



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: IV Month of publication: April 2019

DOI: <https://doi.org/10.22214/ijraset.2019.4507>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

Survey on Skin Disease Detection using Convolutional Neural Network

Puja

Department of Information Science Engineering, New Horizon College of Engineering Outer Ring Road, Marathalli, Bengaluru-560 103

Abstract: Skin diseases are very common in people’s daily life. Each year, millions of people are affected by all kinds of skin disorders. Diagnosis of skin diseases sometimes requires a high-level of expertise due to the variety of their visual aspects. As human judgment are often subjective and hardly reproducible, to achieve a more objective and reliable diagnosis, a computer aided diagnostic system should be considered. In this project , we investigate the feasibility of constructing a universal skin disease diagnosis system using deep convolutional neural network (CNN). The key part of architecture is a Convolution Neural Network that is trained on a skin disease image database. The dataset is obtained from skin disease database available openly HAM10000 dataset. Seven classes of diseases are predicted. It uses softmax layer of CNN for disease prediction. Our project can achieve as high as 90% accuracy. The accuracy can be further improved if more training images are used.

Keywords: Convolutional neural networks, Skin Disease, softmax layer, machine learning

I. INTRODUCTION

Skin diseases are one of the most commonly seen infections among people. Due to the disfigurement and associated hardships, skin disorders cause lots of trouble to the sufferers. Speaking of skin cancer, the facts and figures become more serious. In United States, skin cancer is the most common form of cancer. According to a 2012 statistics study, over 5.4 million cases of nonmelanoma skin cancer, including basal cell carcinoma and squamous cell carcinoma, are treated among more than 3.3 million people in America. In each year, the number of new cases of skin cancer is more than the number of the new incidence of cancers of the breast, prostate, lung and colon in combined. Research also shows that in the course of a lifetime one-fifth of Americans will develop a skin cancer. Skin diseases intend to be prevalent due to climatic as well as the living situation of the vast majority of people. Skin disease doesn’t just affect the skin. It can have a huge impact on a person’s day-to-day life, crush self confidence, restrict their movement, and lead to depression and even ruin relationships. So it is needed to take skin disease seriously. In the field of medical science there is a great demand for computer-aided tools to facilitate many tasks. Many things that were done manually using traditional equipment have been replaced with automated systems. Modern medical science is looking for solution which could assist the doctors with any aspect of work using the new technology. One of the common approaches used in this areas are digital Image processing and Data mining. Our proposed system enables user to recognize skin diseases and provide user advises or treatments in a shorter time period. We build our skin disease dataset from skin disease dataset HAM10000 dataset which is one of the largest photo dermatology source that is available publicly. At first we Pretrain CNN with VGG16/VGG19 models then extract features with CNN for the whole train set Each feature vector is of 4096. Classifies each skin into one of n classes: Specific skin disease sets and trains fully connected layers with skin images 7 classes of diseases are predicted. It uses softmax layer of CNN for prediction.

II. LITERATURE SURVEY

[1-52]

Sl No.	Title of the Paper	Authors	Month & Year	Observations
1	Dermatological Disease Detection using Image Processing and Neural Networks	Mrs S.Kalaiarasi, Harsh Kumar, Sourav Patra	April 2018	Dermatology, image Processing, Machine Learning.
2	Skin disease detection using artificial neural network	D.s Zingade, Manali Joshi, Viraj Spare, Rohan Giri	December 2017	Neural Network, image preprocessing, Back propogation, ANN algorithm.
3	Skin disease detection models	Nisha Yadav	March 2016	Image processing,

