DETECTING the PIGMENT NETWORK in DERMOSCOPY IMAGES: A DIRECTIONAL APPROACH
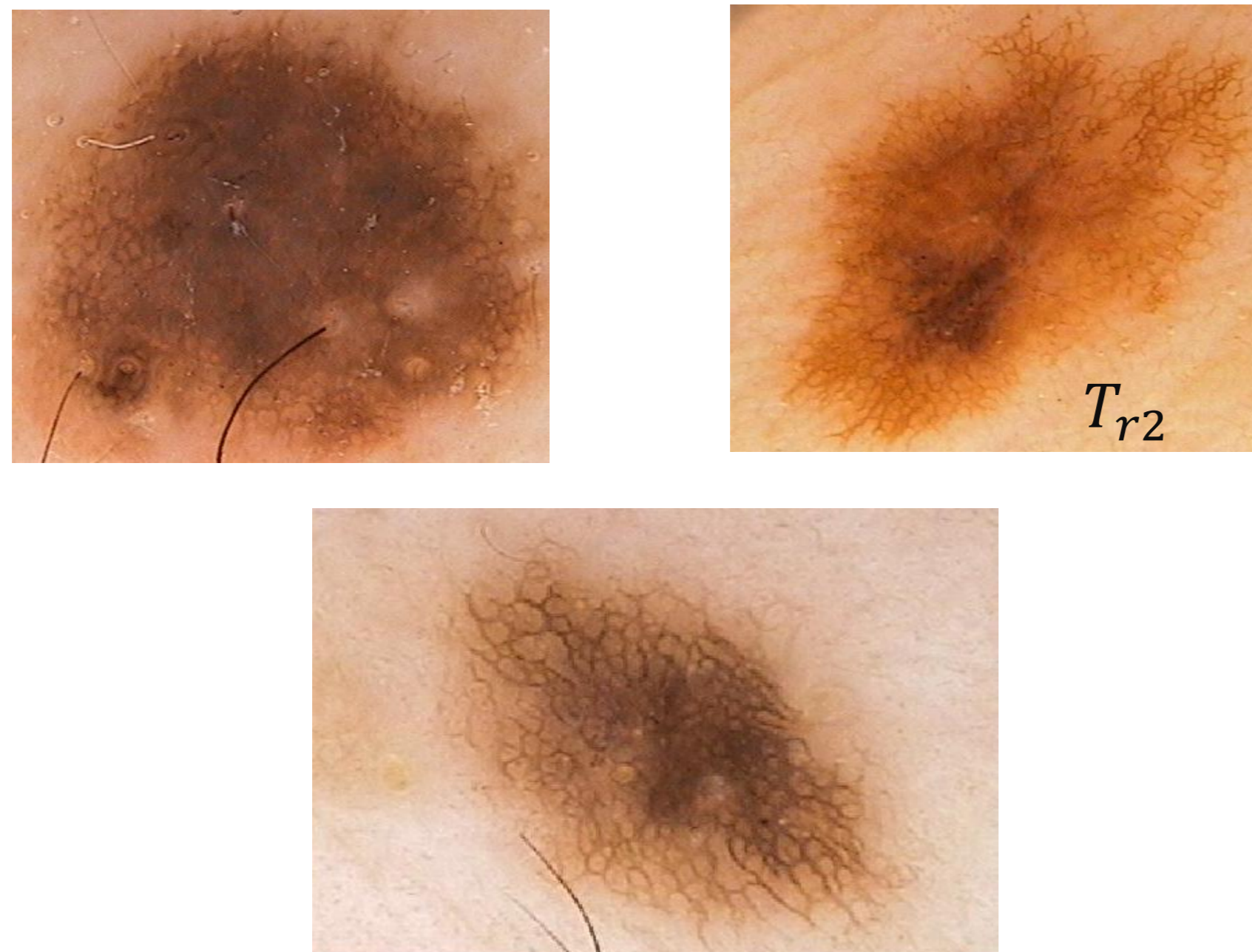
C. Barata   J.S. Marques   J. Rozeira
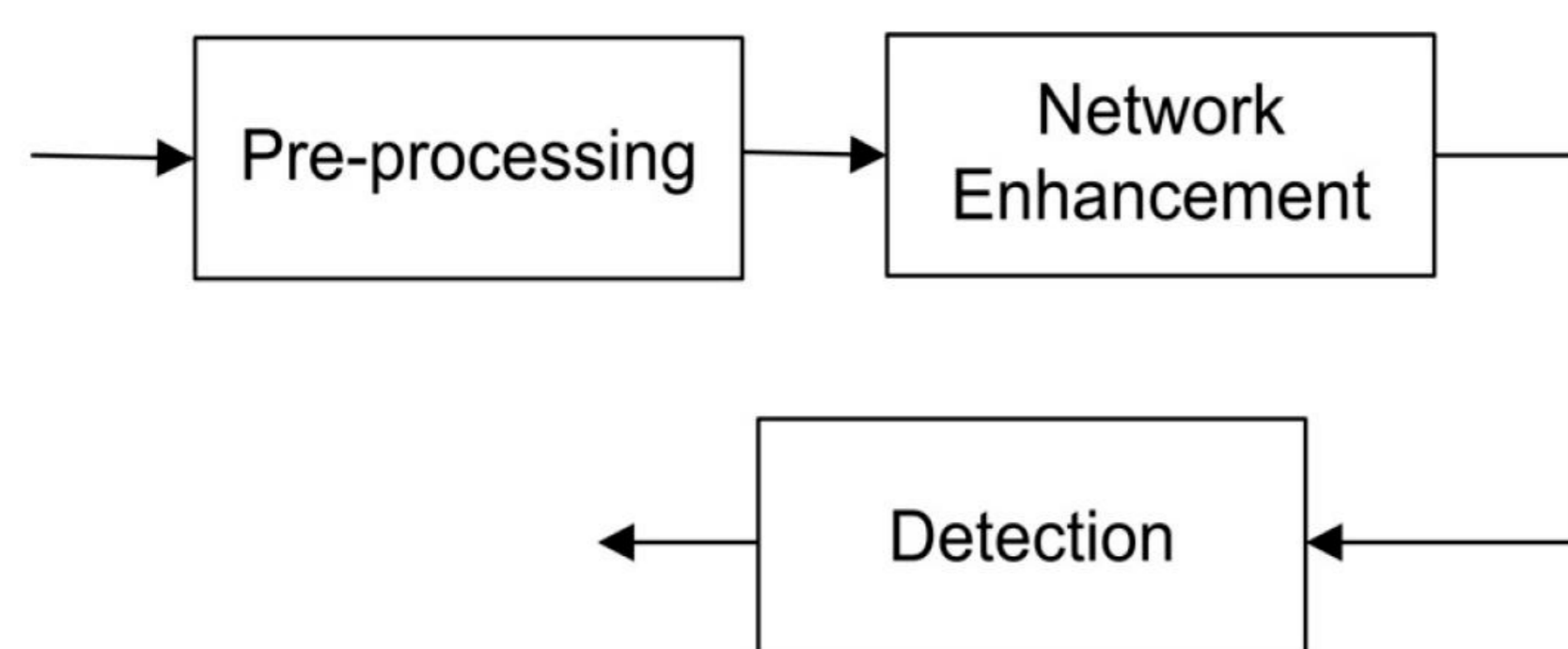
