Melanoma Detection and Segmentation

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In collaboration with MARPÉ מרפא Technologies טכנולוגיות

Introduction

- Melanoma is a skin cancer which is the most common cancer in the west
- Today, finding moles suspected as melanoma requires visual examination by a doctor
  - Takes a lot of time and resources

Goals

- Design an algorithm for classifying suspicious mole areas on a "doctor level".
  - Reproduce the results of the previous project on our data
  - Visualize the results using the Grad-CAM algorithm
  - Compare between given mole masks and Grad-CAM results
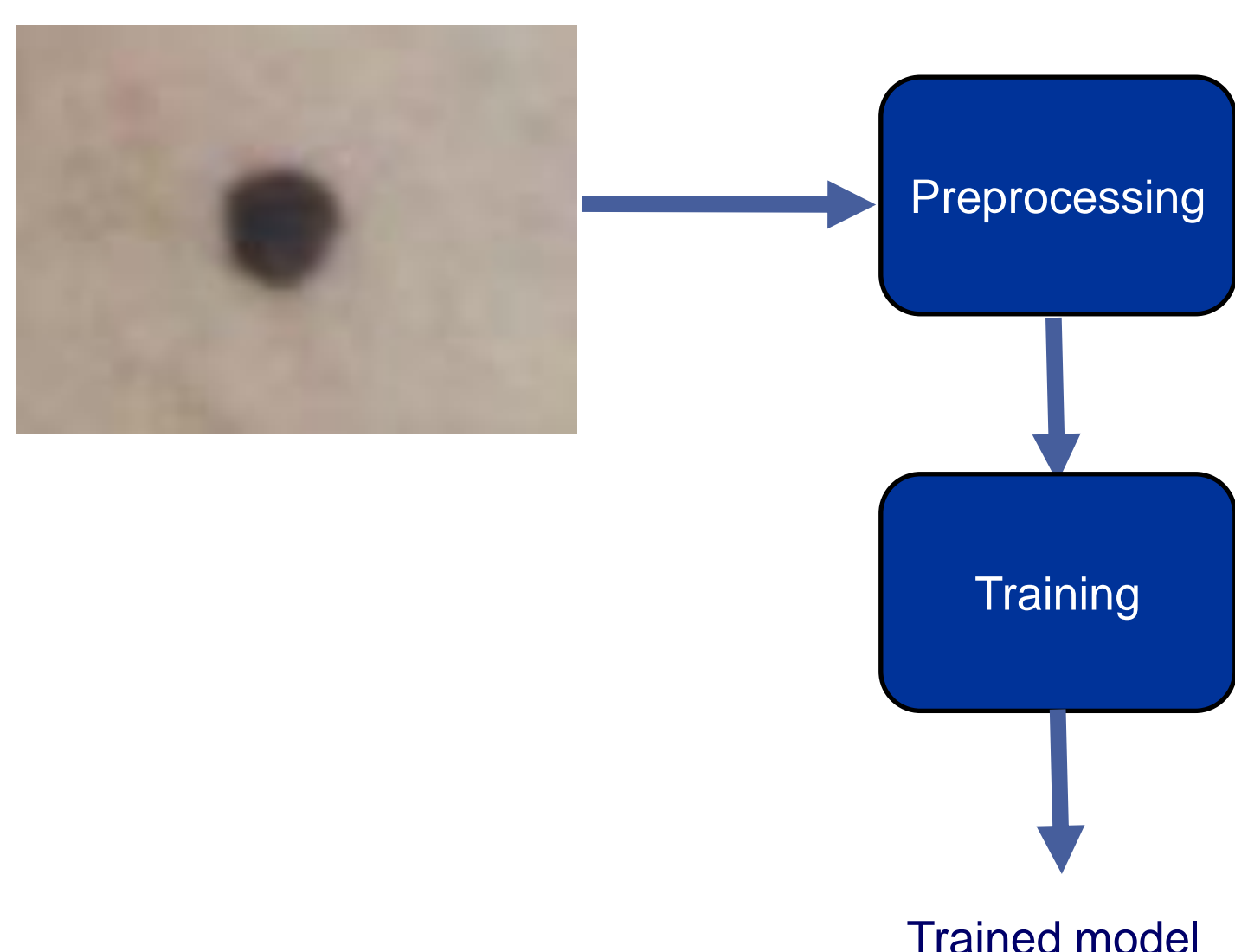
Marpé Technologies

