MAIA

Computer Aided Diagnosis (CAD)

CADx PROJECT – 2022/23

Xavier Lladó, Arnau Oliver, Albert Torrent, Marc Masias
{ xavier.llado, arnau.oliver, albert.Torrent, marc.masias }@udg.edu

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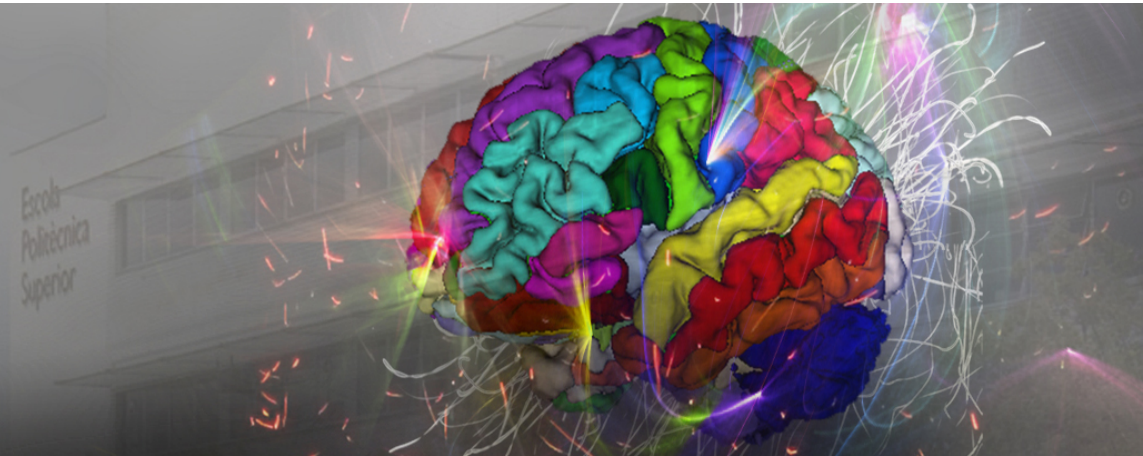
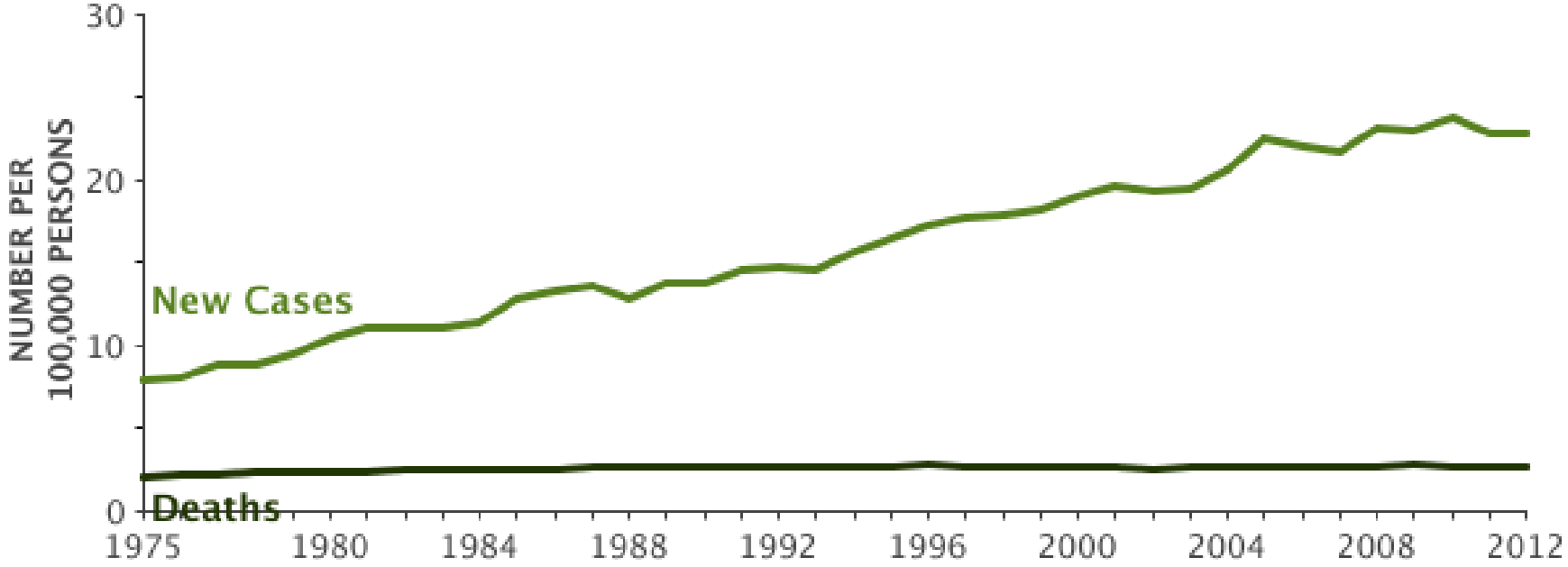


