Création d'une intelligence artificielle à partir d'un algorithme de reconnaissance de formes neuromorphique

STAGE DE MASTER 1 SCIENCES POUR L'INGÉNIEUR

Ingénierie de la Robotique et des Systèmes Intelligents (IRSI)

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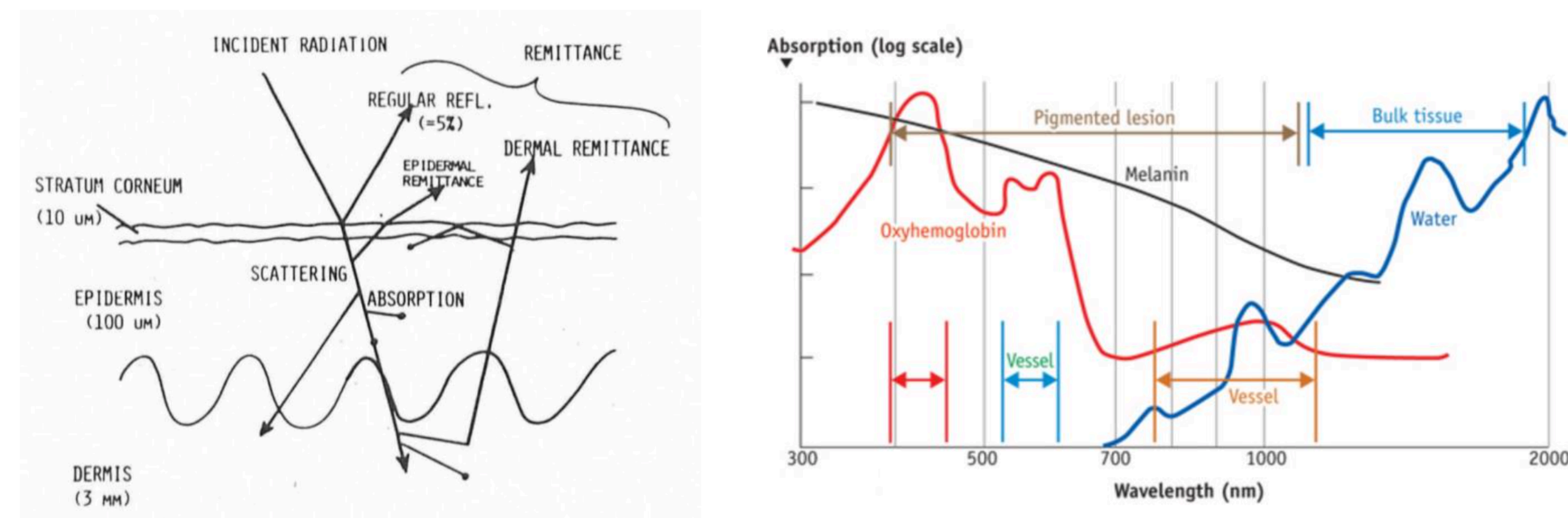et encadré par Ryad Benosman

Skin - Light Interaction

Spectroscopy is a non-invasive method which allows to capture physiological and biochemical data of the tissue [15], [16]. Photons stream directed on the skin by a light source can be scattered, absorbed, reflected or transmitted.

Pathways of the incident light in skin are presented in Fig.1 and absorption coefficient of different chromophores is representing as a function of wavelength in Fig.2, are summarizing, such a complex process of reflecting, scattering and absorbing of the electromagnetic radiation delivered by a light source, related to the individual features of the skin spectra.

Instrumentation
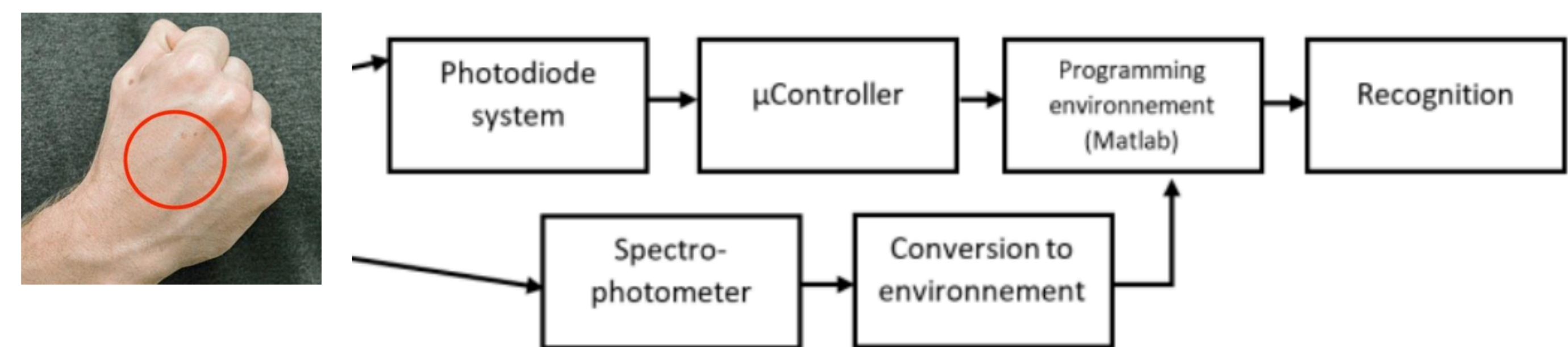
-Device is placed in a light isolated environment

-Skin sample is lighten up with a LED by converging light through the lenses

- Reflected light, captured by the sensors, is converted into electrical current and amplified.

