Project Requirements

Project: Poster Evaluation using Machine learning

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Revision History

Date	Version	Description	Team No.
09-16-2023	1.0	Software Requirement	Team No. 6

Brief problem statement

Problem Statement: The main goal of project is leveraging machine learning techniques in Python to create an automated system that can greatly improve the efficiency and accuracy of evaluating posters. By addressing various challenges, this project aims to overcome the limitations of manual evaluation and achieve enhanced poster assessment through automation.

1. **Subjective Evaluation**: When evaluating the quality of posters, human reviewersfrequently have different viewpoints, which can provide inconsistent results.
2. **Resource-intensive**: Manual poster evaluation takes a lot of time and a lot of humanreviewers.
3. **Scalability**: Finding a scalable approach becomes crucial as the number of posters to be assessed increases.
4. **Objective Criteria**: It might be difficult to define objective criteria for evaluating posters, such as appearance, content relevance, and clarity.
5. **Data management**: It might be challenging to manage a broad dataset of posters with avariety of sizes, formats, and topics.

In order to increase efficiency and objectivity in the evaluation of posters based on present criteria, project aims on creating machine learning model in Python.

STAKEHOLDER:

There are several stakeholders involved in the process of poster evaluation using machine learning. Here are some key stakeholders:

1. **Designers**: Designers play a crucial role as they are responsible for creating the posters. They rely on the evaluation system to receive feedback and insights to improve their designs and optimize the effectiveness of their visual communication.

2. **Marketers and Advertisers**: Marketers and advertisers utilize the poster evaluation system to ensure that their messaging is effectively conveyed through posters. They can evaluate their campaigns and make data-driven decisions to optimize their advertising strategies.

3. **Clients or Customers**: Clients or customers who commission the design and production of posters have a stake in the evaluation process. They want to ensure that their posters meet specific design requirements, resonate with their target audience, and effectively communicate their message or brand.

4. **Printing Companies**: Printing companies involved in the production of posters benefit from the evaluation system as it helps maintain quality control. By evaluating posters, they can provide feedback to designers and clients, ensuring that the final printed product meets the required standards.

5. **Academic and Research Community**: The academic and research community has an interest in evaluating and studying posters. They can utilize the evaluation system to collect data, conduct experiments, and analyze the impact of design elements on poster effectiveness.

6. **Regulatory or Compliance Bodies**: In certain industries or contexts, regulatory or compliance bodies may have a stake in evaluating posters to ensure that they meet specific guidelines,

regulations, or legal requirements. The poster evaluation system can assist in adhering to these standards.

7. **Event Organizers**: Event organizers, such as conferences or exhibitions, often use posters as a means of communication. They can benefit from the evaluation system to assess the quality and readability of submitted posters as part of the selection process.

8. **User Experience (UX) Specialists**: UX specialists or experts in human-computer interaction can have a stake in poster evaluation to ensure that the design elements, such as font size and color contrast, provide a positive user experience and are accessible to a wide range of individuals.

9. **Machine Learning Researchers and Developers**: The stakeholders involved in developing and researching machine learning algorithms for poster evaluation have an interest in the accuracy, efficiency, and performance of the system. They continuously improve the algorithms and models used in the evaluation process.

10. **General Public**: The general public can indirectly benefit from the evaluation system as it helps maintain the quality and effectiveness of posters seen in public spaces. Well-designed and engaging posters contribute to a positive visual environment.

Responsibilities

1. **Data Collection**: We have to gather a diverse datasets of posters and make sure that it depicts different poster designs, formats, and topics.

2. **Data Preprocessing**: We have to clean and preprocess the dataset, including handling missing values and inconsistencies.

3. **Feature Engineering**: We have to extract and select relevant features from the posters, considering visual elements and textual content.

4. **Model Development**: We have to create machine learning models for evaluation of postersbased on predefined criteria.

5. **Training and Validation**: We have to divide the dataset into two sets: training and validationsets and train models on training data and fine-tune them using validation results.

6. **Evaluation of model**: We have to assess performance of final models on a separate test set using suitable metrics for evaluation.

7. **Deploying model**: Integrates model into an application or system for automated poster evaluation.

8. **Monitoring and Maintenance**: Continuously monitor the model's performance, retrain as necessary, and address any issues or improvements.

9. **User Feedback and Iteration**: Gather feedback from users and stakeholders to improve the model and system iteratively.

