Deep Learning vs Classical Computer Vision Techniques for Microplastics Classification

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Two key elements in the monitoring of the amount of microplastics in the oceans is the standarization of sampling protocols, and the development of automatic tools to reduce the time consuming task of counting and classifying the particles. The use of Artificial Intelligence techniques, more specifically the use of Computer Vision, could speed up the processing the microplastics samples, both from the sea and the beaches.

In this work, a comparison between two approaches for classifying microplastic particles is presented (Fig. 1). Five types of particles commonly found in the Canary Island beaches are considered. Three corresponds to plastics: pellet, lines and fragment; and two to non plastics particles: oil and organic debris. The first approach is the Computer Vision classical pipeline which is made up of three main stages: image preprocessing, feature extraction and finally the classification stage. The classifier is trained using as input the features extracted in the second stage. On the other hand, Deep Learning is considered as the second approach. In this case, an end-to-end classifier is obtained because the three stages of the classical approach are subsumed into the training stage. Thus, only a set of labeled images is used and the method learns the features to extract and also how to combine them.

For the classical approach a set of features based on color, geometry and texture of the particles is fed to a classifier Random Forest, K Nearest Neighbor and Support Vector Machines has been considered. For the Deep Learning approach, a Convolutional Neural Network has been trained because this architecture has shown good results in other classification tasks. The best result is obtained with the Deep Learning approach with 97.4% of accuracy against 91.1% of the classical approach, which reveals the superiority of Deep Learning in this context.

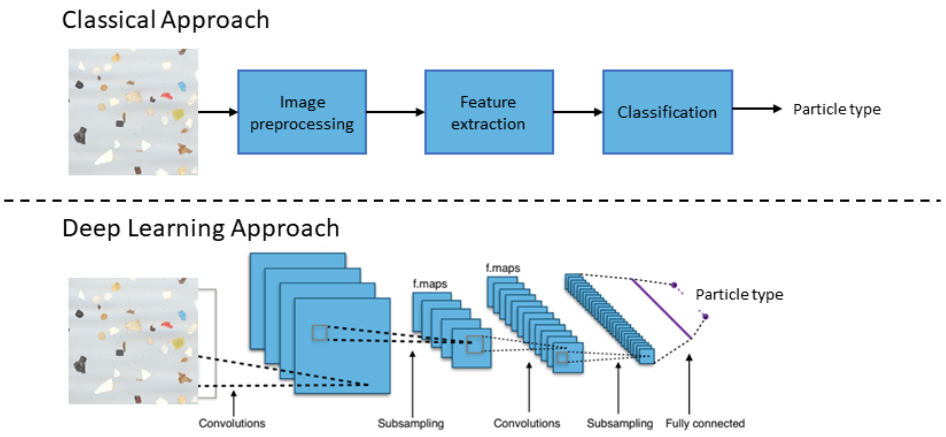

Figure 1. Classical and Deep Learning classification schemas

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