**ARTIFICIAL INTELLIGENCE BASED BUSINESS STRATEGY FOR OPTIMIZED ADVERTISING**

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Project Proposal Report

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# **Declaration**

We declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

|  |  |  |
| --- | --- | --- |
| **Student ID** | **Name** | **Signature** |
| IT 18 5076 152 | Kannangara K K A L | **A spider on a white surface  Description automatically generated with low confidence** |

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

-------------------------------------------- --------------------- Signature of the supervisor: Date:

# **Abstract**

Advertising is the way of connecting products and services with customers. Advertising is always present, though people may not be aware of it. In today's world, advertising uses every possible media to get its message through. Television (TV) commercials are one of the main modes of advertising which is currently tended over a passive mechanism which does not consider user demographics. These innovations are expected to be introduced to the television advertising industry through this study, which will be targeted based on user demographics such as age, gender prediction using image recognition and peer group classification of users who view the screen at a given time. The above mentioned user demographics will be captured with the aid of the Smart TV camera This would result in more user-relevant advertising, making television commercials more user-friendly and attractive.

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# **Introduction**

## **Background**

The world is rapidly developing and in that process, Advertising takes a major role. Advertisements (Ads) allows an organization to gain money by encouraging more individuals to understand the goods and services and thereby contributing to more purchases[1]. Ads encourage customers to make choices about which product and service to purchase. With the help of commercials, a customer gets the best possible choices

Television(TV) Advertising takes a major role in this domain since the majority of humans are used to watch TV. This makes a considerable impact on buying patterns of humans. The traditional advertising mechanism considers the time and location when placing advertisements. In this research, the intention is to put together the advertising mechanism in line with image detection and recognition, to make TV advertising more relevant and convenient to the customer.

Human detection is the task of locating all instances of human beings present in an image, and it has been accomplished most commonly by searching all regions in the image, at all possible scales, and comparing a small area with known templates or patterns of people at each location.[4]

In general, TV is watched in groups. These groups may consist of friends, family, toddlers, children, the elderly, etc. Human object detection is used to identify the number of faces in the image and with the aid of age and gender the particular peer group classification is done.

The next phase comprises the prediction of age and gender. When considering the preferences of a person, age and gender are the two main factors that directly influence their thoughts and ideas. Furthermore, for advertisement classification, age and gender play a precise role. In predicting the human age and gender, the algorithm will be extracting human features with particular to classify the audience base on their age and gender[3][13]. when considering recognition and detection of the age of the audience present on the snapshot a more weightage is given on features like wrinkles, folds, etc. Feature extraction of human faces will lead to making decisions in predicting age and gender.

This project aims to accurately classify and categorize the audience by detecting and predicting the demographics of the audience to bring out the most preferred and suitable commercial to be displayed on the television depending on the above-mentioned demographical criteria.

## **Literature Survey**

**Face Recognition System using KLT Viola Johns Algorithm[5]**

The method presented here for face recognition and monitoring reduces the calculation time with high precision to deliver outcomes. A face is tracked in a video sequence using the KLT algorithm, while Viola-Jones is used to detecting facial characteristics. It was also tested on live videos on a webcam, not just in video sequences. Using this method, several protection and surveillance systems can be built and it is easy to track the appropriate item. These algorithms will be used in the coming days to detect a single target rather than faces.

**A Study on Face Recognition Techniques with Age and Gender Classification[3]**

This paper provides a detailed survey of face identification in the last 51 years and different problems. This study of literature has demonstrated a steadily rising interest in the area of facial recognition. In the scientific community of machine vision and pattern recognition, some well-known topics such as posture, facial expression, lighting, occlusion, various facial characteristics, etc. have drawn a lot of interest during face recognition. To prepare for all these problems, different forms of approaches have been proposed, but there are still some unanswered challenges because there is a variety of optimization.

