



## AUTOMATIC SKIN LESION PREDICTION USING TEXTURE FEATURE AND PROBABILISTIC NEURAL NETWORK

Rashmi Hari and V. G. Sivakumar

Department of Electronics and Communication, Sathyabama University, Chennai, India

E-Mail: [rashmihari14@gmail.com](mailto:rashmihari14@gmail.com)

### ABSTRACT

The project presents malignant melanoma skin lesion classification with Radial basis (RB) kind network classifier and hybrid options illustration victimization color, Heraldic and discriminative strong native binary pattern. Here, 2 different descriptors area unit utilised for characteristics extraction from numerous skin lesions and their fused options offers higher classification with newly approached probabilistic neural network. There area unit 5 different skin lesions unremarkably classified as property *Actinic* Kurtosis (AK), Basal Cell malignant neoplastic disease (BCC), Melanocytic nevus / Mole (ML), Squamous Cell malignant neoplastic disease (SCC), disease of the skin Kurtosis (SK). The system are accustomed classify the queried pictures mechanically to determine the stages of abnormality. For this approach, automatic classifier PNN with RBF are used for classification supported learning with several coaching samples of every phase. Here, the colour options from HSV area and discriminate texture options like energy, contrast, correlation and homogeneity area unit extracted. DRLBP represents an image options inter of histogram bins accustomed discriminate the native edges and texture pattern.

**Keywords:** skin lesion, *Actinic Kurtosis*, neural network.

### INTRODUCTION

Melanoma may be a malignant tumor that starts in cells of skin. Malignant melanoma is one of the most rapidly increasing cancer or one of the leading cancers among many white-skinned populations around the world [1], [4], [7]. Malignant means it will unfold or metastasise to other body components. The skin is that the body's largest organ. It protects from injury and ultraviolet (UV) lightweight from the sun. The skin has a pair of main layers specifically the highest layer, known as as cuticle. The derma is below the cuticle. The cuticle is formed from three forms of cells: Squamous cells that square measure skinny flat cells on skin surface, basal cells area unit spherical cells that lie beneath squamous cells. Melanocytes area unit found in between the basal cells. They create animal pigment that is answerable for skin and eye color. Changes to cells within the skin will cause cancer. Differing types of skin cells cause totally different cancers. Once carcinoma starts in squamous cells or basal cells, it's known as non-melanoma carcinoma. Once cancer starts in melanocytes, it's called malignant melanoma [2]. The lesion diagnosing system involves 2 steps of process like coaching and lesion classification. We can classify the lesion as melanoma or nevus using a classifier with neural network and presents the diagnosis [3]. An artificial neural network Radial basis sorts is employed here as classifier. Feature choice is implanted within the gradable frame that chooses the foremost relevant feature subsets at every node of the hierarchy. The accuracy of the projected neural theme is higher in discrimination of cancer and pre-malignant skin lesions from benign lesions associated it reaches overall classification accuracy is high over 5 common categories of skin lesions, as well as 2 non-melanoma cancer sorts.



**Figure-1.** Actinic Keratosis (AK), Basal Cell Carcinoma (BCC), Melanocytic Nevus / Mole (ML), Squamous Cell Carcinoma (SCC), Seborrheic Keratosis (SK) [9].

Several ways to retrieve pictures on the idea of color similarity are delineated within the literature, however most area unit variations on an equivalent basic plan. Every image additional to the gathering will be analyzed to reckon a color bar graph which shows the proportion of pixels of every color inside the image [6]. the colour bar graph for every image is then stored within the information. At search time, the user will either specify



the required proportion of every color (for example, 75% greenness and twenty fifth red), or submit AN example image from which a color bar graph is calculated. Either way, the method of matching then retrieves those pictures whose color histograms match those most closed questions.

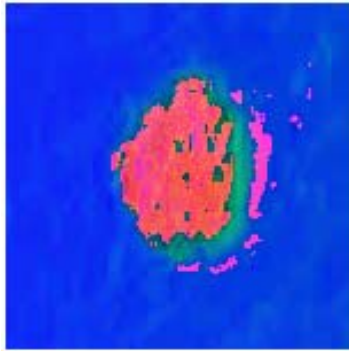


Figure-2. HSV Image on input image.

### PROPOSED METHOD

Local Binary Patterns (LBP) is the one that foremost used ways in face recognition. To enhance the popularity rate and strength, many methods exploitation LBP, are planned. Improved native Binary Pattern (ILBP) is an improvement of LBP that compares all the pixels (including the center pixel) with the mean of all the pixels within the kernel to enhance the strength against the variation in illumination.

