**MSc. in Computing**

**Practicum Approval Form**

# Section 1: Student Details

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| Project Title: | Deep Learning Based Emotion Recognition Implementation and Study |
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| Date of Submission | 05/12/2020 |

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| Date of Submission | 05/12/2020 |

# Section 2: About your Practicum

Please answer all questions below.  Please pay special attention to the word counts in all cases.

**What is the topic of your proposed practicum? (100 words)**

**Topic:**  Deep Learning Based Emotion Recognition Implementation and Study.

Facial expressions are one of the most powerful, natural, and universal signals that humans use to express emotional states and intentions. Expression recognition is important in robotics, medicine, driver fatigue monitoring, and many other human-computer interaction systems.In 2017, Professor Fei-Fei Li of Stanford University stated in a public lecture, "I think the next step in the development of artificial intelligence will require a better understanding of emotions, emotions"**[1]**. I believe that the study of expression recognition is an important foundation for infusing AI technology with an emotional soul. My project is based on deep learning, using CNN (Convolutional Neural Network) framework to train an excellent model with a large amount of data to achieve a high recognition rate expression recognition system by pre-processing the data and selecting appropriate hyperparameters.

**Please provide details of the papers you have read on this topic (details of 5 papers expected).**

1. Peng, X. and Qiao, Y, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen 518055，China；, 2020. *Recent Advances And Challenges In Facial Expression Analysis*. Shenzhen.

2. Melinte, D. and Vladareanu, L., 2020. Facial Expressions Recognition for Human–Robot Interaction Using Deep Convolutional Neural Networks with Rectified Adam Optimizer. *Sensors*, 20(8), p.2393.

3. Kumar, A. and Mozar, S., 2019. *ICCCE 2019*. 1st ed. Pp.317-404.

1. Li, X., 2016. Research On Machine Learning Methods And Applications For Facial Information Processing. PhD. China University of National Defense Technology.
2. Li, S. and Deng, W., 2020. Deep Facial Expression Recognition: A Survey. *IEEE Transactions on Affective Computing*, pp.1-1.

**How does your proposal relate to existing work on this topic described in these papers?** (200 words)

In the context of the success of deep learning, a branch of machine learning, facial expression analysis has also made great progress. Melinte, D. and Vladareanu, L present in one issue two different FR models, one known to be very accurate but with low inference speed (faster area-based convolutional neural networks) and the other less accurate but with higher inference speed (single lens detector convolutional neural networks). For emotion recognition, migration learning and fine-tuning of three CNN models (VGG, Inception V3, and ResNet) were used 【3】. For extraction of face representation two different popular models of Deep learning based called Lightened CNN and VGG-Face and have reflected in < ICCCE 2019>【4】，Kumar, A. and Mozar, S  used of convolutional long- and short-term memory networks to predict surface air temperature is a good example of the role of deep learning in artificial intelligence techniques.This was a great source of inspiration for my project.In Li Xuan’s PhD thesis he details the fundamentals of deep learning**[7]**, the advantages of deep networks, and the training process and results of deep networks. In his research, he shows the use of models trained with deep learning for face recognition with a 99.7% recognition rate, where the methods used may be applicable to my project.Lee Shan and Deng Weihong separate emotion recognition type based on deep learning to static emotion recognition and dynamic emotion recognition, they explained what is different between the two types of emotion recognition.  In static emotion recognition, the output is a single image, it only includes spatial information, In dynamic emotion recognition, the output is video sequence, it includes spatial information and time information**[2]**. We have to consider what type of emotion recognition we are using, and how to process static emotion recognition or dynamic emotion recognition.

What are the research questions that you will attempt to answer?  (200 words)

1. How to process video sequence to implement dynamic emotion recognition?

2. How to train a high-quality emotion recognition model with a large number of face images. How can we get lots of data?

How will you explore these questions? (Please address the following points.  Note that three or four sentences on each will suffice.)

- What software and programming environment will you use?

 Jupyter notebook, OpenCV and Tensorflow. Jupyter notebook allowed developers to implement and display each step of coding. OpenCV will provide access to the camera or process face images, also OpenCV allowed to extract each frame from video, while tensorflow will allow us to call functions to train a model that actually does the emotion recognition.

- What coding/development will you do?

Python and R language. Python comes with a huge amount of inbuilt libraries. Many of the libraries are for Artificial Intelligence and Machine Learning. OpenCV is the one of library from Python. We use R to analyze accuracy of emotion recognition.

- What data will be used for your investigations?

 There is a lot of data in open source that can be used.We will also use the video from people who are around us,supervisor, classmates and friends to test our project.

- Is this data currently available, if not, where will it come from?

 We can get a lot of image data from open source for testing and training.

Example:

FERET face database .Created by the FERET project, this image set contains a large number of images of faces, and each image contains only one face.Photographs of the same person with different expressions, lighting, postures and age variations are included in the set. It contains over 10,000 multi-posed and light.It is one of the most widely used face databases in the field of face recognition.

YALE face database (Yale University, USA) .Created by the Yale Center for Computational Vision and Control, it contains 165 images of 15 volunteers with variations in lighting,expressions, and gestures.

- What experiments do you expect to run?

In the experiment, we first test whether our system can accurately capture the expressions of people in pictures or videos, then test whether it can recognize what expressions (sad, happy or others), and what the recognition rate is.

- What output do you expect to gather?

The accuracy of experiments recognition, successful face recognition image and fail face recognition image

- How will the results be evaluated?

What is its recognition rate, and how does it compare or compare favorably to existing experiments recognition technologies