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Comparative analysis of advanced Face Recognition Technique

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ABSTRACT: This project entitled “Comparative analysis of advanced Face Recognition Techniques”, it is based on fuzzy c means clustering and associated sub neural network. It deals with the face is a complex multidimensional visual model and developing a computational model for face recognition is difficult. In this paper, it represents a method for face recognition based on parallel neural networks. Neural networks (NNs) have been widely used in various fields. However, the computing efficiency decreases rapidly if the scale of the NN increases. In this paper, a new method of face recognition based on fuzzy clustering and parallel NNs is proposed. The face patterns are divided into several small-scale neural networks based on fuzzy clustering and they are combined to obtain the recognition result. The facial feature vector was compared by PCA and LDA methods. In particular, the proposed method achieved 98.75% recognition accuracy for 240 patterns of 20 registrants and a 99.58% rejection rate for 240 patterns of 20 non-registrants. Experimental results show that the performance of our new face-recognition method is better than those of the LDA based face recognition system.

1. Introduction

This project entitled “**Comparative Analysis of advanced Face Recognition Techniques**”, it is based on fuzzy c means clustering and associated sub neural network. It deals with the face recognition plays an important role in many applications such as building/store access control, suspect identification, and surveillance. Over the past 30 years, many different face-recognition techniques have been proposed, motivated by the increased number of real-world applications requiring the recognition of human faces. There are several problems that make automatic face recognition a very difficult task. The face image of a person input to a face-recognition system is usually acquired under different conditions from those of the face image of the same person in the database.

Therefore, it is important that the automatic face-recognition system be able to cope with numerous variations of images of the same face. The image variations are mostly due to changes in the following parameters: pose, illumination, expression, age, disguise, facial hair, glasses, and background. In many pattern-recognition systems, the statistical approach is frequently used. Neural-network (NN)-based paradigms, as new means of implementing various classifiers based on statistical and structural approaches have been proven to possess many advantages for classification because of their learning ability and good generalization. Generally speaking, multilayered networks (MLNs), usually coupled with the back propagation (BP) algorithm, are most widely used for face recognition. As one drawback of the BP algorithm, when the scale of the NN increases, the computing efficiency decreases rapidly for various reasons, such as the appearance of a local minimum. The HCM is the most well-known conventional (hard) clustering method. The HCM algorithm executes a sharp classification, in which each object is either assigned to a cluster or not. Because the HCM restricts each point of a data set to exactly one cluster and the individuals belonging to each cluster are not overlapped, some similar individuals cannot be assigned to the same cluster, and, hence, they are not learned or recognized in the same NN. In this paper, fuzzy c-means (FCM)



is used. In contrast to HCM, the application of fuzzy sets in a Classification function causes the class membership to become a relative one and an object can belong to several clusters at the same time but to different degrees. FCM produces the idea of uncertainty of belonging described by a membership function, and it enables an individual to belong to several networks. Then, all similar patterns can be thoroughly learned and recognized in one NN.

II. PREPROCESSING

Lighting Compensation:

We adjusted the locations of the lamps to change the lighting conditions. The total energy of an image is the sum of the squares of the intensity values. The average energy of all the face images in the database is calculated. Then, each face image is normalized to have energy equal to the average energy $\text{Energy} = \sum (\text{Intensity})^2$.

Facial-Region Extraction:

The method of detecting and extracting the facial features in a grayscale image is divided into two stages. First, the possible human eye regions are detected by testing all the valley regions in an image. A pair of eye candidates is selected by means of the genetic algorithm to form a possible face candidate. In our method, a square block is used to represent the detected face region. Fig. shows an example of a selected face region based on the location of an eye pair. The relationships between the eye pair and the face size are defined as follows:

$$h_{\text{face}} = 1.8d_{\text{eye}}$$

$$h_{\text{eye}} = \frac{1}{5} h_{\text{face}}$$

$$w_{\text{eye}} = 0.225 h_{\text{face}}$$

Then, the symmetrical measure of the face is calculated. The nose centerline (the perpendicular bisector of the line linking the two eyes) in each facial image is calculated. The difference between the left half and right half from the nose centerline of a face region should be small due to its symmetry.

