Proposal

For

Year Project

Bachelor of Science in Information Technology

Gender Classification from facial image

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Read carefully before filling the form.

1. Please do not alter the layout of the application form. Information must be filled in the spaces provided, under set format.
2. Guidance notes in various fields should not be deleted.
3. Required information should be duly filled in the specified fields.

Guidelines and Forms

Submission Procedure

Duly filled proposal forms completed in all respects should be submitted in form of soft copy in the VLE. On receipt of the applications the proposals will be evaluated by the examiner and proposal would then be defended by student groups. The project group may need to revise the proposal in light of the examiner's recommendations.

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Application for the Project

1. Project Identification

1.1 **Reference Number:**

2022_PRJ101_01(Year_Module_groupNo)

(for office use only)

1.2 **Problem statement**

Gender classification is to determine a person's gender, e.g., male or female, based on his or her physical cues. Usually facial images are used to extract features and then a classifier is applied to the extracted features to learn a gender. Gender classification algorithms have important applications in many domains today such as demographic research and as well as human-computer interaction.

According to Dautenhahn (Dautenhahn, 2007), social skills are essential requirements in robotic field when it comes to human-machine interaction. A socially competent robot can ease human-machine interaction and gain human acceptance (Dautenhahn, 2007). In order to improve social skill, a machine must know information about the person it interacts with. For example, to start a conversation with human being, the machine must first address the person with Sir or Madam. One of the approaches for machines to gain access to such information is through gender classification using face recognition techniques.

(Please refer here on how to write a problem statement.)

1.3 **Project Title:**

Gender Classification from facial image

(Provide a concise, accurate and informative title which immediately orientates your reader to the focus of your project.)

1.4 **Key Words:**

Biometric technology

Gender Classification

Face Detection

Image datasets

Convolution Neural Network (CNN)

(Please provide a maximum of 5 key words that describe the project. The key words will be incorporated in our database.)

1.5 **Project Guide:**

Name:	Pema Yangden	
Designation:		
Mobile # :		Tel. # :
Email:		

1.4.1. Project examiner 1:

Name:	Chimi Dendup	
Designation:		
Mobile # :		Tel. # :
Email:		

1.4.2. Project examiner 2:

Name:	Ong Kean tat	
Designation:		
Mobile # :		Mobile # :
Email:		

1.6 **Project Duration:**

Starting Date:	14/03/2021
Completion Date:	___10/05/2021_____

2. Aims, Goals, Objectives and scope of the Project

2.1 Aims of the Project:

To build a system that can classify the person's gender from his/her facial image using deep learning.

2.2 Goals of the Project:

Detecting the gender of a person from his/her facial image

2.3 Objectives of the Project:

1. Build a gender classification system based on facial images.
2. Detect the accuracy of the male or female images in terms of percentage.
3. Detect the gender from the provided dataset.

2.4 Scope of the Project:

This study focuses on increasing gender classification accuracy using deep learning algorithm which includes Convolutional Neural Network (CNN). Several face datasets were downloaded from the internet and used as training material for the face recognition system. Furthermore, because the goal of this study is to examine and analyze the usage of CNN classification method, only frontal facial photos were utilized as a training set.

3 Project features

3.1 Background

Gender recognition from face images is one of the fundamental re-search areas in computer vision. Automated gender recognition is important in many application areas such as human computer inter-action, biometric, surveillance, demographic statistics etc. Most of the time a human is failed to detect the gender from the image. So there is a wide scope for improving the performances of gender recognition approaches.

Woodrow Wilson (Woody) Bledsoe, the pioneer of facial recognition, conducted the initial study on the subject in the 1960s (University of Texas at Austin, 1998). Without the assistance of humans, Bledsoe's face recognition algorithm was unable to detect the location of facial features. Face detection can be challenging due to factors such as position, perspective, age, distance, lighting intensity, and facial expression.

In year 1987, Sirovich and Kirby published a paper indicate that principle component analysis (PCA) can be used to reduce database of faces to form a face with foundation of facial features (Sirovich & Kirby, 1987). Principle component analysis (PCA) is a conventional approach for recognizing faces which is still a good and extensively used technique for recognizing faces today. Firstly, the facial database is divided by gender and is separated into training set and input set. Then PCA is applied to the training set to extract facial features. Lastly, classification techniques are used to classify input set into their respective categories.

PCA-based face recognition not only can recognize a particular person from its training database, it can also be used to recognize expression, gender, race and age. In this proposal, we analyse different classification techniques to find the technique that offer the highest accuracy in gender recognition.

