine and metric rectification. (week 1)

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- New view synthesis. (week 4)

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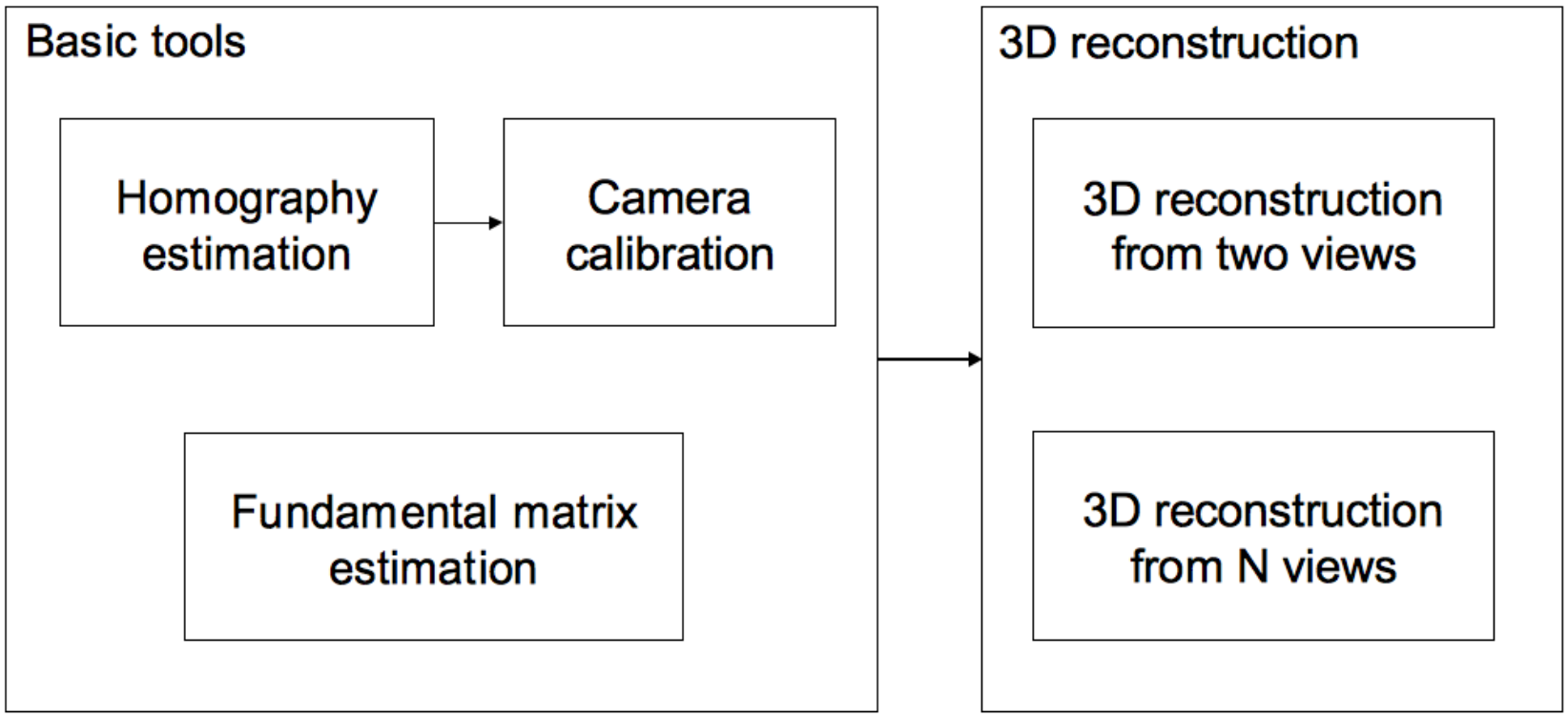
- New view synthesis. (week 4)
- 3D reconstruction from N non calibrated cameras. (week 5)