- Uses visible light to take samples of suspicious moles that will be sent to further examination
- Body mole mapping and tracking system
- Technician-operated
- Images automatically analyzed
- Results are sent to the patient's dermatologist

Training

Offline:
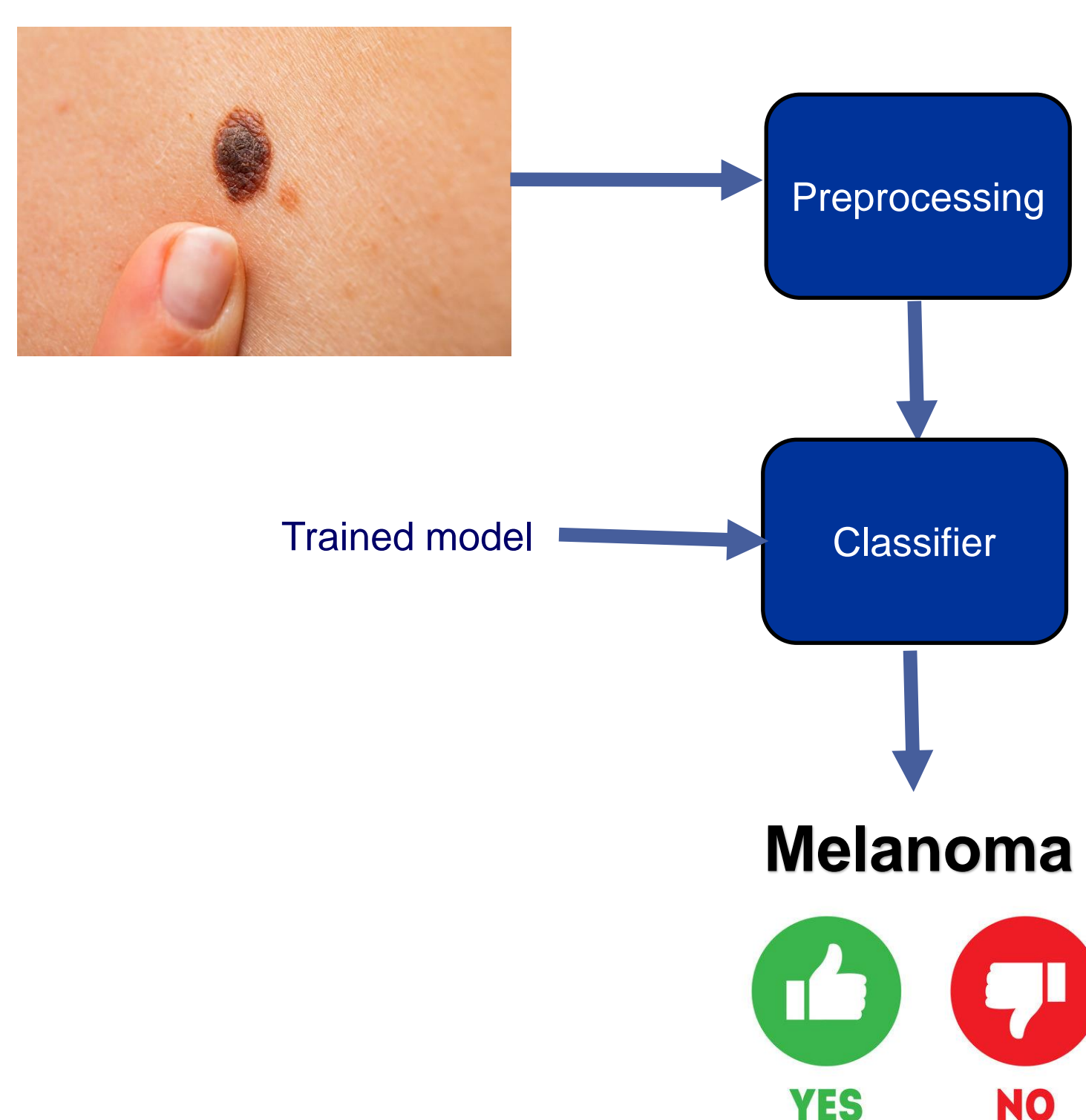
Mole images with labels

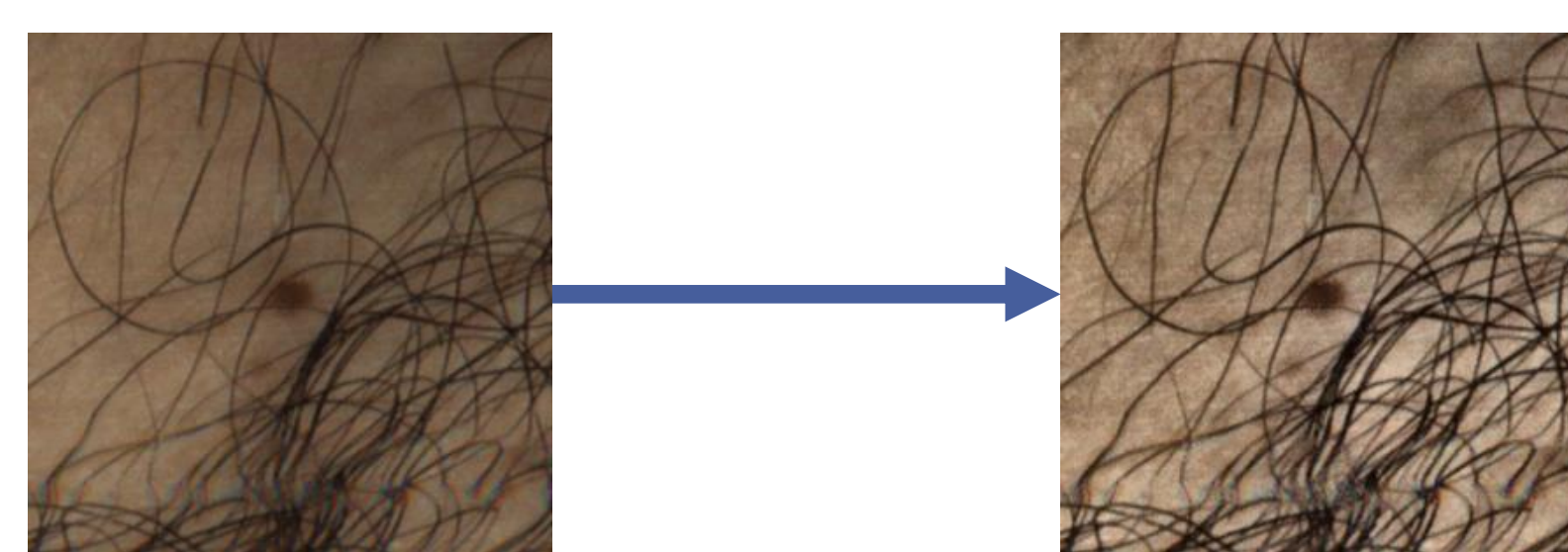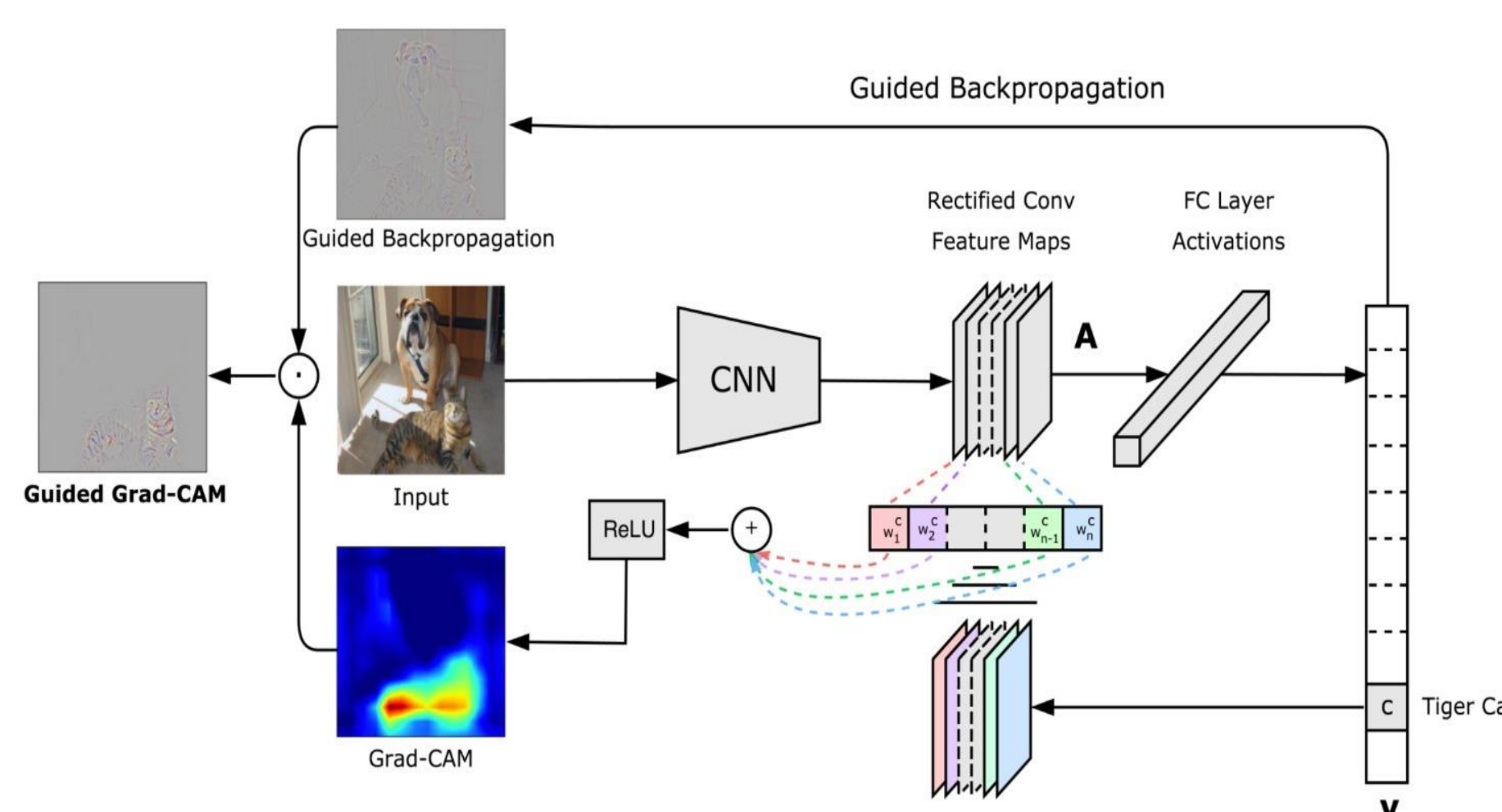## Inference

Online:

Image Preprocessing

| Original | Image processing - CLAHE |

- Splits the image to small pieces
- Calculates histogram for each piece
- Clips the histogram above a defined level
- Equalizes the histogram based on neighbors

Grad-CAM

[Selvaraju et al., 2016]

