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Research Article

Intensified Image Retrivel System :Non-Linear Mutation Based Genetic Algorithm

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Abstract:

Globally, increasing amount of websites and data bases leads to utilization of enormous image data used in the system. The users interact with the images which are downloaded, stocked, uploaded and transmitting the data on regularly. Conversely, searching the particular images within the huge files and websites is the daunting problem. Traditionally, manual searching is not only time consuming but also less accurate process. Moreover, it requires the assistance of expertise for the image searching mechanism. To resolve the issue, an efficient IRS (Image Retrieval System) is needed for the users to automate the searching process. To address the issue, several conventional model attempted to achieve efficient IRS. However, existing researches limited in accuracy and speed. To overcome the limitations, proposed model utilized non-linear mutation updation based GA (Genetic Algorithm) for Reddit based IRS on eight classes. The GA is used for the capability of global optimization, parallelism and greater set of solution space. Nevertheless, it is sort by limited drawbacks such as unguided mutation, local extremum and convergence. To resolve the issue, non-linear mutation updation is added in the GA technique to improve the IRS efficiency. Moreover, VGG-16 algorithm is utilized for the feature extraction method to extract significant features from the data. Correspondingly, input data is acquired from the popular website called reddit which allows the users to upload and share images with the own post and comments of the users. The data is extracted through the API mechanism with the specific hashtag content. The performance of the proposed model is calculated using performance metrics in order to evaluate the IRS efficacy. Moreover, internal comparison is processed in the respective research to reveals the better efficiency of the proposed model.

1. Introduction

In the modern world, growth of websites and databases has become exponential as it become primary medium for sharing images and diverse data. The propagation of websites led to extraordinary development of databases which stock and arrange huge varieties of digital images [1]. Significantly, reddit is the prevalent social media website where the users can contribute in the deliberations, share the content and learn the extensive varieties of subjects. However, enhanced development of digital images on the internet presents a significant challenge for the user to search for the specific images. Besides, classifying and organizing the huge set of images poses a challenge for the users. Therefore, manual image retrieval has several notable disadvantages such as time consuming, can be prone to human error, limited search capabilities and can depend on human expertise [2]. To address the challenges, researches utilized an AI (Artificial Intelligence) based technology for the purpose of generating the efficient IRS. The advancement in AI utilizes a DL (Deep Learning) and ML (Machine Learning) to qualify the enhancement of algorithms to classify images into diverse classes. Moreover, AI technology automatically classify the images into specific category based on the content provided by the user such as colours, patterns, text, etc. Correspondingly, progressions in the IRS such as content based IRS permits the users to search images

in terms of textual explanations or tags which delivers an efficient ways to retrieve images [3].
Accordingly, several conventional researches attempted to attain better IRS with the AI based technology. For instance, in the conventional model, CNN aided system has been designed for the aurora based image retrieval system. It is intensive on the aurora image data which has been taken on the ASI (All Sky Imagers). To attain this, mask RCNN technique has been used in the traditional approach. The experimental outcome signifies better efficiency of the classical model [4]. Similarly, grasshopper based IRS has been constructed with the CNN based framework for image retrieval mechanism. Here, CNN has been used to extract features from the data. Further, particle swarm optimization algorithm and genetic algorithm has been used to manage complex problems. Lastly, grasshopper optimization technique has been used to IRS [5]. In the same way, IRS based system has been constructed using the triplet deep metric learning method. To attain this, CNN based model has been used for the retrieval function. The images used in the classical approach has been based on the remote sensing data. The better efficiency of the traditional IRS model has been identified through the outcome [6]. Accordingly, numerous exiting techniques attempted to attain effective IRS. Nevertheless, lacks in few significant factors such as accuracy and efficiency. Moreover, reddit based IRS is inadequate in the traditional researches.
To resolve the issue, proposed model utilized a particular set of procedures to enhance the efficiency in IRS. Initially, images are extracted from the reddit website with the API technique where the API are loaded in the system. Then. Top trending hashtags are taken and processed to acquire particular 8 classes of images such as bus, cat, city, dog, earth, jallikattu, moon and nature. These images are stored in the system for the IRS process. Correspondingly, input data is loaded in the proposed system. Further, it is pre-processed to prepare the data in terms of proposed IRS. Then, feature extraction is carried out with VGG-16 NN model to extract the important features in the images for improving the IRS performance. Lastly, IRS is processed with non-linear mutation updation based GA technique where the images are classified on the basis of eight classes. The efficacy of the classification is calculated using the performance metrics to evaluate the effectiveness of the proposed IRS. The figure.1 represents the methodology used in the proposed model. The figure 1 signifies the overview of the proposed model. Correspondingly, major contribution of the proposed method is signified in the following:

- To employ non-linear mutation updation based GA technique for IRS to enhance the accuracy.

