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Fast Unsupervised Nuclear Segmentation and Classification Scheme for Automatic Allred Cancer Scoring in Immunohistochemical Breast Tissue Images

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**Highlights**

- A fast nuclear segmentation and classification scheme in breast IHC tissue images that combines a modified morphological Laplacian operator and an improved watershed algorithm, is proposed in this work.
- Unsupervised nuclei classification is also proposed by a median combination of color features using common color separation techniques, for subsequent automatic Allred cancer score evaluation.
- A comparative study versus manual truths given by pathologists is performed in order to demonstrate the effectiveness of the proposed method using accuracy ratio and statistical analysis tools.
- Results of nuclei classification and IHC image scoring are compared with existing supervised and unsupervised techniques in order to provide a better evaluation of the proposed methods' performances.
- Experiments show the superiority of the proposed scheme in terms of nuclei and image classification accuracies, and its ability to reduce the processing time and manual interventions compared to the supervised approaches.

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