- Technique for visualizing the regions of input that are "important" for predictions
- Produce a localization map of regions in the image
- We are interested in the red zones of the map, to see if the mole is included in that area

| Original | After preprocessing | Grad-CAM |
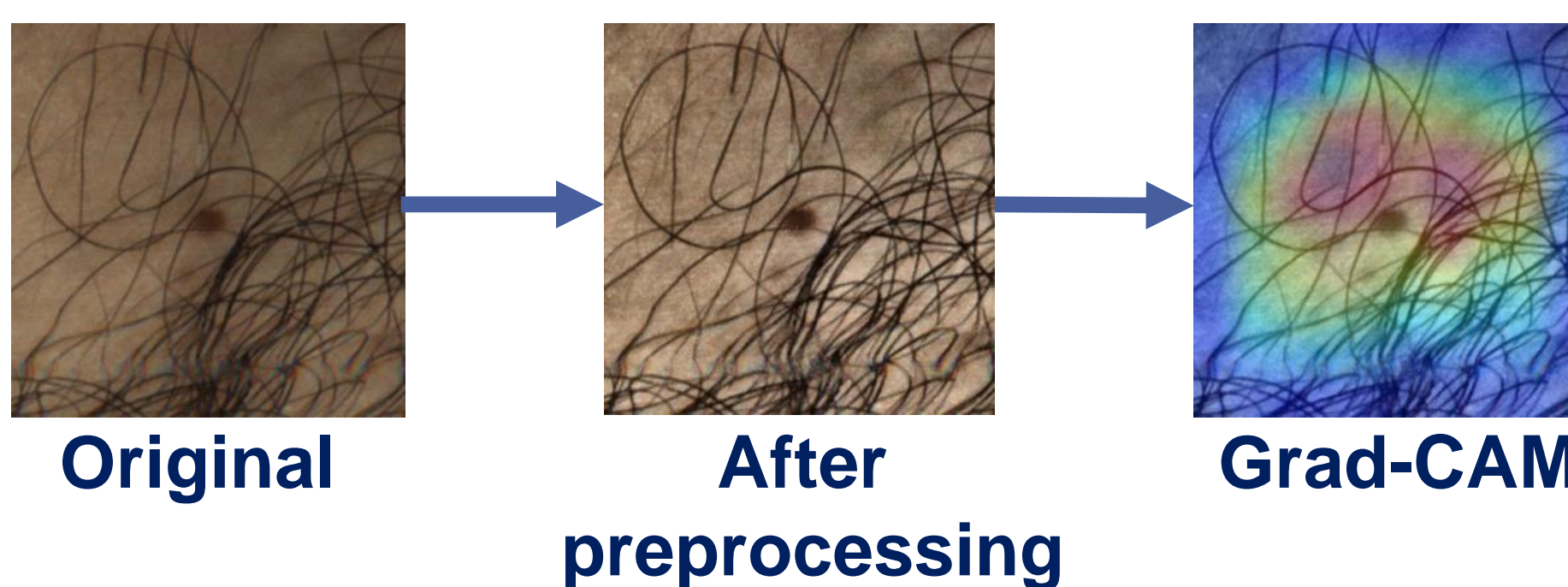
Dataset

- Our dataset splits to 3 sets:
  1. 530 images classified by a doctor from the Ichilov hospital.
  2. "Grabage" images
  3. Images classified by Marpé Technologies
- We have a binary mask for each mole

