



# Computer Aided Diagnosis (CAD)

## **CADx PROJECT – 2021/22**

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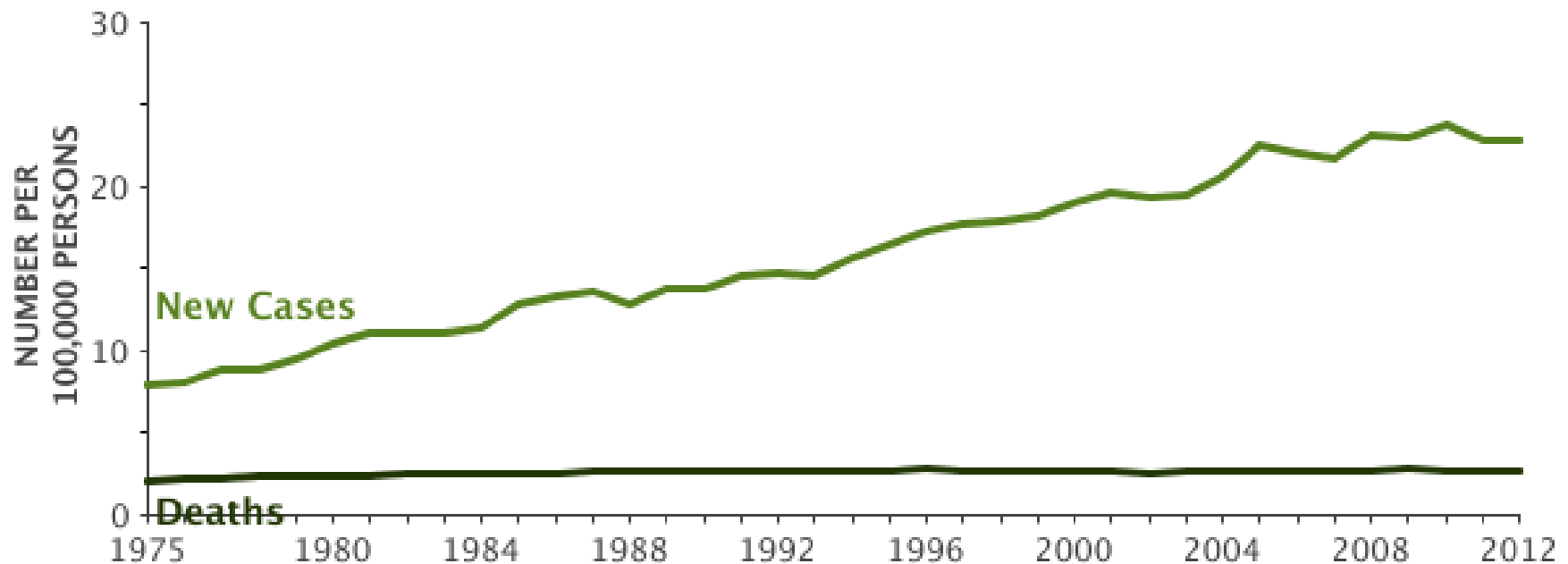


# CADx Project: Objectives

- 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  $\frac{1}{2}$  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

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



Clinical Image

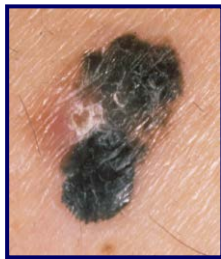


v. Dermoscopy image<sub>6</sub>

# CADx Project: Melanoma

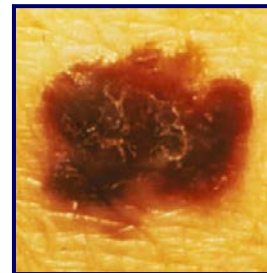
- The **ABCDEs** of Clinical (i.e. simple naked eye examination) Melanoma Diagnosis:

**A**symmetry



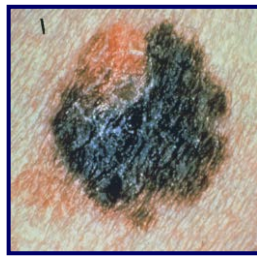
One half of the lesion is shaped differently than the other

**B**order



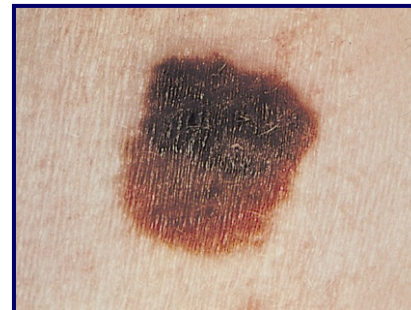
The border of the lesion is irregular, blurred, or ragged