CADx Project: Objectives

- 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 (i.e. to issue a diagnosis)
- 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 ½ 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

- 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 image

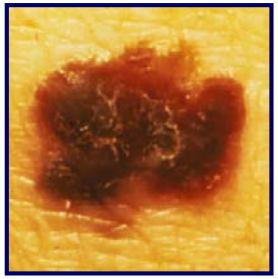
CADx Project: Melanoma

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

Asymmetry

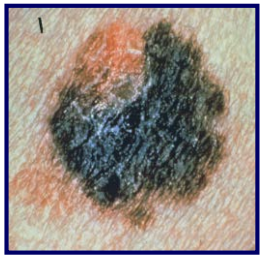
One half of the lesion is shaped differently than the other

Border



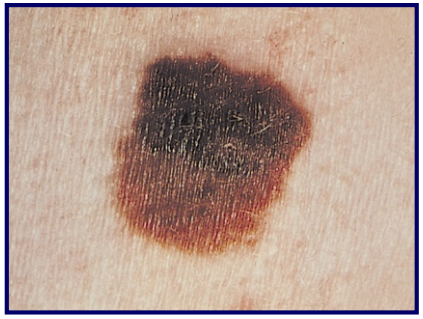
The border of the lesion is irregular, blurred, or ragged

Color



Inconsistent pigmentation, with varying shades of brown and black

Diameter



>6mm, or a progressive change in size

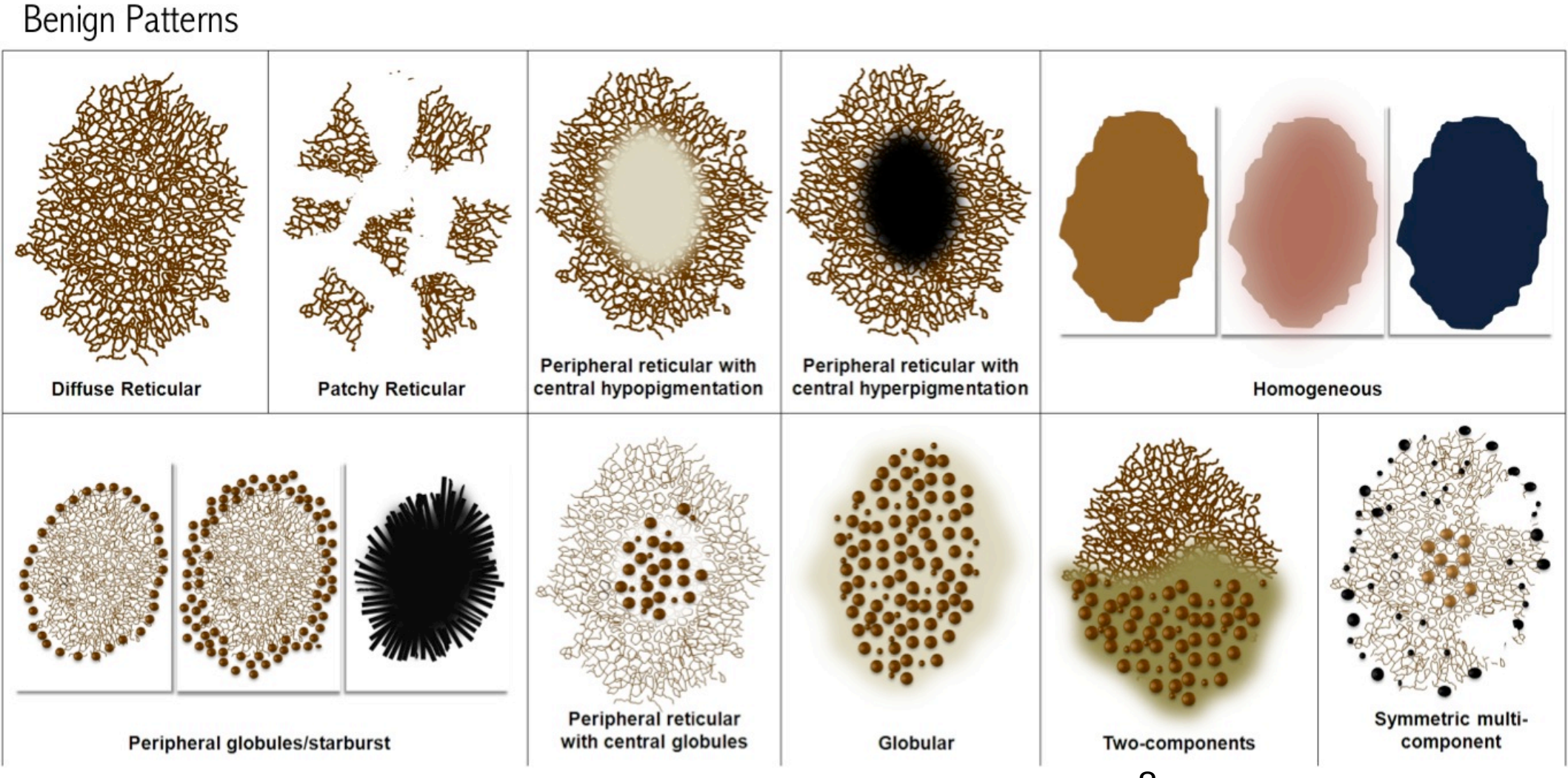
Evolution

The history of change in the lesion

Photos courtesy of the American Cancer Society.