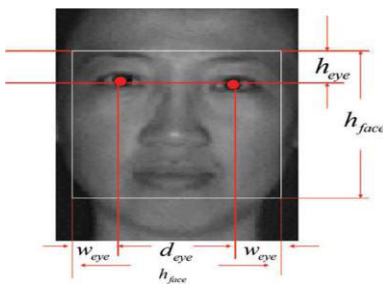


Fig. Geometry of our head model

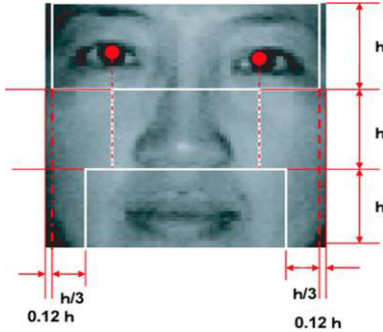


Fig. Windows for facial feature extraction.

a threshold value, the face candidate will be selected for further verification. The facial feature regions will exhibit a low value on the projection. A face region is divided into three parts, each of which contains the respective facial features. The projection is the average of ray-level intensities along each row of pixels in a window. In order to reduce the effect of the background in a face region, only the white windows, as shown in Fig. are considered in computing the projections. The top window should contain the eyebrows and the eyes, the middle window should contain the nose, and the bottom window should contain the mouth.

This method is called the Linear Discriminant Analysis. Here the low-energy discriminant features of the face are used to classify the images.

The transformation matrix W for the LDA is given by the eigenvectors corresponding to the largest eigenvalues of the scatter matrix function ($SW^{-1} \cdot SB$), where SW is the within-class scatter matrix and SB is the between-class scatter matrix. These scatter matrices are defined as: $SB = \sum C N_i (ClasAvg_i - AvgFace) (ClasAvg_i - AvgFace)^T$
 $SW = \sum C \sum X_i (x_k - ClasAvg_i) (x_k - ClasAvg_i)^T$
 where, C is the number of distinct classes, N_i is the number of images for each class i , $ClasAvg_i$ is the average face image of faces in class i , X_i represents the face images that are in class i , $AvgFace$ is the average face image for all images in the dataset.

The steps involved in implementing the algorithm are: Training the Faces:

1. Represent the faces in the database in terms of the vector X .
 2. Compute the average face $AvgFace$ and subtract the $AvgFace$ from the vector X .
 3. Classify the images based on the number of unique subjects involved. So the number of classes, C , will be the number of subjects who have been imaged.
 4. Compute the scatter matrix
 5. Use PCA to reduce the dimension of the feature space to $N - C$. Let the eigenvectors Obtained be $WPCA$.
 6. Project the scatter matrices onto this basis to obtain non-singular scatter matrices SWN and SBN .
 7. Compute the generalized eigenvectors of the non-singular scatter matrices SWN and SBN so as to satisfy the equation $SB \cdot WLDA = SW \cdot WLDA \cdot D$, where D is the eigenvalue. Retain only the $C-1$ eigenvectors corresponding to the $C-1$ largest eigenvalues. This gives the basis vector $WLDA$
 8. Then the image vector X is projected onto this basis vector and the weights of the image are computed.
- Recognition of a new face is done similar to that of the PCA method. Then the Euclidean measure is used as the similarity measure to determine the closest match for the test image with the face in the trained database.