	using image processing	Virendra Kumar Narang Utpal shrivastava		segmentation and feature extraction. Classification model and skin disease prediction.
4	Skin disease classification using convolutional neural network	Simon Schafer , Christian LUudwigs	2018	Skin Disease Classification, Neural Networks.
5	An Intelligent System to diagnosis the skin disease	Manish Kumar and Rajiv Kumar	October 2016	Dermatology,KNN,active contour,ROI,contrast,mean value.
6	Texture based feature extraction for skin disease detection	-	November 2016	Skin disease, texture based feature extraction.
7	Detecting skin disease by accurate skin segmentation using various color spaces	Megha D. Tijare, Dr V.t Gaikwad	December 2018	Color spaces, feature extraction, image preprocessing, KNN,segmentation
8	Skin Disease Diagnosis System using Image processing and Data Mining	R.s gound,Priyank S.gadre,Jyoti B. Gaikwad,Priyanka K. Wagh	January 2018	Processing,Segmentation,Feature Extraction,Feature Classification
9	Digital Dermatology-Skin Disease Detection model Using Image Processing	Shashi Rekha G,Prof.H.Srinivasa Murthy,Dr.sudarson Jena	July 2018	Dermatology,Multivariate Statistical Analysis, Psoriasis, Acne,Melasma,Urticaria
10	Vitiligo detection techniques	Desai Bijal Paresbhai,Prof. Bhatt Bhumika	December 2017	Re-pigmentation,digital preprocessing,Melanin,Vitiligo
11	Automating Skin Disease Diagnosis Using Image Classification	Damilola A.Okuboyejo, Oludayo O.lugbara,Solomon A. Odunaik	October 2019 October 2013	Automated diagnosis, computational intelligence,medical imaging,remote health diagnosis, skin disease
12	An Innovative Approach For Skin Disease Detection Using Image Processing and Data Mining	Er.Shrinidhi Gindhi,Ansari Nausheen,Ansari Zoya,Shaikh Ruhin	April 2017	Image processing,Histogram,Vitiligo,Psoriasis
13	Classification Of Human Skin Diseases using Data Mining	Qusay Kanaan Kadhim	January 2017	Image Processing ,decision Tree
14	Machine Learning Approaches to Multi-Class nHuman Skin Disease Detection	Ms Seema Kolkar,Dr. D.r. Kalbande,dr. Vidya Kharkar		Machine Learning,Classification,Neural Network
15	Skin disease detection system for financially unstable people in developing countries	Rahat Yasir,Md Shariful Islam Nibir,Nova Ahmed	March 2015	Skin disease,Off the record,medical image processing,neural network, mobile computing,telemedicine
16	A Survey on Melanoma diagnosis using image processing and soft computing techniques	J.Premaladha,S.Sujitha ,M.Lakshmi Priya, K.S Ravichandran	2014	Image acquisition, preprocessing,segmentation, feature extraction, post processing, classification
17	A Survey of feature extraction in dermoscopy image analysis of skin cancer	Catarina Barata, M.Emre Celebi, and Jorge S. Marques	August 2015	Dermoscopy, CAD systems, skin cancer,melanoma ,feature extraction
18	Detection of malignant skin disease based on lesion segmentation	Kailas Tambe, G.Krishna Mohan	December 2018	Dermoscopy,skin lesion segmentation algorithm,texture distinctiveness
19	Surveys on detection of Melanoma through Image Processing techniques	Dr S.Mohan Kumar,Shwetha,Shreya Ranja,Sri Lakshmi Chundru,Vivek kumar, Prof. J.Karthiyayini	March 2018	Pre-processing ,segmentation, feature extraction ,melanoma classification, SVM network ,neural network, melanoma validation.
20	Prevalence of skin diseases in rural Kashmir:A Community	Mohammed Sarwar	August 2018	Prevalence, Community, skin disease

	based survey			
21	Epidemiology and prevalence of dermatological diseases among school children of Medak district.	Lakshmi Kumari Villa, Gopi Krishna	November 2015	Skin diseases, epidemiology, prevalence
22	Skin disease in Lambeth	J.N Rea, Muriel I. Newhouse, T. Halil	June 1976	Skin disease, Lambeth, prevalence
23	Prediction of skin diseases using data mining techniques	S.Reena Parvin, O.A Mohamed Jafar	July 2017	GLCM, Gaussian Filter, Multi SVM, K-NN, Naive Bayesian, K-Means
24	Human skin detection using RGB < HSV and YCbCr color models	S.Kolkur, D. Kalbande, P.Shimpi, C.Bapat, J.Jatakia	2017	Skin detection, color models, image processing, classifier
25	A survey of occupational skin disease in UK health care workers	K.M. Campion	December 2014	Alcohol Gel, hand washing, health care workers, moisturizers, occupational skin disease, soap
26	Skin disease diagnosis system using image processing	Ms.Poonam T.Handge, Ms.Arati S.Khalkar, MS. Kajal S.Randhe, Ms Pallvi G. Patil, Mr. Deepak Y.Thorat	Feb 2019	Preprocessing, segmentation, feature extraction, feature classification
27	A study on different techniques for skin cancer detection	Nikita Raut, Aayush Shah, Shail Vira, Harmit sampat	September 2018	Melanoma, skin cancer, soft computing, artificial intelligence, neural networks, accuracy
28	AN intelligent system for the diagnosis of skin cancer on digital images taken with dermoscopy	Heydy Castillejos- Fernandez, Omar Lopez- Ortega, Felix Castro Espinoza, Volodymyr Ponomaryav	2017	Segmentation: fuzzy logic, color detection, classification
29	Survey of data mining techniques used in healthcare domain	Sheenal Patel, Hardik Patel	March 2016	Data mining, health care, classification, clustering, association
30	Development of a mathematical model for skin disease prediction using response surface methodology	Sudha J, Aramudhan M, Kannan S	April 2017	Data mining, classification, regression, response surface methodology

