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# Hall Ticket Fraud Detection System using ANN Classifier

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**Abstract -** Document image analysis is a major research direction in the field of image recognition systems for identifying and classifying image objects in documents. Facial recognition is the most widely used and effective system in biometrics. Existing methods have been working on document image analysis and face recognition areas separately. This paper attempts to developa new system that verifies the identity of the person taking the test by comparing the name, seat number, and photo of the ticket. Broadly speaking, the lounge ticket identification system consists of 5 steps: pre-processing, segmentation, face detection, feature extraction and ANN classification. For feature extraction, we use 10 shape features from a new tessellation of the lounge ticket image and 6 features from the object appearance histogram, and pass these features to an ANN classifier to detect lounge ticket fraud. The proposed algorithm was tested on data sets from two different institutions with an average accuracy of 94.12%.

***Key Words***: Preprocessing, Segmentation, Face detection, Feature extraction.

## *1.* INTRODUCTION *( Size 11, Times New roman)*

Hall tickets are commonly used for online and offline exams. The fraud problem in the detection and recognition of hole tickets is of great interest in the document field because it can identify the ownership of the document. In the context of document image retrieval, room tickets provide an important indexing format for efficiently exploring data.
Given the large number of lounge tickets, detecting fake lounge tickets is a very effective way to find documents.. The main focus of this paper is to detect fraud in the exam hall tickets which consists of textual elements like name, register number, etc and graphical elements like photo of the candidate. The system is aimed to detect unauthorized person appearing for examination i.e., by replacing the original candidate photo with an unauthorized person.

Hall ticket fraud detection is a critical problem that needs to be addressed in the academic world. One approach to tackling this problem is by using an artificial neural network (ANN) classifier. ANN is a powerful machine learning technique that has been successfully used in many real-world applications, including image recognition, natural language processing, and fraud detection.

The basic idea behind using an ANN classifier for hall ticket fraud detection is to train a neural network on a large dataset of legitimate and fraudulent hall tickets. During the training phase, the neural network learns to identify the patterns and features that distinguish between legitimate and fraudulent hall tickets. Once the neural network is trained, it can be used to classify new, unseen hall tickets as either legitimate or fraudulent with a high degree of accuracy.

To implement an ANN classifier for hall ticket fraud detection, the first step is to collect a large dataset of both legitimate and fraudulent hall tickets. This dataset can be collected from various sources, such as previous academic records, exam attendance records, and other relevant data sources.


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**Fig 1: Sample hall ticket image**

### Algorithm: Hall Ticket Recognition

Input : Colored images of hall tickets.
Output : Authentication flag(Authorized or Unauthorized person)
Method : ANN Classifier

**Train phase:**

Start
Step 1 : Preprocessing Input images
Step 2:Segment the images by using morphological operations
Step 3 : Extract features using shape features and histogram features
Step 4 : Detection of face using Ada boosting algorithm
Step 5: ANN Classification
End

**Testing phase:**

Start
Step 1 : Preprocessing Input image
Step 2 : Segment the image by using morphological operations
Step 3 : Extract features using shape features and histogram features
Step 4 : Detection of face using Ada boosting algorithm
Step 5 : ANN classifier for feature match. IF Feature matches test image results as authorized person otherwise
unauthorized person
End

### 1.1 Image Acquisition & Database creation

The images are acquired by scanning. Scanning is a way of changing the exam hall ticket document into digital format. Examination room ticket images are scanned with the HP Photosmart C4388 Series Scanner. Images are scanned at 300 dpi to create 3510 X 2550 pixel images and added to the training data set.

In image processing, main purpose of preprocessing stage is to enhance the image in ways that raise the opportunity for success of the other processes. Preprocessing enhances the quality of the input image. In this work, the system of Preprocessing includes the resizing and binarization.

Resizing is used to change the size of an image or scale an image. Normalizing the images by bringing them to common resolution by converting all sizes of images 200 X 200

### 1.2 Segmentation

Segmentation subdivides an image into **component areas** or objects. Image segmentation is **commonly** used to **detect** objects and boundaries (lines, curves, etc.) in **an image.**In the proposed work the segmentation is performed using morphological operations. After binarization, document images are usually filtered to reduce noise. For documents, more specific filters can be designed to take advantage of the known characteristics of the text and graph components. The scanned lounge ticket itself may be contaminated with noise-causing dust
or stains. There may be some noise in the scan itself. Noise also occurs during denaturation, aging, copying or data collection. Existing noise must be removed from the scanned document image to make it suitable for further processing.

***Dilation* :** Dilation is an operation which grows or thickens objects in binary image. The extent of thickening is controlled by a flat line structuring element. Dilation is a process where ON (white-color pixel) valued layers are added to boundaries to increase their size, which in turn reduces the size of the OFF regions(black-color pixel).

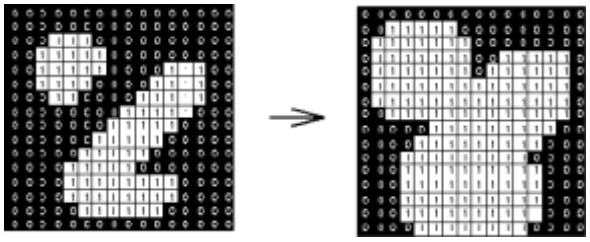


**Fig 2: Process of Dialation**

### 1.3 Face Detection

Face detection is a difficult task in image processing which has wide range of applications. The existing methods for face detection can be divided into two types, image based methods and feature based methods We developed an intermediate system using a boost algorithm to train a classifier that can process images quickly with high detection rates. An aggressive learning algorithm that produces robust classifiers. Simple classifiers contain simple rectangular wavelets similar to the Haar criterion. Simplicity and a new representation of images, called integral images, allow these Haar-like functions to be computed very quickly.There are three kinds of Haar-like features. 1) two-rectangle features, 2) threerectangle features, and 3) four-rectangle features. The value of a two-rectangle feature is the difference between the sum of the pixels within two rectangular regions

### 1.4 Feature Extraction

The feature is a function of one or more measurements, each of which specifies some quantifiable property of an object, and is computed such that it quantifies some significant characteristics of the object. Attributes such as shape, histogram, texture, color, etc. are used to describe the content of an image.

