Deep Learning for Computer Vision in Education

A. Course Level: Advanced

B. Course Synopsis

Deep learning is part of machine learning methods based on artificial neural networks. Recent advances in deep learning have led to the development of new applications of computer vision and education in our everyday lives. This course aims to introduce students to computer vision and neural network techniques with applications to education. Specifically, it is designed to guide students to apply deep learning models to real-world computer vision problems, such as image classification and object detection for educational purposes. In the course, students will learn how to conduct the basic image and video processing operations using open source computer vision library. They will also learn how to implement, train, test and evaluate Convolutional Neural Network (CNN) architectures on different image datasets so that they can build their own computer vision applications for education.

C. Content and Teaching & Learning Activities

	Topic	Teaching & Learning Activities
1	**Computer vision fundamentals:** ○ Introduction and image formation ○ Image processing	• Lectures • Group discussions • Lab practice
2	**Deep learning and neural networks** ○ Machine learning principles ○ Basic neural networks ○ Deep learning framework ○ Convolutional neural networks	
3	**Deep learning for image understanding** ○ Image classification ○ Object detection/localization ○ Facial expression recognition and affective computing in education	• Lectures • Case studies • Lab practice • Group presentations
4	**Deep learning for video understanding** ○ Object tracking ○ Action recognition and localization ○ Human object interaction for educational purposes	

D. Course Assessment

(1) Individual work (60%): Students are required to (i) complete hands-on assignments on an individual basis; and (ii) participate in class and/or online activities.
(2) Group project (40%): Students are required to work in groups to apply what they have learned in the course to develop a computer vision application to solve a real-world problem in education.