10. **Scaling and Optimization**: optimizing the system for scalability to handle more posters

System requirements

Poster evaluation using machine learning has a list of software requirements as following:

Development Environment	
Operating System	Windows, Mac OS, Linux
Programming Language	Python
Framework	TensorFlow, PyTorch, or scikit-learn
Java Runtime	Pythons runtime
Environment SharingTool	Google Drive
Modeling Tool	Jupyter Notebook / Google colab
Text editor	Visual code
Database	MySQL
Version Control system	Github
Hosting	Google Cloud

Feature requirements

1. Functional:

No.	User Story Name	Description	Release
1	User Interface	→ We have to develop a UI where users canupload poster images and view evaluated results. → We have to ensure providing options for users to customize evaluation criteria and settings, if applicable.	R1
2	Data collection and preprocessing	→Collect a labeled dataset of posters along with annotations that includes font size, text color, background color, sentences, indentation, images,logos,reference links. → Preprocess poster images, extracting similar features such as text, images, and logos using image processing libraries like Open CV.	R1
3	Font Size Evaluation	→ Implement the ML method to forecast and assess font sizes in the posters based on extracted text areas. → By training model using labeled datasets & also by utilizing appropriate approaches for regression. →To analyze predictions of font size by using some measures such as MSE/MAE.	R1

4	Color Comparison	→ Create an algorithm to analyse color that compares hues of text & background in posters. → Use color space conversions like RGB to HSV to extract characteristics for comparision. →Compute color relevance measures to examine difference in text and background color.	R1
5	Duplicate Sentences	→ We have to Implement NLP technique to identify and compare duplicate sentences within the poster content.	R1
6	Indentation Evaluation	→ We have to design an algorithm to recognize and evaluate the indentation of the text or paragraphs in the poster. → We have to utilize image processing methods like line detection or contour analysis to analyze and measure indentation patterns.	R1
7	Image/Logo Differentiation	→We have to develop an image classification algorithm to differentiate between images and logos in the posters. → We have to train a ML model, such as a convolutional neural network (CNN), using labeled data to classify image/logo regions. → We have to use appropriate evaluation metrics like accuracy, precision, recall, or F1 score to assess the differentiation performance.	R1
8	Reference Link Validation	→We have to implement a module to extract and validate reference links or URLs mentioned in the poster content. → We have to utilize web scraping techniques or third-party libraries to check the validity and availability of the reference links.	R1
9	Integration and Deployment	→We have to integrate the trained machine learning models and evaluation modules into the user interface developed in step 1. →We have to ensure smooth data flow and interaction between the UI and the backend modules. → We have to deploy the system to a suitable platform, considering factors such as scalability, performance, and security.	R1

10	Testing and Maintenance	→ We have to conduct comprehensive testing of the entire system, including the UI functionality, feature extraction, and model predictions. →We have to regularly update and maintain the system to accommodate new requirements, fix issues, and incorporate user feedback.	R1

2. Non-Functional

In addition to the functional requirements, the successful development of a poster evaluation system relies on non-functional requirements. These requirements focus on the system's performance, usability, security, maintainability, compatibility, integration, and accessibility:

1.Performance:

Timely Response: The system should provide quick and efficient evaluation results, ensuring that the processing time for each poster remains acceptable.

Scalability: The system should handle a growing number of users and evaluation requests without significant performance degradation.

2.Usability:

User-Friendly Interface: The UI should be intuitive and easy to use, enabling users to interact without extensive training.

Responsiveness: The UI should offer real-time feedback and progress indicators to keep users updated throughout the evaluation process.

Customizability: The system should allow users to modify evaluation criteria and settings according to their specific needs.

3.Security:

Data Privacy: The system should handle user data and uploaded posters confidentially, safeguarding against unauthorized access or disclosure.

Secure Communication: The system should utilize secure protocols (e.g., HTTPS) for data transmission, ensuring the prevention of data interception or manipulation.

4.Maintainability:

Modularity: The system should have a modular and well-structured design, allowing for easy maintenance and future updates.

Code Documentation: Clear comments and API documentation should accompany the code-base to assist developers in understanding and maintaining the system.

Error Handling: The system should incorporate robust error handling mechanisms to gracefully manage exceptions or invalid inputs.

5.Compatibility:

Platform Compatibility: The system should be compatible with various operating systems and devices.

Browser Compatibility: The UI should work seamlessly across major web browsers.

6.Integration:

External Service Integration: The system should support integration with third-party servicesor APIs to provide additional functionality.

Database Integration: If applicable, the system should integrate with a database system to manage evaluation results and user preferences.

7.Accessibility:

Compliance with Accessibility Standards: The UI should adhere to accessibility standards, allowing users with disabilities to access and use the system effectively. This includes considerations for keyboard navigation, alternative text for images, and other accessibility features.

