

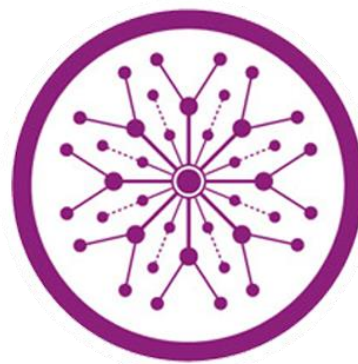
Smart Advertisement

Final Year Project

Session 2020-2024

A project submitted in partial fulfillment of the degree of

BS in Computer Science



Department of Computer Science

Faculty of Computer Science & Information Technology

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AI-WebBased	[☒] Development [☐] Research [☒] R&D			
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Plagiarism Free Certificate

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Smart Advertisement

Change Record

Author(s)	Version	Date	Notes	Supervisor's Signature
Huzaifa	1.0	20-7-2023	Define project scope and objectives	
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Huzaifa		22-9-2023	Provide ongoing user support	
Waleed		23-9-2023	Implement system monitoring	
Muhammad Yasir		24-9-2023	Perform regular system maintenance	

APPROVAL

PROJECT SUPERVISOR

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Date: _____

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PROJECT MANAGER

Comments: _____

Date: _____

Signature: _____

HEAD OF THE DEPARTMENT

Comments: _____

Date: _____

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Dedication

This project is dedicated to the tireless efforts of researchers, engineers, and innovators in the field of artificial intelligence and computer vision. Their groundbreaking work has paved the way for advancements that make intelligent systems like Smart Advertisement possible. We dedicate this project to the future generations of technologists and visionaries, who will continue to push the boundaries of what technology can achieve in making our world more connected and intelligent.

Executive Summary

In today's digital age, advertising plays a pivotal role in shaping consumer behavior and driving sales. To maximize the effectiveness of advertisements, it is crucial to deliver content tailored to the specific demographics of the audience. This project introduces a groundbreaking solution: a Smart Advertisement System that utilizes real-time gender detection to dynamically display male-focused or female-focused content on digital screens.

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Chapter 1

Introduction

1. Introduction

In today's world, advertisements are ubiquitous and play a significant role in shaping our perceptions and preferences. However, it's become evident that many people, particularly females and males, have distinct preferences when it comes to the gender representation in advertisements. This project seeks to bridge this gap by creating a Smart Advertisement system.

1.1 Background

As the world has gone online with the use of technology in communication, marketing, and business, there is a need for most advertisers to find means of marketing goods and services to the intended audience based on certain characteristics such as gender.

Modern developments in computational vision and differentiation methods, for example, in facial recognition and object recognition, enable one to identify the gender based on the images and video feed. Thus, advertisers employing targeted advertisement strategies pointed out that such specific advertisements are more effective in influencing the audience and making sales than general advertisements. It is most logical to assume that if adverts are shown based on the gender of a particular viewer then relevance and effectiveness is boosted.

1.2 Existing System / Competitive Analysis

During our competition analysis, we noted that the current methods of advertisement do not possess the flexibility to actively match with people's preferences efficiently. Screen advertising is more conventional compared to new forms of advertising and mostly uses demographic targeting thus viewers end up disliking the adverts and the funds spent on them are a waste. While some firms use facial recognition technology, these solutions remain invasive and provoke such values as privacy. To this end, our Smart Advertisement system wants to offer the public a non-intrusive and at the same time more personal approach.

1. 3 Problem Statement

The issue that lies at the core of our study is the actual awareness gap between the audience and contents promoted through advertisements. This diversity not only creates a conflict in the viewers but also affects the advertising outcome negatively. Existing methods do not meet this need to a sufficient extent, which opens the way for a finer analysis of the problem.

1. 4 Limitation of the Study

Specifically, the objectives of our study include designing a gender detection system that is affordable, unobtrusive, and does not invade users' privacy. For the next three months, the three principal areas of attention will be working on the development of a basic proof of concept, incorporating sensing equipment and gender-identification software. Further, it is possible to expand on what it can be used for besides adverts, for instance, promotional material in physical shops, and data analysis.

Lastly, it would be worthy of note that our Smart Advertisement project is a project that will change the way advertisement is been done by matching advertisement content with gender preference that will make viewers more engage and satisfy. By using this technology, it will be our aim to close this gap and at the same time, not infringe consumer privacy and keep the costs reasonable.

1.5 Proposed Solution

The solution that can be proposed is a sensor-based system that can detect the gender of persons in front of the ad. Thus, by anonymously defining whether a male or female is present, advertisers are able to show content that would be appreciated by the viewers. It presents a differential focus when it comes to advertising since it can improve the consumers' experiences and, thus, the possibility of better advertising impact.

1.5.1 Implementation Tools and Techniques

- Hardware: Cameras, micro-controllers, and display screens.

- **Software:** Programming languages Python, , machine learning libraries (e.g., numpy, pandas, seaborn,Tenserflow Kiras), and database management systems.
- **Machine Learning:** Utilizing deep learning models for gender classification.
- **User Interface:** Developing a user-friendly interface using relevant frameworks.
- **Testing:** Employing rigorous testing methodologies, including unit testing and user testing.
- **Privacy Measures:** Implementing encryption, anonymization, and data access controls to ensure privacy compliance.

1.6 Project Plan

Project Duration: 9 to 12 Months

Milestones

- 1) Project Initiation**
- 2) Hardware procurement**
- 3) Sensor Integration**
- 4) Advertisement Database Creation**
- 5) Gender Detection Algorithm Development**
- 6) User Interface Design**
- 7) Prototype Testing**
- 8) Final integration and Testing**
- 9) Quality Assurance**
- 10) Documentation**
- 11) User Training**
- 12) Deployment**
- 13) Project Completion**

1.7. Work Breakdown Structure

1. Project Initiation

- ☐ Scope of the project and its goals

- ☐Examining the stakeholders and their responsibilities

- ☐Establish project timeline

2. Research and Requirements Gathering

- ☐Review gender preference data that has been collected in the past

- ☐Gauge the interest of the target group of users

- ☐Define the specifications of the technical aspect of the chosen sensor

3. Sensor Development

- ☐Like a camera that picks the gender of the people crossing the path of the dryer.

- ☐Ensure accuracy of the sensor through testing as well as calibration.

- ☐Connect the sensor to a micro controller.

4. Data Collection and Analysis

- ☐Collect data for and in various context

- ☐To ensure an organised form of data collection, the data collected is analyzed to differentiate between male and female.

- ☐Take the results of the analysis in order to refine the detection algorithm

5. Ad Content Database

- ☐Build up a list of advertisements to be sorted by gender appeal.

- ☐Prepare such ads and incorporate them into the database.

- ☐To ensure that the website can be updated easily, there is need to incorporate a content management system.

6. User Interface

- ☐Develop an intuitive and easy to use a human interface for the system setup and control

- ☐Deploy the developed UI on the web or mobile environment

- ☐Ensure accessibility and usability

7. Integration

- ☐Merge the cam-sensor with the ad content database

- ☐ Establish equations which can be used to correlate the gender identified with the advertisements suitable for the latter.
- ☐ Test all sub-systems that would ensure efficient functioning of the entire system

8. Testing and Quality Assurance

- ☐ Engage in proper testing in a bid to trace the bugs.
- ☐ Confirm that the gender of the speakers is recognized by the system
- ☐ Introduce stress testing as well as edge-case testing

9. User Training and Documentation

- ☐ Authoring of user manuals and documentation
- ☐ Offer seminars to the end-users or Advertisers

10. Deployment and Maintenance

- Introduce the Smart Advertisement system in the targeted areas
- Develop a schedule and a protocol for updating the system, and maintaining the sensors

1.7.1 Roles & Responsibility Matrix:

The purpose of roles & responsibility matrix is to identify who will do what.

WBS #	WBS Deliverable	Activity #	Activity to Complete the Deliverable	Duration (# of Days)	Responsible Team Member(s) & Role(s)
1	Project Initiation	1.1	Define project scope and objectives	5	Huzaifa Manzoor
1	Project Initiation	1.2	Identify key stakeholders and roles	10	Huzaifa Manzoor
2	System Requirements	2.1	Conduct market research	5	Waleed
2	System Requirements	2.2	Define system requirements	5	Waleed
3	Hardware Setup	3.1	Procure cameras and hardware	15	Huzaifa Manzoor
3	Hardware Setup	3.2	Set up camera systems	15	Huzaifa Manzoor
4	Software Development	4.1	Develop gender detection algorithm	14	Yasir yaseen
4	Software Development	4.2	Integrate algorithm with camera system	16	Yasir Yaseen
5	Testing and Quality Assurance	5.1	Conduct system testing	20	Yasir Yaseen
5	Testing and Quality Assurance	6.1	Address and fix identified issues	12	Yasir Yaseen
6	System Integration	6.2	Integrate the system with advertisement	10	Huzaifa Manzoor
6	System Integration	7.1	Test integrated system	10	Huzaifa Manzoor
7	Documentation	8.1	Create user manuals and	25	Yasir Yaseen

			documentation		
8	Deployment and Rollout	8.2	Deploy the system in a test environment	8	Huzaifa, Yasir Yaseen
8	Deployment and Rollout	9.1	Deploy the system in production	10	Huzaifa, Yasir Yaseen
9	Training and User Support	9.2	Conduct user training sessions	12	Waleed Akhtar
9	Training and User Support	10.1	Provide ongoing user support	7	Waleed Akhtar, Huzaifa
10	Monitoring and Maintenance	10.1	Implement system monitoring	10	Waleed Akhtar, Yasir
10	Monitoring and Maintenance	10.2	Perform regular system maintenance	10	Waleed Akhtar, Yasir

PROJECT DETAILS

1.7.2 Gantt Chart

PROJECT START-UP DATE	23-9-2023
PROJECT ENDING DATE	9-12 months needed

Mile-Stones

- 1) Project Initiation
- 2) Hardware procurement
- 3) Sensor Integration
- 4) Advertisement Database Creation
- 5) Gender Detection Algorithm Development
- 6) User Interface Design
- 7) Prototype Testing
- 8) Final integration and Testing
- 9) Quality Assurance
- 10) Documentation
- 11) User Training
- 12) Deployment
- 13) Project Completion

TASK AND ASSIGNMENTS

Task Title	Start Date	End Date	Assigned To
Project Initiation	23-9-2023	9-12 months	Huzaifa Manzoor
Hardware Procurement	23-9-2023	9-12 months	Huzaifa Manzoor
Sensor Integration	23-9-2023	9-12 months	Huzaifa Manzoor
Gender Detection Algorithm	23-9-2023	9-12 months	Huzaifa Manzoor, Waleed Akhtar
Advertisement Database Creation	23-9-2023	9-12 months	Huzaifa, Waleed
User Interface Design	23-9-2023	9-12 months	Waleed Akhtar
Prototype testing	23-9-2023	9-12 months	Yasir Yaseen
Final Integration Test	23-9-2023	9-12 months	Huzaifa, Waleed, Yasir
Quality Assurance	23-9-2023	9-12 months	Huzaifa, Waleed, Yasir
Documentation	23-9-2023	9-12 months	Waleed, Huzaifa, Yasir
User Training	23-9-2023	9-12 months	Waleed
Deployment	23-9-2023	9-12 months	Huzaifa, Waleed
Project Completion	23-9-2023	9-12 months	Huzaifa, Waleed, Yasir

Empathy Map

Says: I want ads that are relevant to my interests. I want to reach my target audience effectively. We need a reliable and accurate gender-detection system.	Thinks: I don't like wasting time on irrelevant ads. How can I optimize my ad spending? How can we improve sensor accuracy?
Does: Skips or ignores ads that don't interest them. Seeks cost-effective advertising solutions. Researches and develops cutting-edge technology.	Feel: Frustrated when shown ads they don't care about. Anxious about ad performance and ROI. Committed to creating a valuable product.