A. Problem Statement

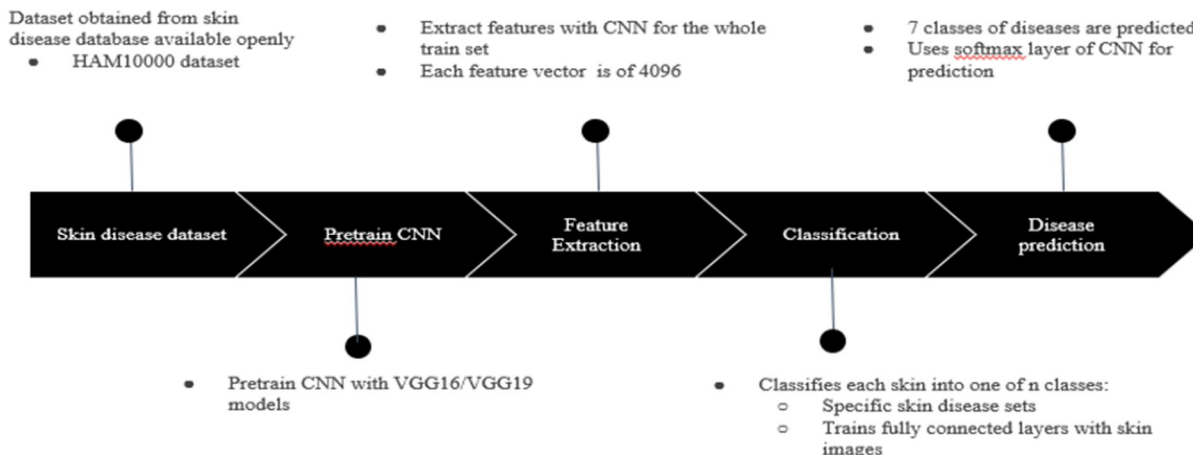
The objective of the project is to have a system that classifies skin diseases based on images with reliable accuracy with prediction, so as to use it as a computer aided diagnostic system. Have a promising accuracy that the system can be used. Generating a model that is efficient in computation power and loading time. The ultimate goal is to ease the doctors role in the detection of skin cancer by providing better and more reliable results, so that more patients can be correctly diagnosed.

B. Data Set

Training of neural networks for automated diagnosis of pigmented skin lesions is hampered by the small size and lack of diversity of available datasets of dermatoscopic images. We tackle this problem by releasing the HAM10000 (“Human Against Machine with 10000 training images”) dataset. We collected dermatoscopic images from different populations acquired and stored by different modalities. Given this diversity we had to apply different acquisition and cleaning methods and developed semi-automatic workflows utilizing specifically trained neural networks. The final dataset consists of 10015 dermatoscopic images which are released as a training set for academic machine learning purposes and are publicly available through the ISIC archive. This benchmark dataset can be used for machine learning and for comparisons with human experts. Cases include a representative collection of all important diagnostic categories in the realm of pigmented lesions. More than 50% of lesions have been confirmed by pathology, while the ground truth for the rest of the cases was either follow-up, expert consensus, or confirmation by in-vivo confocal microscopy.

III. METHODOLOGY

We build our skin disease dataset from skin disease dataset HAM10000 dataset which is one of the largest photo dermatology source that is available publicly. At first we Pretrain CNN with VGG16/VGG19 models then extract features with CNN for the whole train set Each feature vector is of 4096. Classifies each skin into one of n classes: Specific skin disease sets and trains fully connected layers with skin images 7 classes of diseases are predicted. It uses softmax layer of CNN for prediction



A. CNN Architecture

CNNs primarily focus on the basis that the input will be comprised of images. This focuses the architecture to be set up in way to best suit the need for dealing with the specific type of data. One of the key differences is that the neurons that the layers within the CNN are comprised of neurons organised into three dimensions, the spatial dimensionality of the input (height and the width) and the depth. The depth does not refer to the total number of layers within the ANN, but the third dimension of a activation volume. Unlike standard ANNs, the neurons within any given layer will only connect to a small region of the layer preceding it. CNNs are comprised of three types of layers. These are convolutional layers, pooling layers and fully-connected layers.

- 1) The input layer will hold the pixel values of the image.
- 2) The convolutional layer will determine the output of neurons of which are connected to local regions of the input through the calculation of the scalar product between their weights and the region connected to the input volume. The **rectified linear unit** (commonly shortened to ReLu) aims to apply
- 3) an 'elementwise' activation function such as sigmoid to the output of the activation produced by the previous layer.
- 4) The pooling layer will then simply perform downsampling along the spatial dimensionality of the given input, further reducing the number of parameters within that activation.

