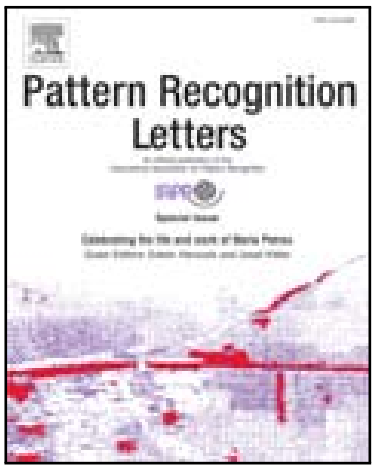

Executable Thematic Special Issue on Pattern Recognition Techniques for Indirect Immunofluorescence Images Analysis

Mehrtash Harandi , Brian C. Lovell , Gennaro Percannella , Alessia Saggese , Mario Vento , Arnold Wiliem

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Editorial paper

Executable Thematic Special Issue on Pattern Recognition Techniques for Indirect Immunofluorescence Images Analysis

In recent years we have supported the development of a progressively growing number of application areas of Pattern Recognition. These are mainly devoted to the exploitation of cutting edge scientific methodologies to address problems of our society. This activity is generating entirely new scientific communities. Groups of scientists are developing competing robust prototypes more or less ready to be transformed into real working systems. In the field of medical image analysis this trend has been even more evident than in others, as the availability of assisted diagnosis tools will allow the medical community to increase their productivity as well as improve the quality and precision of their diagnosis.

Among all, rather novel interests are concentrating on the indirect immunofluorescence images (IIF) — images obtained by stained biological tissue interacting with special sources of light to generate fluorescent image responses. These techniques are especially suited to detecting antibodies in the patient serum, which is critical for diagnosing many autoimmune diseases. Due to its effectiveness, diagnostic tests for systemic autoimmune diseases are gaining more interest in both the academic and industrial communities. Nevertheless, today IIF is still a subjective method very dependent on the experience and expertise of the pathologist. As a consequence, there is strong demand for a completely automatic system with the potential of increased test repeatability and reliability as well as faster test turn-around time with lower costs.

These issues have been researched by an increasing number of academic groups. In the last few years these groups have provided innovative contributions to the different aspects of the analysis of IIF images as image acquisition, pre-processing, segmentation, and pattern classification [1-4]. Such interest has been also boosted by a series of benchmarking activities on IIF cell and specimen classification held at leading international conferences in the areas of pattern recognition (ICPR 2012 and ICPR 2014) and image processing (ICIP 2013). In all cases these competitions had strong participation from the scientific community, collecting several dozens of distinct software submissions [5-9].

This special issue describes advances achieved through this series of initiatives, and we are very pleased by their success. We have adopted an innovative format recently launched by the journal. This is an executable thematic issue and is aimed at promoting "reproducible research" by collecting the most relevant contributions in this area and comparing them independently on the large datasets already used for the "Performance Evaluation of Indirect Immunofluorescence Image Analysis Systems" competition held at ICPR 2014. Specifically, the participants have been requested to submit executable methods for addressing one or both of the following classification tasks.

- TASK 1: classify the pre-segmented cell images belonging to IIF images according to one of six different staining pattern classes
- TASK 2: classify the pre-segmented IIF specimen images according to one of seven different staining pattern classes

The special issue was open to all of the research community, including those groups that already participated in the benchmarking activities held at ICPR 2012, ICIP 2013 and ICPR 2014.

The organization of this executable special issue comprised two phases. In the first phase the participants submitted the software implementation of their proposed method, all the parameterizations required to execute the software, with a preliminary description of the approach. Then the organizers evaluated the performance of the submissions on the unseen private part of the dataset. Only the best performing methods were selected for