(Explains why you are doing the project. It provides a brief overview of the background to the project and establishes a particular area, or problem, that needs to be investigated further. It provides a clear statement of the topic of the proposed work.)

3.2 Literature Review:

Paper Review

Mäkinen & Raisamo (2008) conduct an investigation on gender classification using multiple

algorithms, neural network, SVM, threshold adaboost, LUT adaboost, mean adaboost, and LBP + SVM. Neural network and SVM show superior accuracy when compared to other algorithms. In some cases, neural network offers better accuracy compared to SVM, others cases SVM offers better accuracy. In short, there's no clear winner between the two algorithms. Two databases were used in the research, FERET database and WWW images. 760 images from FERET database and 3808 images from WWW were used in the experiment. Result for FERET database shows neural network offers better accuracy 92.22% while SVM offers 88.89%. On the other side, the result for WWW images shows SVM offers better accuracy 66.48% compared to neural network 65.95%. This phenomena is possibly caused by number of training samples. To prove this, same database and different number of samples were used as training sets to find out and compare changes in accuracy for all algorithms in this project.

Face detection methods are divided into roughly four categories, the feature invariant approaches, template matching approaches, knowledge-based approaches and appearance-based approaches (Yang & Ahuja, 2001). Feature invariant approaches locate facial features that are invariant to face angle, position, pose and lighting condition. Template matching approaches uses pre-selected faces as templates to compare with input image. The knowledge-based approaches uses rules and fact about human faces to model facial features, for example a face consist of pair of symmetric eyes, a nose underneath the eyes and the mouth at the bottom. Appearance-based approaches is similar to template matching approaches, it uses pre-labeled sets of images to train or derive pattern database which can be compare with input image.

Tathe and Narote (2012), Chai et. al. (2009), and Rahman et. al. (2013) proposed a face detection technique using human skin color models. The skin color area in image is located using skin color models and template matching is then performed within the area to locate the face actual location. Using skin color to locate face position and its features do improve face recognition performance since skin color required a little computation compared to appearance-based approach. In addition, detect faces using human skin color could reduce chances animals or objects being detected as human face.

Chai et. al. (2009) suggested that by eliminating beard and moustache from image can

improve face recognition performance. But in this project, beard and moustache were retained as it's features because it is an important feature that distinguish male and female.

Sirovich and Kirby (1987) published a paper indicated that principle component analysis (PCA) can be used to reduce database of faces to form a face with foundation of facial features. In other words, PCA finds the data that best describe the variance of facial feature among faces. In this project, PCA were used to extract features from training samples.

Software Review

3.2.2 GenderGet: Detect your gender with A.I.(Classify)

This Software detects anyone's gender with artificial intelligence techniques with accuracy rate of 98 to 99%. The app will take a picture of a person and then the A.I will start detecting the gender.

3.2.3 Gender Detector – Male/Female

This software detects the person's gender and it uses TensorFlow to predict the result. This software is easy to use, user just needs to face the camera and the result is given in terms of percentage. The drawback of this software is that it doesn't work with front camera.

(Detailed review of what all has been done internationally in the proposed area quoting references and bibliography. This section demonstrates the evolution of Technology, the depth of the project team literature search and builds the confidence of the evaluators about capability of the team in achieving the stated objectives.)

3.3 Requirements

3.3.1 Software Requirements

Google Colab

Google Colab is a cloud-based Jupyter notebook environment that is free to use. Most importantly, it doesn't require any setup, and the notebooks you create may be modified concurrently by your team members, much like Google Docs projects. Many common machine learning libraries are supported by Colab and can be quickly loaded into your notebook.

Anaconda

Anaconda is a distribution of the Python and R programming languages for scientific computing, that aims to simplify package management and deployment.

3.4 Technology

3.4.1 Computer Vision

Computer vision is the study of how computers can perceive and recognize digital pictures and videos in the same way that humans do. The difficulties it confronts are primarily due to a lack of knowledge of biological vision. Computer vision is the process of capturing, processing, analyzing, and understanding digital pictures in order to extract high-dimensional data from the actual environment and create a data that may be used to make choices.

3.4.2 Convolutional Neural Network (CNN)

A Convolutional Neural Network (CNN) is a type of deep neural network (DNN) that is commonly used for image identification and processing, as well as natural language processing (NLP). A CNN, also known as a ConvNet, includes numerous hidden layers, many of which are convolutional, as well as input and output layers. CNNs are multilayer perceptrons that have been regularized.