III. IMPLEMENTATION

1. FUZZY MEANS CLUSTERING:

In fuzzy clustering each point has a degree of belonging to clusters, as in fuzzy logic, rather than belonging completely to just one cluster. For each point x we have a coefficient giving the degree of being in the k^{th} cluster $\mu_k(x)$. Usually, the sum of those coefficients for any given x is defined to be 1:

$$\forall x \sum_{k=1}^{\text{num-cluster}} \mu_k(x) = 1$$

With fuzzy c -means, the centroid of a cluster is the mean of all points, weighted by their degree of belonging to the cluster:

$$\text{Center}_k = \frac{\sum_x \mu_k(x)^m x}{\sum_x \mu_k(x)^m}$$

The degree of belonging is related to the inverse of the distance to the cluster center:

$$\mu_k(x) = \frac{1}{d(\text{center}_k, x)}$$

Then the coefficients are normalized and fuzzyfied with a real parameter $m > 1$ so that their sum is 1. So

$$\mu_k(x) = \frac{1}{\sum_j \left(\frac{d(\text{center}_k, x)}{d(\text{center}_j, x)} \right)^{2/(m-1)}}$$

For m equal to 2, this is equivalent to normalizing the coefficient linearly to make their sum 1. When m is close to 1, then cluster center closest to the point is given much more weight than the others, and the algorithm is similar to k -means.

The fuzzy c -means algorithm is very similar to the k -means algorithm:

- Choose a number of clusters
- Assign randomly to each point coefficients for being in the clusters.

Repeat until the algorithm has converged (that is, the coefficients' change between two iterations is no more than ϵ , the given sensitivity threshold):

- 1) Compute the centroid for each cluster, using the formula above.
 - 2) For each point, compute its coefficients of being in the clusters, using the formula above.
- The algorithm minimizes intra-cluster variance as well, but has the same problems as k -means; the minimum is a local minimum, and the results depend on the initial choice of weights. It has better convergence properties and is in general preferred to fuzzy- c -means.

2. Parallel NNs:

The parallel NNs are composed of three-layer BPNNs. A connected NN with 32 input neurons and six output neurons have been simulated (six individuals are permitted to belong to each subnet). The number of hidden units was selected by six fold cross validation from 6 to 300 units. The algorithm added three nodes to the growing network once.



i. Learning Algorithm:

A standard pattern (average pattern) is obtained from 12 patterns per registrant. Based on the FCM algorithm, 20 standard patterns are divided into several clusters. Similar patterns in one cluster are entered into one subnet. Then, 12 patterns of a registrant are entered into the input layer of the NN to which the registrant belongs.

ii Recognition Algorithm:

When a test pattern is input into the parallel NNs, as illustrated in Fig. 5, based on the outputs in each subnet and the similarity values, the final result can be obtained as follows.

Step 1. Exclusion by the negation ability of NN. First, all the registrants are regarded as candidates. If the maximum output values are less than the threshold value, corresponding candidates are deleted. The threshold value is set to 0.5, which is determined based on the maximum output value of the patterns of the nonregistrant.

Step 2. Exclusion by the negation ability of parallel NNs. Among the candidates remaining after Step 1, the candidate that has been excluded in one subnet will be deleted from other subnets. If all the candidates are excluded in this step, this test pattern is judged as a nonregistrant.

Step 3. Judgment by the similarity method. If some candidates remain after Step 2, then, the similarity measure is used for judgment. The similarity value between the patterns of each remaining candidate and the test pattern is calculated. The candidate having the greatest similarity value is regarded as the final answer.

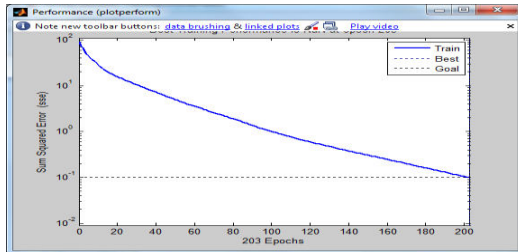
Table: SUBNETS AFTER PARTIAL UNIFICATION