Chapter 2

Software Requirement Specifications

2.1 Introduction

2.1.1 Purpose :

The concept of Smart Advertisement System is to improve user experience with the messages that are going to be sent to the target audience filtering by gender. Project Name: Advance vision technology to identify the gender of person standing in-front of the cam. Besides, it serves to maximize the efficiency of advertising while at the same time creating a more appealing presentation to the consumers.

Product Name: Smart Advertisements

Version:[new]

In this proposal Our Software Requirements provide the specification of the Advertisement Systems. Our SRS clearly outlines the specification with clear categorizations based on the gender preferences. The SRS does not relate to precise hardware elements but request needed to accomplish targets on the finished item.

2. 1. 2 Document Conventions

It adheres to Standard Typographical Conventions for Consistence for the purpose of clarity. On Styles Colors and Highlights are employed in order to highlight some parts of the document. It categorizes for the higher level requirements. The font size that we chose is 12 and the font –family we utilized is Ariel Roman. Every Requirements Statements is accompanied with its own priority to guarantee that all elements are comprehensively described.

2. 1. 3 Meant for and Suggested Reading

We are Crafted for the Diverse audience such as developers.Project Managers.Gtesters.Users & documentation writers.

Introduction

It gives the higher level Overview presenting the Smart Advertisements Project,Explains about the project and its advantages.

Targeted Population and Document Summary

It Looks at the various kind of reader that can benefit form this document and gives a brief background on the structure of this paper.

System Overview.

As for the Smart Advertisement System, the paper provides its general description as well as Overview of its main functions.

Requirements

Scribe the required function for the successful functioning of the project.

Design and Architecture

Describe and design the architecture of Smart Advertisement Systems.

Testing

Explain how would you and the professional organization test and conduct procedures to guarantee that the system is reliable and efficient.

Implementation and Timeline:

Offers a time-frame on when Smart Advertisement project will be commenced and or put into effect.

Conclusion

Summarizes the findings and accumulation for the project development

Recommending Reading Sequence

Begin with Introduction to understand the achieving goals.

Moved to Section 2 for achieving intended audience and document structure.

Proceed then based on your interest such as **System Overview Requirements** and **design structure**.

Conclude with a Conclusion for the Summaries key aspects.

2.1.4 Product Scope**Benefits, Objectives and Goals:****Personalized Management:**

Tailoring Advertisements based on gender preferences enhances viewers engagements and relevance.

Maximize Impact:

We can maximize impact by aligning and and content with individual preferences,

the system aims to maximize the impact of advertising campaigns.

Optimized Advertising Campaigns

Target Advertisements Contribute to more use of efficient budgets reaching the target audience with greater precision.

Alignment With Corporate Goals

The Smart Advertisement System aligns with corporate goals by ensuring a strategic and technologically advanced approach to advertising. By prioritizing viewer satisfaction and personalization, the system contributes to brand loyalty, increased market visibility, and a positive impact on the bottom line.

2.1.5. References

https://www.researchgate.net/publication/308765994_Smart_AdvertisingOverall
Description

2.2 Overall Description

2.2.1 Product Perspective

Context and Origin:

The Smart Advertisement System represents a groundbreaking evolution in targeted advertising, designed to address the nuanced preferences of viewers in real-time. Unlike traditional advertising methods, this system is an innovative and self-contained product tailored to meet the dynamic demands of contemporary audiences.

Origins:

Innovation in Advertising: The project originates from a vision to innovate the advertising landscape by incorporating advanced technologies to enhance viewer engagement.

Targeted Personalization: Understanding that individuals have specific preferences regarding the gender of models featured in advertisements, this system aims to revolutionize ad content delivery.

Context:

Self-Contained Product: The Smart Advertisement System is a standalone product, uniquely positioned to adapt to various contexts and platforms where advertising is prevalent.

Response to Viewer Preferences: Developed as a response to the need for more personalized advertising, the system identifies the gender of individuals in real-time, ensuring that advertisements align with viewer preferences.

System Overview:

For a comprehensive understanding, refer to Section 3: System Overview, which provides a detailed overview of the major components, subsystem interconnections, and external interfaces of the Smart Advertisement System.

2.2.2 User Classes and Characteristics

User Classes and Characteristics

The Smart Advertisement System is designed to accommodate a diverse range of users, each with unique characteristics that influence their interaction with the system.

Viewers:**Frequency of Use:**

Regular, during advertisement broadcasts.

Pertinent Characteristics:

Varied gender preferences, varying levels of technological familiarity.

Importance:

Primary user class the system aims to enhance the viewing experience by delivering personalized advertisements.

Frequency of Use:

Frequent, during campaign setup and monitoring.

Pertinent Characteristics:

Marketing expertise, familiarity with advertisement content creation.

Importance:

Critical for campaign success; they utilize the system to tailor advertisements based on gender preferences.

Content Creators

Frequency of Use:

Periodic, for system maintenance and monitoring.

Pertinent Characteristics:

Technical expertise, security clearance for system access.

Importance:

Crucial for system functionality; they manage and ensure the system's overall performance and security.

Content Creators:

Frequency of Use:

Regular, during content creation and updates.

Pertinent Characteristics:

Graphic design skills, knowledge of gender-specific advertisement trends.

Importance:

Essential for ensuring the relevance and attractiveness of advertisements; they contribute to the content customization process.

Distinguishing Importance:

Primary User Class:

Viewers are the primary focus as their preferences drive the core functionality of the Smart Advertisement System.

Critical Users:

Advertisers play a critical role in ensuring the effectiveness of ad campaigns.

Supporting Roles:

System administrators and content creators provide essential support to maintain system integrity and deliver compelling ad content.

Understanding the diverse needs of these user classes is integral to tailoring the system to meet their respective requirements effectively.

2.2.3 Operating Environment

Environment Description:

The Smart Advertisement System is designed to seamlessly operate in a dynamic and interactive advertising environment, ensuring compatibility and optimal functionality across various hardware and software components.

Hardware Platform:

Camera Systems:

The system is compatible with standard camera systems equipped with gender detection capabilities. It leverages the input from these cameras to identify the gender of individuals in real-time.

Display Devices: The advertisements are intended to be displayed on a variety of devices, including but not limited to, digital screens, monitors, and interactive displays.

Operating System:

Cross-Platform Compatibility:

The Smart Advertisement System is designed to operate across multiple operating systems, ensuring flexibility for deployment. It supports major operating systems such as Windows, macOS, and Linux.

Software Components:

Gender Detection Software: The system integrates with gender detection algorithms to accurately identify the gender of individuals in front of the camera.

Ad Content Management System: Advertisements are managed through a content management system that facilitates the customization and scheduling of gender-specific advertisements.

Applications and Coexistence:

Integration with Advertising Platforms: The system is intended to integrate seamlessly with advertising platforms, allowing advertisers to efficiently manage and monitor campaigns.

Compatibility with Content Creation Tools: Content creators can use standard graphic design tools to create and update gender-specific advertisements, ensuring compatibility with existing workflows.

Coexistence Requirements:

Smooth Integration with Existing Systems: The Smart Advertisement System must coexist peacefully with existing camera systems, display devices, and advertising platforms.

Interoperability: Ensures compatibility with various gender detection software and content creation tools, allowing for a smooth workflow for system administrators and content creators.

2.2.4 Design and Implementation Constraints**Limitations and Constraints:**

The development of the Smart Advertisement System is subject to various items and issues that impose constraints on the options available to developers. These constraints encompass corporate policies, technological considerations, and regulatory requirements.

Corporate and Regulatory Policies:

The system must adhere to data protection and privacy regulations to ensure the ethical use of gender detection technology. Compliance with regional and international standards, such as GDPR, is mandatory.

Adherence to corporate branding guidelines and ethical advertising practices is paramount to maintain the integrity of the advertising content.

Hardware Limitations:

The system's performance is contingent on the capabilities of the deployed camera systems. Developers must work within the constraints of these hardware specifications for real-time gender detection.

Adherence to memory and processing requirements is crucial to ensure the system's responsiveness during the execution of gender-specific advertisements.

Interfaces to Other Applications:

Seamless integration with existing advertising platforms and content creation tools is essential. Developers must align with the specifications of these interfaces to ensure smooth data exchange.

Compatibility with external gender detection software is necessary, requiring developers to conform to defined API specifications.

Technologies, Tools, and Databases:

The choice of gender detection algorithms and technology is a critical aspect. Developers are limited to technologies and tools that align with the accuracy and efficiency requirements of real-time gender identification.

The system must interface with a designated content management system, imposing specific database requirements for ad content storage and retrieval.

Security Considerations:

Stringent security measures must be implemented to safeguard user data and prevent unauthorized access to the gender detection algorithms. Compliance with industry best practices for cyber security is mandatory.

Encryption protocols and secure data transmission methods must be employed to protect sensitive information during communication with external applications and databases.

Design Conventions and Programming Standards:

Developers must adhere to established design conventions and programming standards to ensure code maintainability and ease of collaboration.

The use of a version control system and documentation practices is mandatory to support future system enhancements and updates.

2.2.5 Assumptions and Dependencies

Third-Party Gender Detection Software:

Assumption:

The system assumes the availability and compatibility of a third-party gender detection software for accurate real-time identification.