# Project stages




labs 1, 2, 3

labs 4, 5

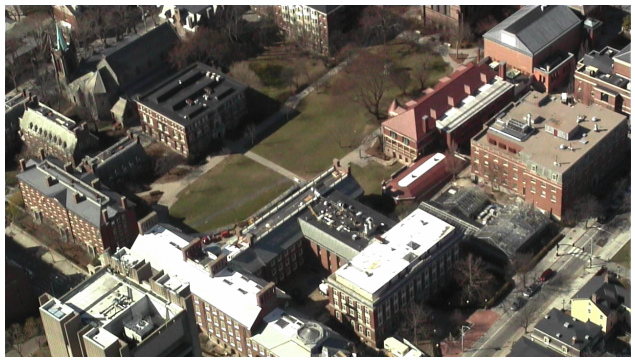
# Datasets

Images of buildings and facades.

- **Facades**

  EPFL-Stretcha dataset
  castle images: 19 cameras
  (calibration matrices)

- **Aerial images**
  Brown university 27 different sites of Providence city



Site 13 (234 images)

Site 22 (173 images)

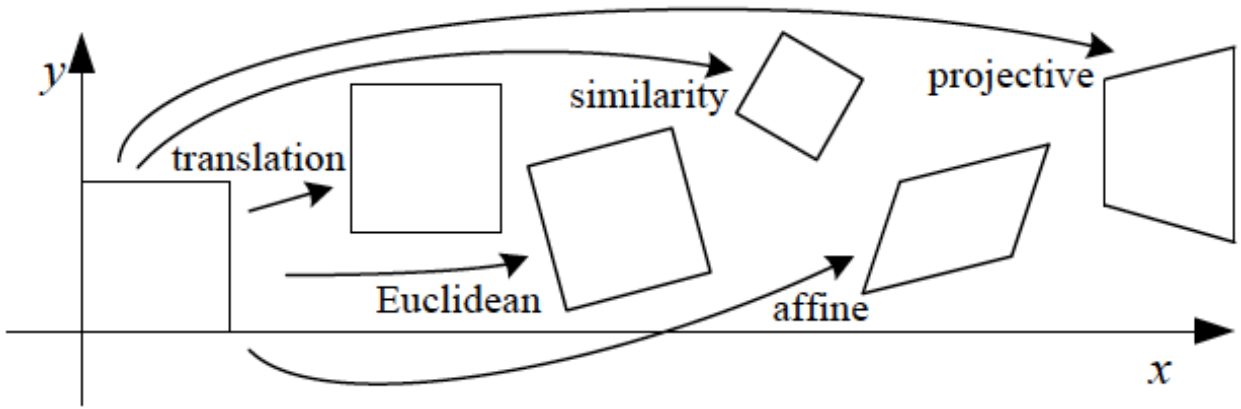
Calibration matrices are available.

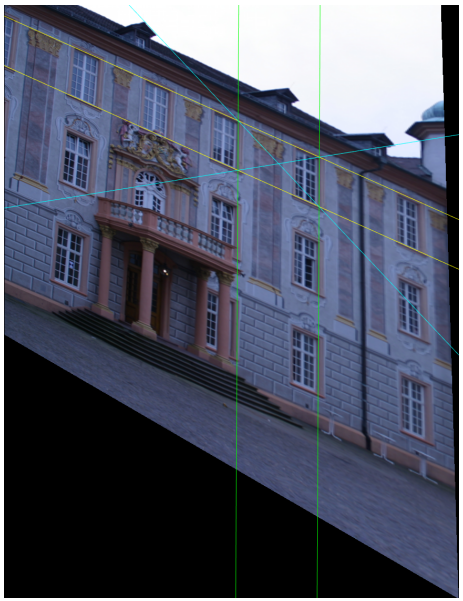
# Datasets

Other images

- **Middlebury**
  Stereo benchmark
  Different datasets
  Ground truth disparity (depth)

# Session 1



# Session 1

**Mandatory tasks:**

- Function that applies a given homography to an image.
- Play with the hierarchy of planar transformations.
- Compute a line that passes through two points.
- Compute vanishing points.
- Compute a tranformed line.
- Affine rectification of an image.
- Metric rectification of an image.