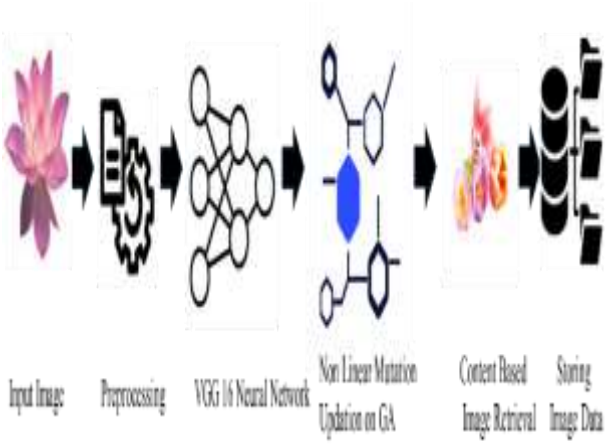

Figure 1. *Methodology of the Presented System*

- To apply VGG-16 for feature extraction to improve the accuracy of proposed IRS.
- To analyse the efficiency of the respective model with performance metrics to evaluate the efficiency of the proposed model.
- To examine the respective research efficiency with internal comparison with the performance metrics.

Paper Organisation

The paper is organised into five sections, the section 2 examines the classical works on IRS model with different approach. The section 3 signifies the methodology of the proposed approach. Consecutively the section. 4 depicts and examines the outcome attained by proposed method and lastly the section 5 describes the conclusion of the proposed model.

Review of Literature

The conventional researches on the image retrieval with ML (Machine Learning) and DL (Deep Learning) is signified in the section.
In the existing model, CNN based architecture has been utilized for the sketch based IRS with semantic re-ranking technique. Further, it has deployed method with two CNN to connect the domain gap among the natural images and sketches semantics. Besides, category similarity measurement mechanism has been used to associate the class relationship among the two images. To attain this, SBIR dataset has been used in the respective model. The experimental outcome signifies the better efficiency of the traditional approach [7].Similarly, multi-layer entropy guided pooling based dense CNN features has been used for the IRS called

REMAP. Then, novel system has been used to ensemble of numerous resolution in the region based features that has been calculated through KL (Kullback –Leibler) divergence. It has been utilized to manage the aggregation mechanism. Moreover, relative entropy guided aggregation that functions conventional CNN in terms of aggregation such as MAC, RMAC, Fisher vector, etc. The efficiency of the traditional mechanism has been identified through the results [8]. Correspondingly, IRS has been designed for the medical images. To accomplish this, deep belief CNN feature representation has been implanted in the classical approach. Primarily, pre-processing has been used to evade the noise with MF (Median Filter). Then the features has been signified using DB-CNN (Deep Belief Convolutional Neural Network). Moreover, image features has been transformed into the binary codes which is followed by the computation of similarity measurement with modified hamming distance. Lastly, retrieval of images has been focused on the relationship values [9].

Likewise, deep convolutional features has been used for the image retrieval. It has been used the pre-trained CNN for the image classification to shape image classification. The experimental outcome represents the better efficacy of the classification with better accuracy [10]. In the same way, image retrieval on terms of relevance feedback in the content has been built in the existing mechanism. To attain this, CNN based model has been used in the classical model. Besides, dataset utilized in the classical model has been comprised of three types such as Caltech, flower dataset and SUN-397 dataset. The experimental results mentions the better efficiency of the conventional model [11]. Consistently, RSIR (Remote Sensing Image Retrieval) system has been used in the traditional model for the remote sensing image retrieval system. Primarily in the existing method, image visual features are encoded where the encoded features are converted into the textual description which condense the image with caption content. This textural description has been used in the query data and archived data, further retrieve the related data to the query data. The outcome of the classical model depicts better efficiency in the image retrieval [12]. Correspondingly, multi sensor based indoor global localization model with combining visual localization has been designed in the traditional model. To achieve this, it utilized CNN based architecture with probabilistic localization method. Besides, classical model comprises of three parts such as fine localization, coarse place recognition and re-localization from kidnapping. The experimental outcome represents the better performance of the traditional model with better accuracy [13].

Similarly, DBN (Deep Belief network) aided method has been designed in the conventional model for the process of image retrieval. The DL based method has been used for the feature extraction and classification method. The performance of the existing method has been tested through stimulation. The efficiency of the classical approach has been understand through the experimental results with the accuracy of 98.6% for 1000 images and 96% for greater than 1000 images [14]. Consistently, IRS has been processed through the visual saliency system. Primarily, in the traditional model, saliency map has been produced through the combination of direction, color and saliency map. Further, image pattern has been recognized through the saliency map with multi feature fusion paradigm of image data. Besides, to tackle the complexity issue, existing method used two stage method such as classification through cognitive level of complexity and cognitive load aided complexity function. The outcome of the classification signifies the better efficacy [15]. In the same way, DFHN (Deep Fuzzy Hashing Network) based architecture has been used for the image retrieval system. It concatenates DNN based model and fuzzy logic method to improve the classification performance. The classification outcome depicts the better efficacy of the existing method [16].

Correspondingly, multilabel remote sensing IRS has been designed in the conventional mechanism. Moreover, FCN (Fully Convolutional layer) has been utilized to identify segmentation map of the every data. Furthermore, feature extraction has been carried out using RS dataset which comprises of pixel based problems. The outcome of the conventional system depicts better efficacy in image retrieval method [17]. Likewise, content based IRS has been designed in the existing approach. To attain this, it has used two types of feature extraction techniques such as ORB (Oriented Fast and Rotated BRIEF) and SIFT (Scale Invariant Feature Transform). It has been processed with two publicly available dataset such as corel database and wang database. The outcome of the classification represents better efficiency with accuracy value of 86.20% [18].

Problem Identification

- Accuracy is the important metric to determine the overall correct predictions in the system. However, it has been lacked in the classical models [14, 18].
- Several traditional models focused on the IRS on various sectors. Nevertheless, reddit based IRShas been inadequate in the existing researches [12, 16].