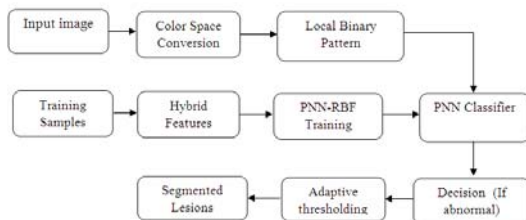


Figure-3. Block diagram - Skin Lesion classification using Local Binary Pattern.

For the aim of retentive the spatial and gradient data, associate degree extended version of native Binary Patterns (ELBP) that encodes the gradient magnitude image additionally to the first image was propose to represent the speed of native variation. Native Dennis {gabor|physicist} Binary Pattern (LGBP) is another illustration approach supported multi-resolution spatial bar chart combining native intensity distribution with the spatial data via introduction of the Gabor wavelets into the Local Binary Pattern because the image pre-processing; so, it's strong to noise and transformations of the local images [10].

### CONTRAST STRETCHING

This is associate degree extension to ancient bar chart equalisation technique. It enhances the distinction of

images by reworking the values in the intensity image I. not like HISTEQ, it operates on little information regions (tiles), rather than the complete image. Each tile's distinction is increased, in order that the bar chart of the output region more or less matches the desired bar chart. The neighboring tiles area unit then combined victimization linear interpolation so as to eliminate unnaturally elicited boundaries. The distinction, particularly in solid areas, may be restricted so as to avoid amplifying the noise which could be gift within the image,

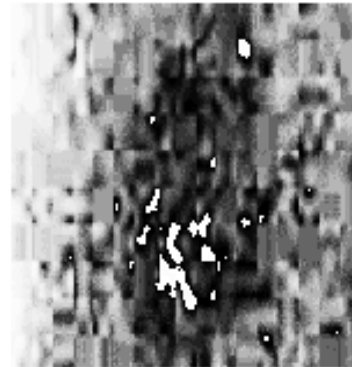


Figure-4. Contrast-Histogram equalization image.

### LOCAL BINARY PATTERN

Local binary pattern (LBP) operator is outlined as a gray level invariant texture live during a local neighbourhood. the first LBP operator labels the pixel of a picture by threshold the 3X3 neighbourhood of every pixel and concatenating the results binomially to make variety. Black (or white) representing pixels that are less (or more) intense than the central pixel. once encompassing pixels are all black or all white, then that image region is flat (i.e. featureless). teams of continuous black or white pixels are thought of "uniform" patterns which will be -and-forth between black and white pixels, the pattern is considered as "non-uniform".

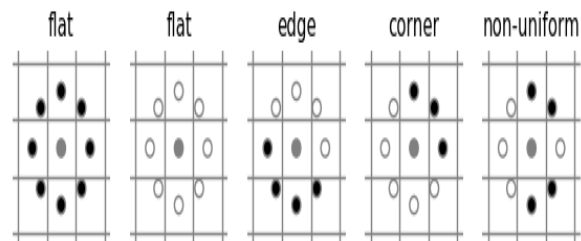


Figure-5. LBP Pattern flat / edge / corner / non-uniform structure.

### FEATURES EXTRACTION

**Energy:** it's a gray-scale image texture live of homogeneity ever-changing, reflective the distribution of image gray-scale uniformity of texture and its weight.



**Contrast:** distinction is that the main diagonal close to the instant of inertia, that live the worth of the matrix is distributed and pictures of native changes in variety, reflective the image clarity and texture of shadow depth.

**Entropy:** It measures image texture randomness, once the house co-occurrence matrix for all values is equal, it achieved the minimum price.