3.4.3 OpenCV

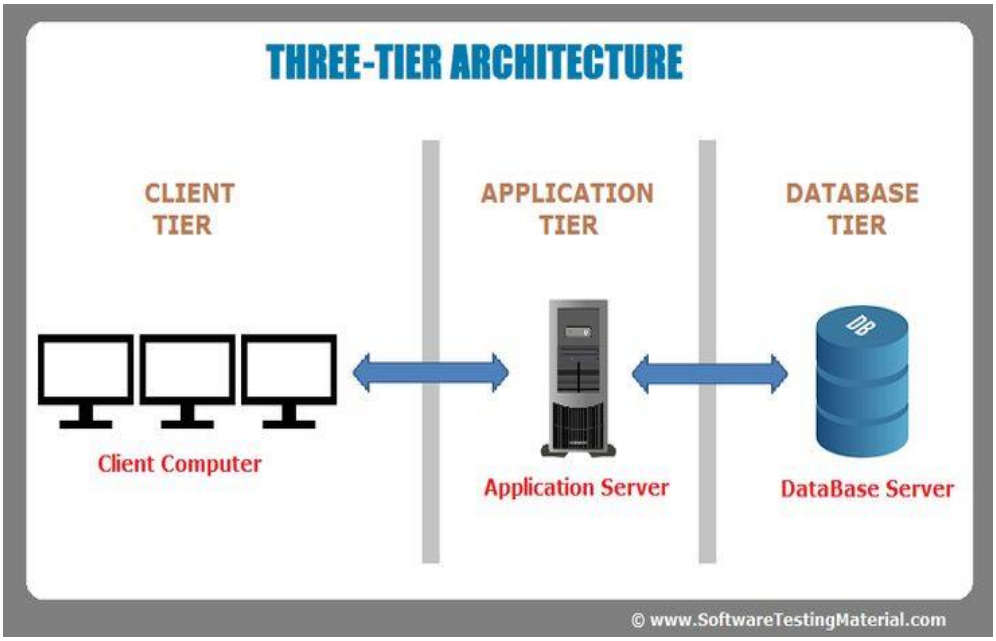
The OpenCV stands for "Open Source Computer Vision." It's an open-source Computer Vision and Machine Learning library, as the name suggests. This library can handle real-time image and video processing while also providing analytical capabilities. It works with the TensorFlow, Caffe, and PyTorch deep learning frameworks.