2. Material and Methods

Proposed Methodology

In the digital era, images are used widely for various factors where enormous images are stored and shared in the website and other databases. However, searching of particular images in the huge file is the significant challenge for the users. Since traditional image searching is the time invasive, can be error prone and less accurate, several researches utilized DL and ML based model for the IRS. Conversely, existing methods limited through accuracy and efficiency. To resolve the problem, proposed method used the particular set of procedures for the Reddit based IRS. The figure 2 signifies the basic flow of the respective research.

The figure 2 represents the general flow of the function used in the proposed model. It is identified the significant model of the proposed IRS comprises of three major mechanism such as data generation, image extraction and content based IRS. It signifies the precise projection of the image extraction used in the proposed model. The detailed illustration of the respective mechanism is illustrated in the following subsections. Correspondingly, the figure 3 signifies design flow of the respective research. The figure 3 represents the methodological flow of the respective IRS mechanism. From the figure 4, it is identified that the proposed model comprises of the data collection, pre-processing, feature extraction, non-linear mutation updation on GA and image retrieval. The detailed description of the projected IRS is depicted in the following subsections.

2.1 Data Collection

The input data utilized for the proposed model is the images taken from popular website called Reddit. It is processed through the API mechanism that are generated through the particular set of top trending hashtags. Accordingly, 8 classes of images are extracted such as bus, cat, city, dog, earth, jallikattu, moon and nature. These set of images are stored for the IRS in the respective research. Correspondingly, extracted images from the reddit website are loaded in the respective system.