Dependency:

The project heavily relies on the effectiveness and reliability of the chosen gender detection software. Any limitations or changes in this software could impact the system's performance.

Camera System Capabilities:

Assumption:

Assumed that the deployed camera systems possess the necessary capabilities for gender detection.

Dependency:

The accuracy of gender detection relies on the capabilities of the camera systems. Any limitations in camera hardware may affect the reliability of the gender identification process.

Advertising Platform Integration:

Assumption:

Assumes seamless integration with popular advertising platforms for campaign management.

Dependency:

The project is dependent on the availability and compatibility of API s provided by advertising platforms. Any changes to these interfaces may impact the system's ability to manage and monitor ad campaigns effectively.

Content Creation Tool Compatibility:

Assumption:

Assumes compatibility with standard graphic design tools for ad content creation and updates.

Dependency:

The project relies on the ability to import and export ad content from commonly used graphic design tools. Changes to file formats or lack of support may impact the workflow of content creators.

Data Privacy and Regulatory Compliance:

Assumption:

Assumes compliance with data privacy regulations and ethical advertising practices.

Dependency:

The project is dependent on the legal and ethical use of gender detection technology. Any changes in privacy regulations or ethical standards may necessitate adjustments to the system.

Availability of Content Management System:

Assumption:

Assumes the availability and compatibility of a designated content management system for ad content storage and retrieval.

Dependency:

The project relies on the specified content management system. Any changes or unavailability of this system may impact the storage and retrieval of ad content.

Adherence to Advertising Standards:

Assumption:

Assumes adherence to advertising standards and guidelines for ethical content creation

Dependency:

The project is dependent on content creators following advertising standards. Deviations from these standards may affect the overall quality and acceptability of advertisements.

User Engagement Preferences:

Assumption:

Assumes that user preferences regarding gender-specific advertisements are accurately represented.

Dependency:

The success of the system relies on accurate identification of user preferences. Any discrepancies in user engagement data may affect the system's ability to deliver personalized content effectively.

2.3 External Interface Requirements**2.3.1 User Interfaces****User Interface Overview:**

The Smart Advertisement System features an intuitive and user-friendly interface designed to enhance user engagement and provide a seamless experience for various user classes.

User Classes:

Viewers: Interact with the system during ad broadcasts.

Advertisers: Manage and monitor ad campaigns.

System Administrators: Oversee system maintenance and monitoring.

Content Creators: Contribute to the customization of ad content.

Software Components Requiring a User Interface:

Gender Detection Module:

Enables configuration and monitoring of real-time gender detection algorithms.

Ad Content Management System:

Facilitates the customization and scheduling of gender-specific advertisements.

Campaign Management Interface:

Allows advertisers to set up, monitor, and analyze ad campaigns.

Logical Characteristics:**Sample Screen Images:**

Provide visual representations of key screens for viewers, advertisers, system administrators, and content creators.

GUI Standards:

Follow established graphical user interface (GUI) standards to ensure consistency and familiarity across the system.

Layout Constraints:

Adhere to responsive design principles for compatibility with various screen sizes and devices.

Standard Buttons and Functions:

Include standard buttons for actions such as "Submit," "Cancel," and "Save." Consistent placement of essential functions ensures ease of use.

Help Functionality:

Implement a help function accessible from any screen to provide context-specific assistance.

Keyboard Shortcuts:

Incorporate keyboard shortcuts for power users, enhancing efficiency in tasks like content creation and campaign management.

Error Message Display Standards:

Ensure clear and informative error messages with consistent formatting for effective user feedback.

User Interface Design:

Separate User Interface Specification: Detailed design elements, including color schemes, typography, and iconography, are documented in a separate User Interface Specification.

Responsive Design: Prioritize responsive design principles to cater to users accessing the system from various devices.

Customization for Viewers:

Gender Preferences:

Allow viewers to set and customize their gender preferences through a user-friendly interface.

Feedback Mechanism:

Include an option for viewers to provide feedback on the relevance and quality of advertisements.

Tools for Advertisers and Content Creators:

Campaign Management Dashboard:

Advertisers can access a centralized dashboard for campaign setup, monitoring, and analytics.

Content Creation Tools:

Provide content creators with tools for creating and customizing gender-specific advertisements.

Security Considerations:**Role-Based Access Control:**

Implement role-based access control to ensure that users only have access to functionalities relevant to their roles.

Secure Login:

Prioritize secure login mechanisms, such as multi-factor authentication, for system administrators and advertisers.

2.3.2 Hardware Interfaces

Supported Device Types:**Camera Systems:**

The system is designed to interface with standard camera systems equipped with gender detection capabilities. Supported types include CCTV cameras, webcams, and other relevant imaging devices.

Display Devices:

Advertisements are intended to be displayed on a variety of devices, including digital screens, monitors, and interactive displays.

Nature of Data and Control Interactions:**Data Interactions:**

The system interacts with camera systems to receive video input for gender detection. Data related to gender-specific advertisement preferences is exchanged with the content management system.

Control Interactions:

System administrators have control interactions with the hardware components for maintenance and monitoring purposes.

Communication Protocols:

Camera Systems Communication:

Utilizes industry-standard communication protocols such as RTSP (Real-Time Streaming Protocol) or HTTP for seamless integration with camera systems.

Content Management System Communication:

Adheres to Restful APIs for efficient communication with the content management system, enabling the retrieval and storage of ad content.

Internal System Communication:

Uses secure communication protocols to facilitate data exchange between system components, ensuring the integrity and confidentiality of sensitive information.

Device Interaction Frequency:

Real-Time Interaction: The system interacts in real-time with camera systems for gender detection. The frequency of interaction is based on the frame rate of the camera feed.

Periodic Interaction: System administrators may interact periodically with hardware components for maintenance, updates, and monitoring purposes.

Device Compatibility:

Camera System Compatibility: The system is designed to be compatible with a range of camera systems, accommodating varying resolutions and frame rates.

Display Device Compatibility: Advertisements are formatted to be compatible with different display devices, ensuring a consistent viewing experience.

Error Handling:

Fault Tolerance: Incorporates fault-tolerant mechanisms to handle potential issues with camera connections, ensuring uninterrupted gender detection.

Error Reporting: Implements a robust error reporting system to notify administrators of any hardware-related issues promptly.

Security Considerations:

Secure Communication: Ensures that all communication between software and hardware components is encrypted to prevent unauthorized access or tampering.

Access Controls: Implements access controls for system administrators, allowing only authorized personnel to interact with hardware components.

2.3.3 Software Interfaces

Gender Detection Software Component:

Purpose:

Responsible for real-time gender identification based on input from camera systems.

Data Items In/Out:

In: Video feed from camera systems. Out: Gender information (e.g., male or female).

Services and Communications:

Interfaces with the Smart Advertisements system through a standardized API. Communication may involve sending and receiving video data and gender information.

Camera Systems Component:

Purpose:

Captures video feed for gender detection.

Data Items In/Out:

Out: Video feed to the Gender Detection Software.

Services and Communications:

Utilizes standard communication protocols (e.g., RTSP or HTTP) to send video data to the Gender Detection Software.

Content Management System (CMS) Component:

Purpose:

Manages and stores gender-specific advertisements.

Data Items In/Out:

In: Advertisements uploaded by Content Creators. Out: Advertisements retrieved for display.

Services and Communications:

Provides API's for the Smart Advertisements system to upload, retrieve, and manage gender-specific advertisements.

Advertising Platforms Component:

Purpose:

Integrates with external advertising platforms for campaign management.

Data Items In/Out:

In: Campaign setup and monitoring commands. Out: Campaign analytics and status.

Services and Communications:

Communicates with external advertising platforms using their respective API s.

Smart Advertisements System:**Purpose:**

Coordinates the overall functioning of the Smart Advertisements system.

Data Items In/Out:

In: Gender information, video feeds, advertisements, campaign commands. **Out:** Display commands to presentation devices.

Services and Communications:

Orchestrates communication between gender detection, camera systems, CMS, and advertising platforms. Communicates through standardized APIs.

Presentation Devices Component:**Purpose:**

Displays gender-specific advertisements to viewers.

Data Items In/Out:

In: Display commands from the Smart Advertisements system. Out: Advertisements to be displayed.

Services and Communications:

Receives display commands from the Smart Advertisements system and shows the corresponding advertisements.

2.3.4 Communications Interfaces

Gender Detection Software:

How it Talks:

Uses the internet (HTTP/HTTPS) to share real-time gender information.

Security Measures:

Keeps the info private using encryption (HTTPS).

Speed:

Needs a fast connection for streaming video data.

Camera Systems:

How it Talks:

Streams videos using a special language (RTSP).

Security Measures:

Tries to keep things secure, might use a secure version of RTSP (RTSPS).

Speed:

Requires a high-speed connection for real-time video streaming.

Content Management System (CMS):

How it Talks:

Talks securely (HTTPS) to manage and share ads.

Security Measures:

Uses secure keys and keeps data safe during travel.

Speed:

Moderate to high-speed needed for managing ads.

Advertising Platforms:

How it Talks:

Communicates with Smart Advertisements using a common language (RESTful APIs over HTTPS).

Security Measures:

Uses keys and encrypts data for safety.

Speed:

Depends on how busy ad campaigns are.

Smart Advertisements System:

How it Talks:

Communicates securely with everything (HTTPS).

Security Measures:

Keeps info safe during the talk.

Speed:

Varies based on what it's doing.

Presentation Devices:

How it Talks:

Speaks with the Smart Advertisements system using internet language (HTTP/HTTPS).

Security Measures:

Keeps data safe while talking.

Speed:

Depends on how quickly it needs to show ads.

2.4 System Features

Features of our Project(Smart Advertisements) are defined in the followings.

System Features 1

Gender Detection:

Description:

The system should be able to accurately detect the gender of individuals standing in front of the camera.

Functionality:

Utilize computer vision algorithms for real-time gender identification.

Account for variations in lighting conditions and camera angles.

System Features 2

User Profiling

Description:

Create and maintain user profiles based on gender detection.

Functionality:

Store user gender information securely. Update profiles in real-time as users interact with the system.

System Features 3

Advertisement Selection:

Description:

Dynamically choose advertisements based on the detected gender.

Functionality:

Maintain a database of gender-specific advertisements. Select and display relevant ads in real-time.

System Features 4

Camera Integration

Description:

Integrate and manage cameras for seamless operation.

Functionality:

Support various camera models and types. Ensure synchronization and communication between cameras and the main system.

System Features 5

User Interface

Description:

Provide an intuitive interface for system configuration and monitoring.