**Correlation coefficient:** Measures the probability incidence of the required element pairs.

**Homogeneity:** Measures the closeness of the distribution of elements within the GLCM to the GLC diagonal.

	1	2	3	4	5	6	7	8	9
1	0.5024	0.4995	0.4999	0.4993	0.5011	0.4999	0.4991	0.5001	0.5007
2	121.4875	118.6884	119.0721	121.9187	122.6533	119.7239	120.9121	111.6420	120.6129
3	0.0032	0.0199	0.0105	0.0124	0.0032	0.0029	0.0352	0.0130	0.0039
4	263.2198	216.7103	340.8117	159.7320	397.6231	167.3385	351.8221	235.8875	357.3660
5	0.0693	0.0797	0.0812	0.0915	0.0774	0.0833	0.1014	0.0956	0.0761
6	2.1785	0.7004	1.9604	0.2181	2.0436	0.6598	0.5426	0.2911	2.3502
7	0.7537	0.9276	0.7616	0.9742	0.7898	0.9247	0.9363	0.9669	0.7228
8	0.8099	0.8228	0.8476	0.9015	0.8448	0.8726	0.9302	0.9007	0.8343
9	4.3324	4.0102	4.1034	3.8318	4.1244	4.0220	3.6389	3.8593	4.1989
10	0.8488	0.8442	0.8438	0.7191	0.8595	0.8465	0.8258	0.7213	0.8362
11	3.4934	3.5969	3.6270	7.3575	3.1646	3.4903	4.0308	6.5769	3.8251
12	0.1608	0.1634	0.1556	0.0208	0.1933	0.1848	0.1667	0.1741	0.1496
13	0.9376	0.9358	0.9352	0.8686	0.9435	0.9377	0.9280	0.8826	0.9317
14	0.5139	0.5269	0.5274	0.8297	0.4864	0.5226	0.5779	0.8516	0.5477

	10	11	12	13	14	15	16	17	18
1	0.4980	0.4992	0.4995	0.4995	0.4987	0.5005	0.5032	0.5127	0.5016
2	122.5828	122.3469	124.0350	123.0220	121.7881	123.5134	105.3401	106.4670	124.4632
3	0.0175	0.0053	0.0030	0.0051	0.0026	0.0087	0.0314	0.0277	0.0039
4	263.3022	257.6192	196.8788	245.5706	256.3669	186.6743	440.2628	2.2329e+03	559.0563
5	0.0960	0.0842	0.1036	0.0945	0.0714	0.0959	0.1116	0.1038	0.0816
6	0.2641	0.6444	0.6512	1.1545	0.8864	0.1888	0.1421	1.2856	1.7829
7	0.9706	0.9109	0.9210	0.8867	0.8958	0.9780	0.9807	0.8255	0.7987
8	0.8995	0.8598	0.8594	0.8007	0.8390	0.9157	0.9325	0.8701	0.8574
9	3.8323	4.0190	3.7854	3.7299	4.2013	3.7535	3.5572	3.7880	4.0596
10	0.7815	0.7622	0.7090	0.8608	0.8230	0.7108	0.7211	0.5972	0.8318
11	5.3384	5.9734	7.6157	3.1691	4.1464	7.5797	6.1850	4.8580	3.9903
12	0.1029	0.0676	0.0269	0.1783	0.1501	0.0237	0.2514	0.6838	0.1279
13	0.9047	0.8933	0.8640	0.9434	0.9260	0.8646	0.8896	0.9133	0.9287
14	0.6878	0.7315	0.8558	0.4816	0.5839	0.8507	0.8609	1.1391	0.5575

	19	20	21	22	23	24	25	26	27
1	0.5012	0.4980	0.4964	0.4980	0.5001	0.4991	0.5001	0.5011	0.5006
2	90.7639	116.5680	114.3154	117.5350	122.9536	95.9949	119.0849	114.4156	115.6253
3	0.0096	0.0296	0.0375	0.0551	0.0186	0.0136	0.0069	0.0148	0.0240
4	379.2121	335.2663	194.9995	364.9125	255.6916	308.6994	176.8763	408.7520	387.0809
5	0.1766	0.1235	0.3413	0.1103	0.1036	0.1134	0.0879	0.0969	0.1048
6	0.4899	0.4541	0.3005	0.2642	1.1661	0.6093	0.9610	1.1670	0.7302
7	0.9352	0.9437	0.9591	0.9663	0.8670	0.9280	0.8812	0.8645	0.9191
8	0.9312	0.8876	0.9622	0.9349	0.9197	0.9346	0.8805	0.9032	0.9310
9	2.9826	3.5349	2.0413	3.5846	3.6802	3.5784	3.9525	3.7591	3.6027
10	0.6017	0.7805	0.7592	0.7227	0.7326	0.6359	0.7694	0.8263	0.8679
11	9.0134	5.1162	5.6071	6.5168	6.6324	7.8934	5.7557	3.5669	2.4050
12	0.2588	0.1710	0.1797	0.1792	0.0996	0.2965	0.0744	0.3144	0.2500
13	0.8390	0.9086	0.8999	0.8836	0.8816	0.8590	0.8972	0.9363	0.9571
14	1.1563	0.6992	0.7557	0.8488	0.8117	1.0767	0.7143	0.5875	0.4072

