

**ARTIFICIAL INTELLIGENCE PROGRAMMING PROJECT**

**Report 1 – Project Introduction**

– Hanoi, September 2021 –

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# I. Project Introduction

## 1. Overview.

### 1.1 Project Information.

* Project name: Analyze and compare facial keypoints detection models ComCC
* Group name: Group 7

### 1.2 Project Team.

| **Full Name** | **Email** | **Mobile** | **Role** |
| --- | --- | --- | --- |
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## 2. Motivation & Problem.

Our primary motivation for this project was the interest in applying a variety of deep learning models to significant problems in order to differentiate, analyze and compare them. In addition, analysing a variety of deep learning models through Facial landmark detection would give practical knowledge and broaden teammates' vision for future careers. Consequently, we will determine which is the suitable model for Facial keypoints detection issue. Furthermore, the competition element also allowed us to benchmark our results against the greater community, and compare the ectiveness of our methods against alternatives.

The applications of facial recognition have played a prominent role in recent years, including facial expression analysis, biometric or facial recognition, medical diagnosis of facial disfigurement and event tracking of line of sight. Various developments have been already observed in facial recognition technologies, but there still a huge scope and needs for future developments.

Detection of facial keypoints is a challenging task given variations in both facial features as well as image condition.Facial features of humans are unique which result in the difficulty of training models and under different illumination conditions, sizes, detecting facial features would be challenging.For , large intrinsic variance of image styles, e.g., grayscale vs. color images, light vs. dark, intense vs. dull, is introduced when face images are collected under different environments and camera settings. The variation in image style causes the variation in prediction results.

Detecting keypoints has to be fast. In analysing facial expressions and detecting faces in images or videos, the recognition in real-time apps takes a few seconds is the must. Therefore, the computation complexity of keypoints detection has to be lower than traditional image classification tasks.

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## 3. Literature review.

Presently, human face-related applications are being developed strongly in many fields from entertainment like photograph apps, filters, etc … to recognize fatigue, drowsy driver faces. Therefore, facial keypoints detection, which is a base for these applications, is an important research topic. Researchers have developed various types of algorithms and models for this topic.

For example, Shutong Zhang, Chenyue Meng (2016)[1] use Deep Convolutional Neural Network after using feature extraction algorithms, Gabor features and other features to detect facial keypoints. Artus Krohn-Grimberghe, Ranjana Vyas(2017)[2] have created their own Deep Convolutional Neural Network which is called NaimishNet. Xuanyi Dong, Yan Yan, Wanli Ouyang, Yi Yang(2018)[3] using a network combining 2 submodules : Style-Aggregated Face Generation Module with CycleGAN and Facial Landmark Prediction Module. Tadas Baltrusaitis, Peter Robinson, Louis-Philippe Morency (2013)[4] has another approaching way by using Constrained Local Neural Field (CLNF) landmark detection model, which include Local Neural Field patch expert and Non-uniform Regularised Landmark Mean Shift fitting technique to detect facial features. Beside that, detecting facial features by Shape Prediction via Progressive Initialization Algorithm of Shengtao Xiao, Shuicheng Yan, Ashraf A. Kassim (2015)[5] is a different method for this topic.

In conclusion, researchers have developed many approaches, common is CNN, for facial keypoints detection. But there are still some challenges such as : lack of data, facial features between people are very different, detect time has to be fast to work well on real-time conditions, data quality is low resolution, significant illumination change, .. that the research has to overcome.

## 4. Contribution

There are many different models, methodologies have been developed to detect facial keypoints. In this research we focus on analyzing the Inception model.

* Explore the performance of the deep learning structures on the task of detecting keypoints and evaluate the effectiveness.
* Specifically illustrating the model have been experienced and give the pros and cons detailly.
* Find another approach for a better solution to address facial keypoints detect problems.

## Reference

[1] Shutong Zhang, Chenyue Meng. Facial keypoints detection using Neural Network. 2016.

[2] Artus Krohn-Grimberghe, Ranjana Vyas. Facial Keypoints Detection using Deep Convolutional Neural Network - NaimishNet. 2017.

[3] Xuanyi Dong, Yan Yan, Wanli Ouyang, Yi Yang. Style Aggregated Network for Facial Landmark Detection. 2018.

[4] Tadas Baltrusaitis, Peter Robinson, Louis-Philippe Morency. Constrained Local Neural Fields for robust facial landmark detection in the wild. 2013.

[5]Shengtao Xiao, Shuicheng Yan, Ashraf A. Kassim. Facial Landmark Detection via Progressive Initialization. 2015.