3.5 System Architecture

3.5.1 System Design

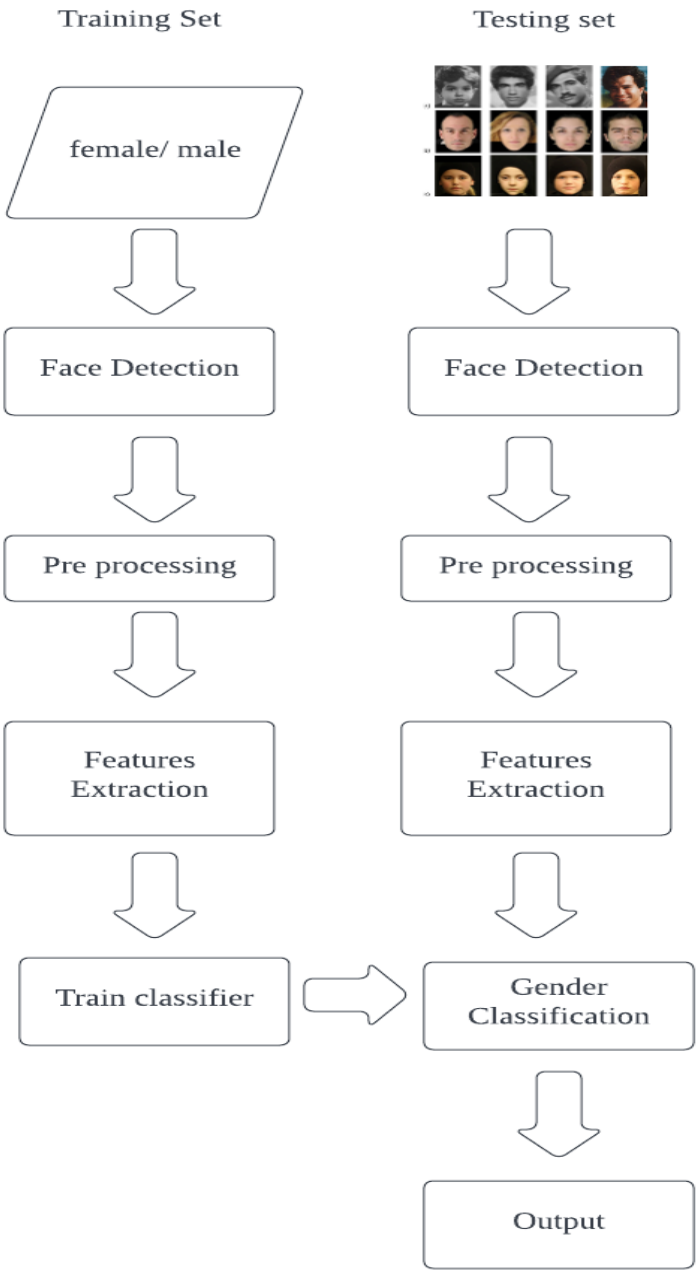
3-tier Architecture

The client does not directly communicate with the server. Instead, it interacts with an application server which further communicates with the database system and then the query processing and transaction management takes place. This intermediate layer acts as a medium for the exchange of partially processed data between server and client. This type of architecture is used in the case of large web applications.



The gender detection architecture will be based on 3-tier architecture because we have an application which will be used by users to detect their gender by giving their facial image as an input, and then the application will interact with the database and compare the input image with the image datasets. The comparison will be based on the face features extracted from the images.

3.5.2 Workflow



3.6 Deployment

The Gender detection will be deployed in a website using convenient frameworks. The website will have a function where user will be able to upload their picture in order to detect the gender.

4 Team Members Role

4.1 **Tshering Jurmey**

Role : Image Classifier

4.2 **Tshewang Dendup**

Role : Image Detector

4.3 **Bik Ram Chuwan**

Role : Image Classifier

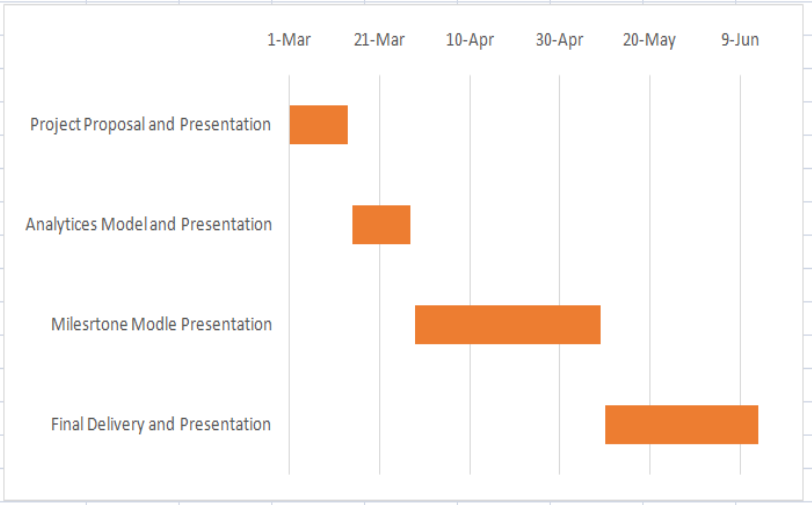
4.4 **Sonam Thinley**

Role : Image Detector

5. Examiner Comments

6. Project Schedule / Milestone Chart /Work plan

Assignment Title	Start date	End date	Duration
Project Proposal and Presentation	1-Mar	14-Mar	13
Analytices Model and Presentation	15-Mar	28-Mar	13
Milesrtone Modle Presentation	29-Mar	9-May	41
Final Delivery and Presentation	10-May	13-Jun	34



[describes what you will do. It is a plan of the tasks which will enable you to achieve the stated aims of your project. To devise a plan, you need to break the project down into a series of steps or stages, and you then outline the tasks within each stage. The project plan should also include a timetable in which you plan the timing for the main tasks. This timetable can help to keep you on track throughout the project. The plan may also include a list of the resources required to do the project.]

(Project schedule using MS-Project (or similar tools) with all tasks, deliverables, milestones, clearly indicated are preferred. Task should be measured in terms of hours)

7. Bibliography

Chai, T. Y., Rizon, M., Woo, S. S. & Tan, C. S., 2009. *Facial Features for Template Matching Based Face Recognition*. American Journal of Applied Sciences, vol. 6, no. 11, pp. 1897-1901.

Yang, MH & Ahuja, N, 2001, *Face Detection and Gesture Recognition for Human-Computer Interaction*, Springer Science & Business Media, Boston.

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Dautenhahn, K., 2007. Socially intelligent robots: dimensions of human–robot interaction. *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 362, no. 1480, pp. 679-704.

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