Functionality:

Allow administrators to set system preferences. Display real-time gender detection and ad selection data.

Logging and Analytics

Description:

Capture and analyze system data for performance and improvement.

Functionality:

Log gender detection results and advertisement interactions. Generate reports for system analytics.

System Features 6

Security and Privacy

Description:

Implement measures to ensure user privacy and system security.

Functionality:

Encrypt and secure user data. Provide options for users to opt-out or manage data sharing preferences.

System Features 7

Description:

Facilitate ongoing system maintenance and updates.

Functionality:

Allow for remote updates and patches. Monitor system health and provide alerts for potential issues.

2.5 Nonfunctional Requirements

2.5.1 Performance Requirements

Response Time

The system should provide real-time gender detection with a response time not exceeding specify maximum acceptable time, e.g., 1 second.

Throughput

The system should be able to process and analyze a minimum of [specify number] faces per second.

Scalability

The system should be scalable to accommodate an increasing number of users and cameras.

Safety Requirements

Response Time

The system should provide real-time gender detection with a response time not exceeding [specify maximum acceptable time, e.g., 1 second].

Throughput

The system should be able to process and analyze a minimum of [specify number] faces per second.

Scalability

The system should be scalable to accommodate an increasing number of users and cameras.

Security Requirements

Data Privacy

Ensure that user data, especially gender information, is stored and transmitted securely, complying with relevant privacy regulations.

Access Control

Implement access control measures to restrict system configuration and sensitive data access to authorized personnel only.

Data Encryption

Use encryption mechanisms to protect data during transmission and storage.

Usability Requirements

User Interface

The user interface should be intuitive and user-friendly, catering to both system administrators and end-users.

Training

The system should be designed to require minimal training for users to interact with and understand its features.

Reliability Requirements

Availability

The system should have a high availability rate, with downtime not exceeding [specify maximum acceptable downtime, e.g., 99.9% uptime].

Fault Tolerance

The system should be designed to handle and recover gracefully from unexpected failures or disruptions.

Error Handling

The system should provide clear and user-friendly error messages in case of detection errors or system failures.

Maintainability/Supportability Requirements

Update Mechanism

Implement a mechanism for easy and regular updates to the system to incorporate improvements and address vulnerabilities.

Documentation

Provide comprehensive documentation for system configuration, maintenance, and troubleshooting.

Portability Requirements

Device Independence

Requirement:

The system should be designed to work with a variety of cameras and hardware devices commonly used in advertising setups.

Rationale:

Device independence ensures that the system can adapt to different camera models and configurations, enhancing versatility.

Efficiency Requirements

Real-Time Processing

Requirement:

The system should process gender detection and advertisement selection in real-time, with minimal latency.

Rationale:

Real-time processing ensures timely and responsive interactions, enhancing the overall user experience.

Domain Requirements

Advertisement Content Guidelines

Requirement:

Adhere to industry-specific guidelines and regulations for the content of advertisements, ensuring compliance with ethical and legal standards.

Rationale:

Following content guidelines helps maintain the reputation of the advertising industry and prevents the display of inappropriate or offensive content.

Chapter 3

Use Case Analysis

Chapter 3: Use Case Analysis

Primary Actor: Viewer

Secondary Actors: Smart Advertisements System, Presentation Devices

Preconditions:

- 1)The Smart Advertisements System is operational.
- 2)The Presentation Devices are ready to display advertisements.

Post-conditions:

- 1)The viewer has successfully viewed gender-specific advertisements.
- 2)Advertisements are displayed on Presentation Devices.

Trigger:

The viewer approaches a Presentation Device equipped with the Smart Advertisements System.

Basic Flow:

- 1)The viewer stands in front of a Presentation Device.
- 2)The Presentation Device captures the viewer's presence.
- 3)The Smart Advertisements System detects the viewer's gender using the Gender Detection System.
- 4)Based on the detected gender, the Smart Advertisements System retrieves and displays gender-specific advertisements.
- 5)The viewer views the displayed advertisements.
- 6)The viewer walks away, ending the interaction.

Alternative Flows:

- 1) If the Presentation Device encounters a technical issue in capturing the viewer's presence:
 - 2)The system displays a message indicating a technical difficulty.
 - 3)The viewer may attempt the interaction again or move to another Presentation Device.
 - 4)If the Gender Detection System encounters difficulties in accurately detecting the viewer's **Gender**:
 - 1)The system may display a default set of advertisements.

2)The viewer still has the option to view advertisements, but they might not be gender-specific.

Exception Flows:

1)If there is a system-wide failure:

2)All Presentation Devices may display a default set of advertisements.

3)Maintenance personnel are alerted to address the issue.

Special Requirements:

1)Presentation Devices must be strategically placed for optimal viewer engagement.

2)The Gender Detection System should have a high accuracy rate in gender identification.

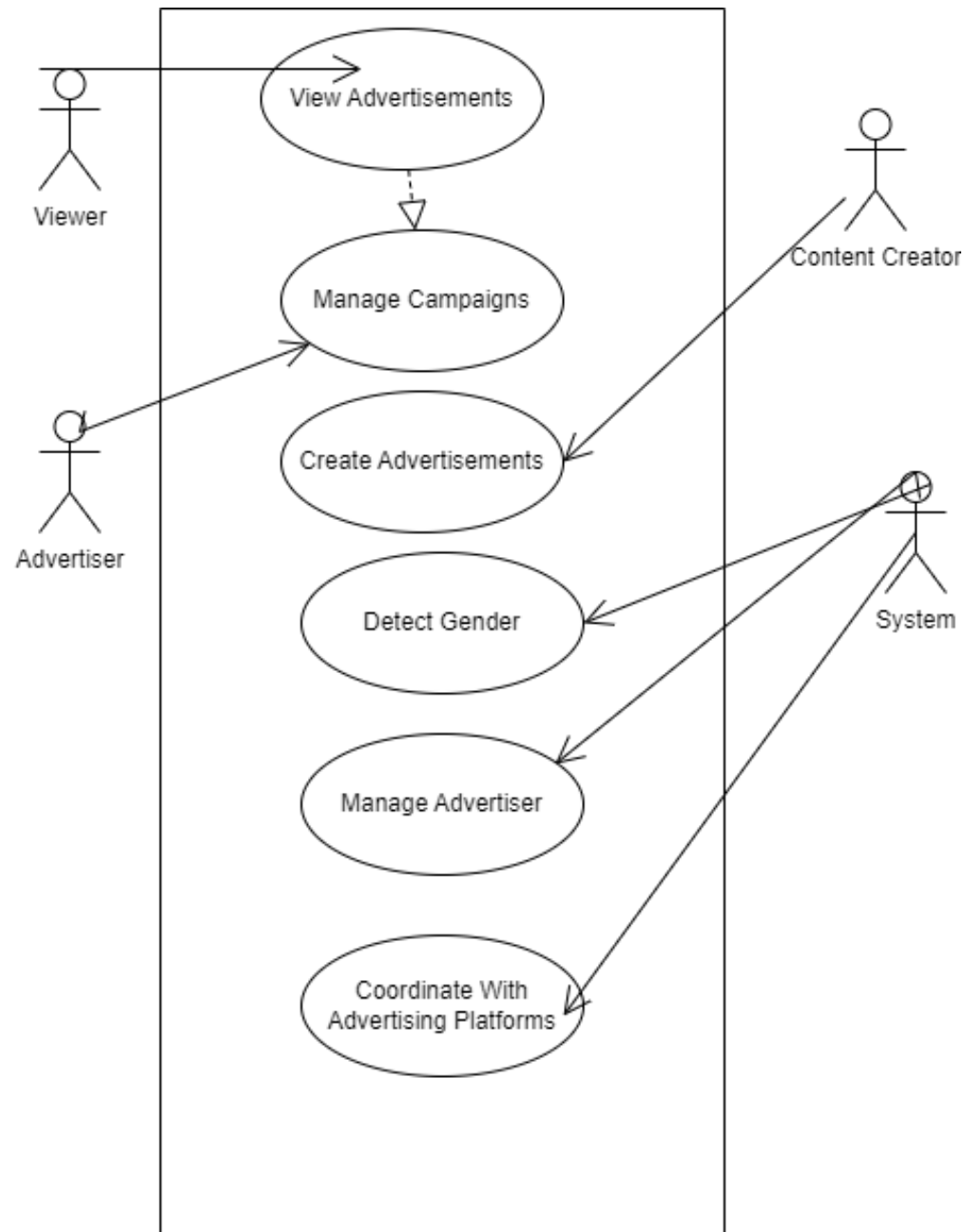
3)Advertisements should be stored and managed efficiently to ensure a quick retrieval process.

Assumptions:

1)The Smart Advertisements System is integrated with reliable Presentation Devices.

2)The Gender Detection System is accurate and can quickly identify the gender of viewers.