**Face Recognition based on Deep Learning[6]**

A new wave of neural network development has been introduced with deep learning in numerous fields of performance, beyond other techniques. In essence, the instance of deep learning derived from the artificial neural network refers to a subset of neural networks with a deep framework of efficient methods of training. Deep learning has been commonly used as an effective technology for the realization of artificial intelligence in automated handwriting recognition, simplification of measurements, voice recognition, image understanding, computer translation, prediction of protein structures, and recognition of emotions. In this article, we concentrate on the study hotspots of face recognition in the field of biometrics-based on deep learning, combined with the related theory and methods of deep learning, face recognition technology, along with the order of deep learning, based on the deep recognition of face learning, application of face recognition to begin research.

**Human Detection in Surveillance Videos and its Applications[12]**

For various application areas, including unusual object detection, human motion classification, congestion analysis, person identification, gender classification and fall detection for elderly people, the precise detection of human beings in a visual surveillance system is crucial. Detecting an object that is in motion is the first step of the detection process. Using background subtraction, optical flow, and Spatio-temporal filtering techniques, object detection could be carried out. Once detected, using shape-based, texture-based, or movement features, a moving object could be classified as a human being. This paper provides a systematic analysis of comparisons to available methods for the identification of human beings in surveillance images. The attributes of a few benchmark datasets and possible human detection research paths have also been explored.

**Real-Time Object Detection[7][8]**

The identification of real-time objects is very complicated since it takes more computing processing capacity to identify the objects at that time. The technology itself should be capable not only of recognizing objects but also of explicitly defining the object. Also, to create such an algorithm to recognize every entity, various types of data sets should be well qualified. Surprisingly, for both software and hardware elements, it has been an easy job to do with new technologies. The key prerequisite for the identification of real-time artifacts is to provide a powerful and precise algorithm to better communicate with system hardware elements, such as primary and secondary cameras. In addition, in order to perform the function, it should be able to continuously maintain compatibility between the hardware and software components. Detecting both dynamic and static objects on a real-time video could be described as a very challenging task, as stated earlier. Many techniques can be used to perform real-time object identification. The leading approaches in the area of real-time object detection are You-Only-Look-Once (YOLO) and Regional-based Convolutional Neural Networks (RCNN). Among them, the most trending method is YOLO.

**Convolutional Neural Networks(CNN)[8],[9]**

The key algorithm that offers all the functionality for most methods of real-time target detection is Convolutional Neural Networks (CNN). The key benefit in using the CNN algorithm is that there is only one layer known as a convolution layer in which a filter is convoluted to produce the final output with separate sections of the input instead of using fully connected layers. Furthermore, convolution layer tents have comparatively less weight that needs to be learned as compared to totally related layers. This is therefore the primary goal of most of the methods of real-time object detection to use the CNN algorithm since it is more effective, more efficient, and accurate.

**You Only Look Once(YOLO)[9],[11]**

YOLO is a one-step approach that embodies both static and dynamic object detection and classifies or names them in real-time object detection. Bounding box prediction is the key distinction between other current networks and YOLO, and class prediction can be achieved by YOLO[9] simultaneously.

First and foremost, the input image is separated into grids of S x S, and then the bounding box of B is added to each row. In a bounding box, the likelihood of an item exists as confidence and when the B bounding box connects to every grid, it gives the confidence score for the output.

## **Research Gap** **& Research Problem**

**Research Gap**

The primary need of the project is to bridge in between and optimize advertising on television to the next level. Moreover, considering the user’s demographics when placing advertisements on television is to be extended. Advertising is the attempt to impact the buying pattern of customers with the ability to deliver the message of trading goods and services. Among various modes of advertising, television commercials take a prominent position. The reason for television advertisements to be popular is that it reaches a vast number of audiences which will directly impact their buying patterns.

The most traditional process of advertising which is carried out on television is in the form of passive advertising which is delivered based on a schedule, which does not take into consideration of the user's demographic data such as age, gender, peer groups, etc. In advertising, user demographics are very important. The cost of advertising is very high as the advertisements are displayed to all users who are watching television. This will directly affect the sales conversions of the ads.

The proposed system consist of an image recognition system that identifies the user, predicts the age and gender to produce an accurate result for contextual-based advertising. It will increase the sales as well as inexpensive.

