

# VivahPix: Intelligent Wedding Photo Organization Using Deep Learning-Based Event Classification and Automated Album Generation

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**Abstract** - Wedding photography produces large collections of images that require significant manual effort for organization and album creation. This paper presents VivahPix, an intelligent wedding photo organization system that automates image sorting, quality assessment, and event-wise album generation using deep learning and image processing techniques. The proposed framework combines duplicate image detection using perceptual hashing, blur detection using the Variance of Laplacian method, and event classification through convolutional neural network (CNN) architectures. Multiple models, including AlexNet, VGG19, MobileNetV2, InceptionV3, and ResNet50, were evaluated using accuracy, precision, recall, and F1-score metrics. The effect of data augmentation was analyzed through comparisons between augmented and non-augmented datasets, while different feature extraction approaches were also evaluated for wedding event classification. The framework was implemented as a Flask-based web application for automated image processing and album generation. Experimental results show that data augmentation improves classification performance and model generalization, while ResNet50 achieves the best overall results among the evaluated architectures. The proposed system significantly reduces manual effort and provides an efficient solution for large-scale wedding photo management.

**Keywords:** Wedding Photo Organization, Deep Learning, Convolutional Neural Networks (CNNs), ResNet50, Image Classification, Data Augmentation, Feature Extraction, Duplicate Image Detection, Blur Detection, Automated Album Generation

## 1. INTRODUCTION

The rapid growth of digital photography has increased the number of images captured during wedding events. A single wedding ceremony can generate thousands of

photographs from functions such as engagement, haldi, mehndi, wedding, and reception. Organizing these images manually is time-consuming and often complicated by the presence of duplicate and blurry photographs.

Recent advances in deep learning and computer vision have enabled automated image classification and quality assessment. This paper presents VivahPix, an intelligent wedding photo organization system that integrates duplicate image detection, blur assessment, event classification, and automated album generation. Multiple CNN architectures, including AlexNet, VGG19, MobileNetV2, InceptionV3, and ResNet50, are evaluated and compared to identify the most effective model for wedding event classification.

The major contributions of this work are:

1. Development of a web-based wedding photo organization platform.
2. Integration of duplicate image removal and blur detection techniques.
3. Comparative evaluation of multiple CNN architectures.
4. Analysis of data augmentation and feature extraction methods.
5. Automated generation of event-wise wedding albums

## 2. RELATED WORK

Recent advancements in deep learning have significantly improved image classification and event recognition tasks. Several studies have demonstrated the effectiveness of CNN-based and transformer-based models for wedding event classification and photo album recognition [1], [2], [16]. These approaches have shown promising results in automatically identifying and categorizing images based on visual content.

Content-Based Image Retrieval (CBIR) and deep feature extraction techniques have also been widely applied for organizing, retrieving, and classifying images from large collections [3], [7], [8], [9], [13], [17]. Robust feature representations play an important role in enhancing classification accuracy and image management efficiency.

Furthermore, image quality assessment techniques such as blur detection and duplicate image identification are essential for maintaining high-quality image datasets. Previous studies have proposed various preprocessing methods for blur detection and near-duplicate image recognition [5], [15].

Unlike existing approaches, the proposed VivahPix framework integrates duplicate detection, blur assessment, CNN-based event classification, feature extraction analysis, and automated album generation within a unified web-based platform, providing a complete solution for wedding photo organization.

### 3. PROPOSED METHODOLOGY

The proposed VivahPix framework automates wedding photo organization through image quality assessment, event classification, and album generation. The workflow consists of image preprocessing, dataset preparation, data augmentation, CNN-based classification, and automated album generation.