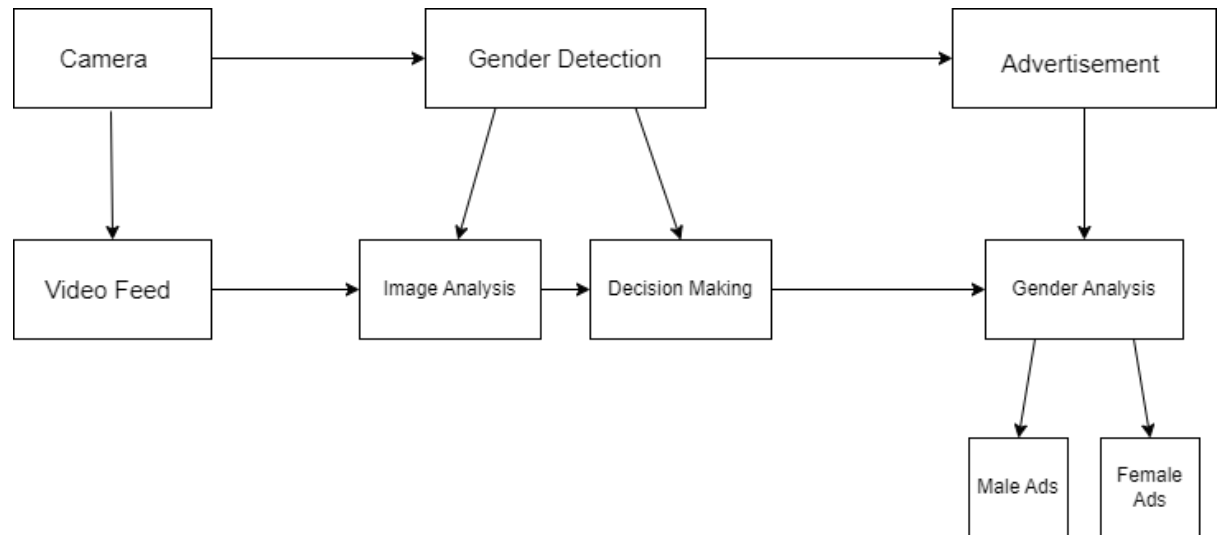
3.1. Use Case Model



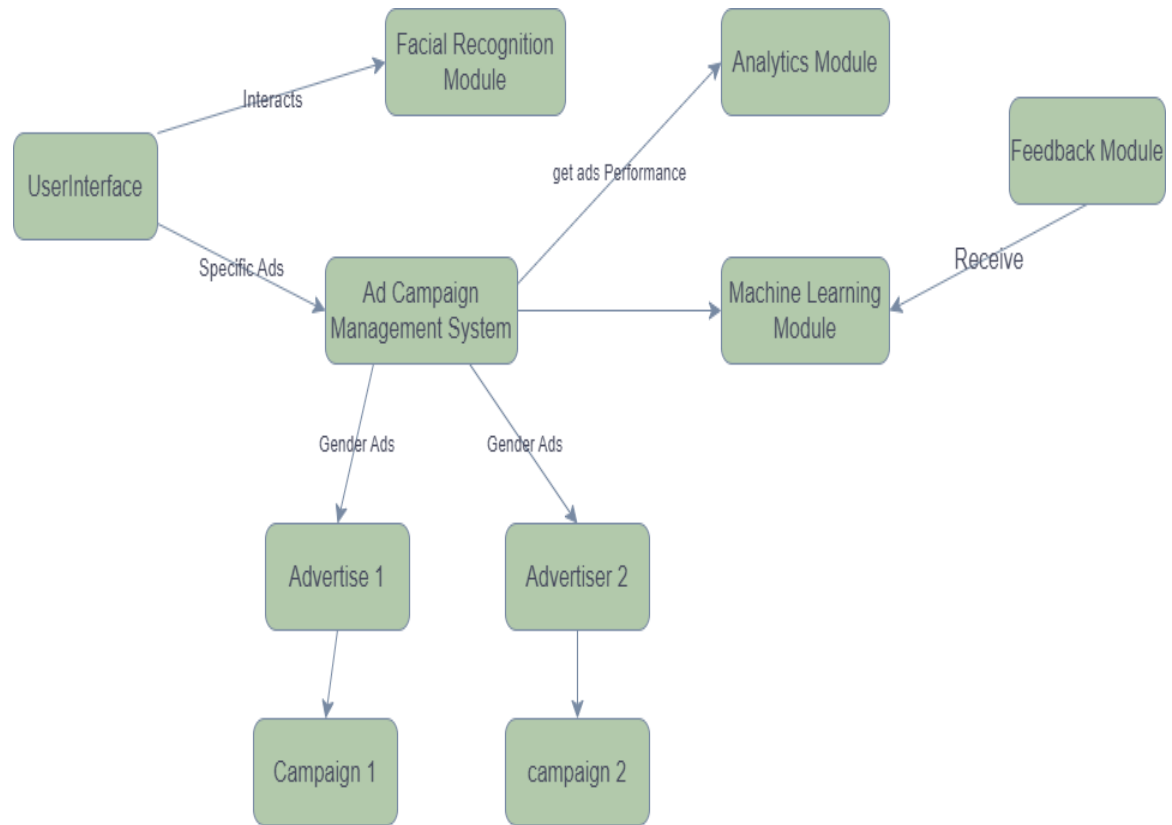
Chapter 4

System Design

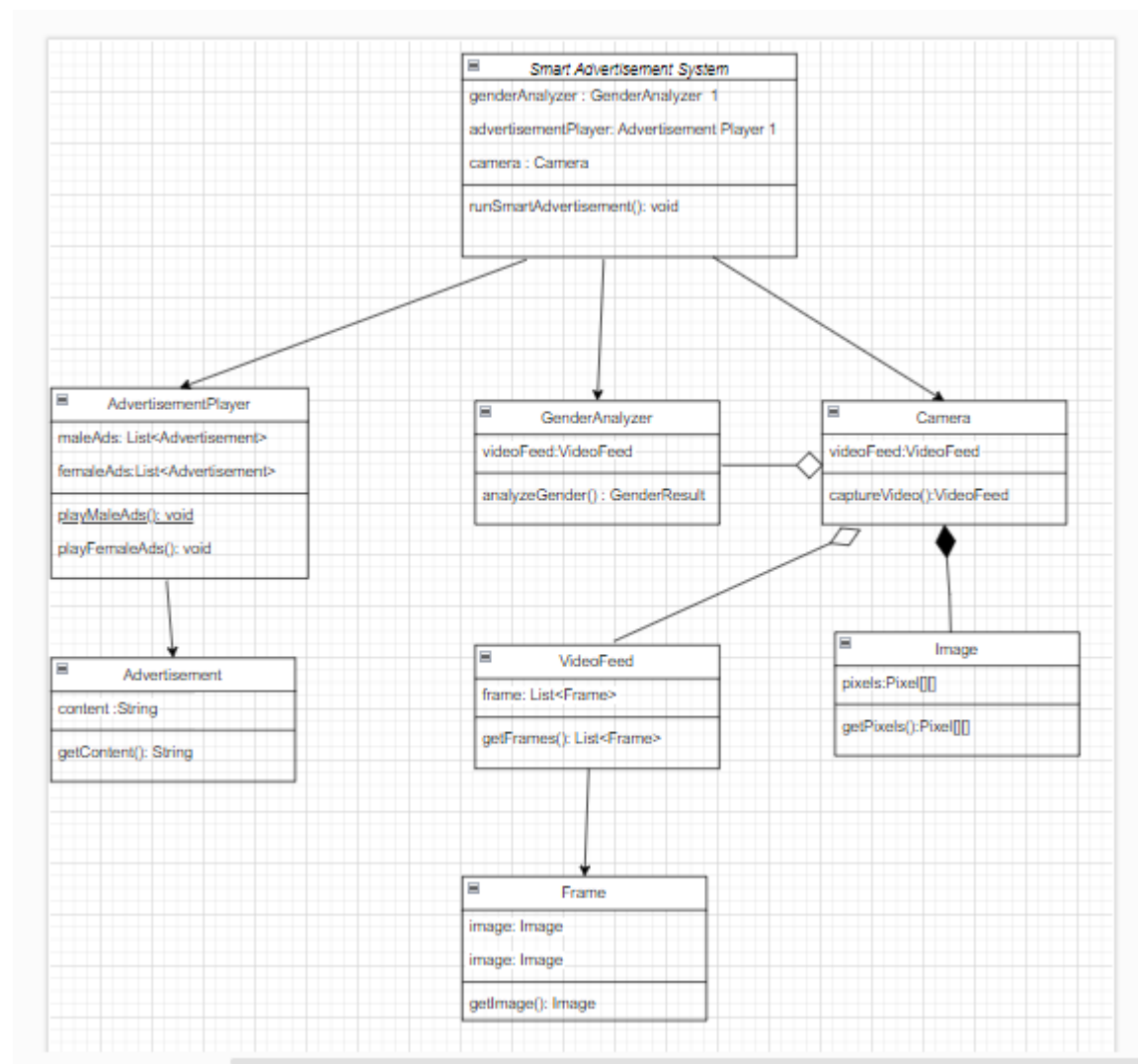
System Design