**Research Problem**

Advertising plays a vital role when it comes to business continuation, studies have shown that companies tend to expend a higher percentage in marketing and advertising campaigns. As for some articles, it has proved what percentage of revenue do these companies spend on marketing and sales(Google – 12%, Salesforce- 46%, Microsoft- 6%, Apple – 6%)[2],[]. It is the way of connecting products and services with customers. In this process, the customer should be the main focus. Platforms such as social media, e-commerce, and video sharing platforms are strictly following user-centric strategies for advertising which considers the user's likes, dislikes, search history, and social profile, etc.

The research should be mainly focused on the customer/audience against the preferences and the degree of satisfaction displayed on the TV. Unlike other platforms, TV Advertisement does not follow a user-centric approach of delivery which is currently based on location and time. Since Television is a much convenient way of advertising, development in that specific area is very important. This will directly affect the sales conversions of products and services.

# **Objectives**

## **Main Objectives**

The main aim of this project is to increase user preferences by optimizing user-preferred and user-centric advertisements. This means the audience is capable to view advertisements related to their interests. Here factors like age, gender, and peer groups are taken into consideration when determining the most suitable advertisement on the TV during a commercial break. This project will be beneficial for both the audience and the advertisement firm by letting the audience make an interest in interested goods which will be advertised and the ability to advertising firms to create advertisement content based on age, gender, and peer group which will directly affect the users in purchasing goods and services more effectively and efficiently.

## **Specific Objectives**

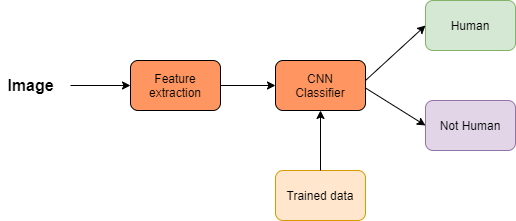
.

* Gathering online data sets and training the model.
* Detect human objects from the captured snapshots.
* Extract features to predict gender.
* Extract features to predict the age.
* Detect the number of human objects in the captured snapshot, and classifying them into peer groups.

# **Methodology**

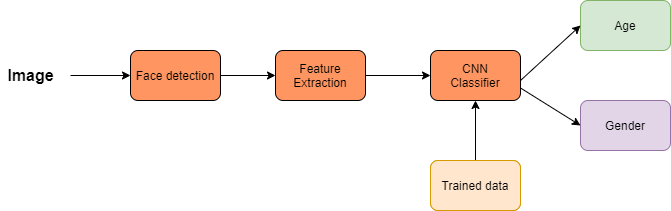
To detect users and predict their age, gender, and the peer group they are associated with using image detection and recognition, this research is proposing a system consisting of four major steps.

The initial step of this study is facial detection which is a computer vision problem that involves finding faces in photos. Convolutional Neural Networks (CNNs) based methods are to be used for the classification task due to their excellent performance in the facial analysis[8][9]. Training a data model with labeled images with faces is the main part of this step. Training data is the knowledge used to train an algorithm or model in machine learning to predict the result expected by the model to predict.



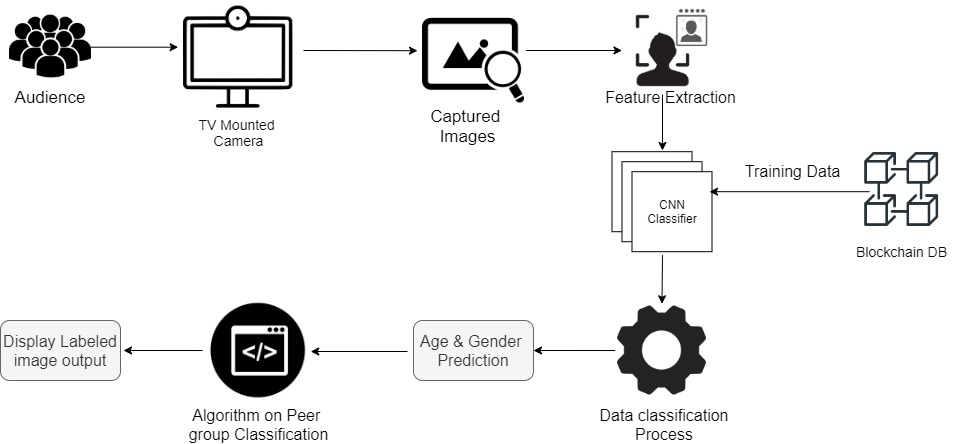
**Fig 3.1: Components of Human Detection System**