The fully-connected layers will then perform the same duties found in standard ANNs and attempt to produce class scores from the activations, to be used for classification. It is also suggested that ReLu may be used between these layers, as to improve performance.

B. Code & Implementation

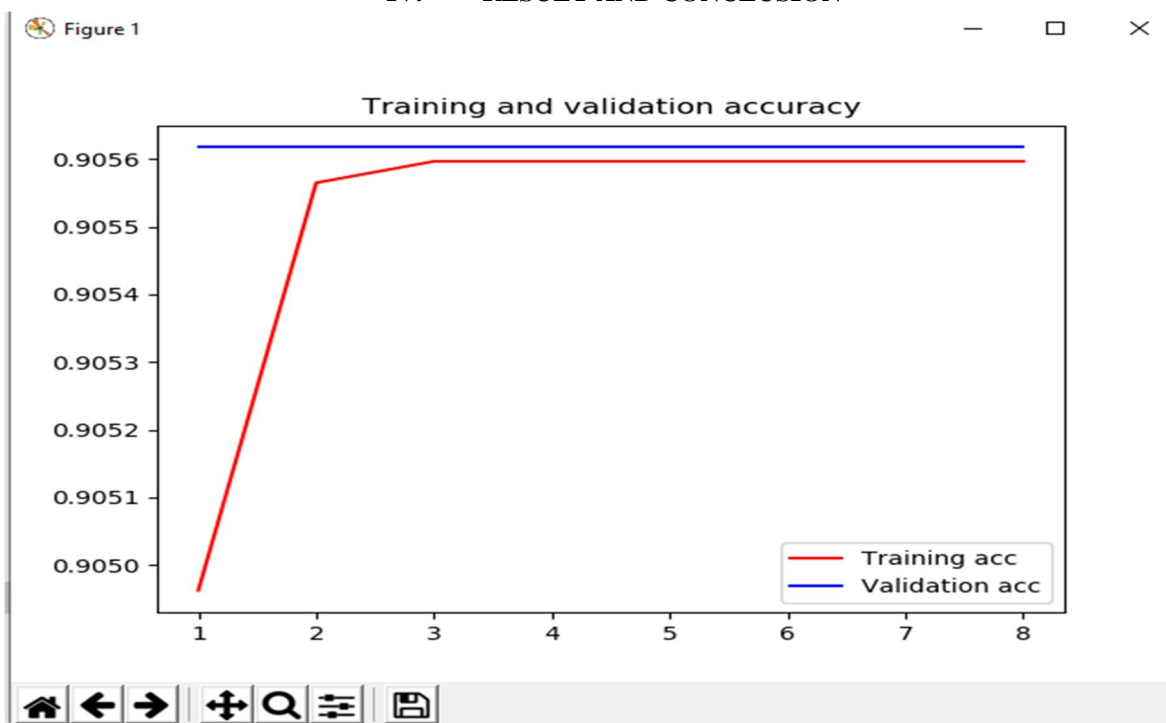
```
import tensorflow as tf
labs = list(set(y))
alt_num_labs_train = np.asarray([labs.index(i) for i in y_train])
alt_num_labs_val = np.asarray([labs.index(i) for i in y_val])
model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation=tf.nn.relu),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(7, activation=tf.nn.softmax)
])
adm = tf.keras.optimizers.Adam(lr=0.001, beta_1=0.9, beta_2=0.999, epsilon=None, decay=0.9, amsgrad=False)
model.compile(optimizer=adm,
              loss='sparse_categorical_crossentropy',
```

```

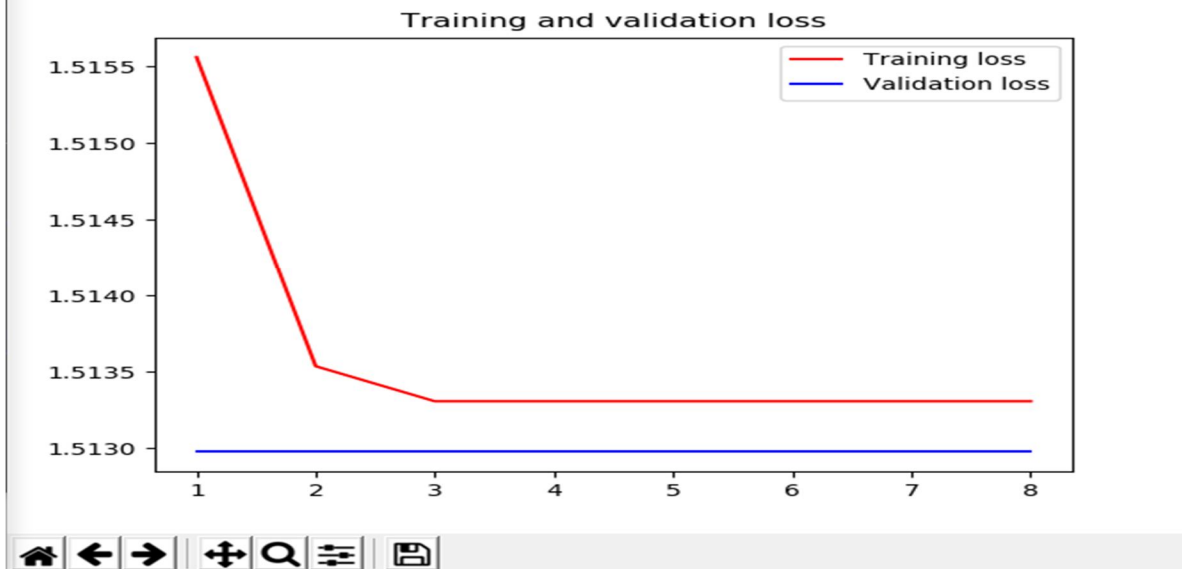
metrics=['accuracy'])
model.fit(train_features, alt_num_labs_train, epochs=1)
if not (os.path.exists("model_CNN_nonopt.h5")):
    model.fit(train_features, alt_num_labs_train, epochs=15)
    model.save_weights("model_CNN_nonopt.h5")
else:
    model.load_weights("model_CNN_nonopt.h5")
    eval_score = model.evaluate(val_features, alt_num_labs_val)
    print("Evaluation score (CNN non opt):", eval_score)
import matplotlib.pyplot as plt
acc = _history['acc']val_acc = _history['val_acc']
loss = _history['loss']
val_loss = _history['val_loss']
epochs = range(1, len(acc) + 1)
plt.title("Training and validation accuracy")
plt.plot(epochs, acc, 'red', label='Training acc')
plt.plot(epochs, val_acc, 'blue', label='Validation acc')
plt.legend()
plt.figure()
plt.title("Training and validation loss")
plt.plot(epochs, loss, 'red', label='Training loss')
plt.plot(epochs, val_loss, 'blue', label='Validation loss')
plt.legend()
plt.show()