	28	29	30	31	32	33	34	35	36
1	0.4995	0.4970	0.4984	0.5028	0.5009	0.5009	0.5028	0.5009	0.5009
2	123.6424	123.5567	120.2873	106.0704	91.5442	91.5442	106.0704	91.5442	91.5442
3	0.0088	0.0080	0.0081	0.0090	0.0110	0.0110	0.0090	0.0110	0.0110
4	359.6075	251.8120	232.7020	268.2658	338.6234	338.6234	268.2658	338.6234	338.6234
5	0.1012	0.0982	0.0964	0.2775	0.3185	0.3185	0.2775	0.3185	0.3185
6	0.6412	0.7178	0.6000	0.3012	0.2941	0.2941	0.3012	0.2941	0.2941
7	0.9128	0.9022	0.9307	0.9610	0.9610	0.9610	0.9610	0.9610	0.9610
8	0.8411	0.8220	0.9065	0.9570	0.9517	0.9517	0.9570	0.9517	0.9517
9	3.8285	3.8400	3.7952	2.2987	2.0763	2.0763	2.2987	2.0763	2.0763
10	0.8149	0.7660	0.7992	0.6324	0.5648	0.5648	0.6324	0.5648	0.5648
11	4.3325	5.8893	4.8580	7.9820	8.7777	8.7777	7.9820	8.7777	8.7777
12	0.1535	0.0629	0.1107	0.2956	0.3782	0.3782	0.2956	0.3782	0.3782
13	0.9226	0.8948	0.9133	0.8575	0.8433	0.8433	0.8575	0.8433	0.8433
14	0.6059	0.7210	0.6426	1.0851	1.2513	1.2513	1.0851	1.2513	1.2513

**Figure-6.** These four figures of tables shows the comparison between GLCM features on energy, contrast, entropy, correlation coefficient, homogeneity.

## NEURAL NETWORK

Neural networks square measure prophetic models loosely supported the action of biological neurons. the choice of the name “neural network” was one in all the great PR achievements of the 20th Century. It definitely sounds a lot of exciting than a technical description like “A network of weighted, additive values with nonlinear transfer functions” [8]. However, despite the name, neural networks square measure off from “thinking machines” or “artificial brains”. A classic neural network may need 100 neurons. Neural network is that the best tool in recognition and discrimination between completely different sets of signals. to induce best results victimisation the neural network, it's necessary to decide on an appropriate design and learning formula. sadly there's no secured methodology to try and do that. the most effective thanks



to do this is to decide on what's expected to be appropriate in step with our previous expertise so to expand or shrink

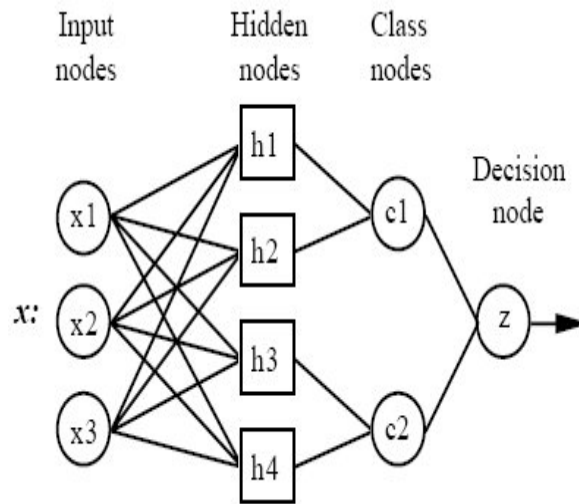


Figure-7. Neural network.

the neural network size until an affordable output is obtained

## RESULT AND DISCUSSIONS

The derivation of the PNN classifier was described. PNNs have been used for classification issues. The PNN classifier conferred sensible accuracy, terribly tiny coaching period of time, hardness to weight changes, and negligible grooming time. There are six stages concerned within the planned model that are ranging from the information input to output. The primary stage is ought to be the image process system. Essentially in image processing system, image acquisition and image improvement are the steps that have to be compelled to do. in this paper, these 2 steps are skipped and every one the photographs are collected from available resource. The planned model requires changing the image into a format capable of being manipulated by the pc. The adult male pictures are regenerate into matrices kind by victimisation MATLAB. Then, the PNN is employed for classification of the Skin Lesion pictures. Atlast, performance supported result obtained and analyzed at the tip of the event section.