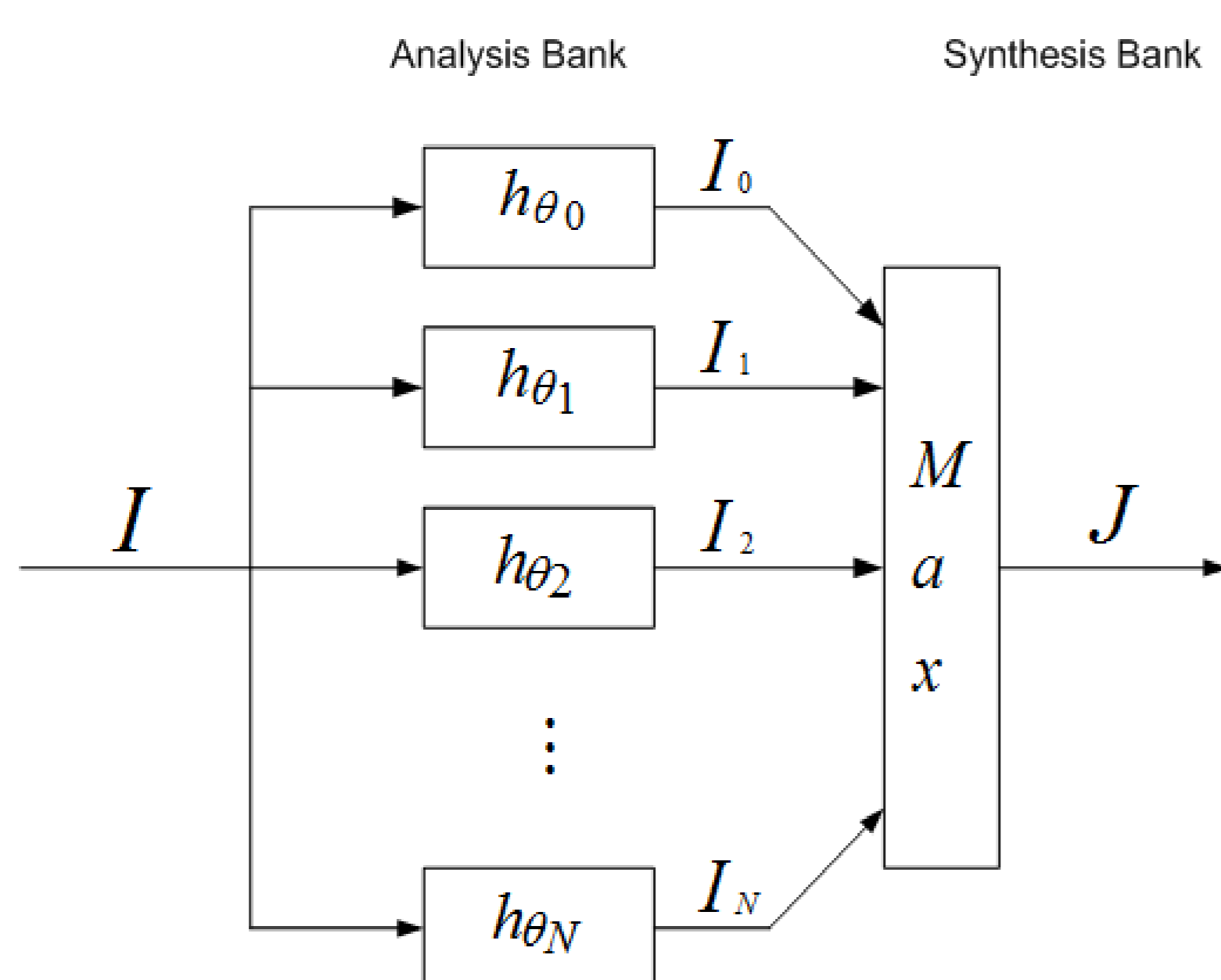IST/ISR   IST/ISR   Hospital Pedro Hispano