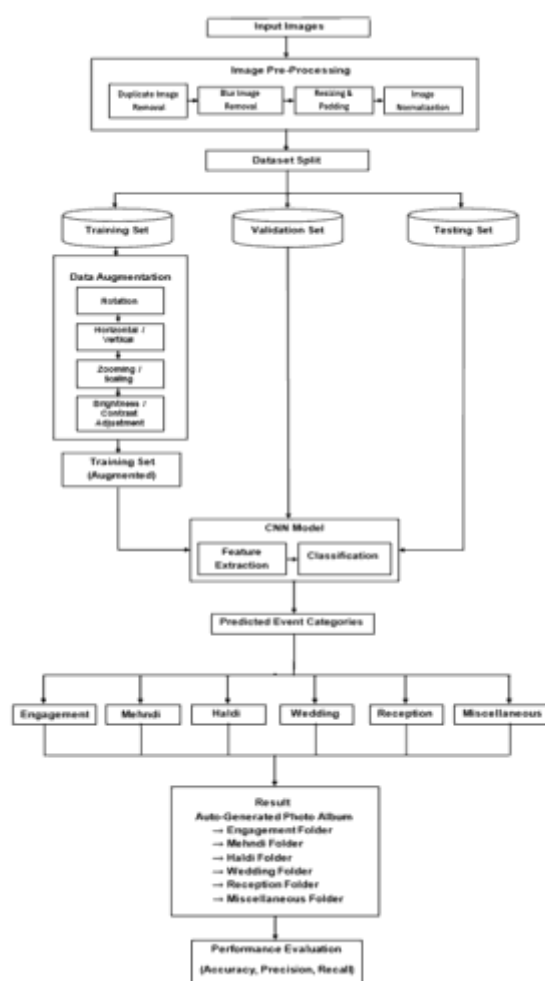


**Fig -1:** Proposed VivahPix Framework Architecture

#### A. Image Preprocessing

Uploaded wedding photographs first undergo preprocessing to improve data quality and classification performance. Duplicate images are identified using Perceptual Hashing (pHash) and separated from the main dataset. Blur detection is then performed using the Variance of Laplacian method, and blurry images are moved to a separate folder.

After quality assessment, images are resized to  $224 \times 224$  pixels and normalized to ensure compatibility with the CNN models and improve training performance.

#### B. Dataset Preparation

The dataset is divided into training, validation, and testing subsets. The training set is used for model learning, the validation set for performance monitoring and tuning, and the testing set for final evaluation.

### C. Data Augmentation

To improve model robustness and reduce overfitting, data augmentation techniques such as rotation, flipping, zooming, scaling, and brightness adjustment are applied to the training images. Comparative experiments are conducted using augmented and non-augmented datasets.

### D. Feature Extraction and Event Classification

Feature extraction is performed automatically by the convolutional layers of the CNN models. Multiple architectures, including AlexNet, VGG19, MobileNetV2, InceptionV3, and ResNet50, are evaluated for wedding event classification.

The classification module categorizes photographs into six event classes:

- Engagement
- Mehndi
- Haldi
- Wedding
- Reception
- Miscellaneous

A comparative analysis is conducted to identify the most effective architecture for wedding event recognition.

### E. Automated Album Generation

Based on the predicted event labels, photographs are automatically organized into separate event-wise folders. Individual albums are generated for Engagement, Mehndi, Haldi, Wedding, Reception, and Miscellaneous events, while duplicate and blurry images are stored separately.

### F. Performance Evaluation

The proposed framework is evaluated using Accuracy, Precision, Recall, and F1-Score. Experimental analysis compares different CNN architectures, data augmentation strategies, and feature extraction methods to determine the most suitable model for automated wedding photo organization.

## 4. SYSTEM IMPLEMENTATION

The VivahPix system was implemented as a web-based application that integrates image preprocessing, deep learning-based event classification, and automated

album generation. The system was developed using Flask for backend operations, HTML, CSS, JavaScript, and Bootstrap for the frontend, OpenCV for image processing, and TensorFlow/Keras for model deployment. The implementation provides an intuitive interface for organizing large collections of wedding photographs.

### A. VivahPix Logo and Branding

The proposed system, **VivahPix**, derives its name from “Vivah” (wedding) and “Pix” (photographs), reflecting its objective of intelligently organizing wedding photographs using image processing and deep learning techniques. The VivahPix logo serves as the visual identity of the application and is integrated throughout the user interface. It represents the combination of wedding photography and intelligent digital organization while maintaining a consistent and professional appearance across the platform. Responsive design techniques ensure proper visualization across different devices and screen resolutions.



**Fig -2:** VivahPix Official Logo

### B. User Authentication Module

The authentication module provides secure access through user registration, login, and password recovery functionalities. New users can create accounts using their username, email address, and password, while registered users can securely access the platform through login. A password reset feature with email verification enables secure account recovery, ensuring that only authorized users can manage and organize wedding photographs.