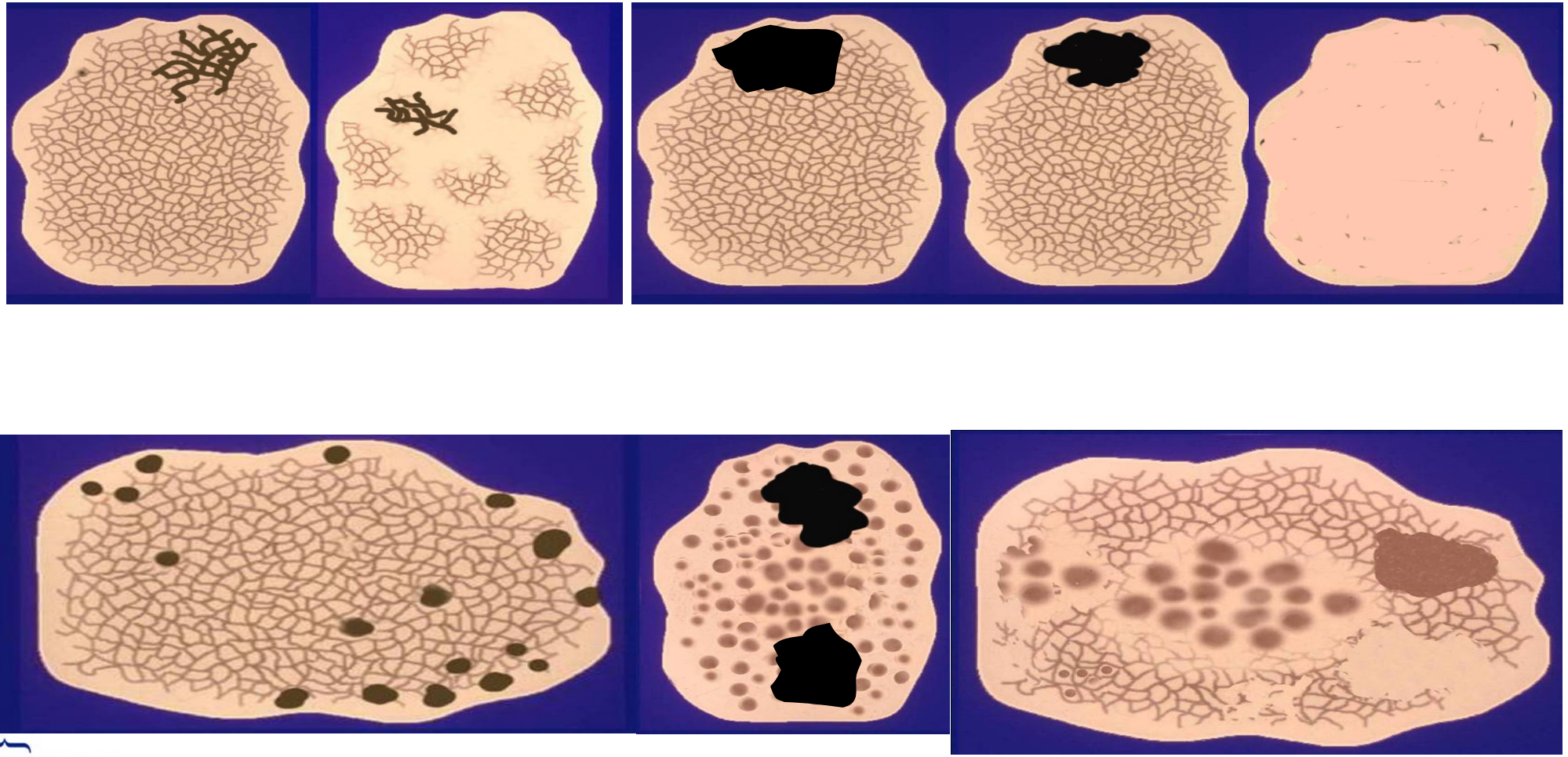
CADx Project: Melanoma

- Benign lesions tend to have symmetric patterns of dermoscopic features



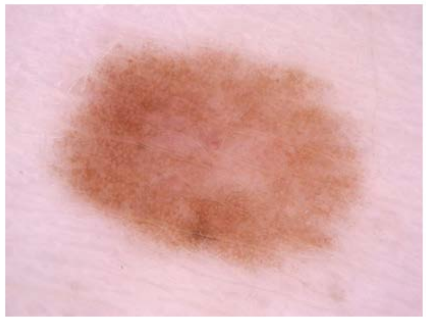
CADx Project: Melanoma

- Melanomas tend to have asymmetric patterns of dermoscopic features



CADx: Challenge 1 (updated!)

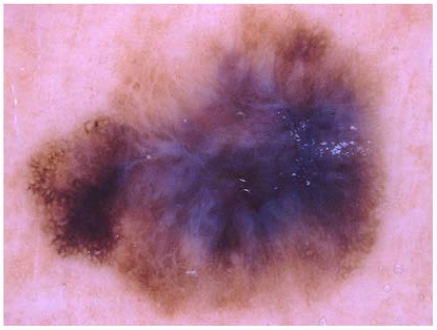
Nevus



Binary problem: Nevus vs Others

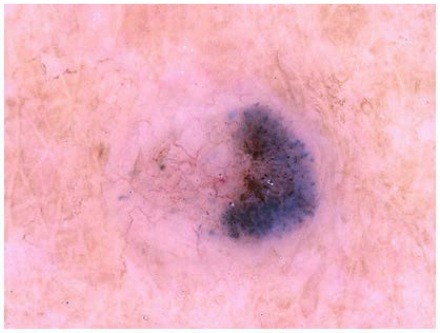
Pigmented Benign Keratoses

Melanoma



Dermatofibroma

Basal Cell Carcinoma



Benign, but…

Malignant

CADx: Challenge 2 (updated!)