```

IV. RESULT AND CONCLUSION



Screenshot 1: Training accuracy shows how the model learned out of the training data given. Testing accuracy shows how much the model is able to cope up with unknown data. Variation of them over epoch shows how its happening over each epoch and improving the learning.



Screenshot 2: Loss corresponds to the amount of information missed by the model in training and testing. The more it absorbs, the better the learning process.

V. CONCLUSIONS

Convolutional Neural Networks differ to other forms of Artificial Neural Network in that instead of focusing on the entirety of the problem domain, knowledge about the specific type of input is exploited. This in turn allows for a much simpler network architecture to be set up. Future work may include increasing the dataset size and trying this technique on greater number of images. Different machine learning algorithm will be investigated in order to improve the accuracy.

REFERENCES

- [1] Dr. Mohan Kumar S & Dr. Balakrishnan, Classification Of Breast Mass Classification – CAD System And Performance Evaluation Using SSNE, IJSET – International Journal of Innovative Science, Engineering & Technology, Vol. 2, Issue 9, 417-425, ISSN 2348 – 7968
- [2] Dr. Mohan Kumar S, Dr. Balakrishnan, Classification Of Breast Mass Classification – CAD System With Performance Evaluation, International Journal of Engineering And Computer Science, Volume 4, Issue 09, 14187-14193, ISSN 2319-7242, September, 2015
- [3] Dr. Mohan Kumar S, Dr. Balakrishnan, Classification Of Breast Microcalcification- CAD System And Performance Evaluation Using SSNE, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 9, 824-830, ISSN: 2277 128X, Sep-2015
- [4] Dr. Mohan Kumar S, Karthikayini, Essential Best Practices And Processes In Higher Educational Technical Institutions, International Journal Of Engineering Research And General Science, Volume 3, Issue 6, 231-236, ISSN 2091-2730 231, December, 2015
- [5] Dr. Mohan Kumar S, Karthikayini, LNW-A System Model For A High Quality Effective E-Learning Using Cloud Environs, International Journal of Current Research and Review, Volume 7, Issue 23, 21-25, ISSN: 0975-5241, December, 2015
- [6] Dr. Mohan Kumar S, Ayurveda Medicine Roles In Healthcare Medicine, And Ayurveda Towards Ayurinformatics, International Journal of Computer Science and Mobile Computing, Volume 4, Issue 12, 35-43, ISSN 2320-088X, December, 2015
- [7] Dr. Mohan Kumar S, Muralidhara, Importance Of Accreditation And Autonomous Status In HEI – An Assessment With Special Orientation To Karnataka State, International Journal of Engineering Sciences & Research Technology, Volume 5, Issue 1, 472-479, ISSN : 2277-9655, January, 2016
- [8] Dr. Mohan Kumar S, Interrelated Research Works And Importance Of Object Oriented Analysis And Modeling, International Journal of Engineering Sciences & Research Technology, Volume 5, Issue 1, Page Numbers:59-62, ISSN : 2277-9655, January, 2016
- [9] Dr.S Mohan Kumar, R.Jaya, A Survey On Medical Data Mining – Health Care Related Research And Challenges, International Journal of Current Research, Volume 8, Issue 01, Page Numbers; 25170-25173, ISSN:0975-833X, January, 2016
- [10] R.Jaya, Dr S Mohan Kumar, A Study On Data Mining Techniques, Methods, Tools And Applications In Various Industries, International Journal of Current Research & Review, Volume 8, Issue 04, Page Numbers:35-43, ISSN:0975-5241, January, 2016
- [11] Clara K, Dr S Mohan Kumar, Cyber Crime Variant Activities And Network Forensic Investigation, International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 04, Page Numbers: April 2016, ISSN:2250-2459, March, 2016,
- [12] Clara.K, Dr S Mohan Kumar, Exploratory Study Of Cyber Crimes, Digital Forensics And Its Tools, International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 04, Page Numbers: April 2016, ISSN:2250-2459, March, 2016
- [13] Revathi Y, Dr S Mohan Kumar, Efficient Implementation Using RM Method For Detecting Sensitive Data Leakage In Public Network International Journal of Modern Trends in Engineering and Research, Volume 3, Issue 04, Page Numbers: 515-518, ISSN (Online):2349-9745 ISSN (Print):2393-8161, April, 2016
- [14] Revathi Y, Dr S Mohan Kumar, Review On Importance And Advancement In Detecting Sensitive Data Leakage In Public Network, International Journal Of Engineering Research And General Science, Volume 4, Issue 02, Page Numbers:263-265, ISSN:2091-2730, April, 2016