T_{r2}

Objective: Detection of Pigment Network in Dermoscopy Images – linear dark structures with different orientations over a lighter background.

Overview of the Detection System

Directional Filters

Enhance linear structures such as Pigment Network's dark lines and hair
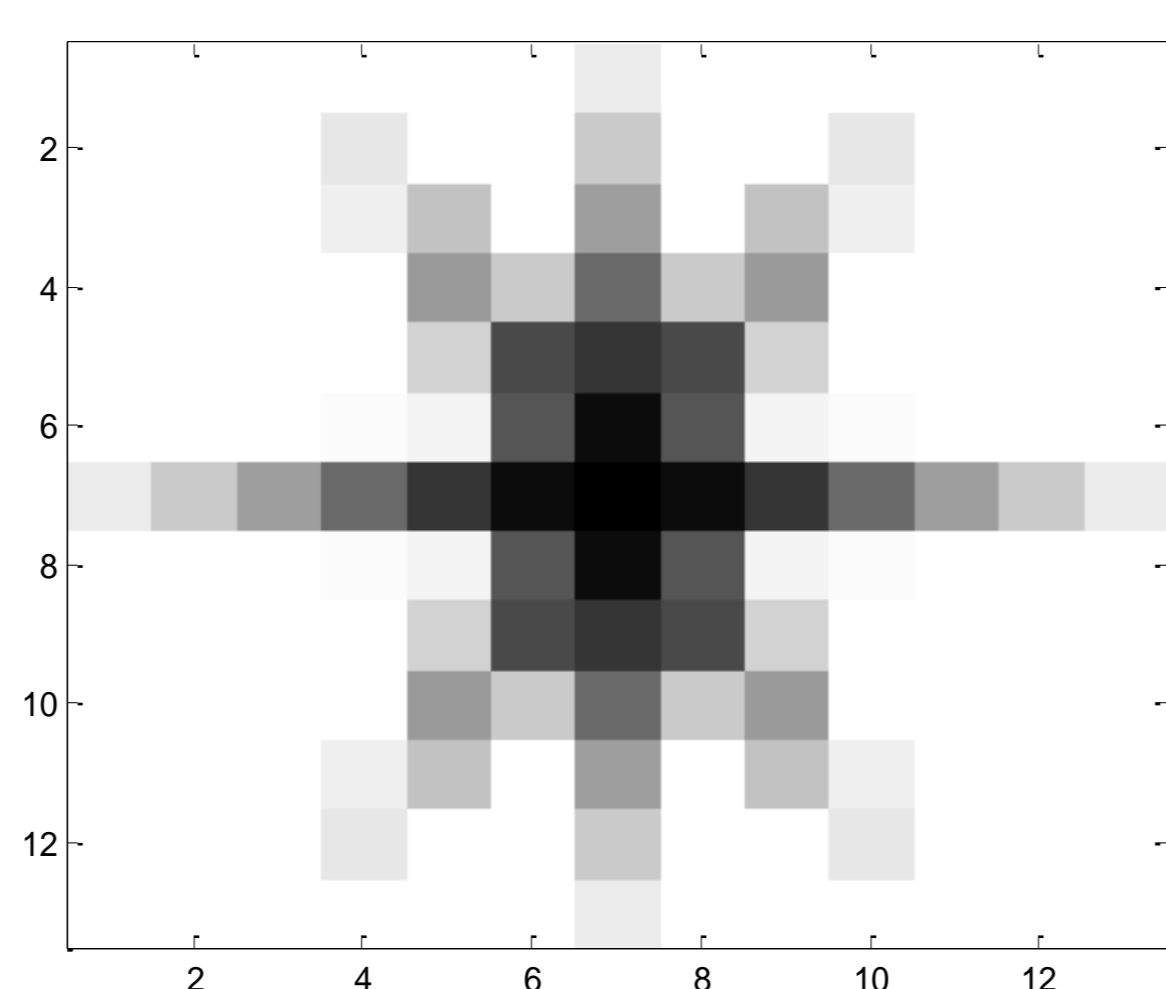

$$h_{\theta_i}(x,y) = G_1(x,y) - G_2(x,y) \quad, \theta_i \in [0,\pi]$$

$$G_k(x,y) = C_k \exp\left\{-\frac{x'^2}{2\sigma_{x,k}^2} - \frac{y'^2}{2\sigma_{y,k}^2}\right\}, k = 1,2$$

