Exercises for
Pattern Analysis
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Assignment 4, 07/06.2018

General Information:

Lecture (3 SWS):	Tue 12.15 – 13.45 (H16) and Thu 12.15 – 13.45 (H16)
Exercises (1 SWS):	Tue 12.00 – 14.00 (02.151b-113) and Thu 10.00 – 12.00 (02.151b-113)
Certificate:	Oral exam at the end of the semester
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Random Forest

Exercise 1 Rules for submitting the programming exercise :

(a) Work together in pairs (max. two people).

(b) You have to show your code to the tutors not later than the deadline. It is recommended that all team members shows up.

(c) Your code has to be in C or C++. We recommend using *OpenCV* for Matrix algebra and visualization, as it is available in the CIP pool.

(d) You can either use CIP pool PCs or your own laptop.

(e) Plagiarism will be punished by assigning zero points, removal from the programming exercises and/or by a report to the examination office. According to Wikipedia, plagiarism is *the "wrongful appropriation" and "stealing and publication" of another author's "language, thoughts, ideas, or expressions" and the representation of them as one's own original work.*

Exercise 2 Programming exercise:

The goal of this exercise is to implement the methods in a Random Forest for density estimation. The output of each tree in a Density Forest is added up with the outputs of all the others trees; finally, the average is retuned. In order to compare the effects of the number of trees in a density forest, the marginal distributions of 2D data have to be computed.

(a) Download *main.cpp*, *DensityTree.cpp* and *DensityTree.h* from Studon. The main.cpp file contains code that generates 2D data in addition to functions for visualization and the averaging process of the trees in a forest.

(b) Implement the *train* function in the DensityTree class.

(c) Implement the *densityXY* function in the DensityTree class.

(d) The file *main.cpp* does not have to be modified.

(e) (not graded) For a cleaner implementation add methods to the DensityTree class. For exemple, a method that returns the Information Gain could be used in the training method.

(f) **Deadline for submission : June 19th/20th**