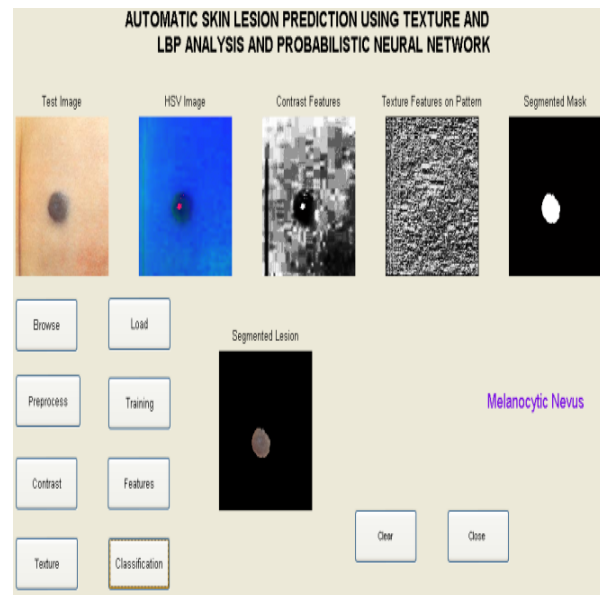


Figure-8. Skin is affected by Melanocytic nevus.

## Spatial Fuzzy C-mean Clustering

The segmentation specifies the method of partitioning a digital image into multiple divisions. The goal is to change and alter the representation of a picture into one thing that's additional meaningful and easier to research. The segmentation is performed by victimisation spacial fuzzy C suggests that agglomeration formula. it's AN unattended agglomeration formula that classifies the computer file points into different categories supported their inherent distance from one another. It includes the spatial perform to switch membership perform to get the correct result by analyzing native neighbourhood information.

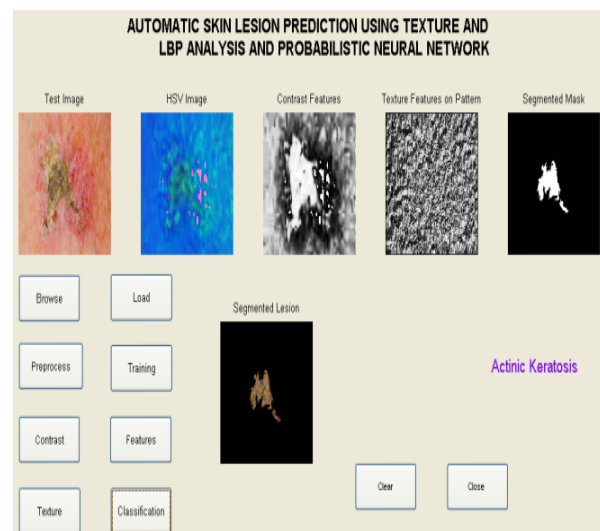
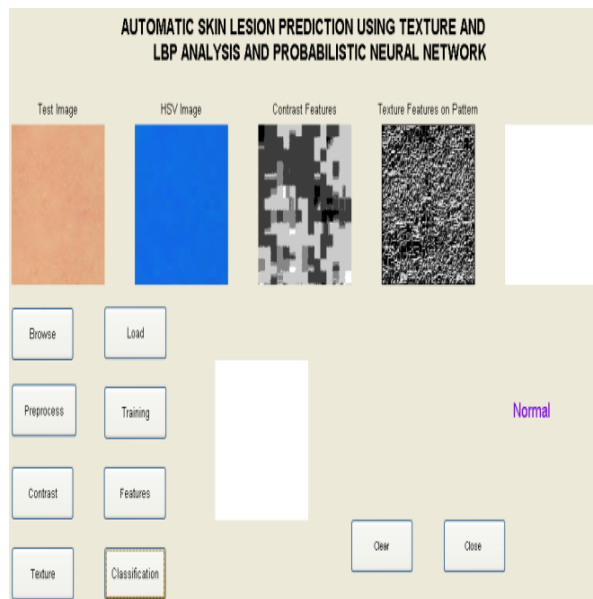
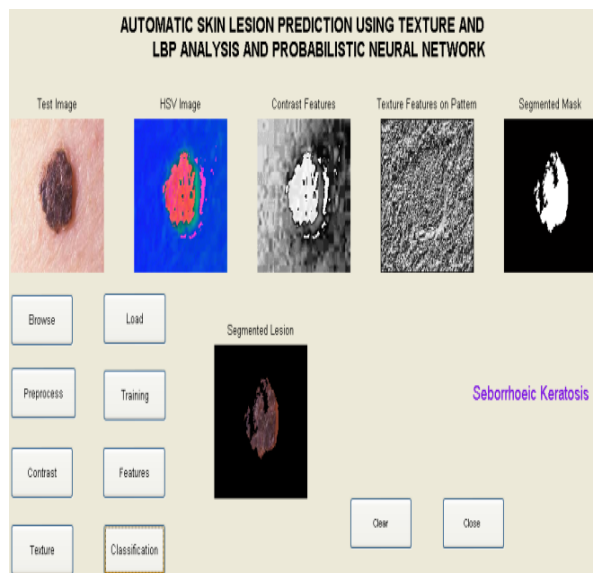