$$x' = x\cos\theta + y\sin\theta$$
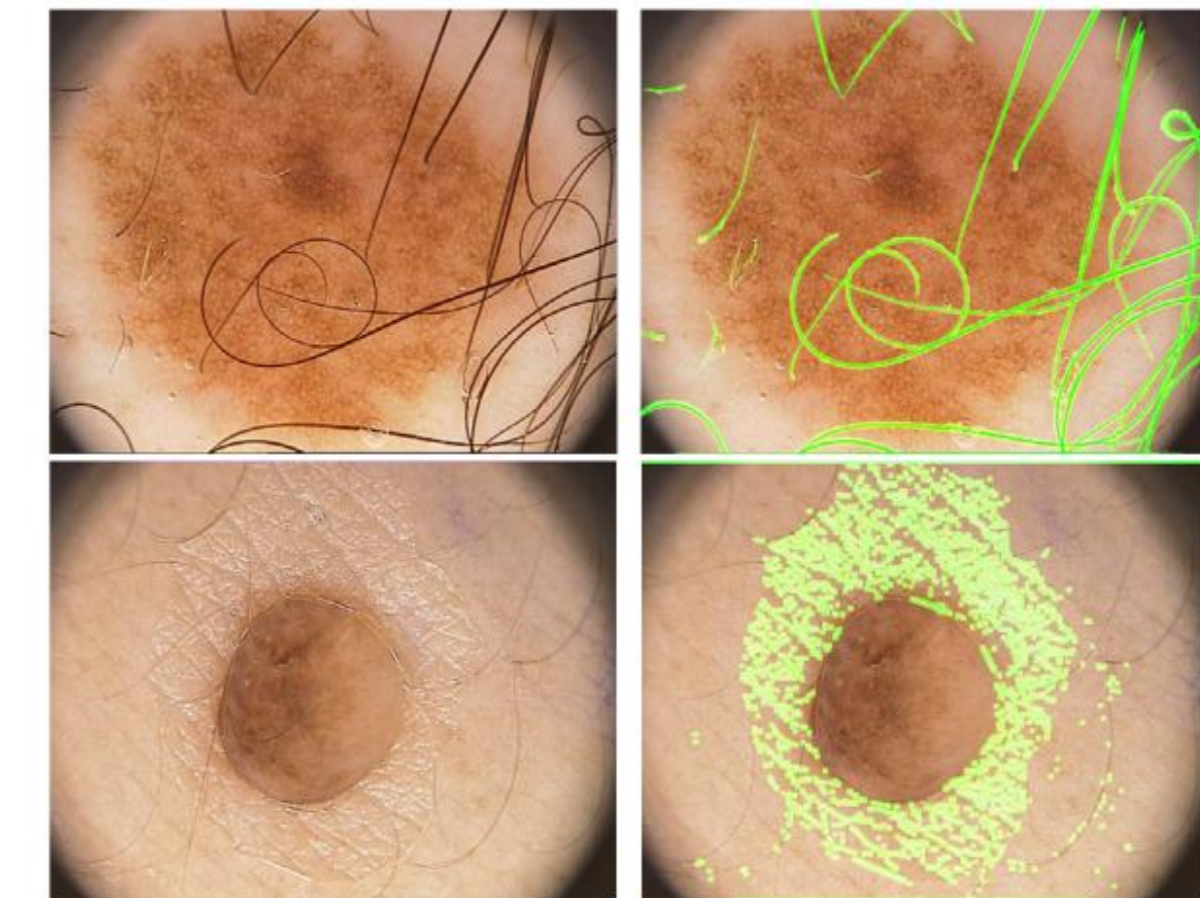$$y' = y\cos\theta - x\sin\theta$$