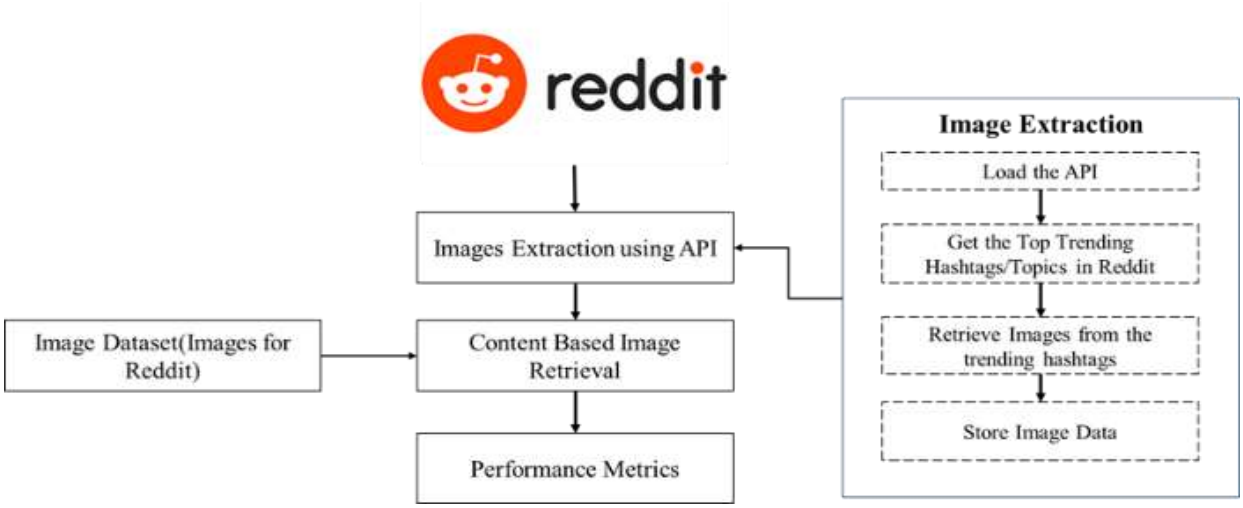

Figure 2. *Basic Flow of the Presented System*

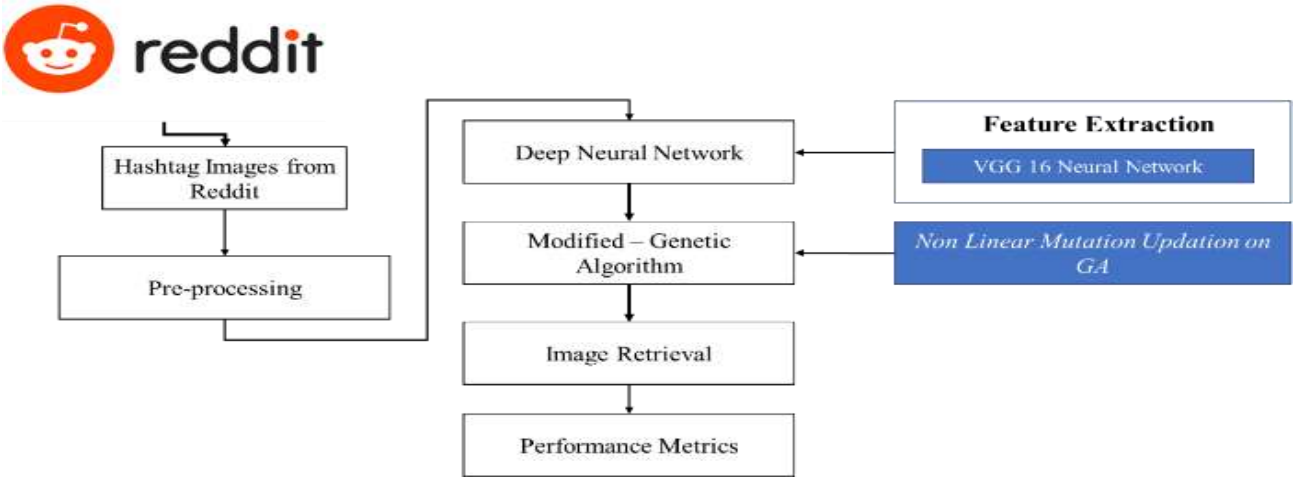

Figure 3. *Design Flow of the Presented Model*

2.2 Pre-Processing

Researches utilize the pre-processing technique to enhance the IRS accuracy. It prepares the images data in terms of efficient retrieval. It minimizes unwanted and irrelevant features from the images which affects the retrieval mechanism. The presented research used the pre-processing model to improve the accuracy and reliability of the IRS.

2.3 Feature Extraction: VGG 16 Neural Network

The feature extraction is used to extract the important features from the data in order to boost the IRS performance. The proposed model utilized the VGG16 Neural network for the feature extraction mechanism. Here, input is the processed with the attention technique.

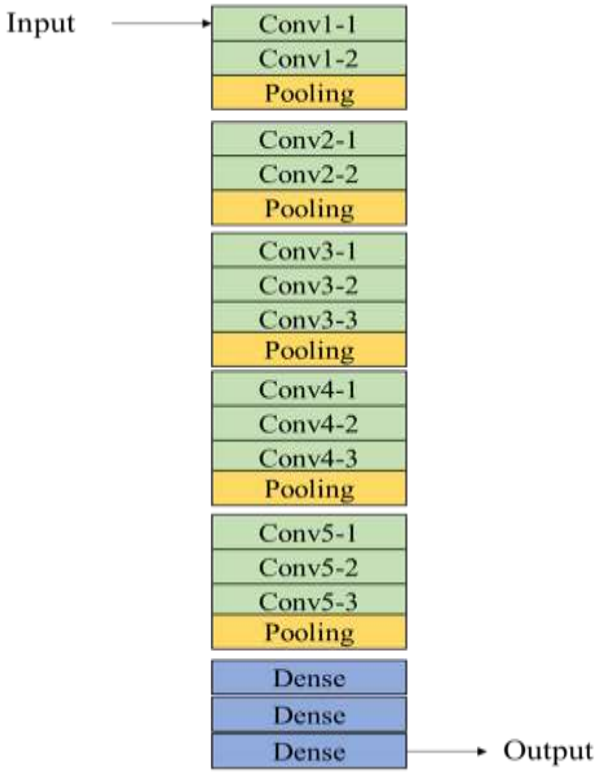

Figure 4. *VGG 16 Neural Network Model*

Let $A = (x_1, x_2 \ldots x_n)$ be the input which is the pre-processed data. Further, input data is functioned with the attention model. Accordingly, attention method take the significant features and highlight on the basis of the IRS. This mechanism improves the efficiency of the proposed IRS. Accordingly, attention process is calculated in the system in terms of three metrics such as values, keys and queries. Here, values is represented as V, keys is signified as k and queries is denoted as Q. The metric used for the attention function is processed as the linear model which is illustrated in equation (1) and (2).

$$Q, K, V = Linear(A) \quad (1)$$

$$\mathrm{A_{attention}} = \mathrm{Attention\ (Q, K, V)} \quad (2)$$

Correspondingly, VCG 16 neural network uses the technique of layer normalization and residual connection for the matrix function. It is the dimension consistent function and process the hidden layer in the standard normal distribution operation which is illustrated in equation (3) and (4). This mechanism boosts the convergence and speed of IRS.

$$\mathrm{A_{attention}} = \mathrm{A} + \mathrm{A_{attention}} \quad (3)$$

$$A_{attention} = LayerNorm\ (A_{attention}) \quad (4)$$

Consistently, residual connection is functioned with layer normalization mechanism for the purpose of finding last context vector in the system. The process of the extraction in hidden and attention and feature extracting mechanism is represented in the equation (5) (6) and (7).

$$A_{hidden} = A_{hidden} + A_{attention} \quad (5)$$

$$\text{Feature} = A + VGG\ (CONV(X)) \quad (6)$$

$$z = c + Linear(Feature) \quad (7)$$

The data from the feature extraction is further processed in the IRS with modified genetic algorithm.

2.4 IRS: Modified – Genetic Algorithm

The feature extracted images from the VGG-A6 model is fed to the IRS with GA based classification model. The GA is the widely used ML based technique for the classification mechanisms. It is used for the capability of constrained and unconstrained optimization problems. Moreover, it have various advantages for classification such as global optimization, parallelism and greater set of solution space. However, it have few limitations such as computational complexity, parameter sensitivity and handling of constraints. To tackle the issue, non-linear mutation updation is added in the GA technique. Accordingly, the function of IRS is processed with GA where non-linear mutation updation is carryout to boost the IRS. Considering a vector for the variables used in the system $Y = (Y_v, v \in V)$. The variable are indexed through the set which is signified as $V = \{1,2 \ldots . Q\}$. Correspondingly, every Y_v has the finite set attributes I_v with $|I_v|$ levels. Hence, resultant factor can be represented in a p-dimensional eventuality table that are signified in the equation (8).

$$I = Y\ I_{\ v\in V} \tag{8}$$

Whereas I depicts the amount of image features $i = (\ i_v, v \in V)$ and$i_D = (\ i_v, v \in D)$. Hence, amount of features process on the basis of multinomial dispersal system. Besides, prospects of features are designed through the classified linear method.