- A stepper motor on a mechanical arm, providing rotational movement with several angles during the measurement

- The signal, acquired by a sensor which is a photodiode, is sampled by the microcontroller, and is sent through a serial port to the computer.

- Saved and processed data is used as training example of a learning algorithm in order to develop a recognition tool.
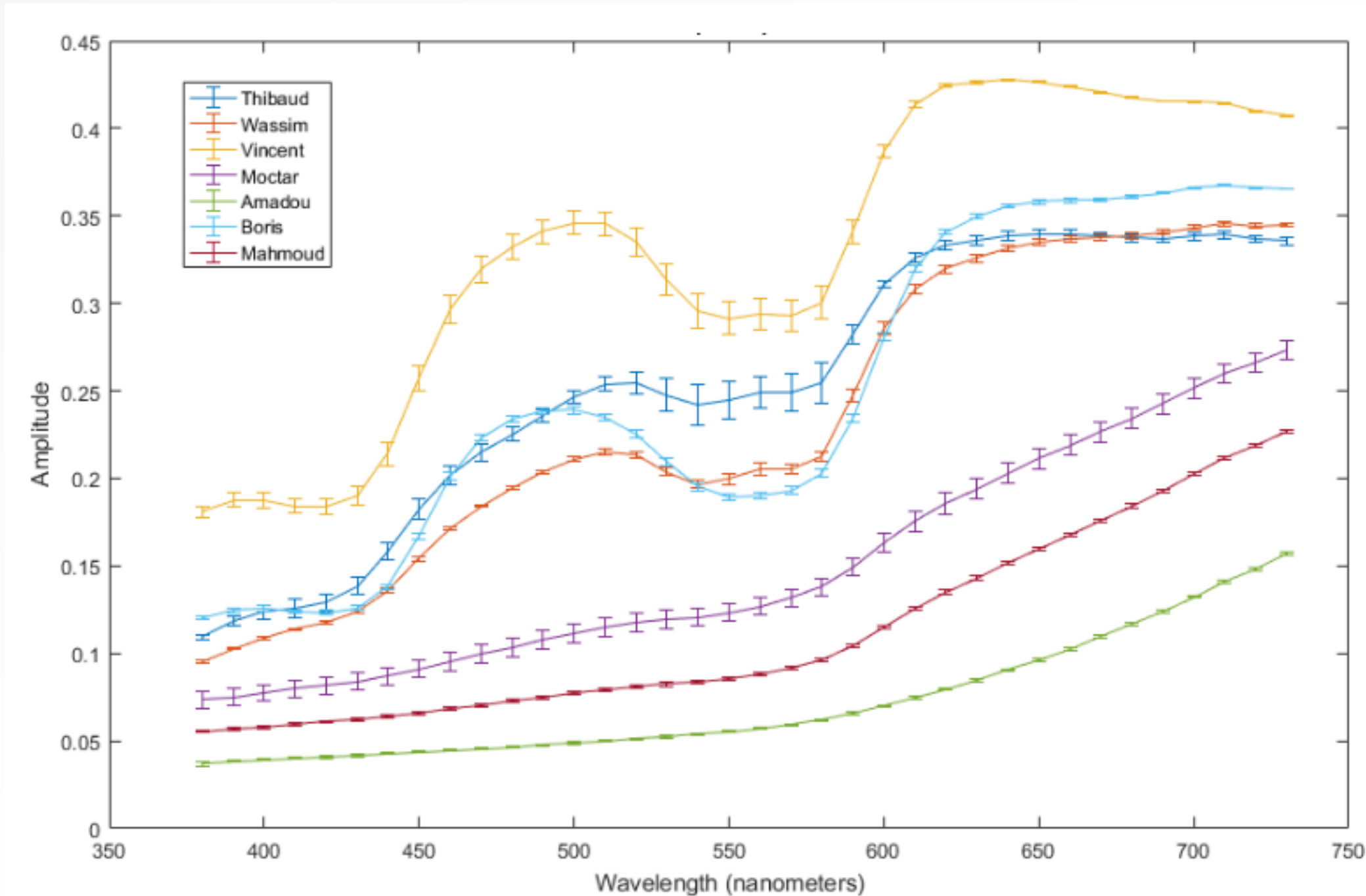
Results

