Editorial: Towards feature extraction in unconstrained image recognition environments

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Recently, there has been an increased awareness and interest in using pattern recognition techniques for a wide range of problems in the areas of biometrics (Wang, 2012), agriculture (Bauckhage and Kersting, 2013), and document analysis (Bunke and Wang, 1997). While most existing methods provide very high recognition accuracies with images collected under laboratory conditions with specifically imposed constraints, they tend to perform poor in real-time unconstrained conditions (Kamila, 2015). In unconstrained recognition environments, the quality of features generated by most methods tends to different significantly between the training and the test sets. This is attributed to the unexpected increase in the natural variability (Piper, 1992; Chen et al., 2012) in the test sets often resulting from sensing errors, illumination changes, shape deformation of the objects, changes in object poses and several types of noise in the channel. Developing robust features to changes in different types of natural variability remains as one of the most important pattern recognition problem.

The consequence of the natural variability extends to a problem of feature preparation as of what features needs to be recovered and sensed (Kim and Jeong, 2010; Agraftotis et al., n.d.; Agili et al., 2006). Similar to extracting the features, it also becomes important as of what region of interest in the images are the most useful for a given task, and how much resolution would be required to achieve the best results. For example, it would be unreasonable to think that using a very low resolution (less than 40×40 pixel) face image (Zou and Yuen, 2012; Ren et al., 2011) or character recognition (Ma and Agam, 2013; Kuhl et al., 2008) would help achieve high recognition accuracies in a large data problem with millions of classes. The low resolution image data in such cases implies a compounded problem of loss of information with a relatively higher impact of natural variability.

In this issue, the research papers look into several important domains of applications with a stress on combining feature extracting techniques in the problems of feature analysis for seeds and vegetables, face recognition, and handwritten character recognition. The papers related to application in agriculture implies an increased importance on the application of automation with applied pattern recognition and has a

high social impact given the majority of the world economy depends on the sustained progress and efficiency of production in agriculture. The area of biometrics involving human generated natural patterns such as handwriting or recording of human features such as facial features is another area of importance that has gained popularity in developing interactive devices, user authentication, personalised character recognition, and providing improved security for the data.

With the advent of large data era in most practical situations the complexity of the image recognition tasks increases from being a mere data analysis approach to a more systems approach that would need to take care of data security and operational effectiveness. it has to be noted that there exists several open problems that the researchers can work further in the area of image recognition where the feature extraction becomes a challenging problem such as liveness detection (Rogmann and Krieg, 2015), very low resolution pattern recognition (Zou and Yuen, 2012), multimodal image recognition (Heinrich et al., 2013), and sparse features analysis (Sun et al., 2001) that can have a wide impact on the understanding of feature formation and subsequently with development of robust feature extraction techniques for various image-based pattern recognition tasks.

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