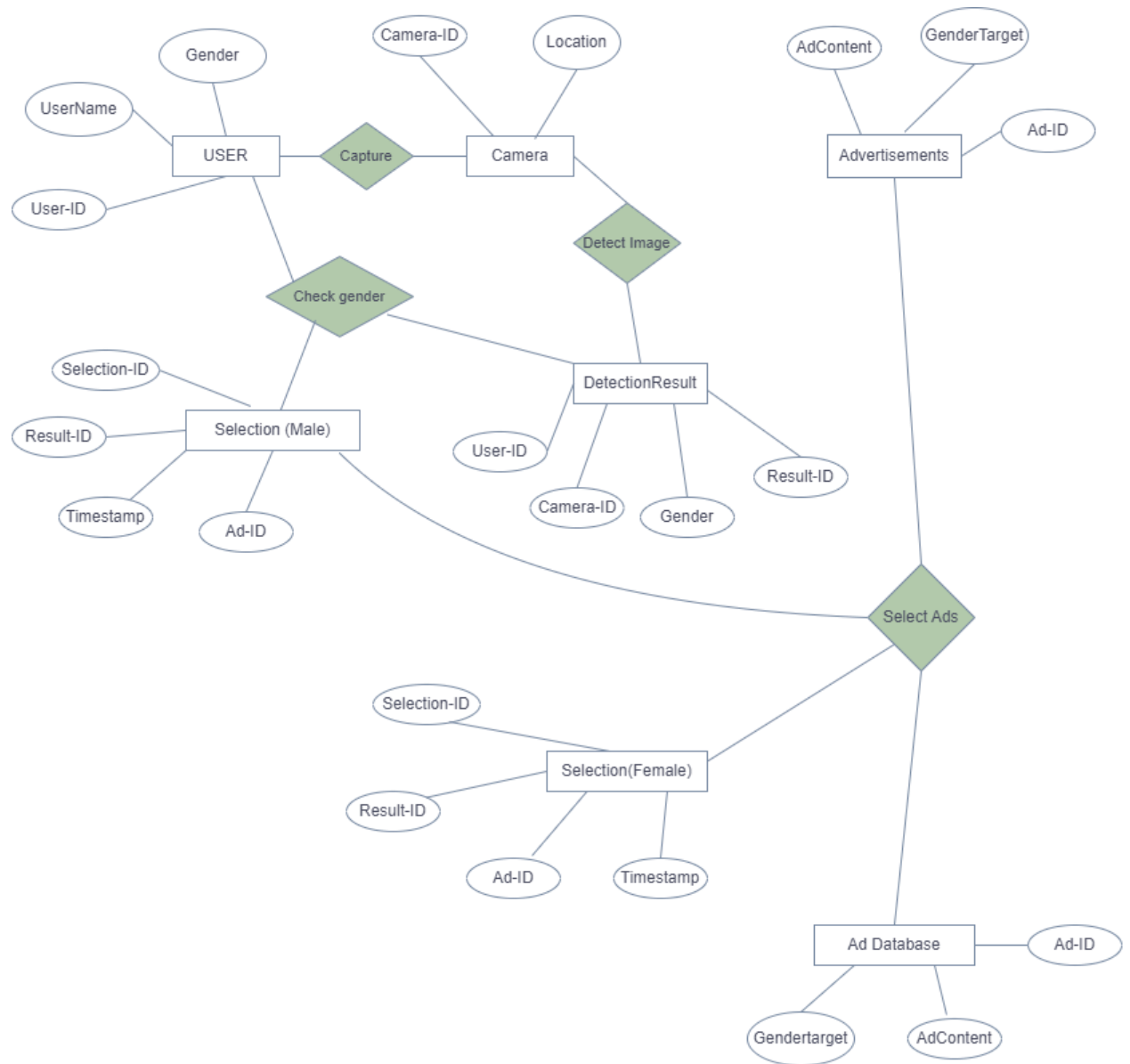
4.1. Architecture Diagram



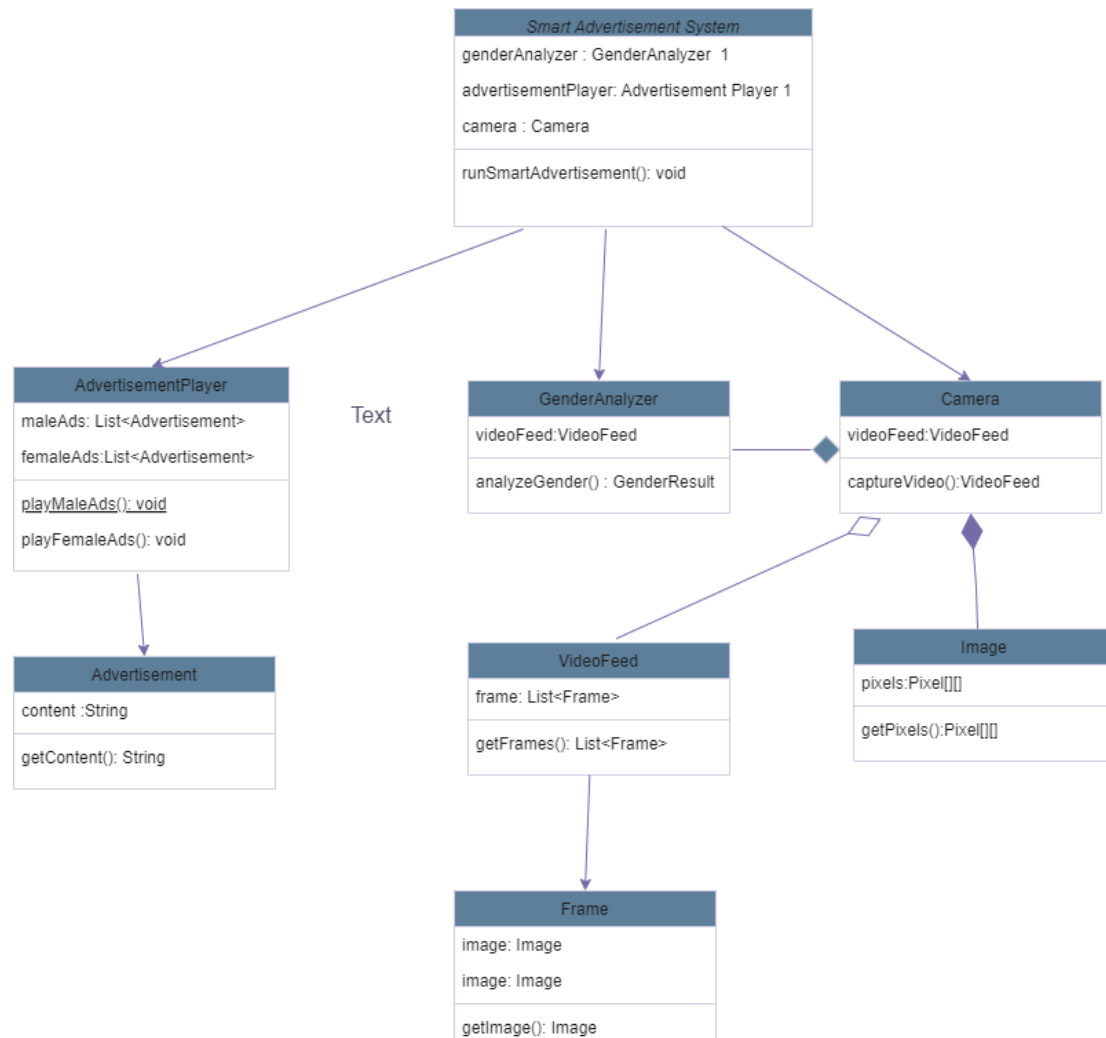
4.2. Domain Model



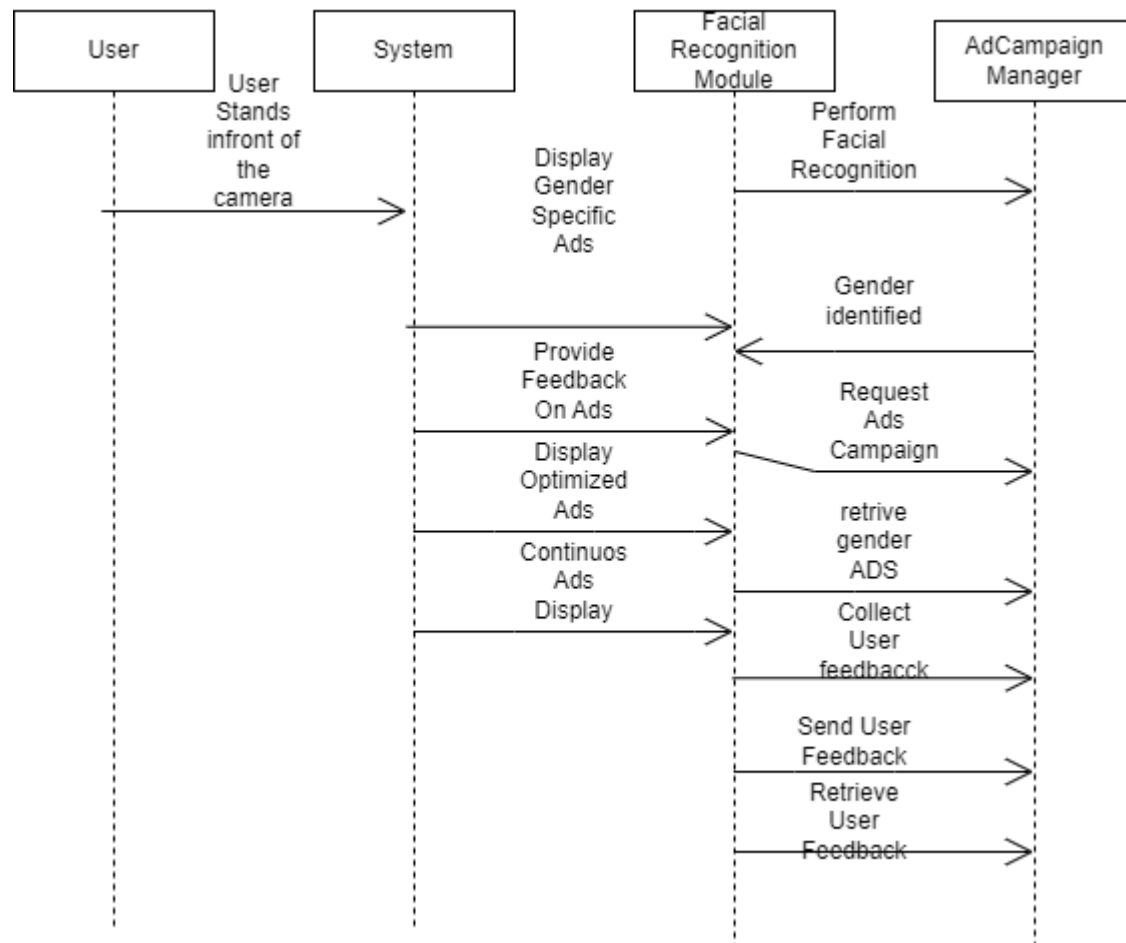
4.3. Entity Relationship Diagram with data dictionary