- [15] Revathi Y, Dr S Mohan Kumar, A Survey On Detecting The Leakage Of Sensitive Data In Public Network International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 03, Page Numbers:234-236, January, 2016
- [16] Vandana CP, "Security improvement in IoT based on Software Defined Networking (SDN)".International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 1 ,Pages 291-295
- [17] Vandana cp,"Internet of Things and Security",International Journal of Computer Science and Mobile Computing ,Volume 5 ,Issue 1Pages 133-139 ,IJCSMC, Vol. 5, Issue. 1, January 2016
- [18] Vandana cp,Study of Resource Discovery trends in Internet of Things (IoT) ,Journal Int. J. Advanced Networking and Applications ,Volume 8,Issue 3 Pages 3084-3089
- [19] Vandana cp,IOT future in edge computing ,Journal International Journal of Advanced Engineering Research and Science Volume 3 ,Issue 12 , AI Publications
- [20] Sujithra ks,Baswaraju Swathi, sonia singh,Inclusive analysis of incomplete data sets using kNN search, International Journal of Innovative Research in Computer and Communication Engineering,
- [21] Subathra Muthuraman, Mrs Swathi Baswaraju, Mrs B Mounica, LARGE SCALE IMAGE RETRIEVAL USING DESCRIPTORS AND DISTANCE MEASURE, International Journal of Computer Science and Mobile Computing, Vol.4 Issue.5
- [22] Swathi Baswaraju, Balani Somesh, Shrestha Niza Barun-SURVEY ON HOME SECURITY SURVEILLANCE SYSTEM BASED ON WI-FI CONNECTIVITY USING RASPBERRY PI AND IOT MODULE, International Journal of Advanced Research in Computer Science . Mar/Apr2018, Vol. 9 Issue 2.
- [23] Mr.Dilish Babu.J, Dr.S Mohan Kumar, A Survey On Secure Communication In Public Network During Disaster , IJESRT -International Journal Of Engineering Sciences & Research Technology, Volume 5, Issue 3, Page Numbers:430-434, ISSN: 2277-9655, March 2016
- [24] Mr.Dilish Babu.J, Dr.S Mohan Kumar, Survey On Routing Algorithms During Emergency Crisis Based On MANET, IJETAE, International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 3, Page Numbers: 278-281, ISSN: 2250-2459, Mar-16
- [25] Mr.Dilish Babu.J, Dr.S Mohan Kumar, Emergency Communication Sysstem For Natural Disaster Using MANET, IJRDO, International Journal of Research and Development Organization, Volume 2, Issue 5, Page Numbers:01 to 10, ISSN:2456-1843, May, 2016
- [26] Ms.Sulochana Panigrahi, Dr S Mohan Kumar, Social Data Analysis Using Big-Data Analytic Technologies- Apache Flume, HDFS, HIVE, IJRDO, International Journal of Research and Development Organization, Volume 2, Issue 5, Page Numbers:16 to 21, ISSN:2456-1843, May, 2016
- [27] Ms.Sulochana Panigrahi, Dr S Mohan Kumar, Social Media Analysis Using Apache Flume, Hdffs, Hive, International Journal of Current Trends in Engineering & Technology, Volume 2, , Issue 2, Page Numbers:282 to 285, ISSN:2395-3152, March, 2016
- [28] Dr. V. ILANGO and Dr. S. Mohan Kumar, Factors For Improving The Research Publicatons And Quality Metrics International Journal of Civil Engineering & Technology (IJCIET) ISSN 0976-6308 and 0976-6316(Print&Online) Volume 8, Issue 4, 04-17,
- [29] Naga Raju Hari Manikyam and Dr. S .Mohan Kumar, Methods And Techniques To Deal With Big Data Analytics And Challenges In Cloud Computing Environment, International Journal of Civil Engineering & Technology (IJCIET), ISSN 0976-6308 and 0976-6316(Print&Online), Volume 8, Issue 4, 04-17,
- [30] V Karthik, Dr.S . Mohan Kumar and Ms. Karthikayini, A Novel Survey On Location Based Node Detection And Identifying The Malicious Activity Of Nodes In Sensor Networks International Journal of Civil Engineering & Technology, (IJCIET), ISSN 0976-6367 and 0976-6375(Print & Online), Volume 8,
