

Performance and Comparison of Various Classifiers Using Psoriasis Skin Image

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ABSTRACT:

Classification Technique is widely used to classify data. Classification is a general process related to categorization. Here we used different types of classifier used here psoriasis skin image are used for this purpose for data. Combination of Features are selected who is extracted from psoriasis skin image such as texture, color Redness features. Texture features include Energy, Entropy, Contrast and Homogeneity and color features include R.G.B and redness feature. Classification of data need to train classifier model after training the model different types of classifier gives different accuracy different types of classifier such as decision tree, support vector machine, nearest Neighbors classifier (KNN) and ensemble classifier is used for this purpose.

Decision tree include simple complex or medium tree SVM include linear SVM fine Gaussian SVM, medium Gaussian SVM coarse SVM, Quadratic SVM, Cubic SVM, Fine Gaussian SVM, Medium Gaussian SVM, Coarse Gaussian SVM, Cosine SVM and Cubic SVM, KNN include Fine KNN, Medium KNN, Coarse KNN, Cosine KNN and Cubic KNN, Ensemble classifier include Bagged, Boosted, Subspace KNN, Subspace Discriminate. After training the model and comparing the all 4 different types of classifier concluded according to their high accuracy and decision tree is best classifier because it give 98.1% accuracy. Decision tree gives 98.1%, SVM, gives 96.3%, KNN give 95.58% and ensemble gives 92.82%.

I also compare model performance by expecting result in scatter plot, confusion matrix and ROC curve.

INTRODUCTION:

Psoriasis is a chronic and irritating skin disease affects quality of life due to its embarrassing social appearance. Generally, psoriasis appears scalp, elbows, knees and lower back but it may spread further to all parts of the bodies. Psoriasis may grow, further to all parts of the bodies. Psoriasis may grow. Further, gives secretion in wet lesions while cracks lead to bleeding in dry lesions. It has variety of forms with distinct characteristics namely plaque, gutter, inverse pustule and erythrodermic of which plaque in most widely appearing in 80% of the cases psoriasis affects about 3% of population in Malaysia according to the dermatological society of Malaysia. Whereas it patient contemplate suicide. There is no permanent cure for psoriasis reported till date but it used to be controlled by prolonged and attentive treatment.^[1] The cause of psoriasis is still unidentified and researcher think of genetic fault as a cause of psoriasis in which skin cells production is faster than normal. For diagnosis and analysis of skin diseased images, dermatology required skilled training to predict the severity and prescribe medication to control it.

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So, objective analysis is essential along with inefficient, unreliable and a laborious subjective analysis. Many researchers have proposed and still working tirelessly on computer-aided diagnosis (CADx) systems for classification of different skin diseased images. In past, an approach is proposed for. The recognition of malignant melanoma versus dysplastic nevus. A methodology proposed in show the classification of skin tumor. These are the two primary key objectives (i) from the 8 features which belong to texture, color, redness and chaotic features, we generate 46 set of feature combinations based on proposed feature selection process. (ii) Demonstrates the effect of classification accuracy on the changing data size to further understand generalization vs. memorization of the training system.^[2]

Psoriasis Skin Diseases:

Psoriasis is an autoimmune skin disease with red and scaly plaques on skin and affecting about 125 million people worldwide. Currently, dermatologist use visual methods for diagnosis the disease severity which merely helps them in stratification and risk assessment of the lesion stage and grade. Further, current methods add complexity while monitoring and follow-up phase.^[3] The current diagnostic tools lead to subjectivity in decision making and are unreliable and laborious. This work presents a comparative performance study using classifier learner system for psoriasis risk stratification and image classification utilizing: 4 texture features, and 4 color feature sets and combinations. 52 image samples (10 healthy and 42 diseased) patients of Indian ethnic origin are used in our database.^[4]

Artificial Intelligence:

Artificial Intelligence (AI) is intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of success at some goal. Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions

that humans associate with other human minds, such as "learning" and "problem solving". As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. For instance, optical character recognition is no longer perceived as an example of "artificial intelligence", having become a routine technology. Capabilities currently classified as AI include successfully understanding human speech, competing at a high level in strategic game systems (such as chess and Go), self-driving cars, intelligent routing in content delivery networks, military simulations, and interpreting complex data. AI research is divided into subfields that focus on specific problems, approaches, the use of a particular tool, or towards satisfying particular applications. Approaches include statistical methods, computational intelligence, and traditional symbolic AI.^[5] Many tools are used in AI, including versions of search and mathematical optimization , logic, methods based on probability and economics. The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience, artificial psychology plus many others.

Data Import and Cross-Validation:

Import a table or matrix directly from the MATLAB workspace. Choose from K-fold, holdout, or reconstitution cross-validation schemes



Fig.1 Data import and Cross Validation

Data Exploration and Feature Selection:

View data distribution in response classes using pair wise scatter plot. Selectively include features in each model.

