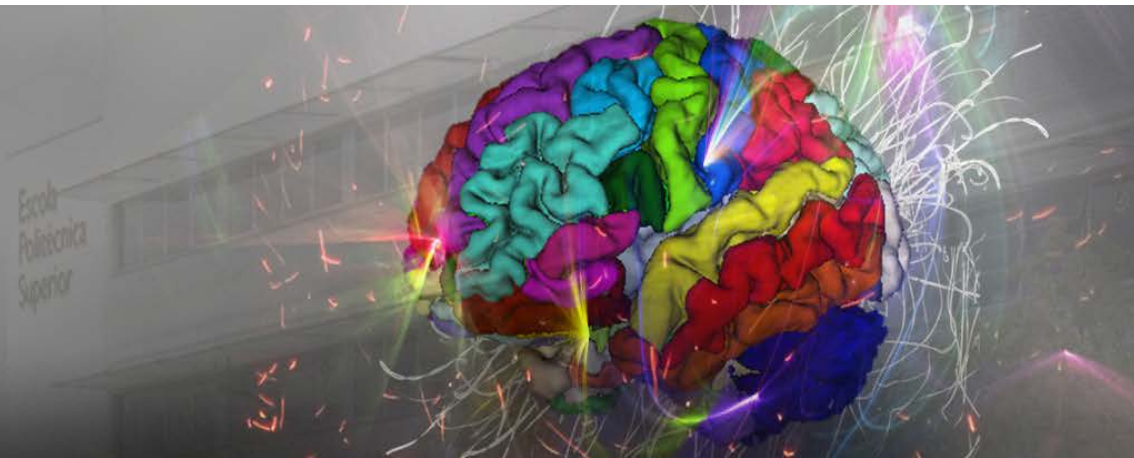




Computer Aided Diagnosis (CAD)

CADx PROJECT – 2018/19

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{xavier.llado,arnau.oliver,kaisar.kushibar}@udg.edu

