BMINF010: Fundamentals of Image Processing and Computer Vision (5 ECTS)

Instructor: Prof. Dr. Davide Scaramuzza

The course is based at UZH but is also open to ETHZ students (info for ETHZ students here).

Rooms: Binzmuhlestrasse 14, 8050 Zurich (Oerlikon) – Lecture room 2.A.10, Exercise room: 2.A.01.

Time:

Lectures: Every Thursday, 10:15 to 12:00;
Exercises: 14:15 to 15:45 on Thursday *roughly* every 2 weeks (check exact schedule below)

Course website: http://rpg.ifi.uzh.ch/teaching.html

Course Schedule (tentative) – Exercises are marked in **yellow**

Date	Time	Description of the lecture/exercise	Lecturer
17.09.2015	10:15 - 12:00	01 - Introduction	Scaramuzza
24.09.2015	08:15 - 10:00	02 - Image Formation 1: perspective projection	Scaramuzza
01.10.2015	10:15 - 12:00 **14:15 – 15:45**	03 - Image Formation 2: camera calibration and omnidirectional cameras **Lab Exercise 1: Matlab intro + filtering exercise**	Scaramuzza Elias Mueggler/Zichao Zhang
08.10.2015	10:15 - 12:00	04 - Filtering & Edge detection	Scaramuzza
15.10.2015	10:15 - 12:00 **14:15 – 15:45**	05 - Point Feature Detectors 1: Harris detector **Lab Exercise 2: Harris detector**	Scaramuzza Elias Mueggler/Zichao Zhang
22.10.2015	10:15 - 12:00	06 - Point Feature Detectors 2: SIFT, BRIEF, BRISK	Scaramuzza
29.10.2015	10:15 - 12:00 **14:15 – 15:45**	07 - Multiple-view geometry 1: Epipolar geometry and stereo **Lab Exercise 3: Stereo vision**	Scaramuzza Elias Mueggler/Zichao Zhang
05.11.2015	10:15 - 12:00	08 - Multiple-view geometry 2 (Part I): Two-view Structure from Motion	Scaramuzza
12.11.2015	10:15 - 12:00 **14:15 – 15:45**	08 - Multiple-view geometry 2 (Part II): Two-view Structure from Motion **Exercise 4: 8-point algorithm and RANSAC**	Scaramuzza Elias Mueggler/Zichao Zhang
19.11.2015	10:15 - 12:00	09 - Multiple-view geometry 3: RANSAC and Visual Odometry	Scaramuzza
26.11.2015	10:15 - 12:00	10 - Dense 3D Reconstruction (Multi-view Stereo)	Scaramuzza
03.12.2015	10:15 - 12:00 **14:15 – 15:45**	11 - Optical Flow and Tracking (Lucas-Kanade) **Exercise 5: Lucas-Kanade tracker**	Scaramuzza Elias Mueggler/Zichao Zhang
10.12.2015	10:15 - 12:00 **14:15 – 15:45**	12 - Image Retrieval **Exercise 6: Recognition with Bag of Words**	Scaramuzza Elias Mueggler/Zichao Zhang
17.12.2015	10:15 - 12:00	14 - Paper presentations + lab visit and live demonstrations	ALL
14.01.2015	08:00 – 18:00	**Oral exams**	ALL

Exercises:
You will be required to bring **your own laptop** to the exercise session. You will need to have **Matlab** already pre-installed in your machine for the exercise. You can download it from the UZH website: http://www.id.uzh.ch/dl/sw/angebote_4.html You will need to install all the toolboxes included in the license. Info on how to setup the license can be found here: http://www.s3it.uzh.ch/software/matlab/

Recommended textbooks:

- Computer Vision: Algorithms and Applications: R. Szeliski - http://szeliski.org/Book/
- Autonomous Mobile Robots: R. Siegwart, I.R. Nourbakhsh, D. Scaramuzza -> **Chapter 4**
- An Invitation to 3D Vision: Y. Ma, S. Soatto, J. Kosecka, S.S. Sastry
- Multiple view Geometry: R. Hartley and A. Zisserman

Paper Presentations or Mini Projects

- Mandatory (**either one**)
- The paper list will be out on November 20, 2015 (10-15 minutes of presentations per student)
- The mini-project list will be out by the second week of the course; project choices must be communicated to the teaching assistants (Zichao and Elias) by **Dec. 1** and the mini-projects should be handed in by **Dec. 19**.

Oral Exam: 14.01.2016, from 8:00 to 18:00

Grade

- Paper presentation or mini project: **40%**
- Oral exam: **60%, 30 minutes**