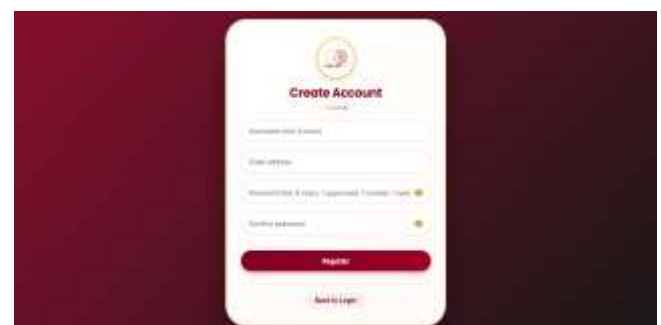


**Fig -3:** VivahPix Create Account Page

The Create Account page allows new users to register by entering their details and creating secure login credentials.



**Fig -4:** VivahPix Login Page

The Login page enables registered users to authenticate themselves and access the VivahPix application.

### C. Photo Upload Module

After successful authentication, users are redirected to the VivahPix home page, which serves as the main interface for wedding photo organization. The dashboard provides access to image upload, album generation, and photo management functionalities through a simple and user-friendly layout.

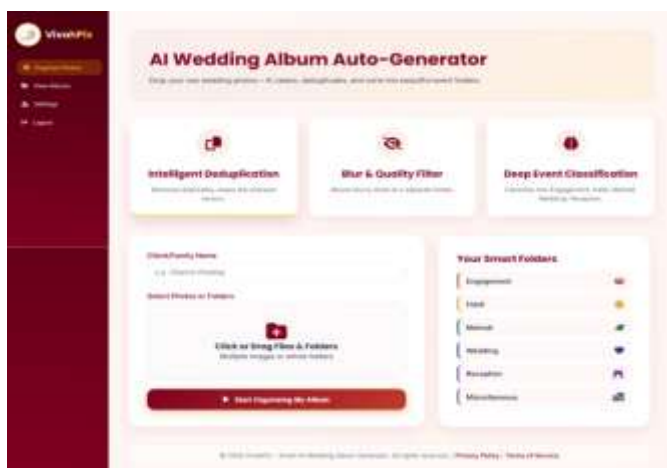


**Fig -5:** Home Page of VivahPix

Users can enter the client or family name and upload a folder containing wedding photographs. The upload module supports bulk image uploads and forwards the selected images to the processing pipeline for analysis

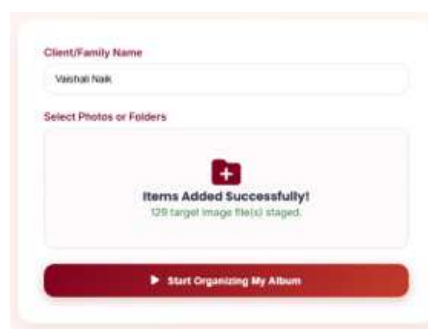


**Fig -6:** Entering Client Name and Uploading Wedding Photograph Folder

Once the upload process is initiated, the system automatically performs duplicate detection, blur detection, image preprocessing, event classification, and album generation.

### D. Image Processing Module

After uploading the wedding photographs, the system performs a series of preprocessing operations to improve image quality and classification accuracy. Duplicate image detection is carried out using Perceptual Hashing (pHash), while blurry images are identified using the Variance of Laplacian method.

The detected duplicate and blurry photographs are automatically separated into dedicated folders. The remaining images are then resized and normalized before being forwarded to the deep learning classification module.



**Fig -7:** Initiating the Album Organization Process

The image processing workflow performs duplicate removal, blur detection, and image preprocessing to prepare photographs for event-wise classification, reducing manual effort and improving organization efficiency.

### E. Deep Learning Classification Module

The classification module automatically categorizes wedding photographs using a trained ResNet50 model. The model extracts visual features and classifies images into six categories: Engagement, Haldi, Mehndi, Wedding, Reception, and Miscellaneous. This automated process eliminates manual sorting and reduces album preparation time.

### F. Automated Album Generation Module

After classification, the system automatically generates event-wise folders based on predicted labels. Separate folders are created for Engagement, Haldi, Mehndi, Wedding, Reception, Miscellaneous, as well as duplicate and blurry photographs.



**Fig -8:** Generated Smart Album Showing Event-wise Classified Photographs

The generated album structure enables users to quickly access and manage categorized wedding photographs. Users can also view, download, and organize albums through the application interface.