3-class problem: classification of malignant cancers

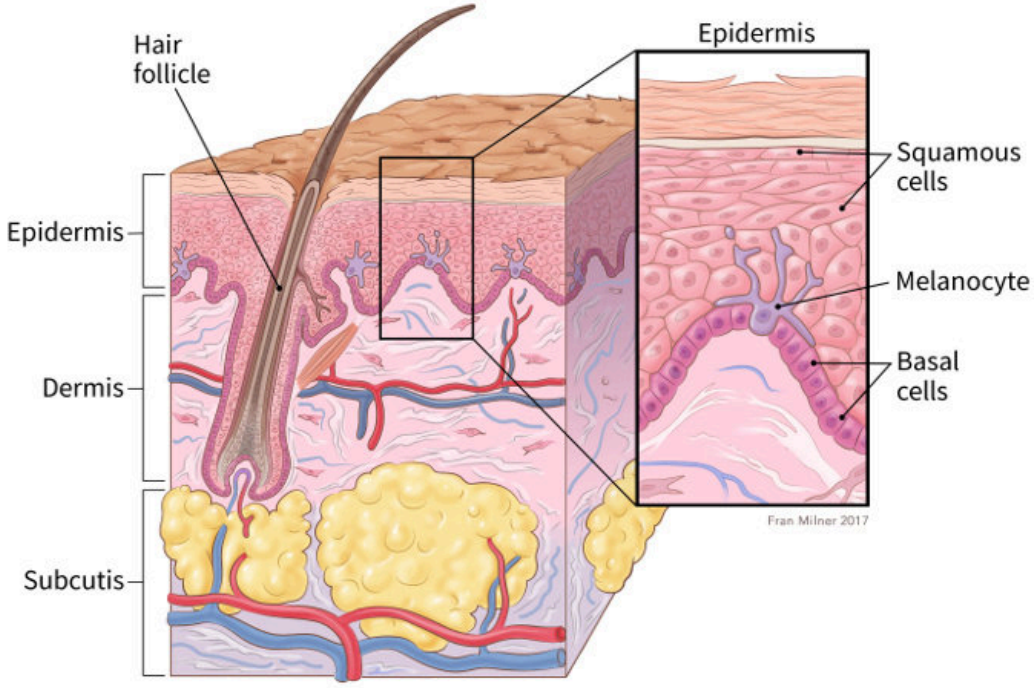


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Image sets

- Challenge 1
  - 15195 images for training (with ground-truth), approx 50% nevus & lesions
  - 3796 images for validation (with ground-truth), approx 50% nevus % lesions
  - XXXX images for testing (without ground-truth), unknown distribution