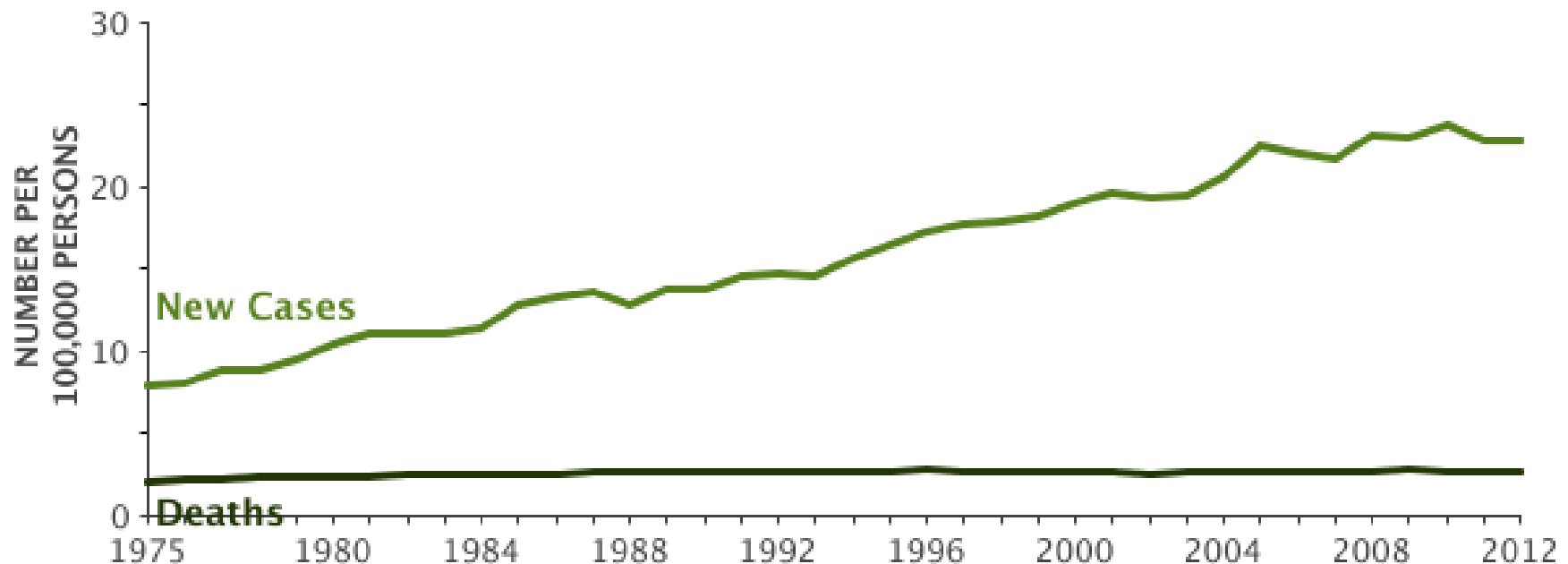


CADx Project: Objectives

- To develop a CADx medical system that help physicians to deliver a diagnosis.
- In particular, we want to develop an algorithm able to give a second opinion.
- This year, the challenge is focused on skin analysis (melanoma detection).

CADx Project: Melanoma

- Melanoma is the deadliest form of skin cancer
- The number of people getting and dying of melanoma keeps growing
- There are over 100,000 new cases of melanoma in the U.S. each year and over 9,000 melanoma deaths



CADx Project: Melanoma

- Melanoma originates in the cells of the skin that make pigment, called melanocytes
- Melanomas look like moles on the skin



- When diagnosed early, melanoma is easily cured by simple outpatient surgical excision
- If permitted to progress, melanomas that are less than an $\frac{1}{2}$ inch across on the surface of the skin can spread (metastasize) and lead to death

CADx Project: Melanoma

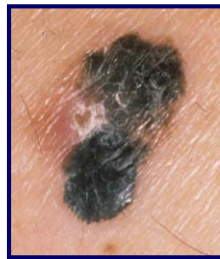
- Discriminating melanoma from benign moles can be challenging- especially in patient with lots of moles and 'atypical' moles



CADx Project: Melanoma

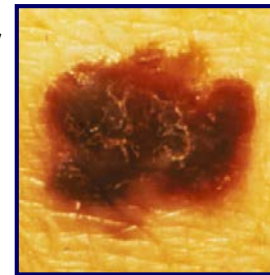
- The **ABCDEs** of Clinical (i.e. simple naked eye examination) Melanoma Diagnosis:

Asymmetry



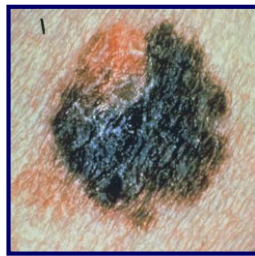
One half of the lesion is shaped differently than the other

Border



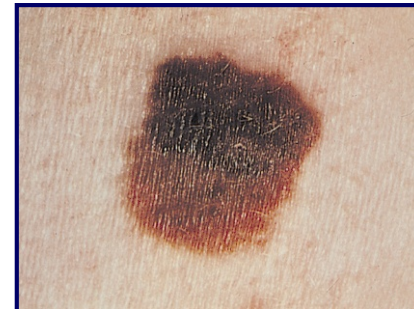
The border of the lesion is irregular, blurred, or ragged

Color



Inconsistent pigmentation, with varying shades of brown and black

Diameter



>6mm, or a progressive change in size

Evolution

The history of change in the lesion

CADx Project: Melanoma

- Dermoscopy is a digital technique that improves melanoma diagnosis
- Dermoscopy permits visualization of features that are not evident on simple visual inspection



