Brief description of the article

"*Joint Acne Image Grading and Counting via Label Distribution Learning*"

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The main goal of this paper is to provide a framework that will simultaneously solve two problems: the first one is to detect and count lesions on the skin and the second one is to predict the acne severity level. Acne is the most common skin disease that needs specific treatment depending on its seriousness. The standard medical criterion for grading acne is a combination of counting lesions and global skin assessment, so that these two problems are closely tied to each other.

Unlike most of the works that focused either on grading severity or on counting lesions, an approach that tackles both tasks at the same time is proposed in this paper. The authors introduced several losses; one for global estimation and one with attention to local information of lesions. Thus, the final model becomes more robust, tends to focus on different aspects of acne images and combines its advantages.

Another proposed idea is to replace lesion number and acne severity grade target labels with two label distributions. Label distribution for counting tasks is based on normal distribution, for grading task distribution is generated from the counting task using the Hayashi medical criterion. The distribution approach helps to mitigate the ambiguity problem: close acne severity shows a similar appearance on the image and a single label does not represent this uncertainty.

To validate all proposed methods authors collected a dataset called ACNE04. This dataset contains acne images, the annotations of its severity and the bounding boxes of lesions annotated by professional dermatologists.

Compared to single label learning and standard label distribution learning, the dynamic distribution generation procedure proposed in the paper showed improvement for both grading and detection tasks. Experiments showed the label distribution of the lesion number can represent the continuous features of acne images. The combination of grading and counting in a unified framework using medical criterion as well as adding links between tasks improved all performance metrics.

Results of the proposed method for grading task were compared with three types of methods, including LDL, hand-crafted feature, and deep feature-based methods. Deep LDL and deep feature-based methods showed comparable results, significantly outperforming hand-crafted methods. All three types of methods were outperformed by the proposed method, thus confirming the advantages of label distribution and multitask learning strategies. The very low standard deviations indicate the stability of the proposed method.

In comparison with object detection and regression based counting methods, the suggested framework showed the best result for counting the number of lesions task. It overcame problems related to these two counting approaches: instability when the object size is small for detection and ignoring the different weights between acne severity levels when counting lesions for regression.