Figure-9. Skin is affected by Actinic Kurtosis.





**Figure-10.** Skin is normal.



**Figure-11.** Skin is affected by the skin Kurtosis.

## CONCLUSIONS

The project bestowed that the skin lesion prediction from camera pictures victimization hybrid spacial options and probabilistic neural network mechanically. Color and texture contents primarily based options were extracted from pictures to differentiate the abnormal skins either malignant {melanoma|skin cancer} or non melanoma skin. Here, at the side of the colour options and applied math options, discriminative sturdy native binary pattern has wont to extract the native texture and it's advantages that, invariant to native form and distinction changes of same objects. Probabilistic neural network is used here to classify take a look at image into traditional or abnormal supported supervised coaching. Its

coaching time is quick and low quality. Finally associate degree abnormal skin image was divided out exploitation fuzzy C-means cluster technique to notice lesion regions. The skin disorder designation network additional improved by introducing frequency domain primarily based options extraction and higher machine learning approach to increase the prediction accuracy.

## REFERENCES

- [1] M. E. Celebi, H. A. Kingravi, B. Uddin, H. Iyatomi, Y. A. Aslandogan, W. V. Stoecker and R. H. Moss. 2007. A methodological approach to the classification of dermoscopy images. *Comput. Med. Imag. Graph.* 31(6): 362-373.
- [2] S. W. Menzies, L. Bischof, H. Talbot *et al.* 2005. The performance of solar scan: An automated dermoscopy image analysis instrument for the diagnosis of primary melanoma. *Archives Dermatol.* 141(11): 1388-1396.
- [3] H. Iyatomi, H. Oka, M. E. Celebi, M. Hashimoto, M. Hagiwara, M. Tanaka and K. Ogawa. 2008. An improved internet-based melanoma screening system with dermatologist-like tumor area extraction algorithm. *Comput. Med. Imag. Graph.* 32(7): 566-579.
- [4] H. Ganster, P. Pinz, R. Rohrer, E. Wildling, M. Binder and H. Kittler. 2001. Automated melanoma recognition. *IEEE Trans. Med. Imag.* 20(3): 233-239.
- [5] R. P. Braun, H. S. Rabinovitz, M. Oliviero, A. W. Kopf, and J. H. Saurat. 2005. Dermoscopy of pigmented skin lesions. *J. Am. Acad. Dermatol.* 52(1): 109-121.
- [6] M. E. Celebi, W. V. Stoecker and R. H. Moss. 2011. Advances in skin cancer image analysis. *Computerized Medical Imaging and Graphics.* 35(2): 83-84.
- [7] I. Maglogiannis and C. N. Doukas. 2009. Overview of advanced computer vision systems for skin lesions characterization. *IEEE Transactions on Information Technology in Biomedicine.* 13(5): 721-733.
- [8] A. K. Jain, R. P. W. Duin, and J. Mao. 2000. Statistical pattern recognition: A review. *IEEE Trans. on PAMI.* 22(1): 4-37.
- [9] Ballerini, Lucia, Robert B. Fisher, Ben Aldridge and Jonathan Rees. 2012. Nonmelanoma skin lesion classification using colour image data in a hierarchical



K-NN classifier. 2012 9<sup>th</sup> IEEE International Symposium on Biomedical Imaging (ISBI).

- [10] Xianchuan Xu. 2009. Medical Image Retrieval Using Local Binary Patterns with Image Euclidean Distance. 2009 International Conference on Information Engineering and Computer Science.