MSc internship – Engineering school internship

Image processing – Machine Learning – Colored Texture

Internship code: EntMLCol-20-21-4

We have developed, at the LARIS laboratory (University of Angers, France) in collaboration with other groups abroad, several innovative algorithms for the extraction of texture features from images [1-6]. These methods have given very encouraging results on different kinds of images, especially medical images.

The objective of the internship will be to design a software, using machine learning and the features extracted by our algorithms, to classify colored images. A testing procedure for this software will be done. A comparison between the results obtained by the trainee's method and those using features from other texture analysis methods will also be performed.

The first part of the internship will thus consist of studying the principles of machine learning as well as the colored texture analysis algorithms designed in the laboratory and those described in the literature [7].

In the second part, the trainee will have to develop a colored image classification tool (machine learning) using the characteristics extracted by the different algorithms and test it. Several families of classifiers will be explored (among others those using neural networks). Moreover, various types of images will be analyzed.

The trainee will finally have to establish a synthesis of the advantages and disadvantages obtained for each algorithm, image type and classifier.

The internship will take place at the LARIS laboratory (University of Angers, France).

Contact: Anne Heurtier (anne.heurtier@univ-angers.fr)

Bibliography:

[1] Hilal, M., Gaudencio, A. S. F., Berthin, C., Vaz, P. G., Cardoso, J., Martin, L., & Humeau-Heurtier, A. (2019, October). Bidimensional Colored Fuzzy Entropy Measure: a Cutaneous Microcirculation Study. In 2019 Fifth International Conference on Advances in Biomedical Engineering (ICABME) (pp. 1-4). IEEE.

[2] Gaudêncio ASF., Hilal M., Vaz PG., Cardoso JM., Humeau-Heurtier, A. (2020) Bi-dimensional colored fuzzy entropy applied to melanoma dermoscopic images- Entropy 2020–The Scientific tool of the 21st century, 2020

[3] Azami, H., da Silva, L. E. V., Omoto, A. C. M., & Humeau-Heurtier, A. (2019). Two-dimensional dispersion entropy: An information-theoretic method for irregularity analysis of images. Signal Processing: Image Communication, 75, 178-187.

[4] Humeau-Heurtier, A., Omoto, A. C. M., & Silva, L. E. (2018). Bi-dimensional multiscale entropy: Relation with discrete Fourier transform and biomedical application. Computers in Biology and Medicine, 100, 36-40.

[5] Silva, L. E., Duque, J. J., Felipe, J. C., Murta Jr, L. O., & Humeau-Heurtier, A. (2018). Two-dimensional multiscale entropy analysis: Applications to image texture evaluation. Signal Processing, 147, 224-232.

[6] Azami, H., Escudero, J., & Humeau-Heurtier, A. (2017). Bidimensional distribution entropy to analyze the irregularity of small-sized textures. IEEE Signal Processing Letters, 24(9), 1338-1342.

[7] Humeau-Heurtier, A. (2019). Texture feature extraction methods: A survey. IEEE Access, 7, 8975-9000.
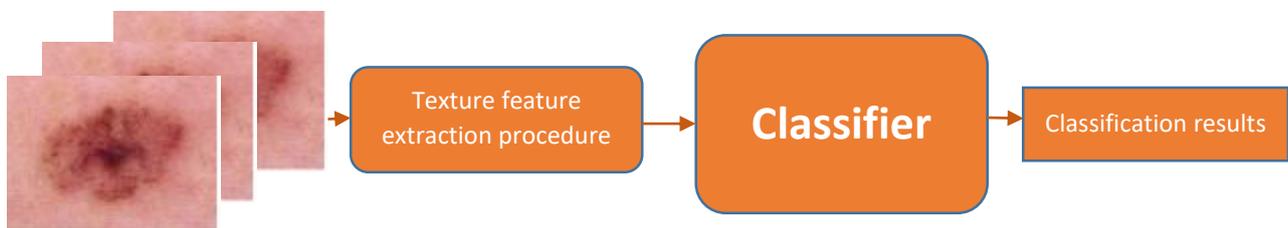
Flowchart of the image processing procedure