

HOMEWORK 2

Due date: February 15, 2016, 11:55PM.

Bibliography: Course lecture notes Lessons 4, 9-11. Textbook pp. 107-122, 130-137, Sections 2.5, 3.1.
Feel free to use Octave within the theoretical exercises to avoid tedious arithmetic.

1. (1 course point) Textbook p.110, Exercises 2.5.1, 2.5.2
2. (1 course point) Textbook p.111, Exercise 2.5.5
3. (1 course point) Textbook p.120, Exercise 2.5.21
4. (1 course point) Textbook p.121, Exercises 2.5.27
5. (Computer application 4 course points) We start investigation of realistic applications by consideration of image analysis.

Task 1. (1 course point, ex officio). Work through the OctaveImageIO.tm tutorial. The tutorial considers the problem of face recognition.

Task 2. (1 course point). Construct a database of images of interest to your working group. Self-organize in groups of 2-4 students. Organize the images into a matrix $\mathbf{A}$ with each image represented by a column vector.

Task 3. (2 course points). Compute how close the images in your database are by:

- i. Computing $\text{rank}(\mathbf{A})$
- ii. Compute the angle between columns of $\mathbf{A}$.
- iii. Compute the norm of differences between columns of $\mathbf{A}$.

For all the above, interpret the results you obtain.