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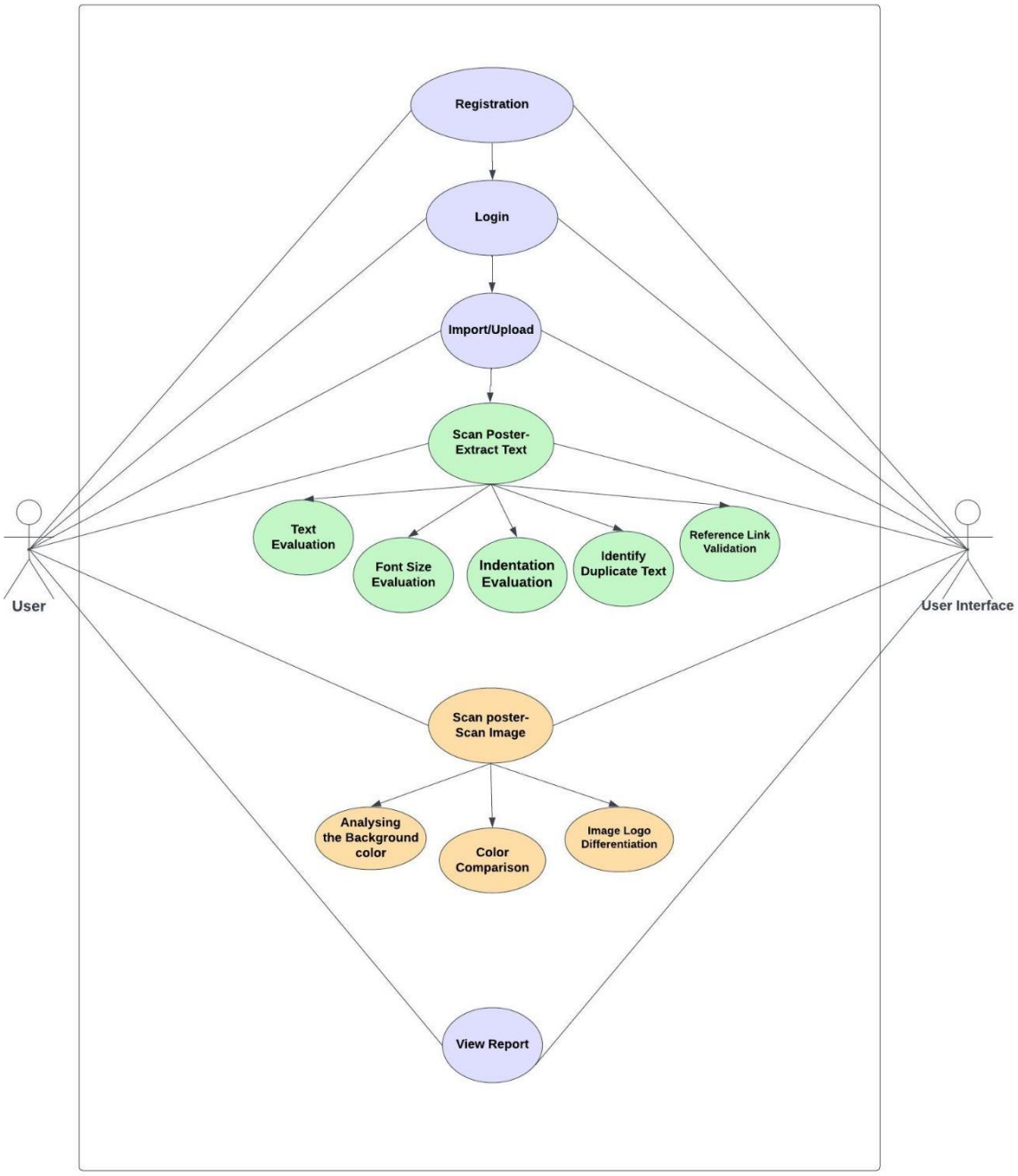
USE CASE DIAGRAM:



Use case description

Use Case Number	UC-01
Use Case Name	**Registration**
Overview	The user shall enter his personal information upon registration.
Actor(s)	User , Web App
Pre-condition(s)	• The portal has been configured, launched, and is working.
Scenario Flow	**Main (success) Flow:** 1. User selects the option to register. 2. System requests personal information. 3. The user provides personal information. a. Email ID b. First Name c. Last Name d. Date of birth e. Setup a password. 4. The system verifies the required information using OTP sent to the users given email id. if the OTP is invalid, it will display an error message, and return to **Step 2**. If not, the system will save the new user details and add his account into the database
Alternate Flows	The user will have the chance to cancel a registration after Step (2) by just clicking on the “Cancel” button ,the system will display the main page and can also change password using reset password link sent to the registered mail id
Post Condition	The system will not store the user information unless the user clicks on “Register”.