The facial features of a human being have characteristics that define the personality, maturity, sexuality, feelings, and ethnic group of individuals. [13]. Taking into consideration of the above-mentioned features this system is to be developed to predict age and gender with the aid of an online dataset. The pre-trained images will be used to classify the testing data captured using the camera embedded in the smart Tv. To predict age and gender, technologies like OpenCV and a CNN(Convolutional Neural Network) based approach is suggested, which is used to address sexual orientation labels as a collection of independent annotations and train the classifiers that predict the age group and gender of the human being. When predicting the age group it is proposed to classify according to these age group ranges such and infant, child, teenager, adult, and elderly.

***Fig 3.2: Components of Age and Gender Prediction***

By considering the above-mentioned sexual orientation results the images will be further classified in the form of peer groups. The peer group is only considered if the image is detected with multiple faces. The peer group classification will be important for advertisement classification.

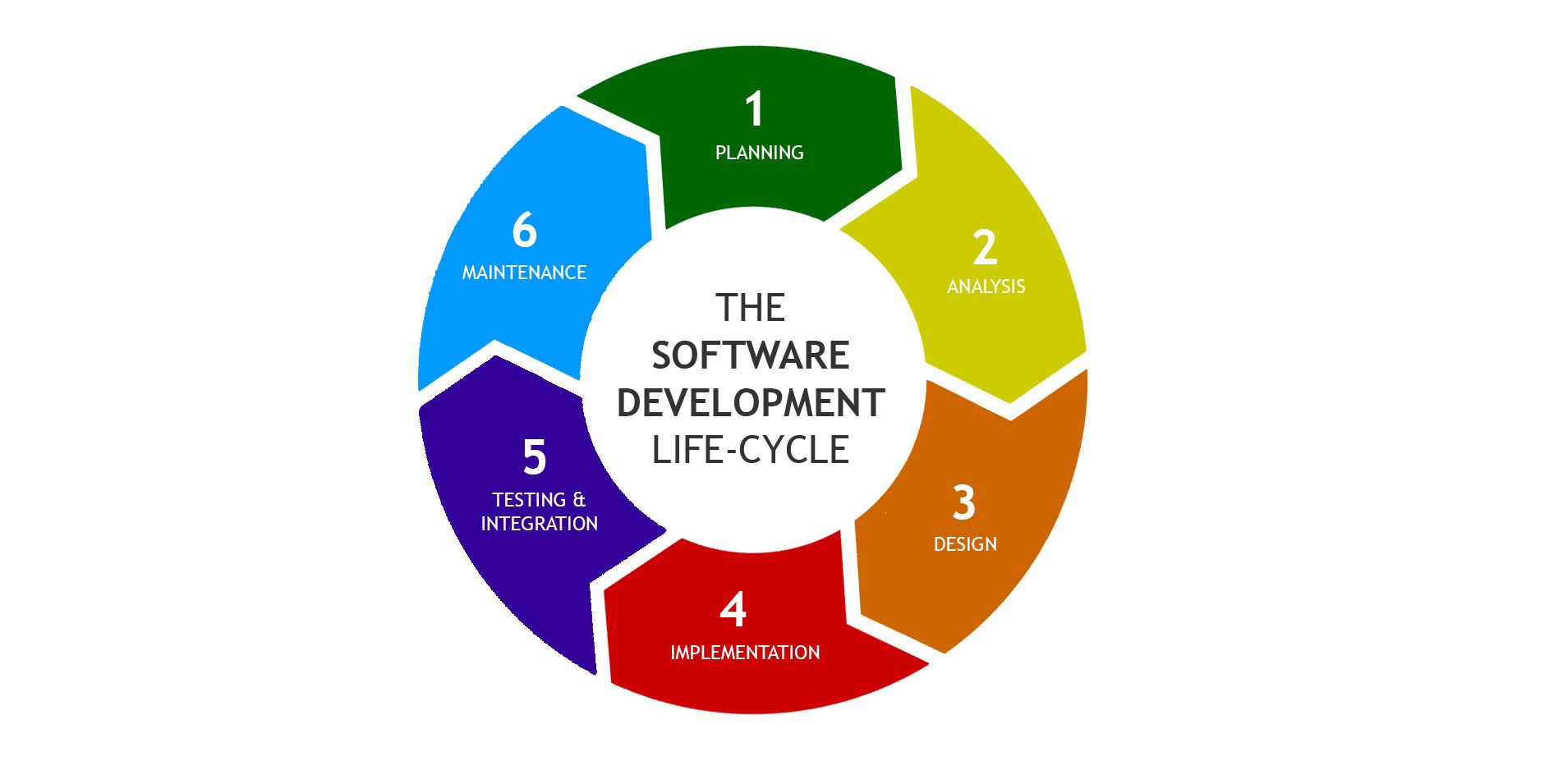
## **System Architecture**

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**Figure 3.3: System Architecture Diagram**

## **3.1.1 Software Solution**

Choosing the most appropriate and effective software development approach is the first challenge to face when designing designing any software solution. More things need to be considered before choosing the technique, such as the nature of the project, the defined duration, and the possible risks that will be faced during the implementation period. There is a comparatively broad scope for the proposed system and it can be defined as a high-risk project because it involves many complicated algorithms and technologies. The agile approach of software development is therefore the best and the most applicable. The structure of the agile approach is basic, but it is sufficiently efficient to complete the specified timeline with the proposed artifact. Scrum is used as the agile approach in this scheme, since it can be applied to handle and monitor any iterative and gradual project in wider frameworks. The main stages of the technique for agile growth and what will be achieved during each process are as follows:



**Figure 3.4: Software Development Life Cycle**

**Requirement Gathering and Analysis**

Requirement selection is the first step after choosing the subject and the scope. By exchanging a questionnaire with the television audiences and advertising agencies who are the future consumers of the proposed artifact, the initial criteria selection would be conducted. The key features will be tested by the users during this stage and adjustments will be made accordingly after considering their responses.

**Design and Development**

All mock-ups, case diagrams and other structural diagrams will be designed to minimize the complexity of the project structure during this step..

**Testing**

Before the development phase, each component will be tested, and even after the development process, the entire system will be tested with connecting components to ensure the system works as expected.

**Testing Plan**

The agile methodology in software testing involves testing as quickly as possible in the software development lifecycle. It represents one of the main client engagement and testing code as soon as it becomes available. The code should be stable appropriately to take it to device testing. Rigorous regression testing may be performed to ensure the bugs are patched and checked.

**SDLC Test Elements and Tasks**

Test Strategy

* Planning and Test Schedules
* Resource Planning

Test Development

* Unit testing
* Test of data

Managing Defects

* Bug Tracking
* Fixing

Integration Testing

* Combination Testing
* Installation Testing
* Requirement testing

**Feedback**

The software component will be installed during this process to encourage users to use it for usability testing and get their input. From there on, if necessary, improvements will be made.

## **Functional requirements**

* The should provide feedback report by considering the user’s engagement towards the advertisements
* The system should be secured in a way that protects the user’s privacy.
* The system should detect human objects and at the same time should detect static objects and disregard them.