Cluster	Cluster member
Cluster1	15 16 17 2 11 14
Cluster2	13 5 14 18 12 19
Cluster3	20 10 6 7 11 8
Cluster4	1 12 18 17 19 2
Cluster5	4 3 8 11 5 6
Cluster6	2 19 16 17 14 12
Cluster7	9 6 10 7 3 8

IV.EXPERIMENTS

This paper was analyzed depending upon the time and performance. The face was identified by PCA and LDA method. The table 4.1 shows the result of the performance and time analysis.

s.no	Method	Performance	Time
1	PCA	98.9	2.9287
2	LDA	98.3	3.1353



Performance output of PCA

V. CONCLUSION

This project proposed a fuzzy clustering and parallel NNs method for face recognition by using PCA and LDA method. The patterns are divided into several small-scale subnets based on FCM. Due to the negation ability of NN and parallel NNs, some candidates are excluded. The similarities between the remaining candidates and the test patterns are calculated. It judged the candidate with the greatest similarity to be the final answer when the similarity value was above the threshold value. Otherwise, it was judged to be nonregistered. This project was compared with LDA and PCA method, and it was analyzed. The result of this analysis is, the PCA method is better than the LDA.

REFERENCES

- [1] Kalaiprasath, R; Elankavi, R; Udayakumar, R; , Cloud security and compliance-a semantic approach in end to end security, International Journal on Smart Sensing and Intelligent Systems, V-10, I-5, PP:482-494, 2017.
- [2] Elankavi, R; Kalaiprasath, R; Udayakumar, R; , Wireless Zigbee Network Cluster-Capacity Calculation and Secure Data Conveyance Using Indegree, International Journal on Smart Sensing and Intelligent Systems, V-10, I-5, PP:174-185, 2017.
- [3] Kalaiprasath, R; Elankavi, R; Udayakumar, R; , A New Approach for Cloud Data Security: From Single to Cloud-of-Clouds, International Journal on Smart Sensing and Intelligent Systems, V-10, I-5, PP:604-613, 2017.
- [4] Elankavi, R; Kalaiprasath, R; Udayakumar, R; , Data Mining with Big Data Revolution Hybrid, International Journal on Smart Sensing and Intelligent Systems, V-10, I-5, PP:560-573, 2017.
- [5] Elankavi, R; Kalaiprasath, R; Udayakumar, Dr R; , A fast clustering algorithm for high-dimensional data, International Journal Of Civil Engineering And Technology (Ijciect), V-8, I-5, PP:1220-1227, 2017.
- [6] Gajmal, Yogesh M; Udayakumar, R; , Blockchain-based access control and data sharing mechanism in cloud decentralized storage system, Journal of web

engineering, PP:1359–1388-1359–1388, 2021.

- [7] Gajmal, Yogesh M; Udayakumar, R; , A Bibliometric Analysis of Authentication based Access Control in Cloud using Blockchain, Library Philosophy and Practice, PP:0_1-16, 2021.
- [8] Shirke, S; Udayakumar, R; , Robust lane identification by using EW-CSA based DCNN, J. of Critical Reviews, V-6, PP:18-21, 2019.
- [9] Subhash, Ligade Sunil; Udayakumar, R; , A BIG SHARK ADAPTION ALGORITHM BASED RESOURCE ALLOTMENT APPROACH IN CLOUD COMPUTING ENVIRONMENT, PalArch's Journal of Archaeology of Egypt/Egyptology, V-17, I-7, PP:5374-5379, 2020.
- [10] Gajmal, Yogesh M; Udayakumar, R; , Privacy and utility-assisted data protection strategy for secure data sharing and retrieval in cloud system, Information Security Journal: A Global Perspective, V-31, I-4, PP:451-465, 2022.
- [11] Gajmal, Yogesh M; Udayakumar, R; , Analysis of Authentication based Data Access Control Systems in Cloud, PalArch's Journal of Archaeology of Egypt/Egyptology, V-17, I-7, PP:5319-5328, 2020.
- [12] Shirke, Suvarna; Udayakumar, R; , Evaluation of crow search algorithm (CSA) for optimization in discrete applications, 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), PP:584-589, 2019.
- [13] Shirke, Suvarna; Udayakumar, Ramanathan; , A novel region-based iterative seed method for the detection of multiple lanes, International Journal of Image and Data Fusion, V-11, I-1, PP:57-76, 2020.
- [14] Shirke, Suvarna; Udayakumar, R; , Fusion model based on entropy by using optimized DCNN and iterative seed for multilane detection, Evolutionary Intelligence, PP:449-40, 2022.
- [15] Shirke, Suvarna; Udayakumar, R; , Hybrid optimisation dependent deep belief network for lane detection, Journal of Experimental & Theoretical Artificial Intelligence, V-34, I-2, PP:175-187, 2022.
- [16] Subhash, Ligade Sunil; Udayakumar, R; , Sunflower whale optimization algorithm for resource allocation strategy in cloud computing platform, Wireless