Use Case Number	UC-02
Use Case Name	**Login**
Overview	The user shall enter his loginID and password.
Actor(s)	User , Web App
Pre-condition(s)	User should be a previously registered person and further user needs to enter username and password to login
Scenario Flow	**Main (success) Flow:** 1. User selects the option to login. 2. System requests personal loginID and password. 3. The user provides required information. 4. The System verifies the login details provided by the user If the details are correct: the user will successfully login and can upload his poster else, will display an error message.  Above picture depicts the login page if invalid password entered
Alternate Flows	If the user cannot recover his login details he/she will have the chance to register as a new user
Post Condition	User cannot upload the poster unless he successfully logs-in

Use Case Number	UC-03
Use Case Name	Font size evaluation
Overview	The user shall get an output of the font size for the extracted text in poster
Actor(s)	user
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. User selects the option for checking the font size. 2. The algorithm will be trained to extract the data using appropriate regression techniques. 3. Evaluation metrics are calculated to check the font size.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will executed their respective scenario flow.
Post Condition	After execution, the system will display the font size of the text.

Use Case Number	UC-04
Use Case Name	Color comparison
Overview	The user shall get a comparison of background color and text color in the poster.
Actor(s)	User
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. User selects the option for the comparison between the background color and the text color 2. The algorithm will utilize RGB to HSV color space conversions for the analysis 3. The pre-trained models will check the color contrast is good or poor.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will be executed with their respective scenario flow.
Post Condition	After execution, the system will display the color comparison result on the UI.

Use Case Number	UC-05
Use Case Name	Duplicate sentences detection
Overview	The user can check whether there are duplicate sentences in the poster.
Actor(s)	User
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. In the UI, the user will select the option of detecting the duplicate sentences . 2. The machine learning algorithm processes the data in the poster and detects the similar or duplicate sentences in the poster using the threshold values.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will be executed their respective scenario flow.
Post Condition	After execution, the system will display the duplicate sentences present in the poster.

Use Case Number	UC-06
Use Case Name	Indentation Evaluation
Overview	The user can check whether the indentation in the poster is correct or not by using the machine learning algorithm.
Actor(s)	User
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. The user will select the option of Indentation Evaluation in the UI. 2. First feature extraction takes place, then data is pre-processed. After that the model is trained and evaluated. 3. We will be using keras to train the model. 4. The model evaluates the poster for selected features.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will be executed their respective scenario flow.
Post Condition	After execution, the system will display whether the poster has correct or incorrect indentation

Use Case Number	UC-07
Use Case Name	Image and logo differentiation
Overview	The user can easily check the difference between image and logo. This process has been automated by using machine learning algorithms
Actor(s)	user
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. The user will select the option of image and logo differentiation. 2. We will be using the Keras and CNN in python for differentiating the images and logos. 3. Then it is redirected to the algorithm and it will preprocess the data, train the model and evaluate the model. 4. Then the result is displayed on the UI where images and logos are differentiated using the pixels.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will be executed their respective scenario flow.
Post Condition	After execution, the system will display the required output.

Use Case Number	UC-08
Use Case Name	Reference link validation
Overview	The user shall verify whether the reference links that are providedin the poster are valid or invalid by using machine learning algorithms.
Actor(s)	User
Pre-condition(s)	The web portal which is the UI has been created and deployed. The user will upload the poster.
Scenario Flow	**Main (success) Flow:** 1. The user will select the option where the reference link will be validated. 2. Firstly, the links will be extracted from poster. 3. The links will be validated using machine learning model and libraries such as Pytesseract or Tesseract.
Alternate Flows	The user can select other features that are to be evaluated in the poster. The system will be executed their respective scenario flow.
Post Condition	After execution, the system will display the result as valid or invalid on the UI.

Individual Contributions

S No.	Name	Student ID	Contribution
1.	Vadaparthi,Jyothirmai	11699561	Use Case Descriptions,Use Case Diagram, Problem Statement, Functional Requirements, Non-Functional requirements
2.	Ashritha,Battula	11712061	Problem Statement, Revision History
3.	Siddareddy Tejaswi Reddy	11697669	Use Case Diagram, Use Case Descriptions
4.	Bhavana Bayyapu	11680072	Use Case Descriptions, Non-functional requirements
5.	Jagruthi Pullaiahgari	11704227	Revision History, Stake holders