## **Non-functional requirements**

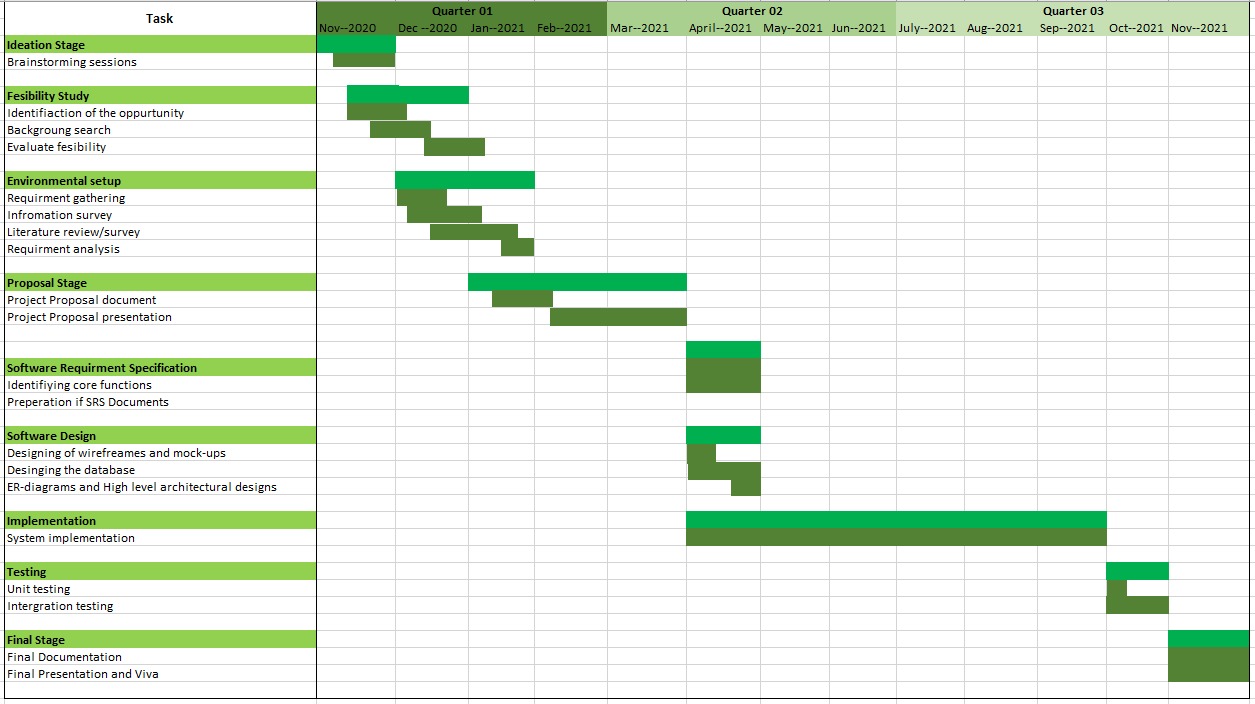
# **Description of Personal and Facilities**

|  |  |  |
| --- | --- | --- |
| **IT number** | **Components** | **Task** |
| IT18507652 | User detection, age, gender prediction and peer group identification. | * Train the model with human images consisting of age, gender labels. |
| * Disregard non-human objects when detection. * Classification of images according to the age and gender. |
| * Further classification into peer groups considering the age and gender of detected images. |

**Table 5.1 Description of personal and facilities**



# **Task and Expected Project Plan**

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**Figure 4.1:Gann Chart**

# **Budget a Budget Justification**

## **Cost of Product**

## **Business Plan**

The business model is a major factor that should be considered when creating the business plan. As per the proposed research, the business model of the proposed research software comprises the ability to optimization of advertisements that are displayed on the TV. Here the technology of Artificial Intelligence and other related technologies are used to achieve the goal. This business model caters to both the advertising firms and the users.

Our marketing strategy is to provide our service to the advertising firms which includes a trial period of 3 months, based on the satisfaction they are capable to purchase our product depending on our schemes available.

The business opportunity benefits both the advertising firms and the audience. Our proposed system is capable to display user-centric and user-preferred advertisements which will increase enthusiasm and engagement which will directly affect the higher sales conversions on the point of the advertising firm. As all businesses aim is to maximize their profits, this opportunity will reflect higher profits and incomes to advertising firms and their campaigns.

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