
Melanoma Detection Project

Digital Monitoring of Skin Lesions via Mobile Devices

Melanoma Detection

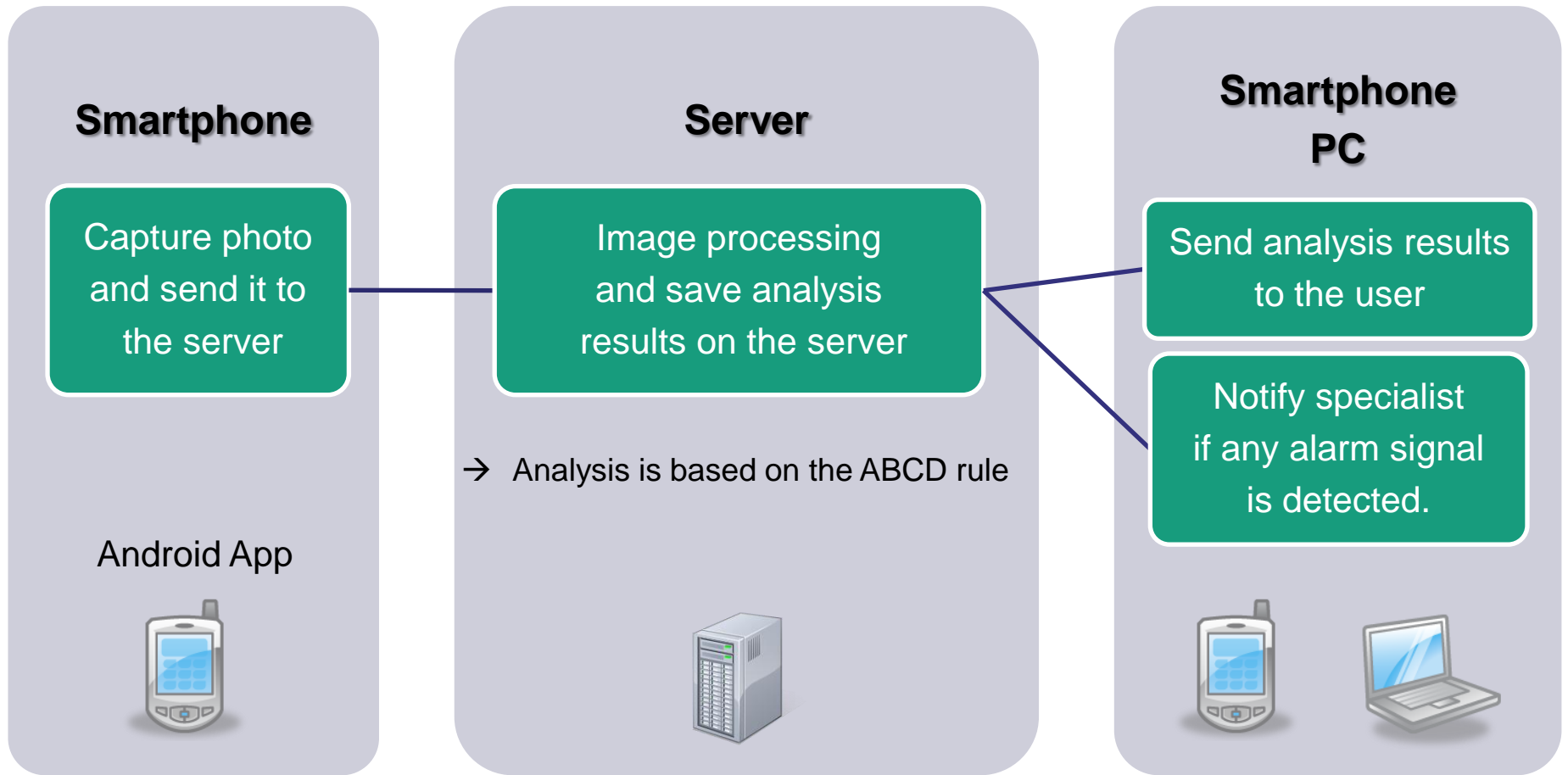
Motivation

- Skin cancers are reaching epidemic proportions in the Caucasian population, and the **early diagnosis** is of vital importance!
- Regular skin **self check-ups** can make the difference! But how to do it?
- How to deliver **dermatologic expertise** in **underserved areas**?
- **Challenge**: Create a patient-oriented tool that **empowers** and **motivates** the users to actively manage their own skin health status.



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System Architecture



Melanoma Detection

ABCD Rule

- Was introduced for Stolz *et al.* in 1994.
- It's based on the analysis of 4 features considered highly relevant for the early detection of melanoma.