Clinical Image

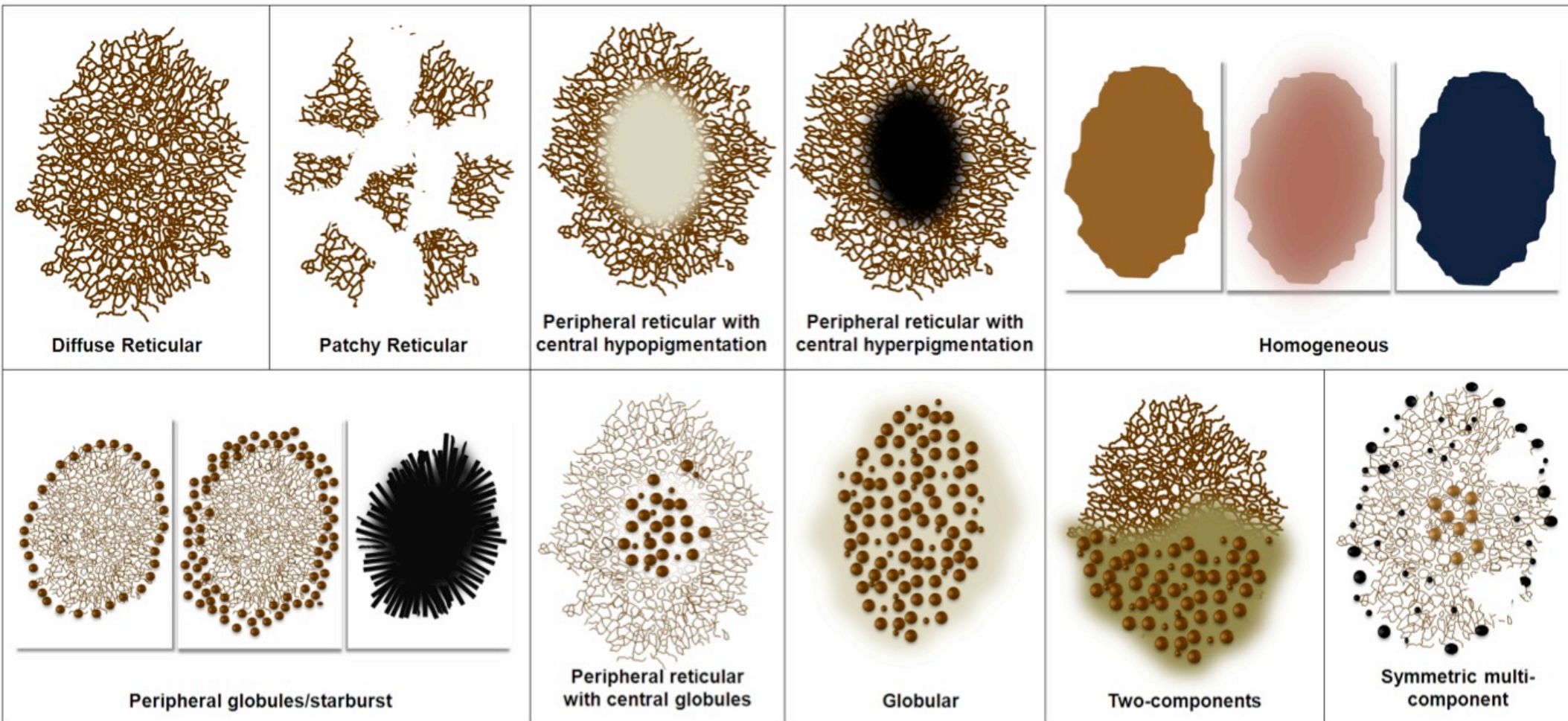


v. Dermoscopy image₇

CADx Project: Melanoma

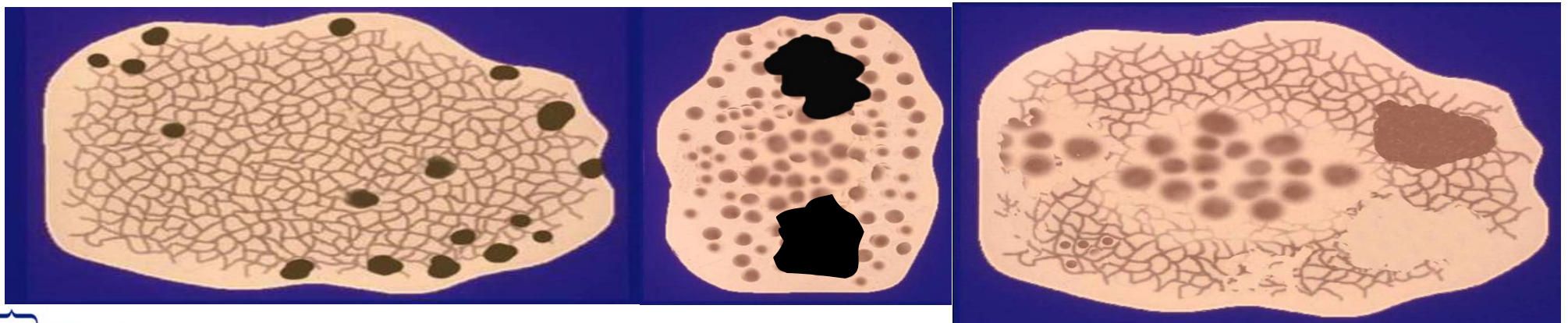
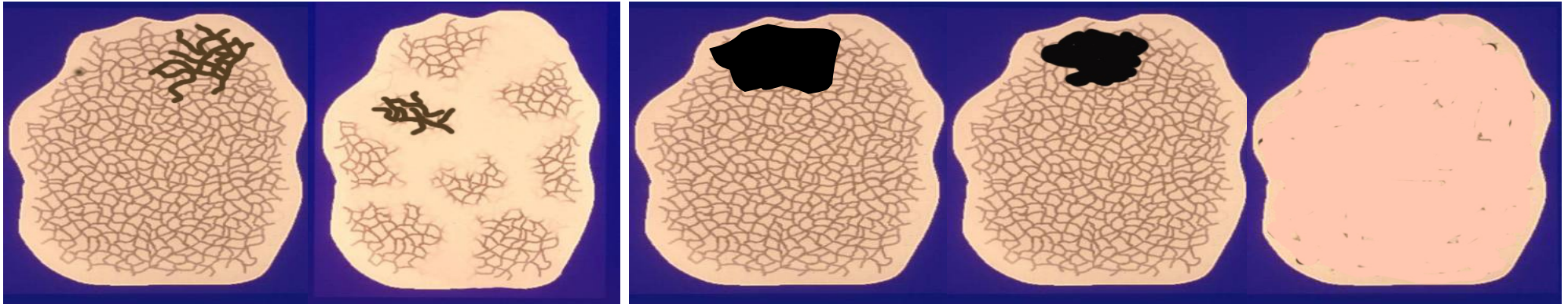
- Benign lesions tend to have symmetric patterns of dermoscopic features

Benign Patterns



CADx Project: Melanoma

- Melanomas tend to have asymmetric patterns of dermoscopic features



Agenda

- Lectures
- Lab sessions
- Seminars
- Lecture activity

setembre 2018						
dl.	dt.	dc.	dj.	dv.	ds.	dg.
					1	2
3*	4*	5*	6*	7*	8	9
10	11	12**	13**	14**	15	16
17	18	19	20	21	22	23
A 24	25	26	27	28	29	30

octubre 2018						
dl.	dt.	dc.	dj.	dv.	ds.	dg.
B 1	2	3	4	5	6	7
A 8	9	10	11	12	13	14
B 15	16	17	18	19	20	21
A 22	23	24	25	26	27	28
29	30 ^{djE}	31 ^{dvA}				

novembre 2018						
dl.	dt.	dc.	dj.	dv.	ds.	dg.
			1	2	3	4
B 5	6	7	8	9	10	11
A 12	13	14	15	16	17	18
B 19	20	21	22	23	24	25
A 26	27	28	29	30		

desembre 2018						
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A					1	2
B 3	4	5	6	7	8	9
A 10	11	12	13	14	15	16
B 17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

gener 2019						
dl.	dt.	dc.	dj.	dv.	ds.	dg.
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7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