### G. User Interface and Result Visualization

A responsive web-based interface was developed to provide an intuitive user experience. The dashboard allows users to upload photographs, monitor processing, and access organized albums.



**Fig -9:** Successfully Downloaded Wedding Album Archive

The results interface displays classified photographs in event-wise folders and provides album management options such as viewing, downloading, and deleting albums. This structured presentation improves navigation and overall system usability.

### H. Account Settings Module

The Account Settings module enables users to manage profile information and account security. Users can update personal details, modify login credentials, and manage account preferences through a secure and user-friendly interface.

The module includes profile editing, password modification, and account deletion functionalities. Password changes require credential validation, while account deletion includes a confirmation mechanism to prevent accidental data removal. These features improve the usability, security, and reliability of the application.

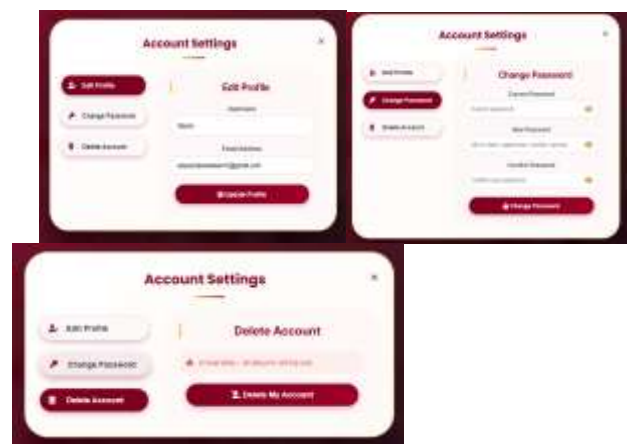


**Fig -10:** Account Settings Interface

### I. System Workflow

The VivahPix workflow begins with user authentication and image upload. Uploaded photographs undergo duplicate detection, blur removal, image

preprocessing, and CNN-based event classification. Based on the predicted labels, the photographs are automatically organized into event-wise folders.

The generated albums can be viewed, downloaded, and managed through the application interface. This integrated workflow provides an efficient end-to-end solution for wedding photograph organization, reducing manual effort and improving album creation efficiency.

### J. System Deployment

To ensure accessibility and practical usability, VivahPix was deployed as a web-based platform on Hugging Face Spaces. The deployment enables users to access the system through a web browser without complex installation or configuration, allowing convenient use across different devices and locations.

VivahPix Application:

<https://huggingface.co/spaces/SayeeOtwanekar/VivahPix>

The successful deployment demonstrates the real-world applicability and scalability of the proposed framework for automated wedding photo organization.

## 5. RESULTS AND DISCUSSION

The performance of the proposed VivahPix framework was evaluated using multiple deep learning architectures and image preprocessing techniques. Experiments were conducted to assess classification accuracy, feature extraction performance, robustness, and the effectiveness of automated album generation. Performance was measured using Accuracy, Precision, Recall, and F1-Score metrics.

### A. Impact of Data Augmentation on Classification Performance

Data augmentation was applied to increase dataset diversity and improve the generalization capability of the ResNet50 model. Techniques such as rotation, flipping, cropping, and brightness adjustment were used to generate additional training samples and reduce overfitting.

**Table -1:** Comparison of Classification Performance on Non-Augmented and Augmented Datasets

| Category   | Non-Augmented ResNet50 (F1-Score) | Augmented ResNet50 (F1-Score) |
|------------|-----------------------------------|-------------------------------|
| Engagement | 0.93                              | 0.95                          |
| Haldi      | 0.97                              | 0.97                          |
| Mehndi     | 0.97                              | 0.97                          |
| Reception  | 0.94                              | 0.96                          |
| Wedding    | 0.94                              | 0.96                          |

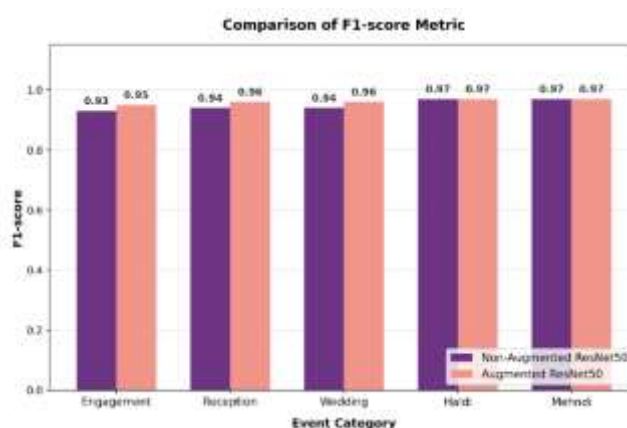


**Fig -11:** F1-Score Comparison of Augmented and Non-Augmented Datasets Across Event Categories

The results show that data augmentation improved classification performance across most wedding event categories. The F1-score increased from 0.93 to 0.95 for Engagement and from 0.94 to 0.96 for both Reception and Wedding categories, indicating improved robustness to variations in image appearance.

