Topics for thesis

Bachelor:

- **Automatic Speech-based Emotion Recognition**

Emotion recognition is an important part of Human-Computer Interaction (HCI). It has various applications in industrial and commercial sectors. In the context of emotion classification, HCI has been divided into three major modalities: vocal-, facial-, and gesture-based recognition. This title focuses solely on audio based input. Humans use intrinsic skills to infer characteristics denoting the emotional patterns from the voice. However, automation of such a process might prove challenging. In order to identify the emotional state of a given utterance one has to derive relevant features, which carry the emotional information. Finding the most discriminative criterion describing emotional states is sought extensively.

Proper selection of features is vital for vocal-based emotion recognition systems, as well as realistic and efficient interaction between human and computer. In the paralinguistic approach, many vocal-based emotion recognition systems use high-level spectral and prosodic features, since both of them contain key data about the emotions present in audio signal.

The rest of the thesis is organized as follows. First, we will extract the paralinguistic features and select an efficient combination between them. Second, we will investigate category of classifiers such as Adaboost, Random Forest and Neural Networks approaches as our methodology of the proposed method is described. Then it is applied to the databases, for the sake of verifying its efficiency.

Requirement degree: Master of computer science or relevant fields

Skills: MATLAB, C/C++, Python, Java

Note: One of the programming language is enough, Preferably MATLAB.
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The rest of the thesis is organized as follows. First, we will extract different types of paralinguistic features. Second, we will apply the classifiers such as Random Forest or Neural Networks approaches on the combinations of features. Then we select an efficient combination between them. This process can repeat on the different databases to find the robustness of selection.

Requirement degree: Master of computer science or relevant fields

Skills: MATLAB, C/C++, Python, Java

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Bachelor:

- Estimation of Human Body Measurements according to Image Taken by Mobile Phone

Even the most advanced 3D scanners still cannot provide reliable, comprehensive measurement data. More precisely, for any reason, including illumination interferences, etc., the measurements offered by the existing 3D scanners, in the most cases, are neither complete nor accurate. As a result, there is a need to estimate the body measurements based on 2D static visual data obtained by mobile phones, which is also more convenient to implement compared to 3D laser scanners. There are a variety of ratios and measurement values of human body, which are almost the same in all instances. As the final goal of the project, we will exploit the latter list to estimate other measurements of the body based on the ones being already provided in the image taken by a mobile phone.

Requirement degree: Master of computer science or relevant fields

Skills: MATLAB, C/C++, Python, Java

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**Master:**

- **Automatic Facial Emotion Recognition for Specific Human Races by using the CNN algorithm**

The majority of human communications, i.e. 93%, are performed through nonverbal means, which mainly involve facial expressions. Thus, detecting facial expressions and acting accordingly is necessary for Human-Computer Interaction (HCI) purposes. Computerized Facial Expression Recognition (FER), which is the main subject of this project, consists in face detection and tracking, feature extraction and emotion recognition. First, the face is detected and tracked throughout a chain of images constituting a video sequence. As facial expressions are dependent on the translation, scaling and rotation of the head, both motion-based and model-based representations are considered, which requires geometric normalization and segmentation. The next step is to extract information from the detected face, which can help distinguish the intended emotion. The main two categories of facial features are geometric and appearance ones. Geometric features consist of the shapes of specific parts of the face, such as eyes, eyebrows and mouth, and the locations of facial points, e.g. the corners of the eyes and mouth. Appearance features are based on the whole face or a certain region. Finally, as one of the most powerful tools in the context of affective computing, a convolutional neural network will be utilized for classification.

**Requirement degree:** Master of computer science or relevant fields

**Skills:** MATLAB, C/C++, Python, Java

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Master:

• Virtual Garment Fitting

Most of the previously proposed methods have failed to accurately model the human body in real-time, especially, when it comes to 3D modeling of the whole body, requiring large amount of data and calculations. Besides, the foregoing techniques, mostly, do not render realistic movement representations in real-time. This project intends to overcome the aforementioned shortcomings. The proposed methodology consists in scanning and performing analysis on both the garment and the body, modelling and assigning reference points on them, and finally, superimposing and depicting the resulting garment model on the user's body.

Requirement degree: Master of computer science or relevant fields

Skills: MATLAB, C/C++, Python, Java

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Master:

- **Data Acquisition Using Depth Segmentation and Classification**

This project concentrates on data acquisition by segmenting the acquired 3D data into separate parts, such as, trousers and shirts, based on previous information about the colors, to model a Gaussian Mixture Model of the body regions, which will be optimized in order to obtain segmented 3D models of the body and the garment. The key points should be defined in a way that can both be detected under various configurations and avoid self-occlusions, which will be fulfilled upon employing anatomical key points with local references through considering pair-wise constraints and solving them by means of a graph matching approach. The common landmarks will be roughly estimated, and according to the key-point information and depth and RGB data, the exact boundaries will be extracted.

Requirement degree: Master of computer science or relevant fields

Skills: MATLAB, C/C++, Python, Java

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