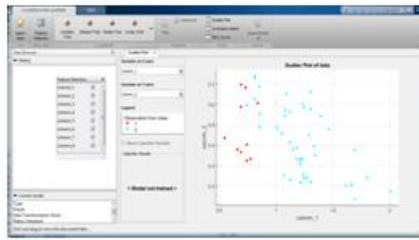


Fig.2 Data Exploration and Feature Selection

Classification Algorithms

- Decision trees: Deep tree, medium tree, and shallow tree
- Support vector machines: Linear SVM, fine Gaussian SVM, medium Gaussian SVM, coarse Gaussian SVM, quadratic SVM, and cubic SVM
- Nearest neighbor classifiers: Fine KNN, medium KNN, coarse KNN, cosine KNN, cubic KNN, and weighted KNN
- Ensemble classifiers: Boosted trees (AdaBoost, RUSBoost), bagged trees, subspace KNN, and subspace discriminate

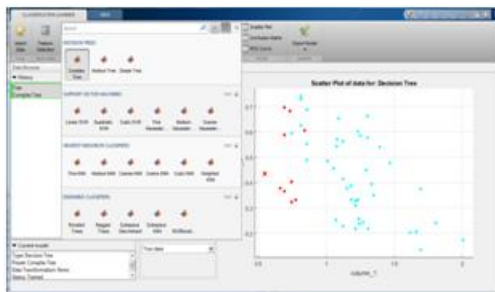


Fig.3 Data import and Classification Algorithms

Model Comparison and Assessment.

- Assess classifier performance using confusion matrices, ROC curves, or scatter plots.
- Compare model accuracy using the misclassification rate on the validation set.
- Improve model accuracy with advanced options and feature selection.

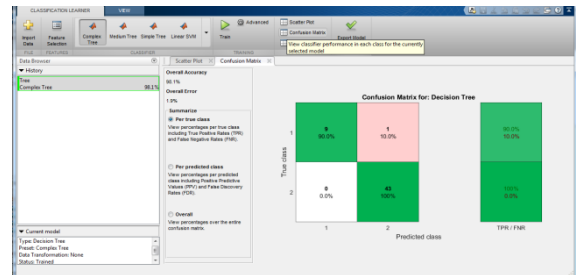


Fig.4 Model Comparisons and Assessment.

Share Model:

- Export the best model to the workspace to make predictions on new data.
- Generate MATLAB code to train classifiers on new data.
- Use MATLAB code in machine learning applications such as computer vision and signal processing.

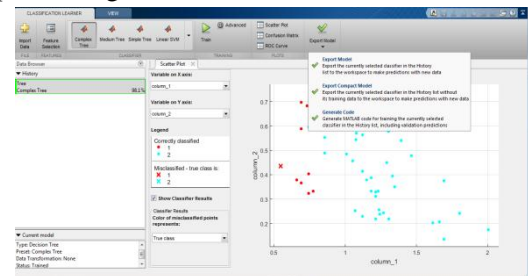


Fig.5 Share Model

Algorithm for Decision Tree Induction

The decision tree induction algorithm works by recursively selecting the best attribute to split the data and expanding the leaf nodes of the tree until the stopping criterion is met. The choice of best split test condition is determined by comparing the impurity of child nodes and also depends on which impurity measurement is used. After building the decision tree, a tree-pruning step can be performed to reduce the size of decision tree. Decision trees that are too large are susceptible to a phenomenon known as over fitting. Pruning helps by trimming the branches of the initial tree in a way that improves the generalization capability of the decision tree. Here is an example recursive function that builds the tree by choosing the best dividing criteria for the given data set.^[6]

It is called with list of rows and then loops through every column, finds every possible value for that column, and divides the dataset into two new subsets. It calculates the weighted average entropy for every pair of new subsets by multiplying each set's entropy by the fraction of the items that ended up in each set, and remembers which pair has the lowest entropy.^[7] If the best pair of subsets doesn't have a lower weighted-average entropy than the current set, that branch ends and the counts of the possible outcomes are stored. Otherwise, build tree is called on each set and they are added to the tree. The results of the calls on each subset are attached to the True and False branches of the nodes, eventually constructing an entire tree. Decision tree include simple complex, medium tree.^[8]

CONCLUSION:

Our hypothesis assumes that color provides important information in psoriasis disease classification. Technique used in psoriasis skin images and Normal skin image. Thus our objective was to present an in depth analysis of skin classification using machine learning parameter performing different types of task such as exploring data, specify validation scheme and assessing result in scatter plot confusion matrix and ROC curve. Performance of different classifier is compared with different types of classifier. There are several aspect of this research that can be improved over time. First evaluation of such method over larger data base. Multi center trails can be conducted leading to larger psoriasis database second. , improving the ground truth representations can be made more objective leading to better inter-observer variability designs. Although, the proposed classification learner system with SVM and KNN has been found performing better for psoriatic lesion classification, there is still a large scope of improvement. The psoriasis severity detection based on novel redness features can be useful to determine state-of-art severity index i.e., PASI. Moreover, higher color significant features can be explored other color spaces, similar to the histological color spaces.

The work of two class problem can be extended for stratification of psoriasis severity to multiclass problem. More validation needs to be performed on a larger pool of data sets to establish a clinical translation of our conceptual prototype design. In this performance and comparison of different types of classifier is proposed. The future work deals with implementing the proposed methodology priority to the problem, identified, increase solution accuracy and result in less process in time for classification technique and other types of classifier is will invent. As a depth of studied color provides an important information is classification technique feature because feature extraction is very important step in classification technique with a combination of RGB, Redness, texture feature are extracted feature extraction. The features have train been used to train a different classifier experiment carried out on a set of dermoscopy image show treat the proposed system offers higher classification accuracy with low false detection rate and achieves accuracy 98.1% which is very good and accurate.

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