**Task 2:**

**Gender classification through Deep Neural Network**

**Introduction:**

Gender classification from images is a common task in the field of computer vision and machine learning. In this report, we will discuss the process of gender classification using Deep Neural Networks (DNNs). The task involves building a DNN model that can predict the gender (male or female) of individuals based on their facial images.

**Model Architecture:**

The model used for gender classification is deep neural network which consists of several dense (fully connected) layers. The model starts with an input layer with 64x64 = 4096 neurons (pixels in the flattened image). It is followed by four hidden layers with varying numbers of neurons (128, 64, 32, and 16) and ReLU activation functions, which introduce non-linearity to the model. The output layer has a single neuron with a sigmoid activation function, suitable for binary classification tasks like gender prediction.

**Model Training:**

The model is compiled using binary cross-entropy loss (since it's a binary classification problem) and the Adam optimizer. It is then trained on the training data for 50 epochs with a batch size of 30. Additionally, a validation split of 20% is used to monitor the model's performance during training.

**Model Evaluation:**

After training, the model's performance is evaluated on the test dataset. The accuracy achieved by the model is approximately 0.826, and the confusion matrix shows that it correctly classifies a good portion of both male and female images.

**Alternative Model:**

Alternative model used for the same task is feedforward Neural Network (FNN) or Multi Layer Perceptron(MLP). This model uses the sparse categorical cross-entropy loss function and a softmax activation in the output layer. It also includes a dropout layer to prevent overfitting. However, the accuracy achieved by this model is approximately 0.677, which is slightly lower than the first model.

**Results Visualization:**

The accuracy plot, generated by plotting the training accuracy and validation accuracy over epochs, offers valuable insights into the behavior and effectiveness of the model.

The training accuracy line on the plot depicts the model's ability to learn and predict the labels correctly on the training dataset. As training progresses, an increasing training accuracy signifies that the model is successfully capturing the underlying patterns within the training data.

**Goals:**

**Image classification**

* Data preprocessing
* Model selection
* Model evaluation
* Deployement