For Haldi and Mehndi, both models achieved high F1-scores of 0.97, demonstrating effective event discrimination even without augmentation. However, augmentation helped maintain consistent performance and enhanced overall model robustness.

The performance gains can be attributed to the increased variability introduced during training, enabling the model to learn more generalized features under different lighting conditions, poses, backgrounds, and image orientations.

Overall, the augmented ResNet50 model consistently outperformed the non-augmented model, confirming the effectiveness of data augmentation for improving classification accuracy and generalization in real-world wedding photograph organization.

## B. Feature Extraction Performance Analysis

To evaluate different feature extraction approaches, three ResNet50-based methods—Basic CNN, Pattern Recognition, and the proposed Hybrid Model—were compared using average Precision, Recall, and F1-Score values across all wedding event categories.

**Table -2:** Performance Comparison of Different Feature Extraction Methods

| Feature Extraction Method    | Average Precision (%) | Average Recall (%) | Average F1-Score (%) |
|------------------------------|-----------------------|--------------------|----------------------|
| ResNet50 Basic CNN           | 59.00                 | 48.00              | 40.00                |
| ResNet50 Pattern Recognition | 86.00                 | 88.00              | 86.00                |
| ResNet50 Hybrid Model        | 96.00                 | 96.00              | 96.00                |

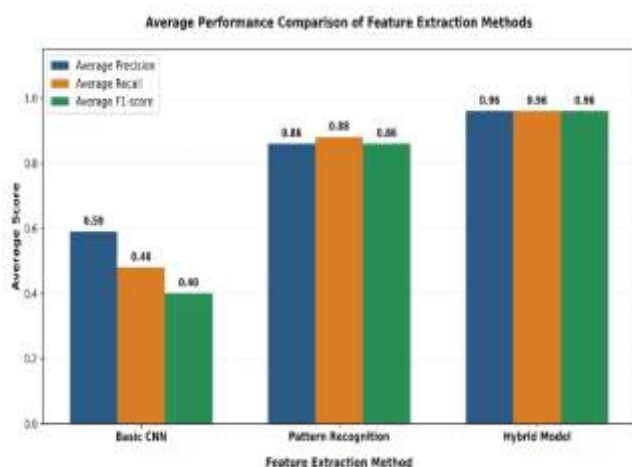


**Fig -12:** Model-wise Average Performance Comparison of Different Feature Extraction Methods Using ResNet50

The results show significant differences among the evaluated feature extraction methods. The Basic CNN model achieved average Precision, Recall, and F1-Score values of 59%, 48%, and 40%, respectively, indicating limited capability in distinguishing visually similar wedding events.

The Pattern Recognition approach improved performance considerably, achieving 86% Precision, 88% Recall, and 86% F1-Score by capturing event-specific visual patterns such as attire, decorations, rituals, and background settings.

The proposed Hybrid Model achieved the highest performance, obtaining 96% Precision, 96% Recall, and 96% F1-Score. By combining deep feature extraction with pattern recognition techniques, it generated more discriminative feature representations and improved classification under varying lighting conditions, poses, camera angles, and event environments.

Overall, the Hybrid Model outperformed the Basic CNN and Pattern Recognition approaches across all metrics, demonstrating the effectiveness of combining complementary feature extraction strategies for automated wedding photograph classification.

## C. CNN Model Performance Analysis

To identify the most suitable architecture for wedding event classification, five pre-trained CNN models—AlexNet, VGG19, MobileNetV2, InceptionV3, and ResNet50—were trained and evaluated on the wedding image dataset using Accuracy, Precision, Recall, and F1-Score metrics.