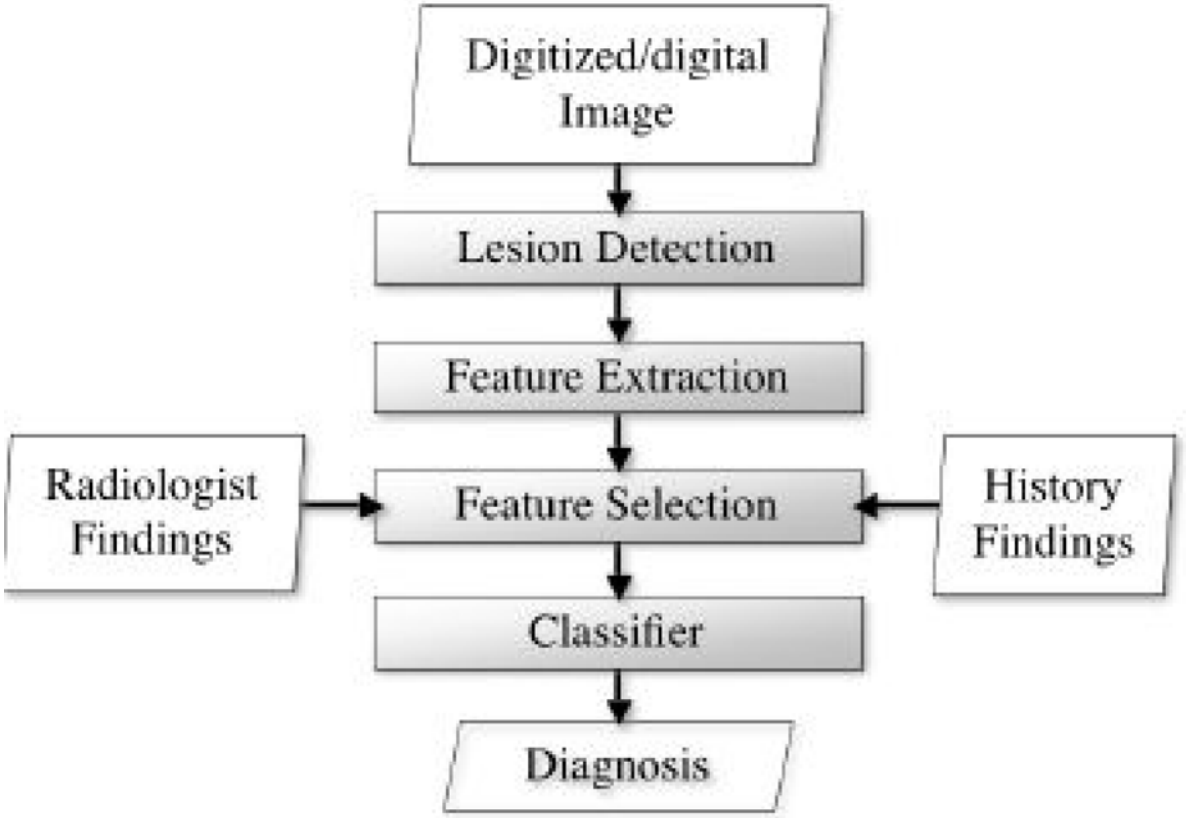
- Challenge 2
  - 5082 images for training (with gtruth), approx 50% mel / 40% bcc / 10% scc
  - 1270 images for validation (with gtruth), 50% mel / 40% bcc / 10% scc
  - XXXX images for testing (without gtruth), unknown distribution

- The validation data is your test data. You should provide in your report (presentation) the results obtained in this dataset
- The test data will be supplied later, and you will have to submit your prediction online.

Expected tasks

- Review the literature (always the first step!)

- Propose a CADx solution for each Challenge using a traditional scheme



Expected tasks

- Review the literature (always the first step!)
- Propose a CADx solution for each Challenge using a traditional scheme
- Reporting:
  - Submit your results in the web for each challenge
    - We will rank the online results ☺
  - A 10-minutes presentation
    - One intro slide explaining how you structured your work
    - Explanation of the approaches developed, clearly stating the best one
    - Provide results for the validation images
    - Finish with conclusions

Agenda

	setembre 2022						
	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
A	19	20	21	22	23	24	25
B	26	27	28	29	30		

	octubre 2022						
	dl.	dt.	dc.	dj.	dv.	ds.	dg.
B						1	2
A	3	4	5	6	7	8	9
B	10	11	12	13	14	15	16
A	17	18	19	20	21	22	23
B	24	25	26	27	28	29	30
A	31						

	novembre 2022						
	dl.	dt.	dc.	dj.	dv.	ds.	dg.
A		1	2	3	4	5	6
B	7	8	9	10	11	12	13
A	14	15	16	17	18	19	20
B	21	22	23	24	25	26	27
A	28	29	30				

Lecture activity

Start / end day

Lab sessions

Defences (tba)

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Evaluation

- Final Mark (FM):
  - First project (30%)
  - Lecture activity (35%)
  - Final project (35%)

- 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

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Good luck!!!
Hope you will enjoy this project!