| Classified by a Doctor | Garbage | Classified by Marpé |
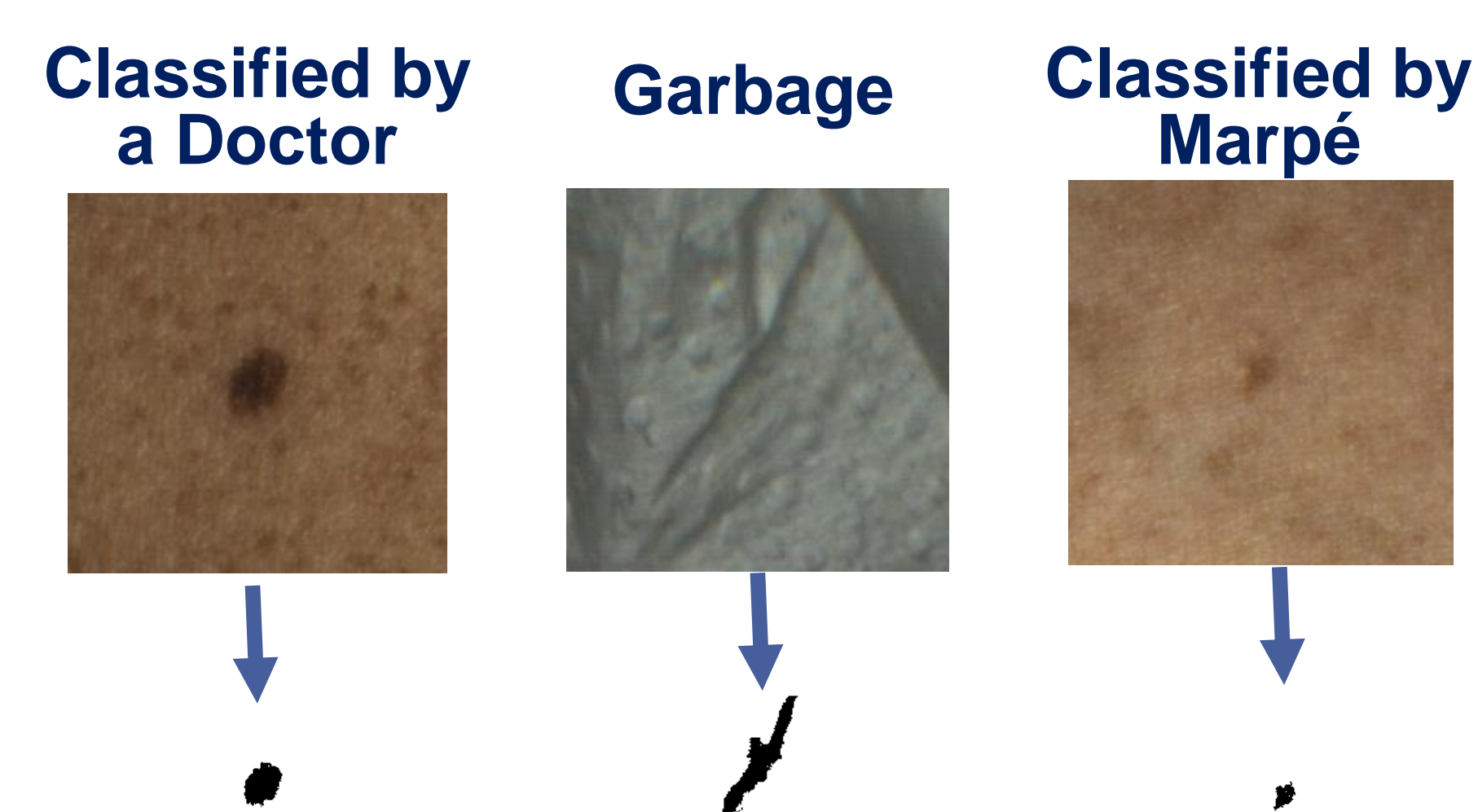
Results

images	correct classification	Incorrect classification	accuracy
16,445	15,229	1,216	92.6%

negative images	correct classification	incorrect classification	false positives
14,798	14,384	414	97.2%

Positive images	correct classification	incorrect classification	false negatives
1,647	845	802	51.3%

Conclusions

- We reached the same accuracy as achieved in the previous project (~93%)
- The segmentation of the images that with negative label is very good - high percentages of success
- The segmentation of the images that with positive label is as good
  - Since we have substantially less images with positive label

Future work

- Adding mask as an input to the CNN (by using the masks we have from Marpé)
- Creating algorithm to make binary mask for the dataset and compare it to the masks we have

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