In shape feature method, first preprocessing done and then measurable properties of image regions are obtained. The 10 shape features mentioned below are used in this work and find the mean of all these values are stored as feature vector.

***Area*:**Defined as the number of physical pixels in an area.

***Perimeter:*** Defined as the distance around the perimeter of the region.

***Form factor*** **:** The pattern of scattering white pixels in an image within the bounding box.

***Major Axis*** **:** It is defined as the length of the major axis of the ellipse that has same normalized second central moments as the region.

Minor Axis: Defined as the length of the minor axis of an ellipse that has a normalized second central moment equal to its area.

$$\text{Roundness}=\frac{4\times Area}{\pi\times Majoraxis^2}$$

***Compactness*** **:** Compactness is an indication of solidness and convexity.

***Density*** **:** Density is defined as the area of white pixels within the bounding box. It is the ratio between area of white pixels within the bounding box and the area of bounding box(BB) which is given by:

$$Density = \frac{Area\ of\ white\ pixel\ within\ the\ BB}{Area\ of\ BB}$$

### 1.5 Train the ANN

Training an Artificial Neural Network (ANN) for hall ticket fraud detection involves several steps. Here are the general steps involved:

1. **Data Preprocessing:** This involves preparing the dataset for training the ANN. It includes cleaning the data, converting categorical data into numerical data, normalizing the data, and splitting the data into training and testing sets.

2. **Defining the ANN Architecture:** This involves defining the structure of the ANN, such as the number of input and output neurons, the number of hidden layers, the number of neurons in each layer, and the activation function used in each layer.

3. **Training the ANN:** This involves feeding the preprocessed dataset to the ANN and adjusting the weights and biases of the network to minimize the error between the predicted and actual outputs. The training process can be iterative, and the ANN can be trained using various optimization algorithms, such as backpropagation.

4. **Deploying the ANN:** Once the ANN is trained and tested, it can be deployed to classify new, unseen hall tickets as either legitimate or fraudulent with a high degree of accuracy.

### 1.6 Classification Result

The classification result would depend on the accuracy and sensitivity of the model being used, as well as the quality of the data being analyzed. It is important to ensure that the model has been properly trained and validated on a representative set of data, and that any false positives or false negatives are carefully reviewed and addressed.


**Fig 3: Result of Classification**

### 1.7 Classification

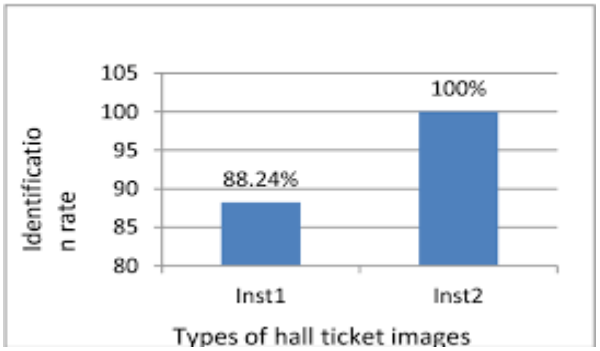
Hall ticket fraud detection typically involves the use of machine learning algorithms for classification. The goal of the classification is to determine whether a given hall ticket is genuine or fraudulent. The first step in the classification process is to gather a dataset of hall tickets that have been labeled as either genuine or fraudulent. This dataset can then be used to train a machine learning model to identify patterns that distinguish between the two categories.

**Table 1 : Identification rate**

| Types of hall ticket images | Training dataset | Segmented images (photo, name and seat number) | Number of hall tickets identified | | Identification rate |
|---|---|---|---|---|---|
| | | | Correctly | Incorrectly | |
| Inst1 | 17 | 45 | 15 | 2 | 88.24% |
| Inst2 | 26 | 78 | 26 | 0 | 100% |
| | | | **Accuracy rate** | | **94.12%** |

The above classification percentage table shows the classification rate of Inst 1 and Inst 2. For Inst 1 both dataset contains the two folders, in training dataset first folder contains the 36images and second folder contains the 9images, testing contains 17 images. Out of these 17images, 14images are authenticated in that 2images are the failures and 3images are unauthenticated. Hence, the identification rate is 88.24%. For Inst 2, training contains 78 images and 26images for testing. Out of 26 images, 25 images are authenticated and 1 is unauthenticated. Hence, the identification rate is 100%. Hence the accuracy rate is 94.12%.

Charts
two different institutes




## 3. CONCLUSIONS

Hall ticket fraud detection is challenging in terms of classifying individual image objects with an automated approach.The hall ticket images are used in the proposed system for off-line exams to provide security based on their entities. The hall ticket images are processed and segmented using morphological operation. Each segment is labeled using connected component labeling technique. The features such as area, form vector, roundness, compactness, density, etc are extracted. ANN classifier is used to detect the fraud in hall ticket images i.e., if candidate name, seat number is mismatched with candidate photo then the system displays person is unauthenticated. The system is developed for the offline examination system to detect the fraudulent hall ticket.

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