The conditional independence among the variables signified as Y_v that are functioned with graph $= (V, E)$. Moreover, it is processed with edge and vertex. The vertex is depicted as V and edge is signified as E, where $E \subseteq V\ X\ V$. Furthermore, a random variables are collected with the related graph G for any triple of disjoint sets(A, B, S) which is signified in equation (9),

$$Y_A \parallel Y_B \mid Y_S \tag{9}$$

The amount of free set of factors in the proposed method where k can be denoted in equation (10)

$$K = -1 + \sum_{c\epsilon c} |I_c| - \sum_{s\epsilon s}\ v(s)|I_s| \tag{10}$$

Since, the graphical model uses the adjacency matrices instead of strings '0' and '1'. An undirected graph $G = (V, E)$ with $|V| = p$ is represented as $Q \times Q$ matrix. Where$A = \left(a_{ij}\right) a_{ij} = 1$. Consider a graph G_1 with the vertices $Vertices\ V = \{\ a, b, c, d\}$ and with the cliques$G_1 = \{abc, bcd\}$. The figure 5 signifies the proposed IRS model with non-linear mutation updation with GA.

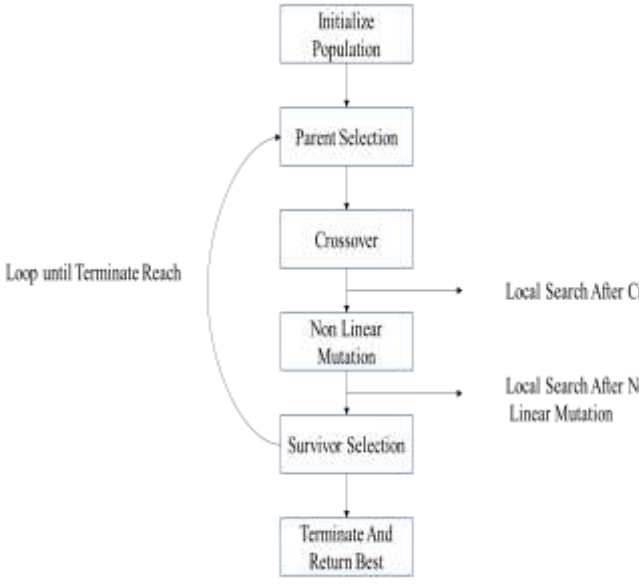

Figure 5. *Proposed Image Retrieval Technique*

The figure 5 represents the process of IRS with non-linear mutation updation on GA. Consequently, respective system uses penalty factor to calculate fitness function and to preclude process after choosing a method by excessive preventable edges. Hence the penalty$-klog(N + \alpha)$, where k is the number of free factors.

For the implementation of GLGA in the high-dimensional setting, the algorithms are used to the appropriate model. Hence, Bayes function is used which is the proportion of subsequent possibilities. Generally, it is used in function selection to relate the IRS. After relating IRS, G by means of equivalent possibility, the Bayes function is processed with the ratio of the regularizing factor of constants which is deprived in equation (11),

$$BF\ G_a, G_b = \frac{IG_a\ (t+s, N+\propto)}{IG_b\ (t+s, N+\propto)} \tag{11}$$

When the system starts to modify the alteration amount linearly, step-by-step consistent with the overall amount of generations, also with the amount of the present generation. When calculating the rates of mutation in ILM/DHC, which is deprived in equation (12), (13) and (14):

$$MR = \frac{LG}{GN} \tag{12}$$

$$BF\ G_a, G_b = MR \tag{13}$$

$$M = MR * popsize \tag{14}$$

In the equation (14), MR represents the rate of features for specific IRS, GN signifies the whole generation value, LG the sum of generation level. Accordingly, M depicts the amount of images that is essential towards IRS "popsize" is population size. Simultaneously, Equations (15) and (16) modifies the IRS rate linearly, gradually consistent with the total amount of generations, then the amount of the present generation. The calculate IRS rates is processed in the following equation (16) and (17).

$$CR = 1 - \frac{LG}{GN} \tag{16}$$

$$C = CR * popsize \tag{17}$$

where CR is the rate of IRS, and C is the amount of features that essential for the IRS procedure.

Correspondingly, efficiency of the proposed mechanisms is calculated with the performance metrics. Further, it is evaluated in the testing phase with the unknown data.

3. Results and Discussions

The section analysis the outcomes attained by the proposed method. It represents EDA, performance metrics, experimental outcomes and comparative analysis of the presented model with existing methods.

Figure 6. *Image Data used in the Presented IRS*

Figure 7. *Image Data used In the Respective IRS*

Figure 8. *Image Data used In the Proposed IRS*

3.1 EDA (Exploratory Data Analysis)

The EDA is used to view and analyse the data for the IRS. It is used to analyse the patterns and features of the utilized data in the proposed model. The figure 6, 7, 8, 9, 10 and 11 signifies the image data used in the proposed method for the IRS. It is extracted from the reddit website through API.

The figure 7 depicts the data used for IRS which signifies the object moon. In the figure 7, object 0.0 is the input image, where rest of the data are the resulted images processed in the proposed IRS. Similarly, figure 8 signifies the data utilized in the respective model.

