Hierarchical Classification of Ten Skin Lesion Classes

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This paper presents a hierarchical classification system based on the k-Nearest Neighbors (kNN) classifier for classification of ten different classes of Malignant and Benign skin lesions from color image data.

Our key contribution is to focus on the ten most common classes of skin lesions. There are five malignant: Actinic Keratosis (AK), Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC), Melanoma (MEL), Intraepithelial Carcinoma (IEC) and five benign: Melanocytic Nevis / Mole (ML), Seborrhoeic Keratosis (SK), Dermatofibroma (DF), Haemangioma (VASC), Pyogenic Granuloma (PYO). Moreover, we use only high resolution color images acquired using a standard camera (non-dermoscopy).

Our image dataset contains 1300 lesions belonging to ten classes (45 AK, 239 BCC, 331 ML, 88 SCC, 257 SK, 76 MEL, 65 DF, 97 VASC, 24 PYO and 78 IEC).

Sequential forward feature selection (SFS) was applied for each classifier in the hierarchical system. SFS finds the features that maximize classification accuracy for a given level.

Accuracy is 93% when discriminating malignant from benign lesions and it reaches an overall classification accuracy of 67% over ten classes of skin lesions, five malignant and five benign.

<table>
<thead>
<tr>
<th>Malignant</th>
<th>Benign</th>
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<tbody>
<tr>
<td>491 (93%)</td>
<td>35 (7%)</td>
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<tr>
<td>115 (15%)</td>
<td>659 (85%)</td>
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Table 1: Confusion matrix on distinguishing between malignant and benign classes: rows are true classes, columns are the selected classes. The classification rate is inserted within brackets