**Table -3:** CNN Model Performance Comparison

| Model       | Accuracy (%) | Precision (%) | Recall (%) | F1-Score (%) |
|-------------|--------------|---------------|------------|--------------|
| AlexNet     | 78.45        | 80.00         | 77.00      | 78.00        |
| VGG19       | 92.35        | 91.00         | 92.00      | 91.00        |
| MobileNetV2 | 90.00        | 90.00         | 91.00      | 90.00        |
| InceptionV3 | 84.00        | 83.00         | 83.00      | 84.00        |
| ResNet50    | 96.00        | 96.00         | 96.00      | 96.00        |

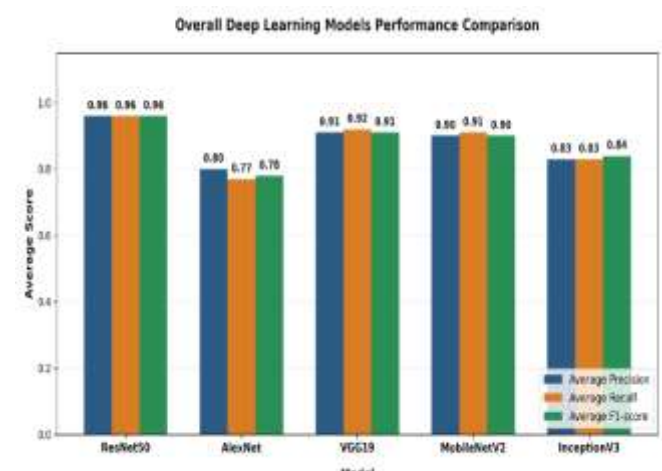


**Fig. 13.** Model-wise Comparison of Average Performance Metrics

Fig. 13 shows the average Precision, Recall, and F1-Score of the evaluated CNN models. Among all architectures, ResNet50 achieved the highest

performance across all metrics, demonstrating superior capability for wedding event classification. Its residual learning architecture enabled deeper feature extraction and improved classification robustness.