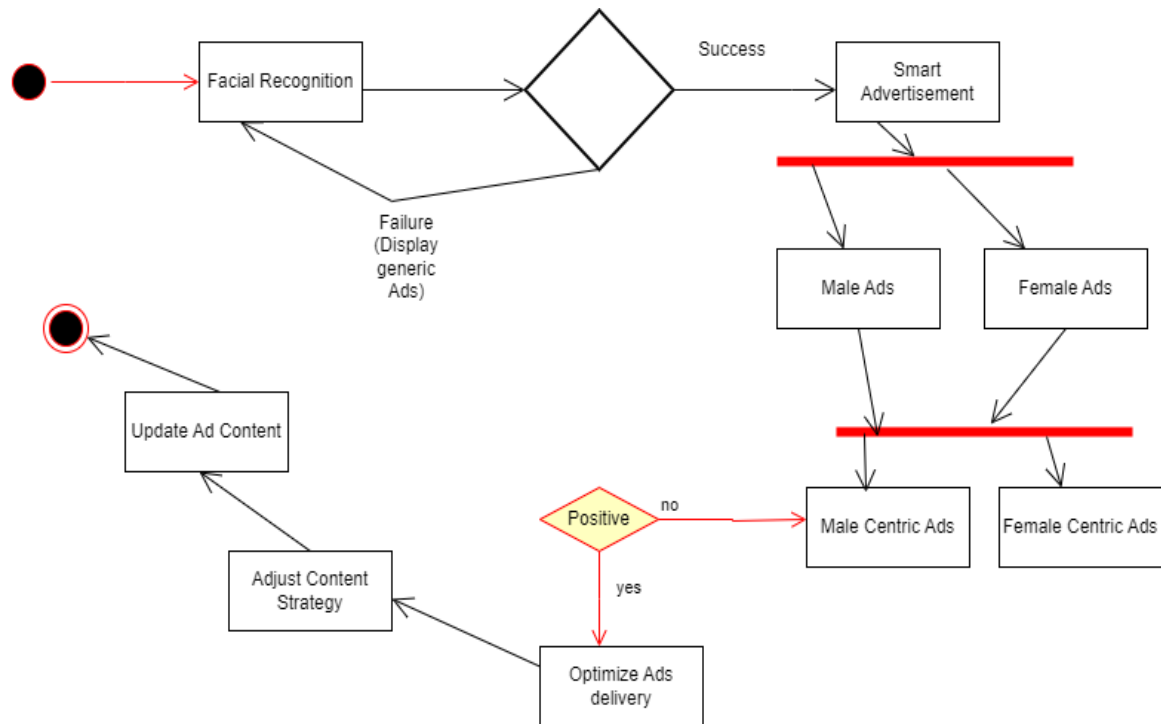
4.4. Class Diagram



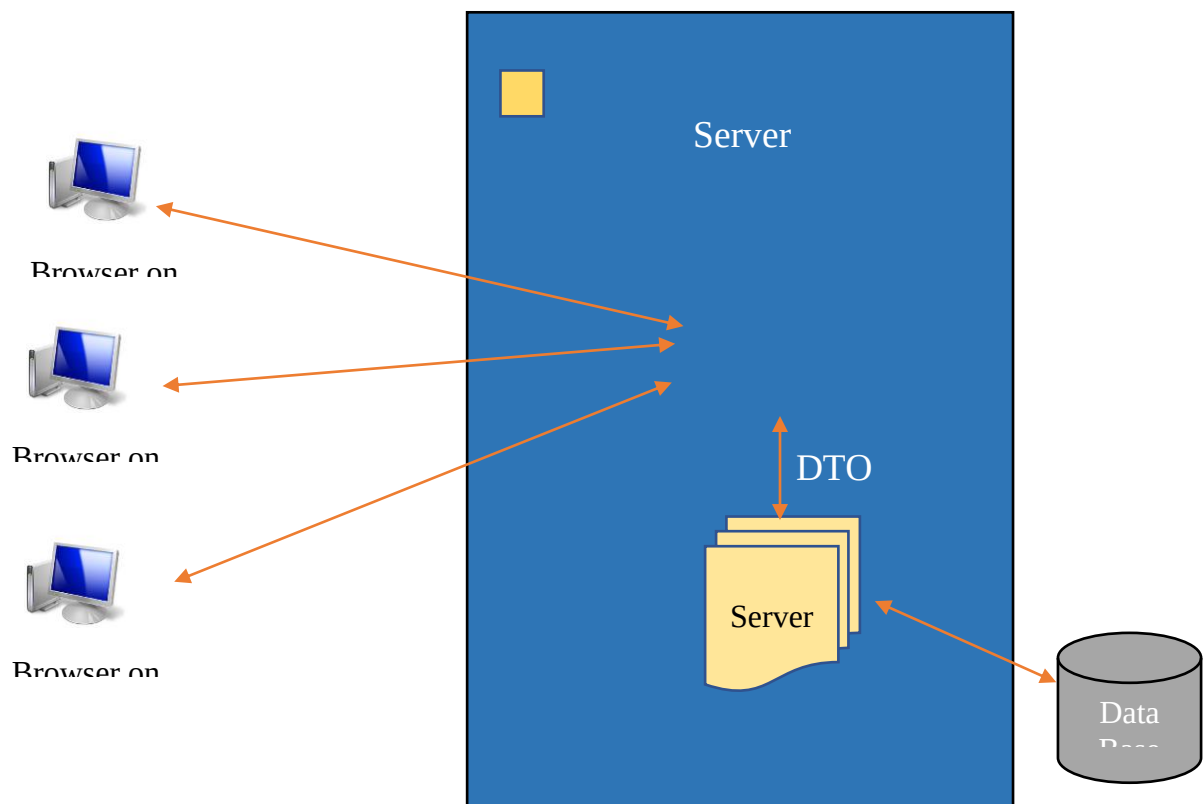
4.5. Sequence / Collaboration Diagram



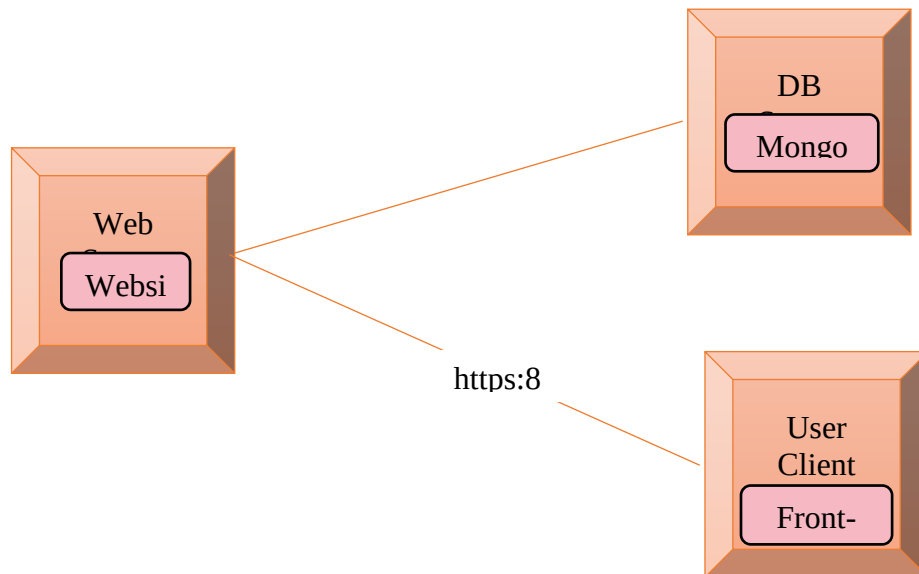
4.6. Activity Diagram



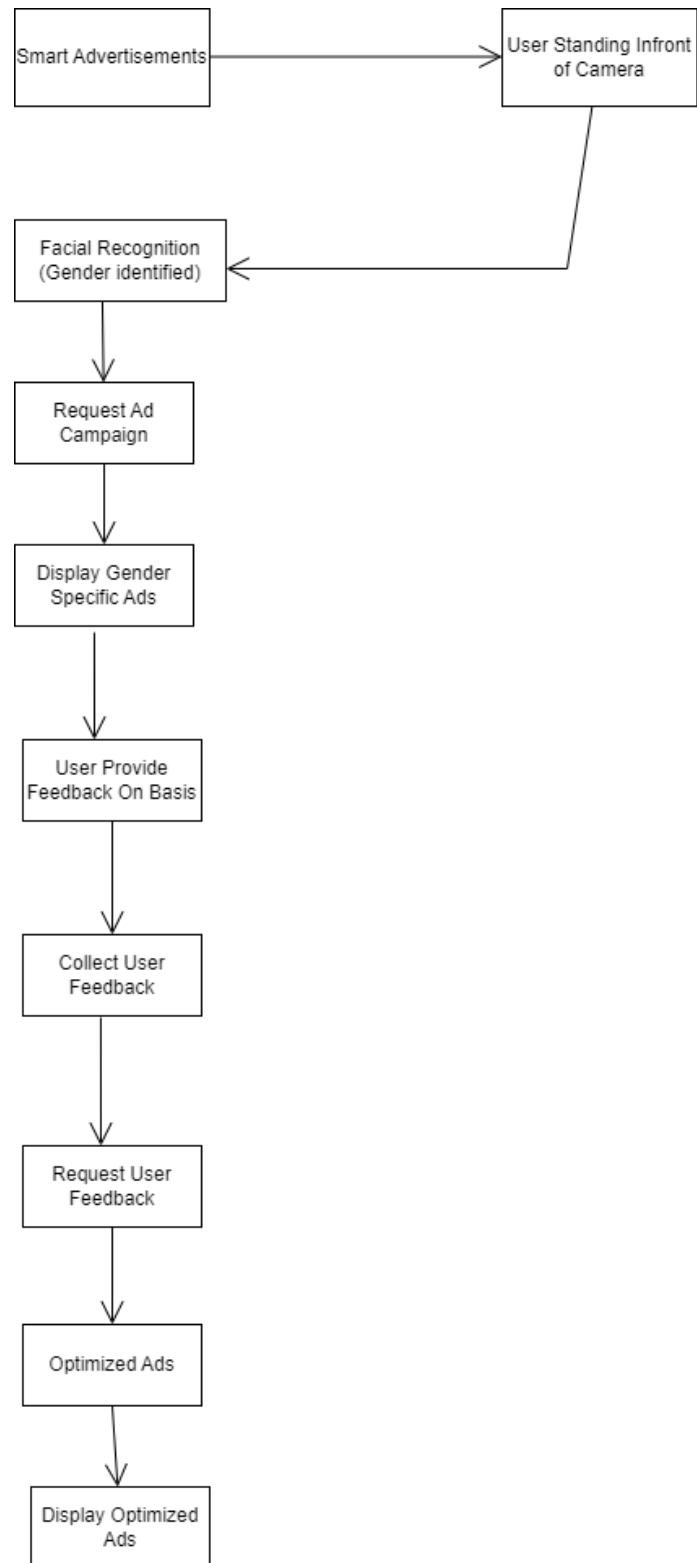
4.7 Component Diagram



4.8 Deployment Diagram



4.9 Flow Diagram



Chapter 5

Implementation

5.1. Components, Libraries

- phyton
- numpay
- pandas
- Seaborn
- openCV
- TenserFlow
- Kiras
- Haarcasding.xml

5.2. Deployment Environment

MicroSoft Azure/ AWS

➤ Tools and Techniques

- VScode
- External Camera

5.3. Best Practices / Coding Standards

- Consistent naming conventions
- Proper indentation and formatting
- Readable and self-explanatory code
- Effective use of comments where necessary

5.4. Version Control

- Git

Chapter 6

Testing and Evaluation

The Testing and Evaluation phase of my final year project document will focus on assessing the functionality and performance of your smart advertisements system. Given the nature of my project, this phase involves accurate testing to ensure the accuracy and effectiveness of gender detection and ad targeting mechanisms.

We will conduct various tests to verify the system's ability to accurately identify the gender of individuals in front of the camera. This may include testing in different lighting conditions, with varied camera angles, and diverse demographic groups to ensure robustness and inclusivity.

Moreover, evaluation will encompass assessing the system's responsiveness in delivering targeted advertisements based on gender detection. You'll measure the system's efficiency in displaying appropriate ads promptly without delays or errors.

Additionally, user feedback and satisfaction surveys may be conducted to gauge the effectiveness and user experience of the smart advertisements system. This will provide valuable insights into user preferences, perceptions, and any areas for improvement.

Overall, the Testing and Evaluation chapter will serve to validate the functionality, reliability, and user satisfaction of your smart advertisements system, ensuring its readiness for deployment and real-world application.

6.1. Use Case Testing

Each use case will represent a specific scenario, such as:

Use Case 1: Gender Detection Accuracy: Test the system's ability to accurately identify the gender of individuals in front of the camera under various conditions (e.g., different lighting, varying distances).

Use Case 2: Ad Selection Based on Gender: Verify that the system appropriately selects and displays advertisements tailored to the detected gender, ensuring that males are shown male-targeted ads and females are shown female-targeted ads.