The figure 6 signifies the data used for IRS which denotes the object bus. In the figure 6, object 0.0 is the input image, where rest of the data are the resulted images fetched in the proposed IRS. Correspondingly, figure 7 signifies the data utilized in the respective model. The figure 8 signifies the data used for IRS which illustrates the object nature. In the figure 8, object 0.0 is the input image, where rest of the data are the resulted images in the proposed IRS. Consistently, figure 9 signifies the data utilized in the respective model. The figure 9 represents the data used for IRS which symbolises the object earth. In the figure 9, object 0.0 is the input image, where rest of the data are the resulted images in the respective IRS. Congruently, figure 10 signifies the data utilized in the respective model.

Figure 9. *Image Data used In the Projected IRS*

Figure 10. *Image Data used In the Presented IRS*

The figure 10 signifies the data used for IRS which represents the object cat. In the figure 10, object 0.0 is the input image, where rest of the data are the resulted images fetched in the proposed IRS.

3.2 Performance Metrics

The section signifies the metrics used for the calculation of efficiency in respective approach.

1. Precision

The precision is the amount of positive prediction that is reached in the respective model. It is measured to examine the quality of the proposed system. The formula for the precision is represented in the following,

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

Where TP, FP are True Positive and False Positive.

2. Recall

The metric recall is used to analyse the percentage of the data which is correctly predicted in the respective system. The formula for recall is described subsequently,

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

Where TP, FN are True positive and False Negative.

3. Accuracy

The accuracy is the significant metric used to examine the number of predictions which are accurately correct in the proposed model. The formula for accuracy is depicted in the following,

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{FP} + \text{TN} + \text{FN}}$$

Where TP, TN, FP, FN are True Positive, True Negative, False Positive and False Negative.

4. F1-score

The F1-score is utilized to examine the predictions in the proposed system which are made for the positive class. The formula for the f1-score is mentioned in the following,

$$\text{F1} - \text{Score} = 2 * \frac{\text{Recall} * \text{Precision}}{\text{Recall} + \text{Precision}}$$

3.3 Experimental Outcomes and Comparative Analysis

The section represents the result accomplished by the presented mechanism and outcome of the comparative analysis. The table 1 and figure 11 represents the result attained by the respective IRS.

Table 1. *Result of the Proposed IRS System*

Classes	Precision	Recall	F1-Score	Accuracy
0	0.96	1	0.98	0.92
1	0.97	1	0.98	0.92
2	1	0.78	0.88	0.92
3	0.95	0.86	0.91	0.92
4	0.95	0.93	0.94	0.92
5	0.89	1	0.94	0.92
6	0.91	0.91	0.91	0.92
7	0.85	0.91	0.88	0.92

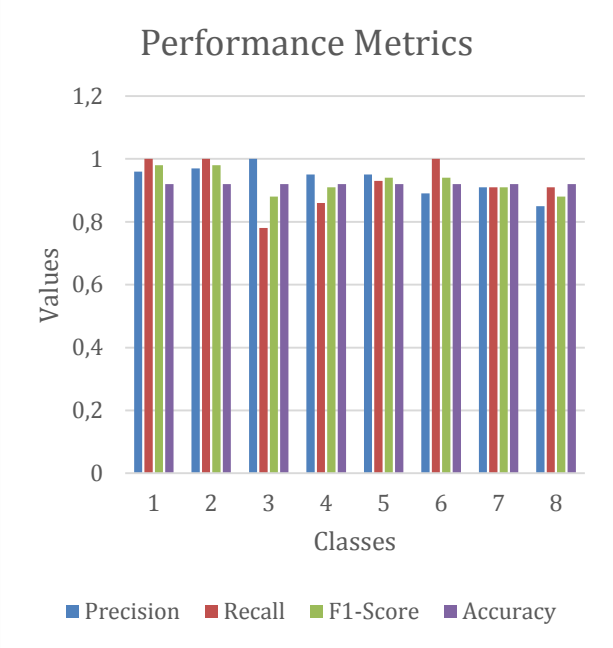

Figure 11. *Outcome of the Projected IRS GA Model*

Table 2. *Result of Classical GA Method*

Classes	Precision	Recall	F1-Score	Accuracy
0	0.94	0.95	0.95	0.84
1	0.92	0.93	0.92	0.84
2	0.97	0.71	0.82	0.84
3	0.91	0.84	0.87	0.84
4	0.93	0.89	0.87	0.84
5	0.85	0.96	0.88	0.84
6	0.87	0.87	0.84	0.84
7	0.82	0.87	0.86	0.84