**C**olor



Inconsistent pigmentation, with varying shades of brown and black

**D**iameter



>6mm, or a progressive change in size

**E**volution

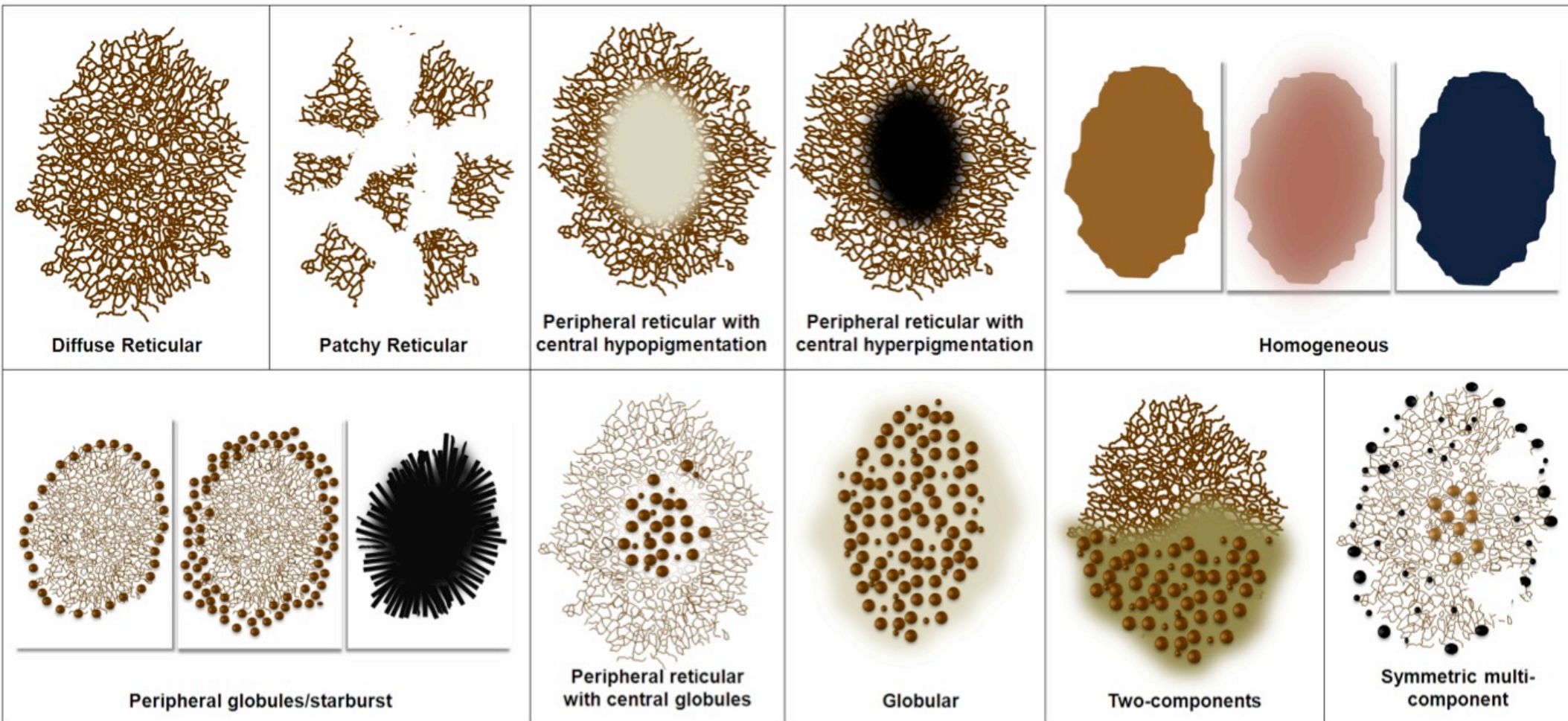
The history of change in the lesion



# CADx Project: Melanoma

- Benign lesions tend to have symmetric patterns of dermoscopic features

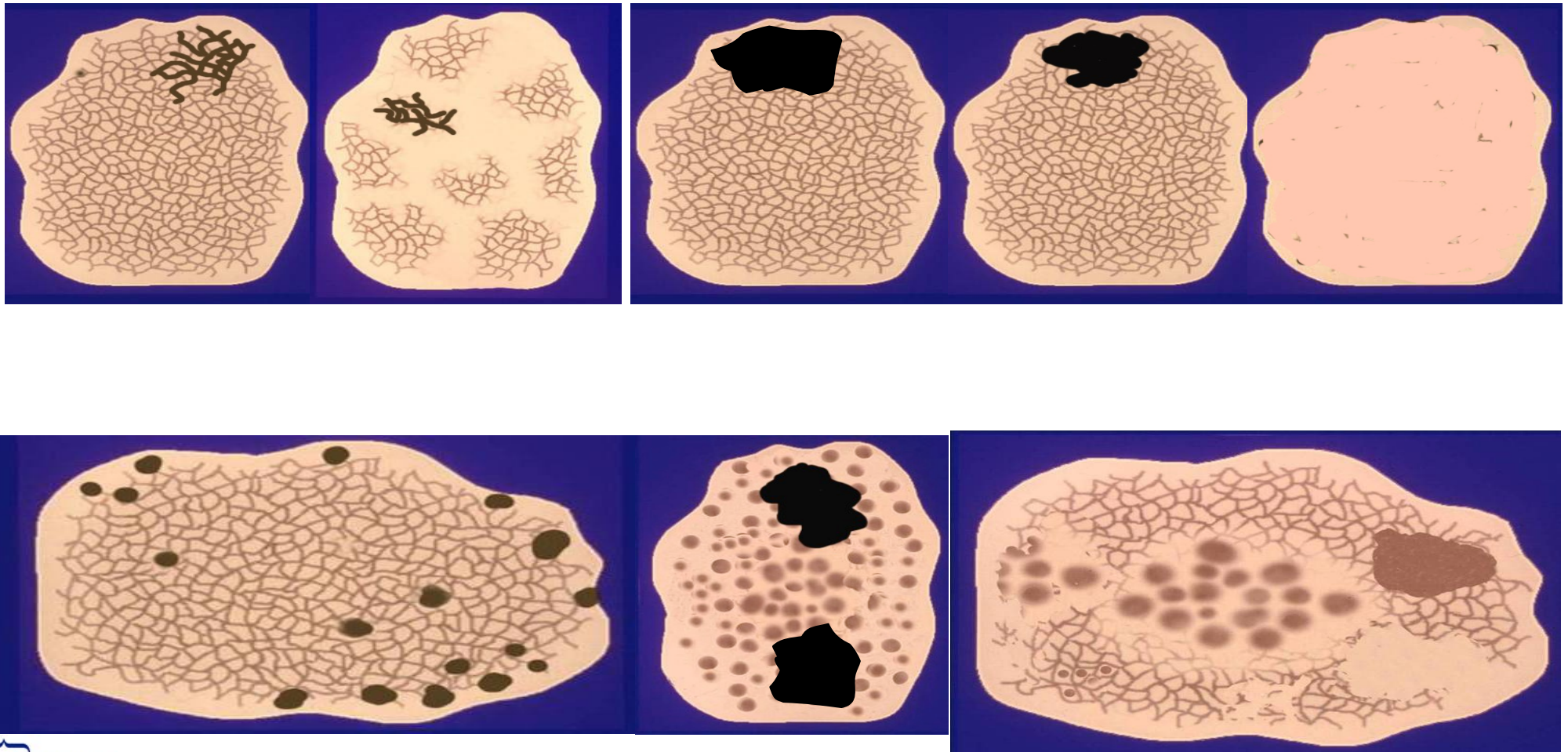
## Benign Patterns





# CADx Project: Melanoma

- Melanomas tend to have asymmetric patterns of dermoscopic features



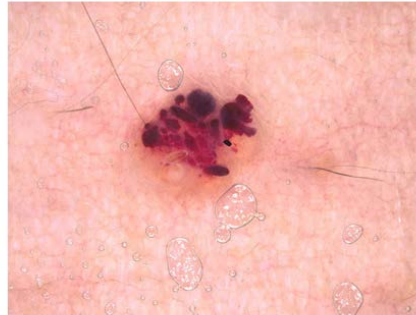