Personal Communications, V-116, PP:3061-3080, 2021.

- [17] Subhash, Ligade Sunil; Udayakumar, R; , A Supremacy–Responsive Resource Distribution Technique for Controlled Workflow Implementation in Cloud Surroundings, Solid State Technology, V-63, I-5, PP:7662-7669, 2020.
- [18] Sindhu, Velagapudi Swapna; Lakshmi, Kavuri Jaya; Tangellamudi, Ameya Sanjanita; Lakshmi, C; , A Deep Learning Approach For Detecting Type 2 Diabetes Mellitus, 2022 International Conference on Computer Communication and Informatics (ICCCI), PP:44936, 2022.
- [19] Priyan, Siluvayan; Udayakumar, R; Mala, Pitschaikani; Prabha, Mariappan; Ghosh, Ananya; , A sustainable dual-channel inventory model with trapezoidal fuzzy demand and energy consumption, Cleaner Engineering and Technology, V-6, PP:100400, 2022.
- [20] Elankavi, R; Kalaiprasath, R; Udayakumar, R; , Potential Exploitation of Broadcasting System Using Multiple Smart Directional Antennas-Help of Sensor Network, International Journal of Mechanical Engineering and Technology (IJMET), V-8, I-6, PP:678-687, 2017.
- [21] Udayakumar, R; Kalam, Muhammad Abul; , Sentiment Analysis Using Machine Learning Algorithms, Mathematical Statistician and Engineering Applications, V-71, I-3s2, PP:1186–1200-1186–1200, 2022.
- [22] GAJMAL, YOGESH M; UDAYAKUMAR, R; , Data Access Controls in Cloud: A Survey., International Journal of Pharmaceutical Research (09752366), V-12, I-4, 2020.
- [23] Udayakumar, R; Khanaa, V; Kaliyamurthie, KP; , Optical ring architecture performance evaluation using ordinary receiver, Indian Journal of Science and Technology, V-6, I-6, PP:4742-4747, 2013.
- [24] Udayakumar, R; Khanaa, V; Kaliyamurthie, KP; , Performance analysis of resilient fth architecture with protection mechanism, Indian Journal of Science and Technology, V-6, I-6, PP:4737-4741, 2013.
- [25] Udayakumar, R; Khanaa, V; Saravanan, T; , Synthesis and structural characterization of thin films of sno2 prepared by spray pyrolysis technique, Indian Journal of Science and Technology, V-6, I-S6, PP:4754-7, 2013.
- [26] Udayakumar, R; Khanaa, V; , Health

monitoring system for induction motors, Int. J. Eng. Comput. Sci, V-2, I-4, PP:1117-1122, 2013.