CADx: Challenge 1

Nevus



Binary problem

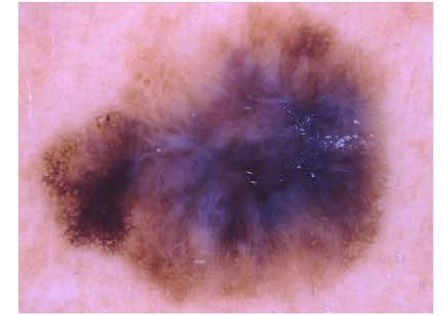
Vascular



Dermatofibroma



Melanoma



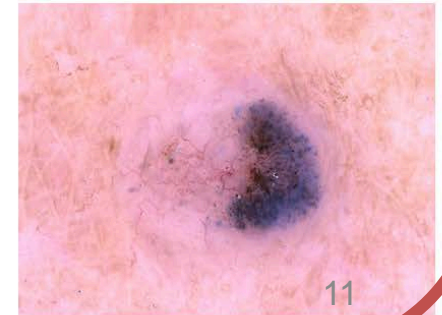
Pigmented
Bowen's



Pigmented Benign
Keratoses



Basal Cell
Carcinoma



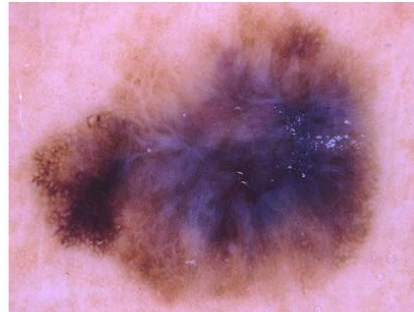
CADx: Challenge 2

3-class problem

Pigmented Benign
Keratoses



Melanoma



Basal Cell
Carcinoma

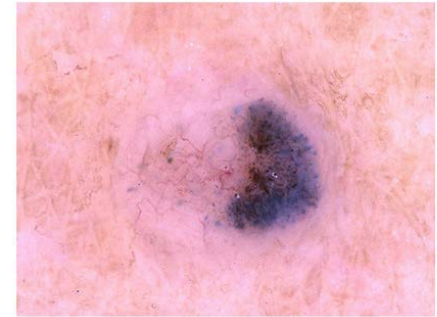


Image sets

- Challenge 1
 - 4800 images for training (with ground-truth), 50% nevus / 50% lesion
 - 1200 images for validation (with ground-truth), 50% nevus / 50% lesion
 - 1015 images for testing (without ground-truth), unknown distribution
- Challenge 2
 - 2000 images for training (with ground-truth), 20% bcc / 40% bkl / 40% mel
 - 500 images for validation (with ground-truth), 20% bcc / 40% bkl / 40% mel
 - 226 images for testing (without ground-truth), unknown distribution
- The validation data is your test data. You should provide your results in this dataset.
- The test data will be supplied later, and you should submit your prediction online.

Expected tasks

- Review the literature (always the first step!)
- Propose a CADx solution for each Challenge
- For each challenge,
 - Implement different strategies: segmentation algorithms / features / classifiers.
 - Evaluate the strategies with the full validation dataset.
 - Choose the best one to supply the results with the test data
- Reporting
 - 10-minutes presentation (week 14-18 January)
 - A slide with a table summarising all the implementations done
 - Explanation of the approaches, clearly stating the best one
 - Provide all the results for the validation images
 - We will rank the online results 😊

Evaluation

- **Final Mark (FM):**

- Lab sessions ~~P1+P2~~ (40%) => Lab sessions P1 (30%)
- ~~Final project~~ (30%) => **Final project (40%)**
- ~~Lecture activity~~ (30%) => Lecture activity (30%)

- Evaluation criteria:

- From labs: 70% strategy and results + 30% document
- From lecture activity: 50% document + 50% presentation and interaction

- Plan your deadlines!

- 100% mark before the deadline
- 80% up to a week after
- 50% more than a week after



Good luck!!!

Hope you will enjoy this project!

