	STTHK 3013 (PATTERN RECOGNITION & ANALYSIS)
UUM — Universiti Utara Malaysia	**A241 – Individual Assignment #3 (10%)** Instructor: Associate Professor Dr Azizi Ab Aziz Submission date: 6th Jan 2025 (before 11.59 pm) via UUM Learning Portal

"Be a lamp, or a lifeboat, or a ladder. Help someone's soul heal. Walk out of your house like a shepherd." [*Rumi*]

THEORETICAL COMPONENT:
1. What are the key differences between deep learning and traditional machine learning techniques?
2. How does the size of a convolutional kernel affect the feature extraction process?
3. Why are CNNs particularly suited for image-related tasks compared to fully connected networks?
4. How can pre-trained models such as VGG, YOLO, ResNet, or Inception be leveraged for transfer learning tasks?
5. Describe the difference between fine-tuning and feature extraction in transfer learning.

PRACTICAL COMPONENT - FACE DETECTION ANALYSIS:
Facial recognition technology has advanced significantly since it was first used in the 1960s, improving both its reliability and methods for resolving issues related to security and privacy. You are given a folder (assgmnt04_face-recognition_basecode) that contains a baseline code (STHHK3013_asgmt04_basic_face_recognition.py) and a pre-trained Haar cascade file for face detection (haarcascade_frontalface_default.xml) to be executed for face detection analysis. For this purpose, you need to consider this:
   i. Make sure you copy the haarcascade_frontalface_default.xml file and paste it into the same folder of your Python code.
   ii. Install OpenCV library (using PIP > pip install opencv-python)
   iii. Install Tensorflow library (pip install tensorflow)
   iv. Press key Q to exit (during file execution)

Based on this case study, you are required to do the following:
1) Concepts:
   a) Why does the CNN use a small kernel size (e.g., 3×3) for convolutional layers?
   b) What is the purpose of the MaxPooling2D layer in the model?
   c) Explain the architecture of this CNN model.
2) Experiment with adding more layers (e.g., convolutional, pooling, or dropout) to the CNN module (at least one addition).
3) Add a function to count the number of faces detected and display this number alongside the frame.

Policy:
All grading of deliverables will be based on standards indicated for each deliverable. Deliverables may not be turned in late, and no cheating! For this class, cheating will include plagiarism (using the writings of another without proper citation), copying of another (either current or past student's work), working with another on individually assigned work, or in any other way presenting as one's work that which is not entirely one's work. The occurrence of plagiarism will result in removal from the course with a failing grade.