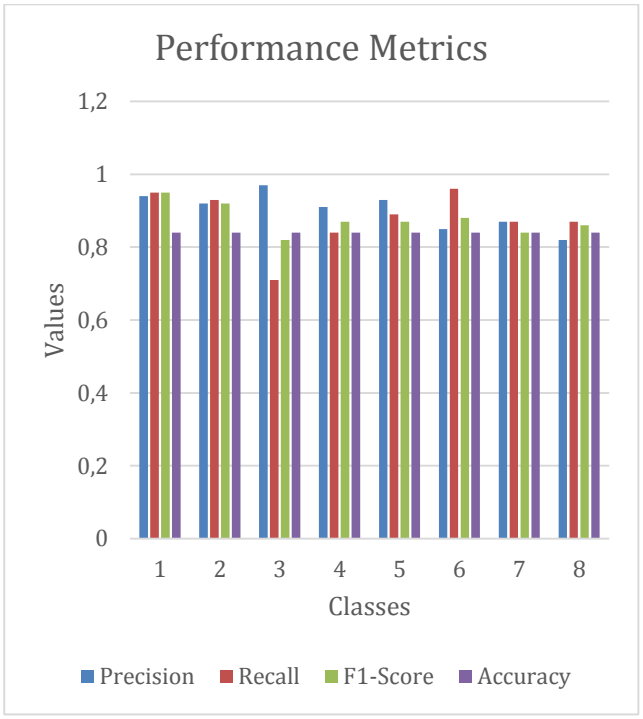

Figure 12. *Outcome of the Traditional GA Model*

The figure 11 and table 1 signifies the outcome of the proposed IRS approach. It is identified that the accuracy attained by the respective model is 92%, where the higher precision is accomplished for the class 2 which is 1. Consistently, greater recall attained for the class 0, 1 and 5 which is 1. Besides, higher f1-score attained for the class 0 and 1 which is 0.98. Correspondingly, table.2 and figure 12 represents the internal comparison of the proposed model with the classical GA system.

The figure 12 and table 2 signifies the outcome of the existing approach. It is identified that the accuracy attained by the classical model is 84% which is significantly lesser than the proposed method. This exposes the greater performance of the respective research. Consistently, table 3 and figure 13 represents the feature extraction outcome in the presented mechanism. The figure 13 and table 3 signifies the outcome of the proposed IRS feature extraction approach. It is identified that the accuracy attained by the respective model is 91%. Besides, precision value accomplished is 0.93, recall is 0.92 and f1-score is 0.95. Congruently, table 4 and figure 14 represents the internal comparison of the proposed model with the classical GA system.

Table 3. *Result of the Proposed IRS Feature Extraction System*

Model	Accuracy	Precision	Recall	F1-Score
VGG-16 Feature Extraction	0.91	0.93	0.92	0.95

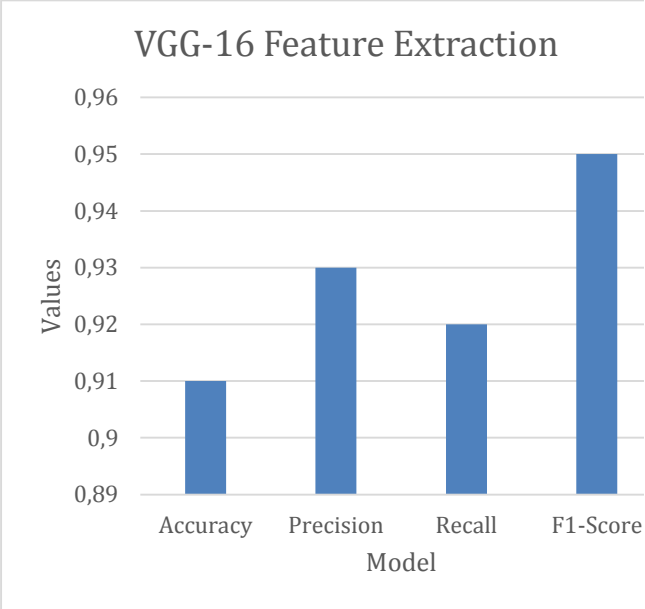

Figure 13. *Outcome of the Projected IRS Feature Extraction Model*

Table 4. *Result of the Traditional VGG-16 Model*

Model	Accuracy	Precision	Recall	F1-Score
VGG-16	0.87	0.91	0.93	0.94

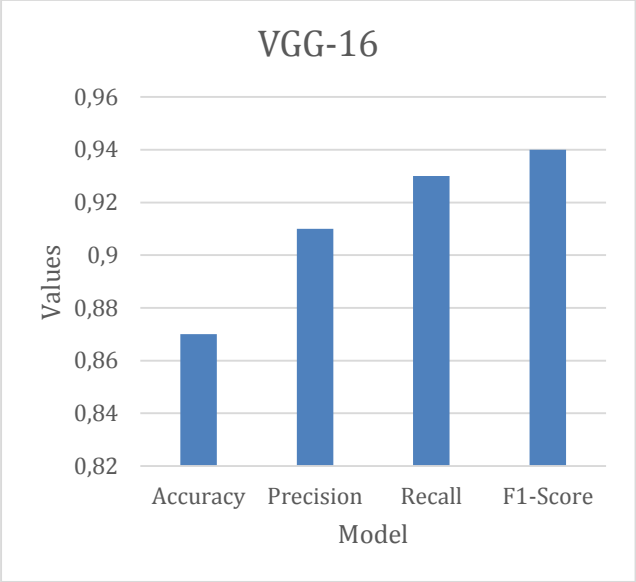

Figure 14. *Outcome of the Traditional VGG-16 Model*

The figure 14 and table 4 indicates the outcome of the classical VGG-16 approach. It is identified that the accuracy attained by the respective model is 87%. Besides, precision value accomplished is 0.91, recall is 0.93 and f1-score is 0.94. Correspondingly, table 5 and figure 15 represents the internal comparison of the proposed model with the Resnet-18 system. The figure 11 and table 1 signifies the outcome of the ResNet-18 approach. It is identified that the accuracy attained by the respective model is

