Coursework

Activity recognition is an important technology in computer vision and it could be applied to many real-life and human-centric problems. The goal of activity recognition is to recognize the actions of one or more people from a series of images. It is a very important and challenging problem to track and understand the behaviour of people through videos captured by a camera. Human activity is complex and highly diverse, posing a huge challenge on the performance of the recognition. To complete the activity recognition task, some basic but not very specific steps need to follow: firstly, the feature of motion needs to be represented to describe the movements and motions in temporal and spatial sequences, in either handcrafted or non-hancrafted way; then the classification is conducted on the extracted features. Specifically, the deep learning based architecture allows the simultaneous feature extraction and classification without prior human knowledge.

The goal of your coursework is to apply your knowledge and practical skills to solve real-world problems in computer vision. This coursework is to design and improve a human body motion recognition system using RGB or RGB-D images, which respectively exclude/include human body skeleton and classifies them into different actions.

Basic functionality

This part is based on the last part of the labs on human motion recognition, and exact tasks include:

- Handcrafted feature detection and extraction
- Feature representation
- Data training and recognition using conventional classifiers (Support Vector Machine)
- Simultaneous feature extraction and classification using deep neural networks (Convolutional Neural Networks for single frames and Recurrent Neural Networks/Long Short Term Memory for video stream)
- And the feature fusion of the conventional ones and non-handcrafted ones (Two-stream Hierarchy)
- Experimental results analysis (e.g. k-fold cross-validation)

Your final report should address but not limit each of the following:

- Introduction: Define and motivate the problem, discuss background material, describe the problem you plan to solve and give a basic outline of what you propose to implement.
- Details of the approach: Include any formulas, pseudo code, and diagrams -- anything that is necessary to clearly explain your system
- Results: Clearly describe your experimental protocols. If you are using training and test data, report the numbers of training and test images. Be sure to include example output figures.
- Discussion and conclusions: Summarize the main insights drawn from your analysis and experiments. You can get a good project grade even with negative results, as long as you show evidence of extensive exploration, thoughtfully analyse the causes of your negative results, and discuss potential solutions.