- [31] Karthik V, Ms.Karthikayini, Dr S Mohan Kumar, Ms Gayathri T, Geocentric Based Node Detection And Revoking Malicious Node In WSN, International Journal for Science and Advance Research in Technology (IJSART), ISSN 2395-1052 (Print&Online), Volume 3, Issue 4, 04-17
- [32] Dr.S. Mohan Kumar and Dr G. Balakrishnan, Wavelet And Symmetric Stochastic Neighbor Embedding Based Computer Aided Analysis For Breast Cancer, Indian Journal of Science and Technology ISSN 0974-6846 and 0974-5645(Print&Online), Volume 9, Issue 47, 12-16
- [33] Sruthi Hiremath, Sheba Pari N and Dr.S. Mohan Kumar, Booster in High Dimensional Data Classification, (DOI: 10.15680/IJIRCCE.2017. 0503349), International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, Issue 3, March 2017, 5984-5989.
- [34] Dr S. Mohan Kumar & Dr.T.Kumanan, Skin Lesion Classification System and Dermoscopic Feature Analysis for Melanoma Recognition and Prevention, IJETAE, International Journal of Emerging Technology and Advanced Engineering, ISSN: 2250-2459 and Volume 7, Issue 7, July 2017,
- [35] Dr S. Mohan Kumar & DrJitendranathMungara, J. Karthikayini, Design and implementation of CNN for detecting Melanoma through image processing, International Journal for Research in Applied Science and Engineering Technology, ISSN : 2321 – 9653, Volume 6, Issue - 3, March – 2018 in (DOI : 10.22214) pp. No.: 2249-2253
- [36] Dr S. Mohan Kumar & J. Karthikayini, Surveys on Detection of Melanoma through image processing Techniques, International Journal for Research in applied science and Engineering Technology (IJRASET), ISSN : 2321 – 9653, volume 6, Issue III, March 2018 in IJRASET, DOI: 10.22214, pp. no.: 1699-1704
- [37] Dr S. Mohan Kumar, Automated Segmentation of retinal images, International Journal of Engineering and Technology, UAE, July 2018, International Journal of Engineering and Technology, UAE
- [38] Dr. S. Mohan Kumar & Anisha Rebinth, Automated detection of Retinal Defects using image mining, A review, European Journal of Biomedical and Pharmaceutical Sciences, European ISSN : 2349 – 8870, Volume 5 , Issue : 01 year : 2018, pp No.: 189 – 194
- [39] Dr. S. Mohan Kumar& Dr.T.Kumanan, Analysis on skin Lesion classification systems and Dermoscopic Feature Analysis for Melanoma International Journal for Research in Applied Science and Engineering Technology (IJRASET), ISSN : 2321 – 9653, Volume 6, Issue - 3, March – 2018 in (DOI : 10.22214), pp. no.:1971-78
- [40] Dr. S. Mohan Kumar & Dr.T.Kumanan, Study on skin Lesion Classifications system and Dermoscopic Feature Analysis for Melanoma, International journal of Creative Research Thoughts (IJCRT), IJCRT1802680, ISSN : 2320 – 2882, Volume 6, issue-1, March 2018, Page No . 1863 – 1873
- [41] Dr. S. Mohan Kumar & Dr.T.Kumanan, Classification System and Dermoscopic Features Analysis for Melanoma recognition and Prevention, International journal of Creative Research Thoughts (IJCRT), IJCRT1802680, ISSN : 2250 – 2459 , Volume 7 , Issue 8, August 2017 , pp no: 351 – 357
- [42] Dr. S. Mohan Kumar& Darpan Majumder, Healthcare Solution based on Machine Learning Applications in IOT and Edge Computing, International Journal of Pure and Applied Mathematics, ISSN: 1311-8080 (printed version) ISSN: 1314-3395 (on-line version) Jul 2018 issue.
- [43] Dr. S. Mohan Kumar, Ashika.A, A Survey on Big Data Analysis, Approaches and its Applications in the real World, Journal of Emerging Technologies and Innovative Research, ISSN: 2349-5162, May 2018 , Volume 5, Issue 5, pp. no.: 93-100