Table 5. *Result of the Resnet-18 Feature Extraction*

Model	Accuracy	Precision	Recall	F1-Score
Resnet-18 Feature Extraction	0.92	0.94	0.93	0.94

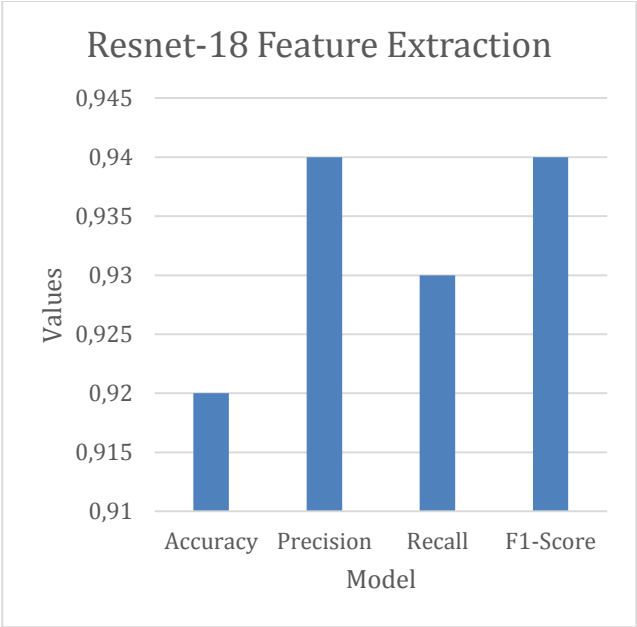

Figure 15. *Outcome of the Resnet-18 Feature Extraction*

92%. Besides, precision value accomplished is 0.94, recall is 0.93 and f1-score is 0.94. Correspondingly, table 6 and figure 16 represents the internal comparison of the proposed model with the classical GA system. The figure 16 and table 6 signifies the outcome of the traditional ResNet-18 approach. It is identified that the accuracy attained by the respective model is 86%. Besides, precision value accomplished is 0.91, recall is 0.92 and f1-score is 0.93. Correspondingly, the outcome of the proposed model signifies the better performance of the presented IRS. Moreover, result of the internal comparison exposes the greater efficacy of the proposed research. Therefore, proposed model utilized the advantages of non-linear mutation updation based GA technique and VGG-16 for feature extraction mechanism for the IRS attained better efficiency with higher accuracy and speed which is revealed through the results. Moreover, due to lack of related data on the conventional researches, internal comparison is carried out in the respective research.

Table 6. *Result of the Classical ResNet-18*

Model	Accuracy	Precision	Recall	F1-Score
ResNet-18	0.86	0.91	0.92	0.93

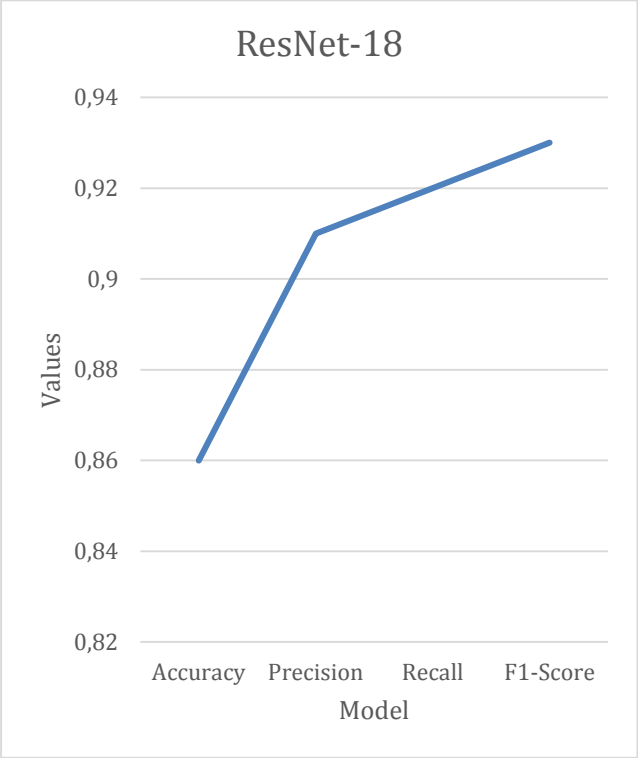

Figure 16. *Outcome of the Classical ResNet-18*

4. Conclusions

In the Contemporary world, enormous images are downloaded, stored and shared every day in diverse websites and databases. It is a challenging task for the users to identify the particular set of images in a huge stock files and websites. Traditionally, manual searching is the time consuming and less accurate process. To resolve the issue, several conventional model attempted to attain efficient IRS but lacks in accuracy and speed. To address the problem, proposed model utilized non-linear mutation updation based GA IRS model and VGG 16 NN method for feature extraction. The input data is acquired from the reddit website where API mechanism is used to extract the images using the hashtag data. Here, 8 classes of images are utilized in the respective research. The performance of the proposed model is calculated using performance metrics where the outcome signifies that the IRS system acquired accuracy of 0.92 and feature extraction is 0.91. Moreover, outcome of the comparative analysis represents the better performance of the proposed method. In future, IRS on various sectors can be considered to enhance the efficiency of the respective research. The proposed model is intended to contribute in the textile industries in supporting T-shirt printing mechanisms. Similar works have been done and reported in the literature [19-23].

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
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