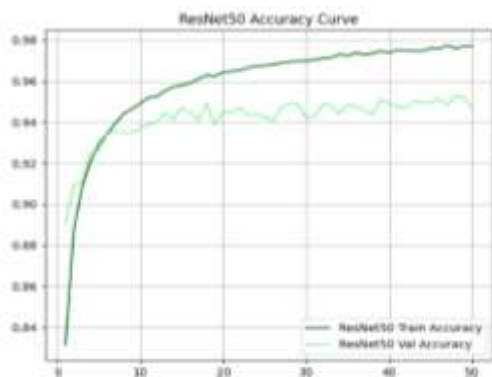


Fig. 14. Training and Validation Accuracy of ResNet50

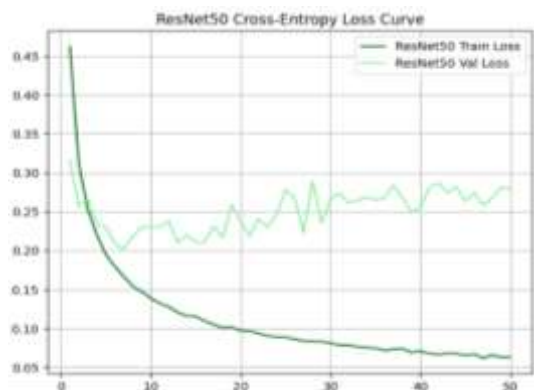


Fig. 15. Training and Validation Loss of ResNet50

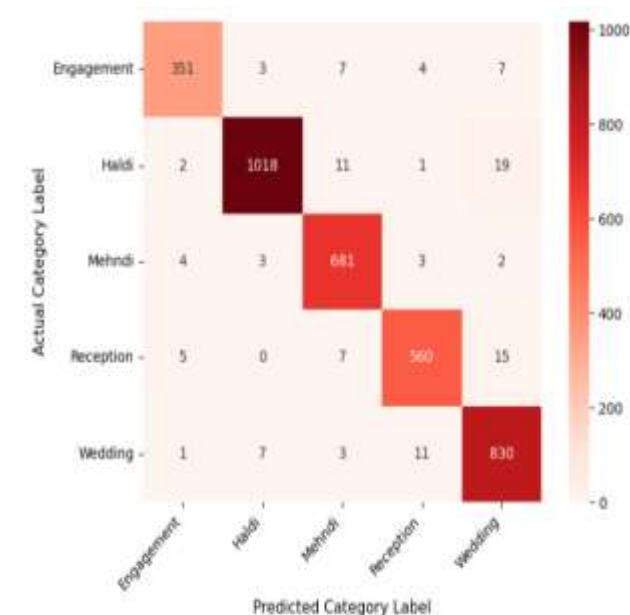


Fig. 16. Confusion Matrix in ResNet50 Hybrid Model

The training and validation accuracy curves indicate stable convergence of the ResNet50 model with minimal overfitting. Similarly, the loss curves show a consistent reduction in loss values, confirming effective optimization and feature learning. The confusion matrix further demonstrates high classification accuracy, with most images correctly assigned to their respective event categories and only a few misclassifications.



Fig. 17. Sample Classification Results of the Proposed ResNet50 Model

To qualitatively evaluate the framework, representative test images from different wedding events were classified using the final ResNet50 model. The model correctly identified Engagement, Haldi, Mehndi, Reception, and Wedding events despite variations in lighting, camera angles, attire, decorations, and backgrounds, demonstrating its applicability to real-world wedding photograph organization.

The experimental results show that all evaluated models learned meaningful visual representations of wedding events; however, notable performance differences were observed. ResNet50 achieved the

highest accuracy due to its residual learning mechanism, which enables deeper feature extraction while mitigating gradient degradation. The model effectively captured event-specific characteristics such as attire, decorations, rituals, and color patterns.

MobileNetV2 and InceptionV3 delivered competitive performance with lower computational complexity, while VGG19 achieved stable results at the cost of higher computational requirements. AlexNet produced the lowest performance because of its relatively shallow architecture and limited feature learning capability.

Overall, the results demonstrate that deeper residual networks are more effective for complex wedding event classification tasks with significant visual variations. The superior performance of ResNet50 establishes it as the most suitable architecture for the proposed VivahPix framework.

### ***D. Discussion***

The experimental results demonstrate the effectiveness of the proposed VivahPix framework for automated wedding photograph classification and organization. Among the evaluated CNN architectures, ResNet50 achieved the highest classification accuracy of 96%, outperforming AlexNet, VGG19, MobileNetV2, and InceptionV3. Its superior performance can be attributed to the residual learning architecture, which enables deeper feature extraction and improved learning capability.

The feature extraction analysis showed that the proposed Hybrid Model achieved the best performance, obtaining average Precision, Recall, and F1-Score values of 96%. By combining deep feature extraction with pattern recognition, the model effectively captured discriminative visual characteristics of different wedding events.

The data augmentation experiments further demonstrated improvements in classification performance and model generalization. The augmented ResNet50 model achieved higher F1-scores across most event categories, indicating increased robustness to variations in lighting conditions, poses, camera angles, and background environments.

Overall, the results validate the proposed methodology for intelligent wedding photograph categorization. The integration of image preprocessing, deep learning-based classification, enhanced feature

extraction, and automated organization provides an efficient solution that reduces manual effort while maintaining high classification accuracy.

The proposed framework streamlined wedding photograph organization through automated duplicate detection, blur detection, and event-wise album generation, demonstrating its effectiveness for real-world applications.

### **6. CONCLUSION**

This paper presented VivahPix, an intelligent wedding photo organization framework that integrates image preprocessing, deep learning-based event classification, and automated album generation. The system employs duplicate image detection using perceptual hashing (pHash), blur detection using the Variance of Laplacian method, and CNN-based classification to automatically categorize photographs into Engagement, Haldi, Mehndi, Wedding, Reception, and Miscellaneous events.

A comparative evaluation of AlexNet, VGG19, MobileNetV2, InceptionV3, and ResNet50 demonstrated that ResNet50 achieved the highest classification accuracy of 96%. The proposed hybrid feature extraction approach also achieved superior Precision, Recall, and F1-Score values of 96%, while data augmentation further improved model robustness and generalization capability.

The framework successfully automated wedding photograph organization by generating event-wise albums and separating duplicate and blurry images, significantly reducing manual sorting effort. Deployment as a web-based application further demonstrated its practical applicability in real-world scenarios.

Future work may focus on incorporating transformer-based vision models, facial recognition for person-wise grouping, video-based event classification, automated highlight generation from wedding videos, image caption generation, and personalized album design recommendations. The framework can also be extended to process both photographs and videos, enabling comprehensive multimedia wedding album management with improved intelligence, scalability, and user experience.

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