- [27] Udayakumar, R; Khanaa, V; , Quantum Computers-A Revolution In Computing, Quantum, V-8, I-4, PP:33-36, 2013.
- [28] Khanaa, V; Udayakumar, R; , Protecting privacy when disclosing information: k anonymity and its enforcement through suppression, database, V-1, I-2, 2012.
- [29] Khanaa, V; Udayakumar, R; , Hybrid Fuzzy Approches for Networks, International Journal of Innovative Research in science, Engineering and Technology, V-12, I-3, PP:24-31, 2012.
- [30] Udayakumar, R; Khanaa, V; Saravanan, T; Saritha, G; , Cross layer optimization for wireless network (WIMAX), Middle-East Journal of Scientific Research, V-16, I-12, PP:2013, 2012.
- [31] Udayakumar, R; Thooyamani, KP; Khanaa, V; , Coarse-Grained Parallel Genetical Gorithm to Solve the Shortest Path Routing Problem Using Genetic Operators, Middle-East Journal of Scientific Research, V-15, I-12, PP:1651-1654, 2013.
- [32] Khanaa, V; Udayakumar, R; , Efficient Pc Controlled By Hand Movement Using Mems Sensor Mouse, Indian Journal of science and Technology, V-12, I-6, PP:1438-1442, 2012.
- [33] Udayakumar, R; Khanaa, V; , Sixth Sense Technology, International Journal Of Engineering And Computer Science, V-2, I-4, 2013.
- [34] Udayakumar, R; Thooyamani, KP; Khanaa, V; , Secure Incentive Protocol for Multi-Hop Wireless Network with Limited Use of Public Key Cryptography, Middle-East Journal of Scientific Research, V-20, I-11, PP:1651-1656, 2014.
- [35] Udayakumar, R; Kaliyamurthie, KP; Khanaa, TK; , Data mining a boon: Predictive system for university topper women in academia, World Applied Sciences Journal, V-29, I-14, PP:86-90, 2014.
- [36] Udayakumar, R; Saravanan, T; , Tailored Image District Processing Precision Andwritten Appreciation, Middle-East Journal of Scientific Research, V-20, I-11, PP:1615-1625, 2014.



- [37] Udayakumar, R; Thooyamani, KP; , Khanaa, R; , Deploying site-to-site VPN connectivity: MPLS Vs IPSec, World Applied Sciences Journal, V-29, I-14, 2014.
- [38] Udayakumar, R; Thooyamani, KP; , Random projection based data perturbation using geometric transformation, World Applied Sciences Journal, V-29, I-1, PP:24-31, 2014.
- [39] Thooyamani, KP; Khanaa, V; Udayakumar, R; , Wide area wireless networks-IETF, Middle-East Journal of Scientific Research, V-20, I-12, PP:2042-2046, 2014.
- [40] Khanaa, V; Thooyamani, KP; Udayakumar, R; , Modelling Cloud Storage, World Applied Sciences Journal, V-29, 2014.
- [41] Khanaa, V; Thooyamani, KP; Udayakumar, R; , Elliptic curve cryptography using in multicast network, World Applied Sciences Journal, V-29, 2014.
- [42] Khanaa, V; Thooyamani, KP; Udayakumar, R; , Two factor authentication using mobile phones, World Applied Sciences Journal, V-29, I-14, PP:208-213, 2014.
- [43] Khanaa, V; Thooyamani, KP; Udayakumar, R; , Patient monitoring in gene ontology with words computing using SOM, World Applied Sciences Journal, V-29, 2014.
- [44] Kaliyamurthie, KP; Parameswari, D; Udayakumar, R; , Malicious packet loss during routing misbehavior-identification, Middle-East Journal of Scientific Research, V-20, I-11, PP:1413-1416, 2014.
- [45] Udayakumar, R; Saritha, G; Saravanan, T; , Modelling and Simulation of Electromechanical Systems Working with Nonlinear Frictional Loads and Controlled by Subordinated Control System of Coordinates, Middle-East Journal of Scientific Research, V-20, I-12, PP:1918-1923, 2014.
- [46] Saravanan, T; Saritha, G; Udayakumar, R; , Cassette Steganography for Entrenched Metaphors in Squashed Videos, Middle-East Journal of Scientific Research, V-20, I-12, PP:2475-2478, 2014.
- [47] Udayakumar, R; Khanaa, V; Saravanan, T; , Energy Demand Management Motor Control Using Multilevel Inverter, Middle-East Journal of Scientific Research, V-20, I-12, PP:2613-2619, 2014.