Feature	Description	Score	Weight
Asymmetry	In 0, 1, or 2 axes; Assess not only contour, but also colors and structures	0-2	x 1.3
Border	Abrupt ending of pigment pattern at the periphery in 0-8 segments	0-8	x 0.1
Color	Presence of up to six colors 1-6 (white, red, light-brown, dark-brown, blue-gray, black)	1-6	x 0.5
Differential Structures	Presence of network, homogeneous areas, streaks, dots, and globules	1-5	x 0.5

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ABCD Rule

- Semiquantitative analysis of each feature allows to calculate the Total Dermoscopic Score (TDS):

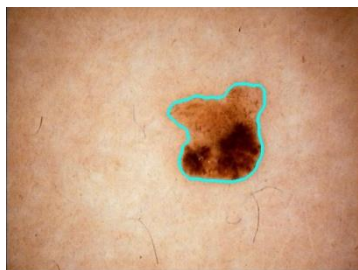
$$\text{TDS} = [(\text{score A} \times 1.3) + (\text{score B} \times 0.1) + (\text{score C} \times 0.5) + (\text{score D} \times 0.5)]$$

TDS	Interpretation
<4.75	Benign melanocytic lesion
4.8-5.45	Suspicious lesion; close follow-up or excision recommended
>5.45	Lesion highly suspicious for melanoma

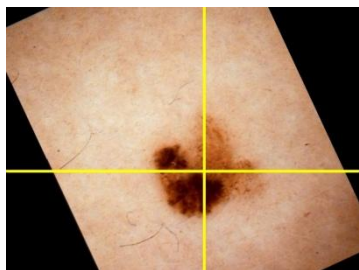
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Image processing and analysis

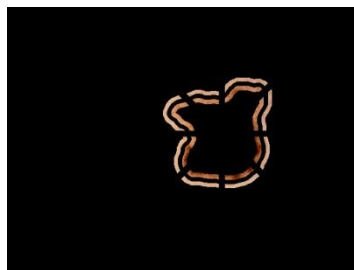
- Pre-processing: Circular Averaging Filter + Contrast Enhancement.
- Segmentation & Feature Extraction:



Segmentation



Asymmetry



Border



Color



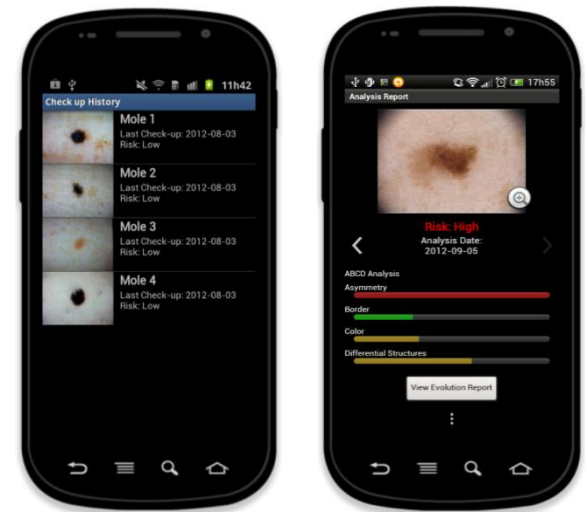
**Differential
Structures**

- Supervised Classification: Random trees classifier with a training dataset of 426 skin lesion images manually classified by dermatologists.

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Key Aspects

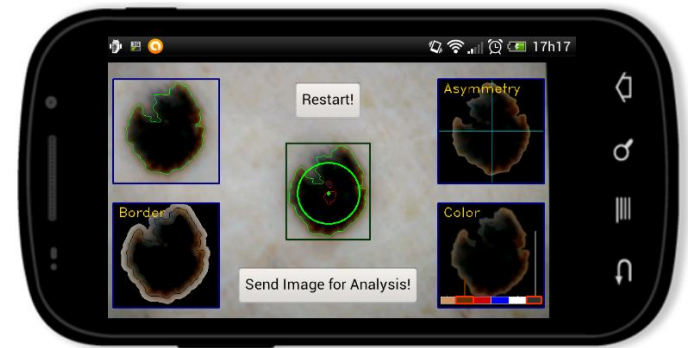
- Android app for **digital monitoring of skin lesions**
- Patient **takes photos** with the smartphone and sends them to server for analysis
- The **automatic supervised classification** of the skin lesions is based on the **ABCD Rule** (cooperation with the Portuguese Institute of Oncology of Porto).
- Not intended to preform a skin cancer diagnosis, but rather **alert the users** to the presence of risk signs and take them **earlier to the doctor**.



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Functionalites

- **Real-time visual feedback** of the extracted ABCD features
- Save the check-up analysis and **associate to a previously analyzed mole**
- Generate an **evolution report** based on the comparison of different check-ups of the same mole
- Schedule **check-up reminders** for a specific skin mole



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Future Work

- Validation of the prototype through tests with real users
- Promote the active involvement of more dermatologists on the validation and supervision of the system.

Thank you

For your attention

