Reviewer's report

Title: Characterization of Digital Medical Images Utilizing Support Vector Machines

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Reviewer: Stefania Seidenari

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General
Although the design of the study appears interesting as a comparison of different classification methods, this study was improperly conducted. Aiming at a 100% sensitivity for the identification of all malignant lesions, the specificity is always lower, especially when comparing difficult to diagnose lesions such as melanomas and dysplastic nevi. In real conditions, a 100% sensitivity and specificity is not even reached by histology, the usual golden standard in this kind of studies. Certainly, these high sensitivity and specificity values are due to selection bias: evident melanoma versus evident nevus images are compared for the diagnosis. Even the identification of "easy to diagnose" lesions can be of value, but, if this was the case in this study, it has to be specified in the method section. Moreover, the study population and the basic statistical analysis have to be reported and described in details.

Discretionary Revisions (which the author can choose to ignore)
1 In Abstract: "Results" sub-section: abbreviations were not explained

Minor Compulsory Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)
1 Some sentences referring to the methods are reported in Results
2 The study population is not described: how many lesions? How many melanomas and what about their thickness? "On what basis a nevus is defined as "dysplastic" (histology or clinical atypia?)
3 In the abstract it is reported that images were "acquired under reproducible conditions". It is not explained in the Materials and methods: what does "reproducible conditions" mean? What kind of instruments or digital cameras were employed? Were images acquired with a fixed magnification and distance? Owing to an indefinite number of variables (light sources, angle of incidence of the light, skin scaling and skin hydration, etc...), I think that it is impossible to have "reproducible" clinical images, or it must be proven recording the same lesions several days after and comparing the obtained parameter with the appropriate statistical tests.
4 The definitions "Melanoma’s Vertical Growth Phase" and “Melanoma’s Radial Growth Phase" referred to the whole lesion and to dark areas inside the melanoma, respectively, are incorrect and misleading terms, referring to histological behaviour of melanomas without a necessary correlation with clinical aspects. These definitions have to be changed.
5 The “Melanoma’s Radial Growth Phase” (RGP) is a manually selected portion of a melanoma images, corresponding to a dark area inside the lesion. It is not specified in how many melanomas it was present. Moreover, the comparison between a selected dark area inside a lesion presumptive known to be a melanoma with a whole lesion is methodologically incorrect. It is obvious that a “dark area” differs for color and shape from a whole pigmented skin lesion, independently of its nature. The selected dark areas in melanomas can be at least compared to similarly selected dark areas in dysplastic nevi, in order to identify differences in color components.
6 Parameters employed for discrimination between RGP and dysplastic nevi by means of discriminant analysis and neural network approaches have not been reported.

7 The “greatest diameter”, one of the two parameter on which the discrimination between melanomas and dysplastic nevi is predominantly based, represents the dimension of the lesion. For discriminating algorithms based on image analysis, all geometric parameters depending on the lesion dimension should be avoided, since melanomas are obviously larger than common nevi and the selection of the study population depends on the human choice (selection bias). Moreover, in order to obtain additional information from a computer in respect to the clinical evaluation, color and texture characteristics should be investigated rather than obvious criteria depending on the lesion selection, such as the dimension.

8 Finally, basic statistics (mean, standard deviation and statistical tests for comparison between the different groups) for the image analysis parameters were not included.

9 The highest number of scientific articles on image analysis on pigmented skin lesions are reported in dermatological journal: the most relevant ones should be included in references.

**Advice on publication:** Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

**Level of interest:** A paper whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Declaration of competing interests:**

none