**Deep Learning - Project Report**

**Title:**

* Facial Age and gender Identification from Images

**Problem Statement:**

* There are several uses for the age-related data that may be derived from face photographs, ranging from biometrics to entertainment. Deciding the age of a face shot automatically is one of the most common and difficult tasks. It can be applied to various tasks, such limiting the media that a customer sees based on their age.   
  Thus, the primary reason for the rise in popularity of facial feature analysis is that it is a practical tool, and advancements in Deep Learning techniques are making face analysis a reality rather than just a theoretical idea.

**Motivation:**

* The exponential growth of facial image data and the widespread use of cameras in the digital age are driving research on autonomous age prediction from face images. With the rise in popularity of social media, online platforms, and selfies, there is a substantial amount of visual data available for research. A growing number of people are interested in developing automated systems that can accurately detect age from facial photographs due to the abundance of photos available.   
    
  Moreover, the practical applications of age prediction can be advantageous to forensics, law enforcement, security control, human-computer interface (HCI), and even business sectors such as retail and hospitality. For example, age estimation can be applied to customized marketing campaigns, security systems, and customer service optimization.   
    
  Scientists regard age prediction to be an interesting and challenging topic due of its complexity. It is affected by a person's emotions, surroundings, genetics, and way of life. The non-linear association between age and facial attributes and the scarcity of large, balanced datasets with precise categorization confound the technique. Two deep learning approaches that researchers are utilizing to improve prediction accuracy, reduce reliance on humans, and automate jobs associated with age and gender prediction include convolutional neural networks (CNNs) and transfer learning.   
    
  Because of the potential applications and technical challenges in the field of age prediction from facial images, researchers are frequently greatly motivated to explore fresh ways.

**Literature review :**

# Paper1 : Age and Gender Prediction using Deep CNNs and Transfer Learning

# The project focuses on using deep learning approaches to solve age, gender, and age estimate classification challenges in facial image analysis. It contrasts the effectiveness of specially designed CNN architectures with pre-trained models such as VGG16, ResNet50, and SE-ResNet50 for feature extraction from facial images. By merging machine learning and transfer learning approaches, the project aims to automate tasks associated with age and gender prediction, decrease the need for human involvement, and increase prediction accuracy. The motivations behind this project include the growing availability of facial image data, the value of age and gender prediction in various contexts, and the difficulties in accurately estimating age and gender from facial features influenced by genetic, lifestyle, and environmental factors.

# Reference:

# Sheoran, Vikas, Shreyansh Joshi, and Tanisha R. Bhayani. "Age and gender prediction using deep cnns and transfer learning." Computer Vision and Image Processing: 5th International Conference, CVIP 2020, Prayagraj, India, December 4-6, 2020, Revised Selected Papers, Part II 5. Springer Singapore, 2021.

# Paper 2 : Age and Gender Recognition using Deep Learning Technique

# The paper "Age and Gender Recognition using Deep Learning Technique" goes into great detail about gender classification using deep learning methods. The study emphasizes how challenging it is to extract gender-specific facial expressions from faces and how crucial gender classification is to understanding social interactions. The paper reviews multiple studies that look into several approaches for automatic gender classification, such as age estimation techniques, 3D facial structures, and body radiation intensity. The research also discusses the application of deep learning models, including CNN and LRF-ELM, for age and gender recognition. Furthermore, comparisons between other models on datasets including FERET, CELEBA, and UTK demonstrate the effectiveness of the proposed model in terms of recall precision and accuracy.

# Reference:

* M. Patel and U. Singh, "Age and Gender Recognition using Deep Learning Technique," 2023 3rd International Conference on Smart Data Intelligence (ICSMDI), Trichy, India, 2023, pp. 238-245, doi: 10.1109/ICSMDI57622.2023.00052. keywords: {Industries;Geometry;Deep learning;Visualization;Biometrics (access control);Brightness;Information filters;Age;Gender;Convolutional neural network;Visual Geometry Group;Deep Belief Networks},

**Method(s):**

In this project, we aim to create a CNN model to detect the age of a person. We will compare the performance of our model with a pretrained model.

Building a Convolutional Neural Network (CNN) model for facial age and gender classification is to be the project's goal.  
  
A preliminary and tentative approach to solving this issue might involve the following actions:   
  
  
1.Preprocessing picture data includes things like resizing, normalizing, and splitting the dataset into training and testing sets.   
2.Data augmentation: Apply changes to the training data, such as flipping, rotating, zooming, and so forth, to enhance model generalization and expand the diversity of the training samples.

3.Explain the convolutional, pooling, and fully connected layers in the architecture of the CNN model. The employment of transfer learning techniques, such as refining previously trained models (such VGGNet, ResNet, or InceptionNet) on the dataset, may also be looked into.   
4.To facilitate the training of the model, split the dataset into training and validation sets. Train the CNN model on the training set using techniques like batch normalization, dropout, and early stopping to prevent overfitting.   
5.Assessment of the Model: Evaluate the trained model's performance on the test set using pertinent measures such as accuracy, precision, recall, and F1-score for tasks involving the categorization of both age and gender.   
6.Model Optimization: To maximize the performance of the model, experiment with various architectures and hyperparameters (such as learning rate, batch size, and number of epochs).   
7.Deployment: After you are happy with the model's performance, you can apply it in real-world scenarios or integrate it into a more extensive application.

**Timetable:**

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| **Timeline** | **Things to be Done** |
| Week 1-2 | Gather datasets |
| Week 3-4 | EDA – Exploratory Data Analysis |
| Week 5-6 | Create CNN model |
| Week 7-8 | Work on improving performance of CNN model |
| Week 9-10 | Run Inference using pretrained model |
| Week 11-12 | Compare performance between pretrained model and CNN model |