**Facial Keypoints Detection -> To find out specific keypoints on facial images**

**Statement:**

Facial recognition is very challenging and difficult problem to solve as each individual image is different from other individual image in many features such as  3D pose, size, position, viewing angle, illumination conditions and many other. To deal with it, the best possible algorithm will be implemented and a model will be built from training dataset and this will be tested on test dataset.

**Question at Issue:**

Facial recognition is very popular biometric technique these days. Various developments has already been observed in facial recognition technologies, but there is still a huge scope and need of improvement. So, the key question at issue is how to make existing technology better in order to detect facial keypoints? What are the main obstacles and factors that affect detection of facial keypoints complex? What improvements can be made to make it more accurate, secure and efficient?   What algorithm can be used to detect facial keypoints? What training data set to be used to test the algorithms? Where can this technology be applied to make it upto what it’s worth?

**Purpose:**

It has always been difficult to find out facial keypoints as each individual face differs from other face in many features. So, the purpose of this project is to build a model or solution that will help in identifying or predicting the facial keypoints from the test data set. First, this model will be trained on training data set and later it will be tested on test dataset to confirm the accuracy of our solution.

**Information:**

The first thing we need is the facial keypoints dataset. In our study, we will be using dataset provided by Kaggle (https://www.kaggle.com/c/facial-keypoints-detection/data). Data provided by Kaggle is sufficient to conduct our study, hence we do not need another data source for this project. Information and tutorial provided by Kaggle is good enough and recognised by many, so we need not worry about the accuracy and relevancy of data. The data contains to spreadsheet in csv file format, named training.csv and test.csv. Model will be built using training.csv and it will be tested on data from test.csv file.

**Assumptions:**

There is no doubt that facial recognition is very popular today, but we are assuming that people are still interested in this technology and they want it improved. Another assumption we are making is about data. Data obtained from Kaggle is accurate and proper for the purpose of this project.

**Concepts:**

The facial keypoint recognition is based on providing data (images) to system and predict the accurate location of facial keypoints. System needs to be trained from provided training data set and identify either hypothesised algorithm or efficient model. To be specific our system will be able to predict the keypoints such as left eye center, right eye center, left eye inner corner, right eye inner corner. We need to explore neural network based classification for the data.

**Implications:**

This project will contribute to the enormous studies that has been completed and going on on facial recognition. It will be able to help in matching faces more accurately and in less time which in turn will increase the efficiency and accuracy of facial recognition systems which are not really popular currently. It may contribute to evolution of another layer of security in biometrics. This may become security feature in smartphones. Also to help in resolving human kidnapping and trafficking, identifying terrorists. But, downside of this is that if it falls in wrong hand or used with wrong intentions, it may jeopardize people’s privacy.

**Inference:**

Facial keypoint recognition system is initial step towards future applications related to facial expression detection and recognition. It acts like bridge between technologies in which key points such as left eye center, right eye center, left eye inner corner, left eye outer corner, right eye inner corner, right eye outer corner play quite an important role. Usefulness of these particular key points is determined by the need to the target application.

**Point of View:**

In our point of view this application will eventually contribute to the existing machine learning technologies by well-trained facial keypoint detection with relatively better accuracy. It will open doors to many more possibilities that can be explored along existing technologies like virtual reality and artificial intelligence systems. These developments can help us lead to build smarter systems such as smart homes and better security systems.

**SUMMARY**

After going through the logic of this problem, we can summarize that facial keypoints detection is a challenging and complex technique because of varying facial features of individuals. The process involves building a machine learning model using the training dataset to make prediction of keypoints on facial images. The accuracy of the model will be determined by the test dataset provided by Kaggle. This model will act as bridge for various facial recognition applications in different sectors.