- [44] Shreya R, Sri Lakshmi Chandru, Vivek Kumar, Shwetha M, Dr. S. Mohan Kumar, Classification of Skin Cancer through image processing and implementating CAD System International journal of Creative Research Thoughts (IJCRT) IJCRT1802680m, ISSN : 2320 – 2882, Volume 6, issue-2 , April 2018 Page No . 1863 – 1873
- [45] S Mohan Kumar & Dr. Balakrishnan, Statistical Features Based Classification of Micro calcification in Digital Mammogram using Stochastic Neighbour Embedding, International Journal of Advanced Information Science and Technology, 2012, ISSN:2319-2682 Volume 07, Issue 07 , November 2012, Page Numbers: 20-26
- [46] S Mohan Kumar & Dr. Balakrishnan ,Breast Cancer Diagnostic system based on Discrete Wavelet Transformation and stochastic neighbour Embedding, European Journal of Scientific Research, 2012, ISSN:1450-216X ,Volume 87, Issue 03 , October 2012, Page Numbers: 301-310
- [47] S Mohan Kumar & Dr. Balakrishnan, Classification of Microcalcification in digital mammogram using SNE and KNN classifier, International Journal of Computer Applications - Conference Proceedings published in IJCA, 2013 ISBN: 973-93-80872-00-6, ICETT proceedings with IJCA on January 03,2013, Page Numbers: 05-09
- [48] S Mohan Kumar & Dr. Balakrishnan, Mutiresolution analysis for mass classification in Digital Mammogram using SNE, IEEE international Conference- ICCSP-13 organized by Athiparasakthi Engineering College, Chennai , 2013, ISBN:978-1-4673-4864-5, Page Numbers: 2041-2045.
- [49] S Mohan Kumar & Dr. Balakrishnan, Categorization of Benign And Malignant Digital Mammograms Using Mass Classification – SNE and DWT, Karpagam Journal of Computer Science, 2013, ISSN No: 0973-2926, Volume-07, Issue-04, June-July-2013, Numbers: 237-243.
- [50] S Mohan Kumar & Dr. Balakrishnan, Classification of Micro Calcification And Categorization Of Breast Abnormalities - Benign and Malignant In Digital Mammograms Using SNE And DWT, Karpagam Journal of Computer Science 2013, ISSN No: 0973-2926, Volume-07, Issue-05, July-Aug, 2013. Page Numbers: 253 to 259
- [51] S Mohan Kumar & Dr. Balakrishnan, The Performance Evaluation of the Breast Mass classification CAD System Based on DWT, SNE AND SVM , International Journal of Emerging Technology and Advanced Engineering, 2013, ISSN 2250–2459, Volume 3, Issue 10, October 2013, Page Numbers: 581-587
- [52] S Mohan Kumar & Dr. Balakrishnan ,The Performance Evaluation of the Breast Microcalcification CAD System Based on DWT, SNE AND SVM, CiiT International Journal of Digital Image Processing, 2013, Print: ISSN 0974 – 9691 & Online: ISSN 0974 – 9586, Issue-November 2013, Page Numbers / DOI: DIP112013005.



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)