Use Case 3: Real-time Responsiveness: Assess the system's responsiveness in dynamically adjusting ad content based on changes in detected gender, ensuring that advertisements are displayed promptly without delays.

Use Case 4: User Interaction: Evaluate the system's handling of user interactions, such as interruptions or changes in front of the camera during ad display, to ensure seamless ad delivery and user experience.

Use Case 5: Error Handling: Test the system's ability to handle potential errors or unexpected situations, such as failure to detect gender or incorrect ad selection, and verify that appropriate error messages or fallback mechanisms are in place.

Equivalence partitioning

Equivalence Classes for Gender Detection: Divide the input space into classes representing different gender characteristics (e.g., male, female, non-binary). Test cases will include scenarios to validate the system's accuracy in detecting each gender class under various conditions.

Equivalence Classes for Ad Targeting: Partition the input space based on the characteristics of advertisements (e.g., male-targeted, female-targeted). Test cases will ensure that ads are appropriately selected and displayed for each gender equivalence class, validating the system's ad targeting functionality.

Boundary value analysis

Gender Detection Boundaries: Test cases will focus on the boundaries of gender detection, such as the youngest and oldest ages typically associated with males and females. This ensures that the system accurately detects gender across the entire age spectrum.

Ad Targeting Boundaries: Verify the system's behavior at the boundaries of ad targeting criteria, such as the age range or specific interests typically associated with male or female audiences. This ensures that ads are appropriately selected and displayed for individuals at the edges of these criteria.

Camera Detection Range Boundaries: Test the system's performance at the boundaries of the camera's detection range, ensuring accurate gender detection and ad targeting even for individuals at the extremes of the camera's field of view.

6.2. Data flow testing

Testing Data Input: Ensuring that data from the camera input is accurately captured and processed by the system for gender detection.

Testing Data Transformation: Verifying that the system correctly transforms the detected gender information into appropriate ad targeting criteria.

Testing Data Output: Validating that the selected advertisements are displayed to users based on the detected gender, confirming the proper flow of data from the system to the user interface.

6.3. Unit testing

Testing Gender Detection Algorithm: Isolating and testing the algorithm responsible for detecting the gender of individuals in front of the camera to ensure accurate and reliable results.

Testing Ad Selection Logic: Testing the logic responsible for selecting and displaying advertisements based on the detected gender to ensure that the appropriate ads are shown to the user.

Testing Error Handling: Verifying that the system handles errors and exceptions gracefully, such as in cases where gender detection fails or ad selection encounters an issue.

6.4. Integration testing

Testing Camera Integration: Verifying that the camera system integrates seamlessly with the gender detection module, ensuring that data captured by the camera is accurately processed for gender detection.

Testing Advertisements Integration: Ensuring that the ad selection module integrates effectively with the gender detection results, enabling the system to select and display relevant advertisements based on the detected gender.

Testing System-wide Interactions: Testing the overall system functionality to ensure smooth interactions between all components, including the camera, gender detection algorithm, ad selection logic, and user interface.

Performance testing

Testing Gender Detection Speed: Assessing how quickly the system can detect the gender of individuals in front of the camera, ensuring timely ad targeting.

Testing Ad Selection Efficiency: Evaluating the system's ability to select and display advertisements promptly based on the detected gender, without delays or lags.

Testing System Resource Usage: Monitoring the system's resource utilization, such as CPU and memory usage, to ensure optimal performance and scalability, especially during periods of high user traffic.

Stress Testing

Testing High User Loads: Simulating a large number of users accessing the system simultaneously to assess its performance and responsiveness under heavy traffic.

Testing Peak Usage Scenarios: Creating scenarios where the system experiences peak loads, such as during peak hours or events, to determine its ability to handle sudden spikes in user activity.

Testing Resource Limits: Pushing the system beyond its capacity limits by increasing the number of concurrent users or processing intensive tasks to identify potential bottlenecks or points of failure.

Chapter 7

Summary, Conclusion and Future Enhancements

7.1. Project Summary

In My Project Summary section of my final year project document, provide a concise overview of my smart advertisements project. This should include:

Introduction: Briefly introduce the project and its purpose, emphasizing the goal of delivering targeted advertisements based on gender detection.

Key Features: Highlight the main features of the system, such as gender detection using a camera and targeted ad selection for males and females.

Methodology: Summarize the approach taken to develop and implement the system, including the use of techniques like Use Case Testing, Equivalence Partitioning, and Unit Testing.

Testing and Evaluation: Mention the testing and evaluation methods employed to ensure the accuracy, functionality, and performance of the system, including Use Case Testing, Boundary Value Analysis, and Performance Testing.

Conclusion: Conclude by emphasizing the significance of the project in providing a solution for targeted advertising and its potential impact on improving user engagement and advertising effectiveness.

7.2. Achievements and Improvements

Our smart advertisements project has achieved several notable milestones, including the successful implementation of gender detection technology using camera input and the development of an efficient ad targeting system. Through rigorous testing methodologies such as Use Case Testing, Equivalence Partitioning, and Integration Testing, we have validated the accuracy and functionality of the system, ensuring that advertisements are tailored and delivered appropriately based on the detected gender. Additionally, our project has identified areas for improvement, such as enhancing the speed and efficiency of gender detection algorithms and optimizing system performance under high user loads. Moving forward, we aim to address these areas and further enhance the robustness and effectiveness of our smart advertisements system.

Critical Review

Our smart advertisements project has demonstrated significant advancements in the field of targeted advertising, leveraging gender detection technology to deliver tailored ads to users. The project successfully implemented key functionalities, including accurate gender detection using camera input and efficient ad selection based on detected gender. Additionally, thorough testing methodologies were employed to validate the system's functionality and performance, ensuring reliability and user satisfaction.

However, despite these achievements, several challenges were encountered during the project's development and implementation. One notable challenge was optimizing the speed and efficiency of gender detection algorithms, particularly in scenarios with varying lighting conditions or complex backgrounds. Additionally, ensuring seamless integration between different system components proved to be a complex task, requiring meticulous attention to detail and extensive testing.

Moving forward, addressing these challenges will be crucial to further enhancing the effectiveness and usability of the smart advertisements system. Future iterations of the project could focus on refining the gender detection algorithms, improving system scalability to accommodate larger user loads, and enhancing user interface design for a more intuitive user experience. Overall, while the project has made significant strides in advancing targeted advertising technology, there is room for continued refinement and improvement to meet evolving user expectations and industry standards.

7.3. Lessons Learned

In the "Lessons Learned" section, key takeaways from the smart advertisements project include the critical role of thorough testing methodologies like Use Case Testing, highlighting the need for early issue detection. Effective communication among team members and adaptability to unforeseen challenges were also crucial for success, emphasizing the importance of clear project management practices and flexibility in project execution. These lessons will inform future projects, emphasizing

the significance of testing, communication, and adaptability in achieving project objectives.

7.4. Future Enhancements/Recommendations

Enhanced Gender Detection Algorithms: Invest in research and development to improve the accuracy and efficiency of gender detection algorithms, particularly in challenging conditions such as low lighting or complex backgrounds. Exploring advanced machine learning techniques and incorporating additional features for gender recognition could enhance the system's capabilities.

Dynamic Ad Content Personalization: Expand the system's capabilities to dynamically personalize ad content based on not only gender but also other demographic factors such as age, interests, and location. Implementing algorithms for real-time content customization could significantly enhance user engagement and advertising effectiveness.

User Interaction and Feedback Mechanisms: Integrate user interaction and feedback mechanisms into the system to gather valuable insights into user preferences and perceptions. Implement features such as user ratings, surveys, and preference settings to tailor ad content more effectively and improve overall user satisfaction.

Scalability and Performance Optimization: Optimize the system's scalability and performance to accommodate larger user loads and ensure smooth operation under high traffic conditions. Enhancements to backend infrastructure, caching mechanisms, and load balancing strategies can help improve system responsiveness and reliability.

Appendices

Appendix A: User Manual

The User Manual appendix provides comprehensive guidance on how to use the smart advertisements system effectively. It includes step-by-step instructions for users to interact with the system, covering aspects such as accessing the system, navigating the user interface, and understanding the functionalities available. Additionally, it may contain troubleshooting tips, frequently asked questions (FAQs), and best practices for optimizing user experience. This appendix serves as a valuable resource for users to maximize the benefits of the smart advertisements system and address any potential issues they may encounter during operation.

In the User Manual appendix, you should include detailed instructions on:

Accessing the Smart Advertisements System: Describe how users can access the system, whether it's through a web application, mobile app, or other platforms.

User Registration and Login: Provide guidance on how users can register for an account (if applicable) and log in to access personalized features.

Navigating the User Interface: Explain the layout and functionality of the user interface, including how to navigate between different sections, view advertisements, and interact with the system.

Gender Detection and Ad Targeting: Describe how the system detects the gender of users and delivers targeted advertisements accordingly, ensuring users understand the relevance of the ads they see.

Reference and Bibliography

Reference and Bibliography

1. [https://www.tensorflow.org/api_docs/python/tf/keras/applications/ResNet50]
2. <https://www.kaggle.com/datasets/playlist/men-women-classification>
3. <https://medium.com/@kenneth.ca95/a-guide-to-transfer-learning-with-keras-using-resnet50-a81a4a2808>

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Page 2 of 71 - AI Writing Overview

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It is essential to understand the limitations of AI detection before making decisions about a student's work. We encourage you to learn more about Turnitin's AI detection capabilities before using the tool.

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What does the percentage mean?

The percentage shown in the AI writing detection indicator and in the AI writing report is the amount of qualifying text within the submission that Turnitin's AI writing detection model determines was generated by AI.

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Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.

What does 'qualifying text' mean?

Sometimes false positives (incorrectly flagging human-written text as AI-generated), can include lists without a lot of structural variation, text that literally repeats itself, or text that has been paraphrased without developing new ideas. If our indicator shows a higher amount of AI writing in such text, we advise you to take that into consideration when looking at the percentage indicated.

In a longer document with a mix of authentic writing and AI-generated text, it can be difficult to exactly determine where the AI writing begins and original writing ends, but our model should give you a reliable guide to start conversations with the submitting student.

Disclaimer

Our AI writing assessment is designed to help educators identify text that might be prepared by a generative AI tool. Our AI writing assessment may not always be accurate (it may incorrectly flag human and AI-generated text) so it should not be used as the sole basis for adverse action against a student. It takes further scrutiny and human judgment in conjunction with an organization's application of its specific academic policies to determine whether any academic misconduct has occurred.