- [48] Thooyamani, KP; Khanaa, V; Udayakumar, R; , Wireless cellular communication using 100 nanometers spintronics device based VLSI, Middle-East Journal of Scientific Research, V-20, I-12, PP:2037-2041, 2014.
- [49] Saravanan, T; Srinivasan, V; Udayakumar, R; , Images segmentation via Gradient watershed hierarchies and Fast region merging, Middle-EastJournal of Scientific Research, ISSN, V-9233, I-15, PP:12, 2012.
- [50] Saravanan, T; Srinivasan, V; Udayakumar, R; , Image Segmentation via Gradient Watershed Hierarchies and Fast Region Merging, Middle-East Journal of Scientific Research, V-15, I-12, PP:1680-1683, 2013.
- [51] Udayakumar, R; Khanaa, V; , Quantum Computers-A Revolution InComputing, Quantum, V-8, I-4, PP:33-36, 2013.
- [52] Khanaa, V; Udayakumar, R; , Hybrid Fuzzy Approches for Networks, International Journal of Innovative Research in science, Engineering and Technology, V-12, I-3, PP:24-31, 2012.
- [53] Khanaa, V; Udayakumar, R; , Efficient Pc Controlled By Hand Movement Using Mems Sensor Mouse, Indian Journal of science and Technology, V-12, I-6, PP:1438-1442, 2012.
- [54] Udayakumar, R; Thooyamani, KP; Khanaa, V; , Secure Incentive Protocol for Multi-Hop Wireless Network with Limited Use of Public Key Cryptography, Middle-East Journal of Scientific Research, V-20, I-11, PP:1651-1656, 2014.
- [55] Kalaiprasath, R; Elankavi, R; Udayakumar, R; , A New Approach for Cloud Data Security: From Single to Cloud-of-Clouds, International Journal on Smart Sensing and Intelligent Systems, V-10, I-5, PP:604-613, 2017.
- [56] Udayakumar, R; Saravanan, T; , Tailored Image District Processing Precision Andwritten Appreciation, Middle-East Journal of Scientific Research, V-20, I-11, PP:1615-1625, 2014.
- [57] R., Kalaiprasath; R., Elankavi; R., Udayakumar; , Cloud Information Accountability (CIA) framework ensuring accountability of data in cloud and security in end to end process in cloud terminology, International Journal of Civil Engineering and Technology, V-8, I-4, PP:376-385, 2017.
- [58] R., Kalaiprasath; R., Elankavi; R., Udayakumar; , Cloud computing security towards end to end terminology, International Journal of Pure and Applied Mathematics, V-115, I-8 Special Issue, PP:637-641, 2017.
- [59] R., Elankavi; R., Kalaiprasath; R., Udayakumar; , Potential exploitation of broadcasting system using multiple smart directional antennas -help of sensor network, International Journal of Mechanical Engineering and Technology, V-8, I-6, PP:678-687, 2017.
- [60] R., Elankavi; R., Kalaiprasath; R., Udayakumar; , A fast clustering algorithm for high-dimensional data, International Journal of Civil Engineering and Technology, V-8, I-5, PP:1220-1227, 2017.
- [61] Kalaiprasath, R; Elankavi, R; Udayakumar, R; , Integrating Multiple Smart Directional Antennas for Full Potential Exploitation of Broadcasting System, International Journal of Science and Research, V-5, I-1, PP:1398-1403, 2016.
- [62] Udayakumar, R; , Media Cloud: An Open Cloud Computing Middleware for Content Management, Journal of Chemical and Pharmaceutical Sciences, V-5, I-2, PP:382-395, 2012.