# CADx: Challenge 1

Nevus



Binary problem

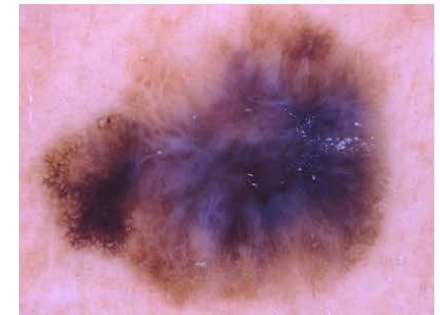
Vascular



Dermatofibroma



Melanoma



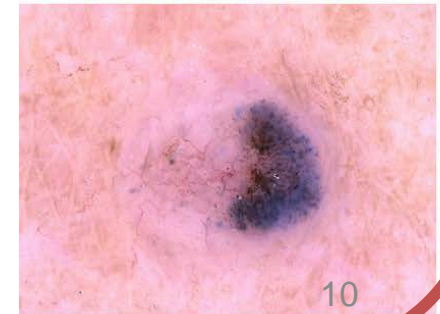
Pigmented  
Bowen's



Pigmented Benign  
Keratosis



Basal Cell  
Carcinoma



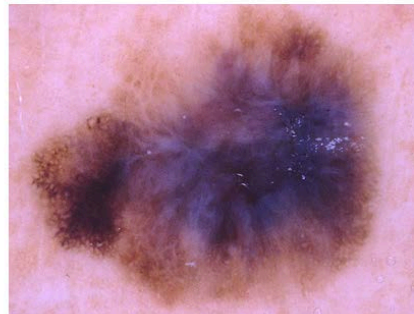
# CADx: Challenge 2

3-class problem

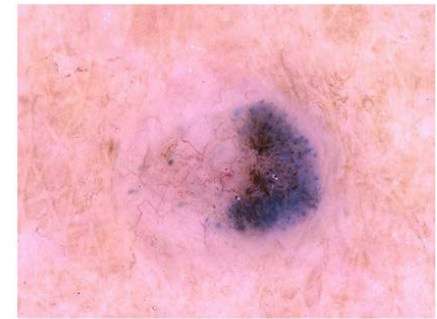
Pigmented Benign  
Keratoses



Melanoma



Basal Cell  
Carcinoma



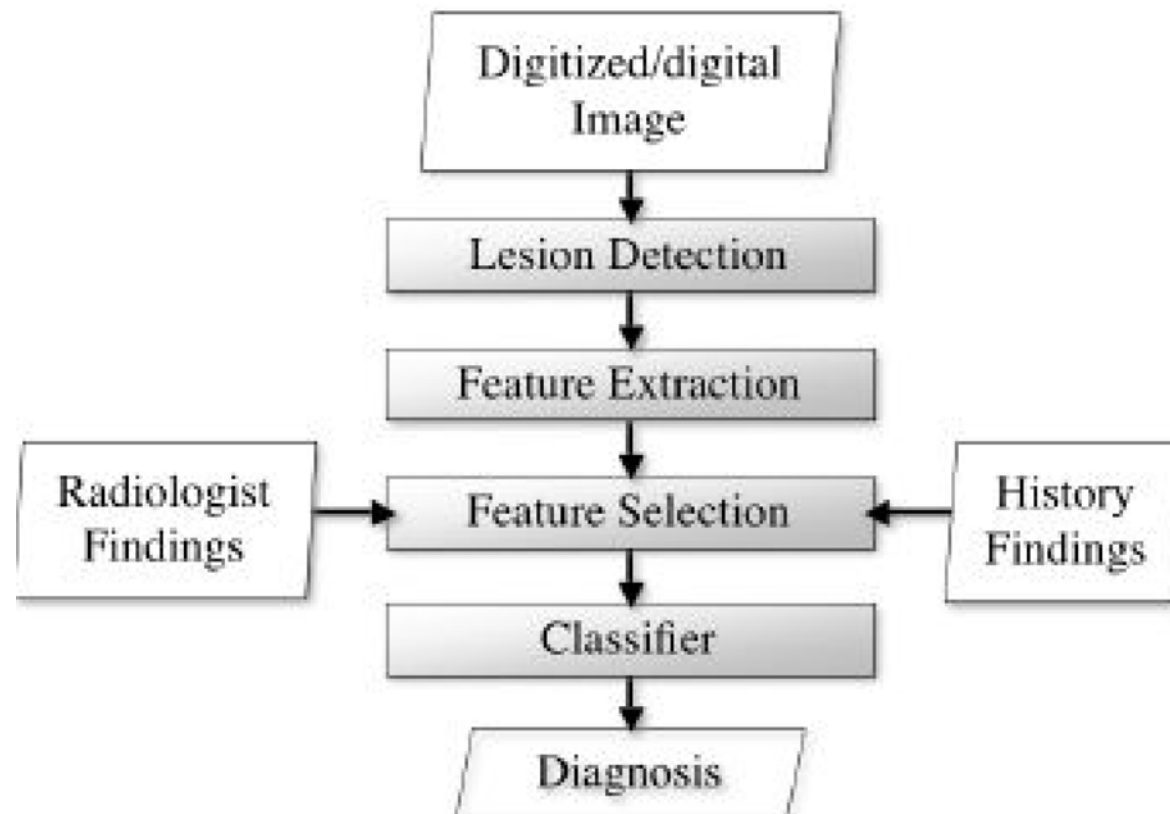


# Image sets

- 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 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

octubre 2021

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

novembre 2021

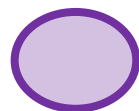
	dl.	dt.	dc.	dj.	dv.	ds.	dg.
A	1	2	3	4	5	6	7
B	8	9	10	11	12	13	14
A	15	16	17	18	19	20	21
B	22	23	24	25	26	27	28
A	29	30					



Lab sessions



Individual presentations (deadline for online results will be few days before)



Lecture activity

# 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



Good luck!!!

Hope you will enjoy this project!