Example of Directional Filters

Pre - Processing

1. Reflection Detection - Thresholding

$$I(x,y) > T_{r1} \cap I(x,y) - I_{avg}(x,y) >$$

2. Hair Detection- 64 Directional Filters + Thresholding
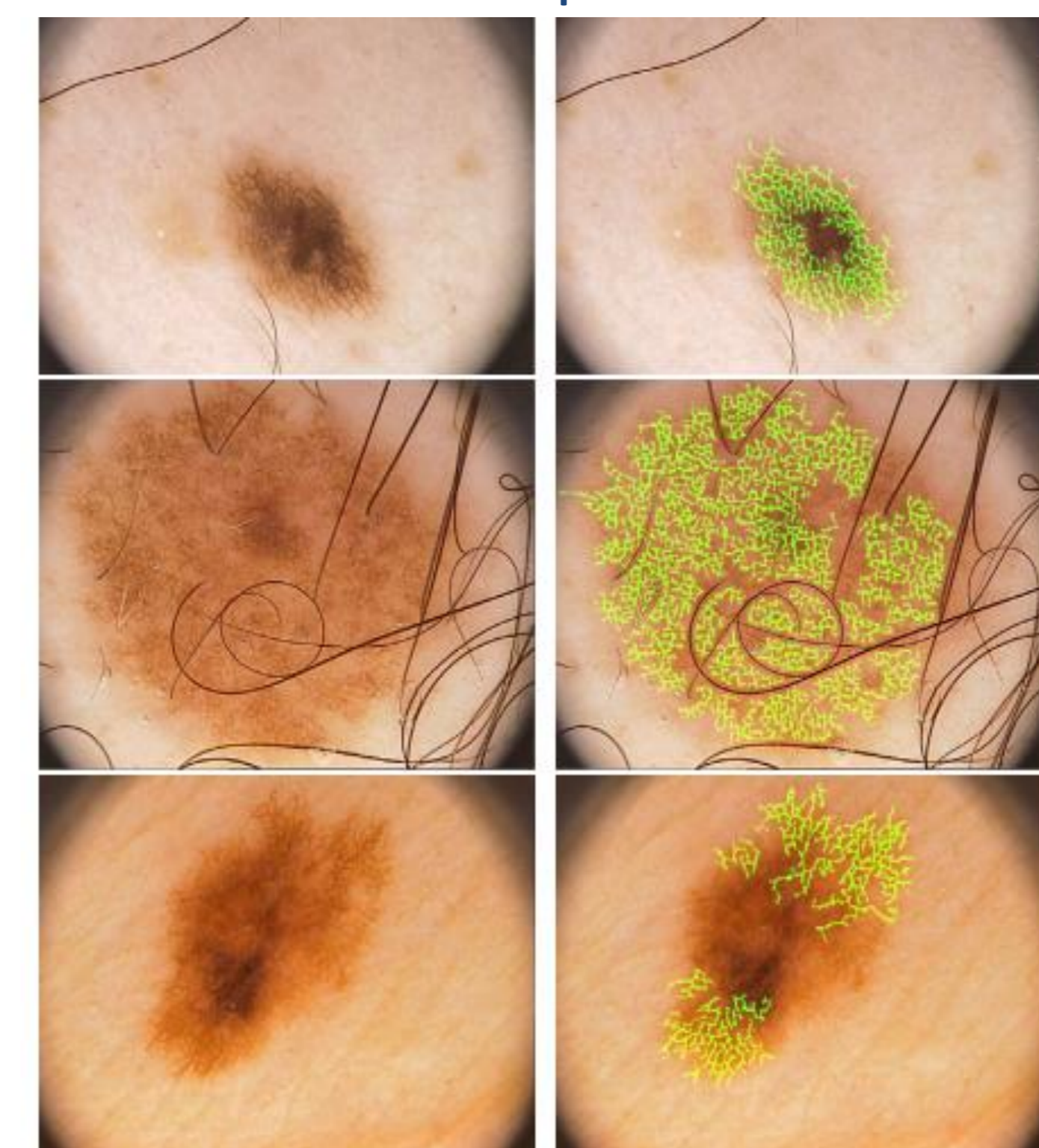

Hair and Reflection Detection

Network Enhancement and Detection

Network Enhancement - 18 Directional Filters + Thresholding

Network Detection -   Connect component Analysis (Regions R_i) + Exclusion of small Areas

$$A(R_i) > A_{min}$$

Examples:

Negative Example:

Results

	Not detected	Detected
No network	67,5%	32,5%
Pigment network	20%	80%

Conclusions

An algorithm for network detection that explores the line color and geometry was proposed. This algorithm uses a bank of directional filters.
Experimental results show that the algorithm achieves good detection scores and it is therefore a good tool in a dermoscopy analysis system.