**Optional tasks:**

- Metric rectification of an image with a single step (pages 55-57, Hartley-Zisserman book).

# Session 1

**Language:** MATLAB

**Provided functions:** lab1.m,
guide of the lab with the different steps of the lab session.

**To Do:**

- Complete the code in lab1.m as indicated in the same file
- Write the function apply_H.m

# Session 1

Comments on the function apply_H

- Use MATLAB function `interp2`
- Automatically adjust the size of the transformed image

# Session 1

Affine and metric rectification need the identification of some lines.


http://www.ipol.im

# Session 1

**Provided information:**

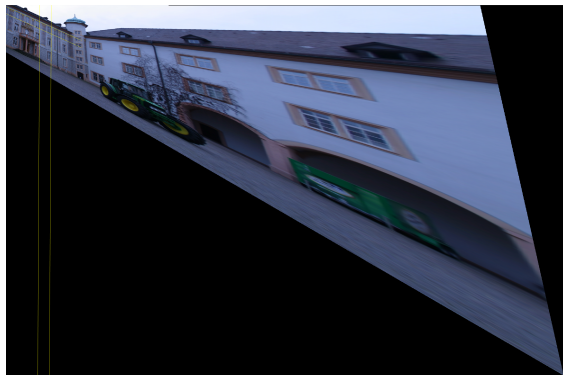

You can assume that windows are square.

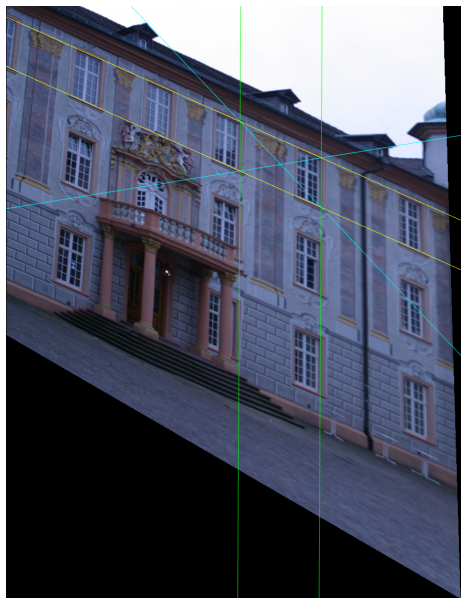
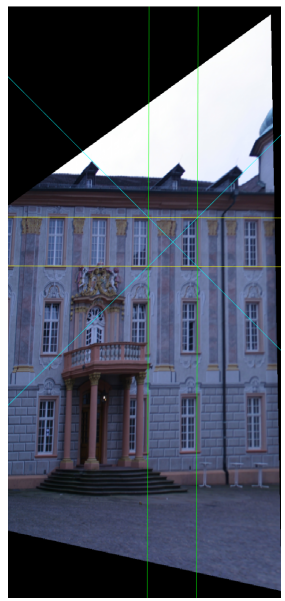
# Session 1

**Provided information:**

# Session 1

Affine and metric rectification of left facade image 0001

- Crop original image (only left facade)
- Show properly transformed lines

# Evaluation

To deliver **by 9am of the day before** the next lab session:

- **Code deliverable:**
  - READY TO BE LAUNCHED on the provided images
- **Short document (10 pages):**
  - Results.
  - Problems and comments, conclusions.

# Evaluation

**Grading:**

- Report: **2 points**
- apply_H.m function: **2 points**
- Play with different transformations: **0.5 points**
- Decompose affinity: **0.5 points**
- Affine rectification + angles: **2 points**
- Metric rectification + angles: **2 points**
- Affine + metric rectification 2nd facade: **1 point**
- Optional Metric rectification (single step): **+ 1.5 points**