Fig. 10. Spectrum of skin samples acquired from right back of hand of each seven subjects
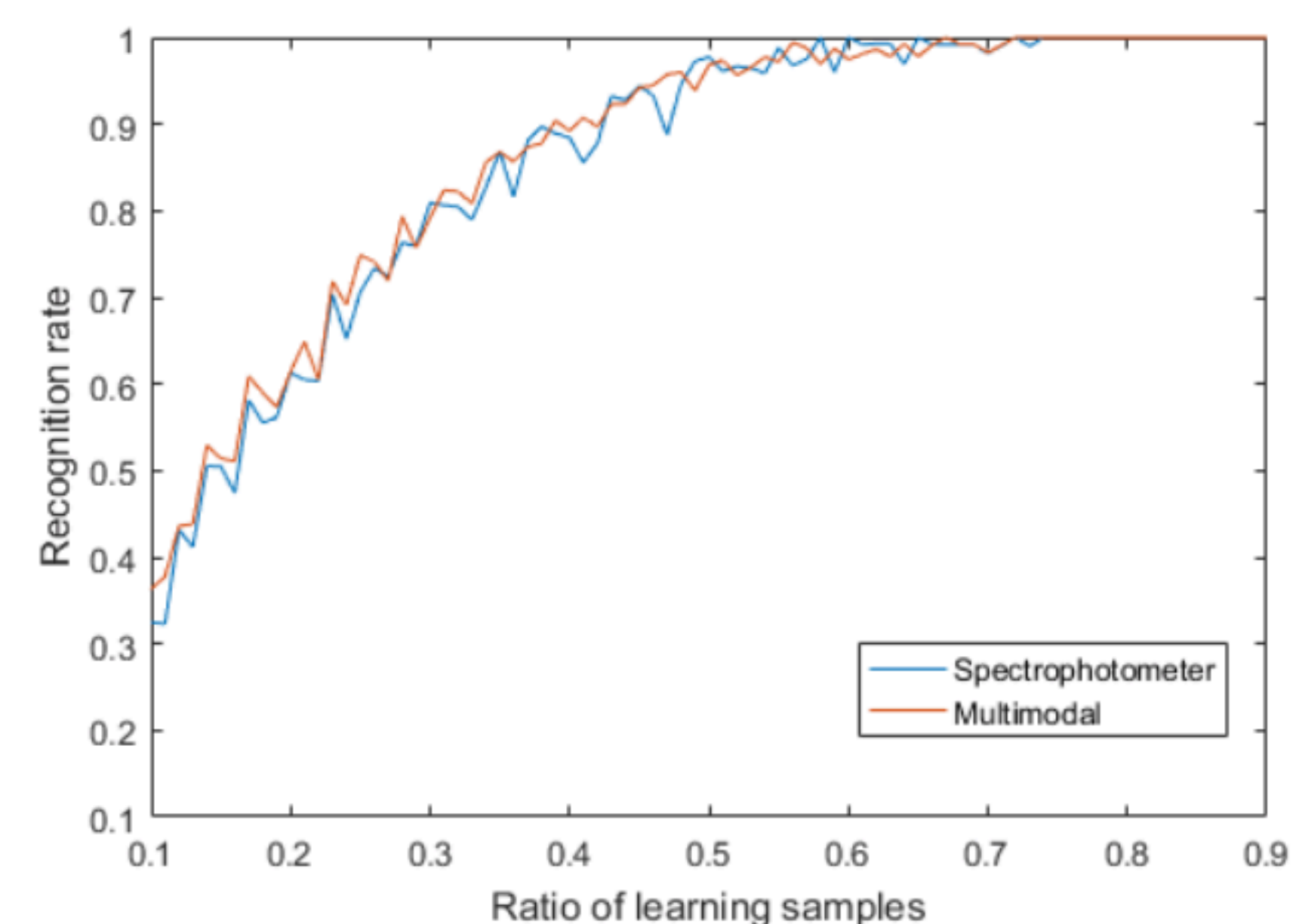

Fig. 12: Recognition rate for the two modalities of the recognition task. In blue, the recognition task was done with the spectrophotometer data, in red, all the data (with our system) was used. Only one angle is used in the algorithm.

Fig. 11. Polar scattering diagram of subjects of dull discovery

Conclusion

Skin recognition system is presented using a spectrometer in order to obtain input data as scattering diagrams due to the skin components, for learning algorithm which provides individual detection, reaching 100% accuracy with seven test subjects.

The improvements in skin recognition may be used in medicine as a pathology detector instead of biopsy procedure, in cosmetology in order to observe reaction of chemical components on the skin, in computer graphics for animation, photorealistic rendering as well as in biometrics in order to individual detection.