- [63] Udayakumar, R; , A modified collage steganography using modified fuzzy C-means algorithm on images, International Journal of Innovative Research in Computer and Communication Engineering, V-7, I-1, PP:83-89, 2012.
- [64] Udayakumar, R; , Computer Simulation of Polyamidoamine Dendrimers and Their Complexes with Cisplatin Molecules in Water Environment, Computer Simulation, V-2, I-4, 2014.
- [65] Thooyamani, KP; Udayakumar, R; , A Study on Fraud Detection Techniques: Credit Card, Journal of Computer Science and Applications, V-9, I-9, PP:1398-1403, 2007.
- [66] Rao, Kanamarlapudi Venkata Srinivasa; Udayakumar, Ramanathan; Khanaa, Velu; , An Efficient Authentication Method For Smart Card Verification In Online, Advances in Science, Technology and Engineering Systems Journal V, V-2, I-4, PP:133-138, 2017.
- [67] Udayakumar, R; Khanaa, V; Saravanan, T; , Energy Demand Management Motor Control Using Multilevel Inverter, Middle-East Journal of Scientific Research, V-20, I-12, PP:2613-2619, 2014.
- [68] Kaliyamurthie, KP; Udayakumar, R; , The Relationship between Semaphores and Telephony Using Saros, EUROSIAN JOURNAL OF SCIENCE AND TECHNOLOGY, V-7, I-1, PP:77-89, 2020.
- [69] Subhash, Ligade Sunil; Udayakumar, R; , A BIG SHARK ADAPTION ALGORITHM BASED RESOURCE ALLOTMENT APPROACH IN CLOUD COMPUTING ENVIRONMENT, PalArch's Journal of Archaeology of Egypt/Egyptology, V-17, I-7, PP:5374-5379, 2020.
- [70] Subhash, Ligade Sunil; Udayakumar, R; , A Supremacy–Responsive Resource Distribution Technique for Controlled Workflow Implementation in Cloud Surroundings, Solid State Technology, V-63, I-5, PP:7662-7669, 2020.
- [71] Udayakumar, R; Khanaa, KP Kaliyamurthie; Geo, AV Allin; , Heterogenous Patterns in Database Using Mining, , 2014.
- [72] Udayakumar, R; , INFLUENCE OF WAR IN THE WORKS OF GEORGE ORWELL AND HAROLD PINTER, European Journal of Molecular & Clinical Medicine, V-7, I-3, PP:4902-4905, 2020.
- [73] Udayakumar, Rajangam; Prema, Durairaj; Kamaraj, Malaiyandi; , ANTIMICROBIAL ACTIVITY OF ETHANOLIC RHIZOME EXTRACT OF CURCUMA AMADA ROXB.(MANGO GINGER), , 2015.
- [74] Udayakumar, R; Kalam, Muhammad Abul; , Sentiment Analysis Using Machine Learning Algorithms, Mathematical Statistician and Engineering Applications, V-71, I-3s2, PP:1186–1200-1186–1200, 2022.
- [75] GAJMAL, YOGESH M; UDAYAKUMAR, R; , Data Access Controls in Cloud: A Survey., International Journal of Pharmaceutical Research (09752366), V-12, I-4, 2020.
- [76] Kothari, Kesar M; Udayakumar, R; Karthikeyan, Ram; Raj, Nikitha; , Modeling of the Manifold Configuration for Maximum Efficiency in a Hydraulic Machine, International Journal of Fluid Machinery and Systems, V-13, I-1, PP:136-149, 2020.
- [77] Udayakumar, R; Shah, Vivek J; Venkatesh, Sai Vijay; , Performance and Emission Characteristics of Biodiesel from Rapeseed and Soybean in CI Engine, Intelligent Manufacturing and Energy Sustainability: Proceedings of ICIMES 2019, PP:209-219, 2020.



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