MSc internship – Engineering school internship

Deep learning – Machine learning

Information theory – Image processing – Texture

Internship code: EntIA-21-22-1

We have developed, at the LARIS laboratory (University of Angers, France) in collaboration with other research groups abroad, several innovative algorithms for the extraction of texture features from images [1-5]. These methods have given very encouraging results on numerous different kinds of images (see Figure 1), especially medical images.

With the texture features obtained from the above-mentioned algorithms, the Institute of Technology, Carlow (Ireland) applied machine learning approaches to classify different kinds of images (biomedical data and material textures such as bread, linen, cotton, among others). The results are very encouraging, and as such we would like to further this research.

The goal of the internship would be to:

- apply & test deep learning methods using images and entropy features as input
- determine how to tune entropy algorithm parameters: are there parameters that would give good classification results whatever the image types (see Figure 2)?

The above tests could be performed both on grayscale images and color images.

The internship will take place at the LARIS laboratory (University of Angers, France) and / or at the Institute of Technology, Carlow, Ireland.

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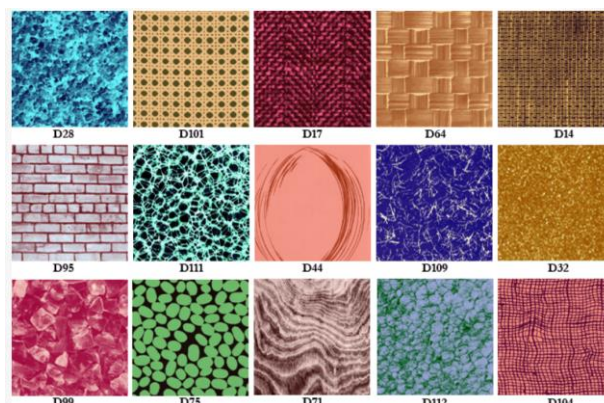Vincent O'Brien (Vincent.OBrien@itcarlow.ie)

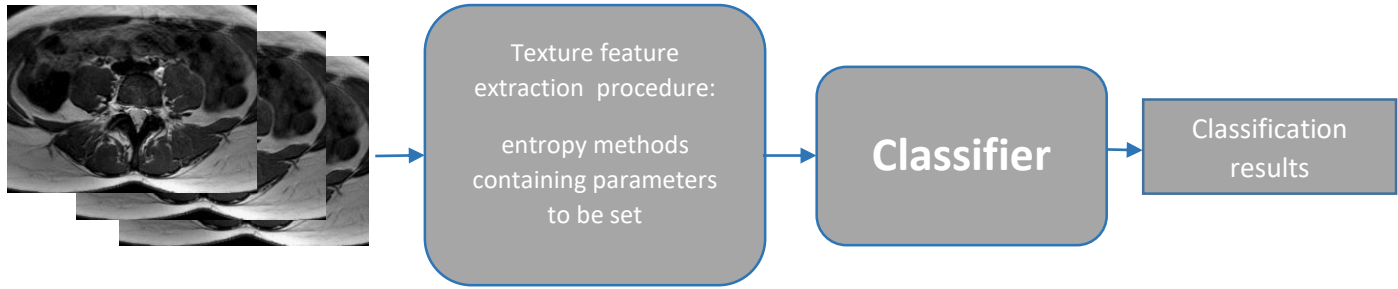Figure 1: Different kinds of textures (colored Brodatz texture database)

Figure 2: Flowchart of the image processing procedure

Bibliography:

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[2] 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.

[3] 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.

[4] 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.

[5] 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.

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