

## Project Topics Fall 2022 (Gokhan Kaya)

**1 - Object Size Measurement with Smartphone Camera:** Develop a smartphone application which measures the dimensions of real life objects. You can guide the user to do certain things in order to create a reference for the measurement. For example, the user can walk towards the object. If you know the amount of the movement, you can predict the object size by comparing initial and final image captured by the camera. You can also use the camera api and learn about the focus point distance.

**2 - Web Filter Extension:** Develop a browser extension which handles web content filtering using a modular approach. Suppose that you don't want to see any content which includes a certain keyword. For example, you search something and the search engine returns various results as a list. One of the items in that list includes the keyword you don't want to see. Once enabled, your browser extension modifies the result of the search by removing the blocked item from the list. You are left with the items which are not blocked and you can continue browsing. Because every webpage will have a different structure, your extension needs to be configured to recognize specific webpages. You can write modules for different webpages and your extension can block the same keyword on different webpages if the module is provided. Automatic module generation or guessing the structure of the webpage and trying to block a specific element will also be a part of this project.

**3 - Video Frame Search:** Search and match a video sequence in a dataset by comparing video frames. Youtube and other streaming content providers already use such a technology in order to detect violations of copyright rules. You will do a literature review and compare different approaches, implement and if possible improve the performance of the approaches. Can we find a target frame among a big set of video sequences?

**4 - Audio-video Sync Using Lip Reading With Machine Learning:** Sometimes, video and audio can be out of sync. Your job is to find sections of the video where there is a person talking and visible. Then, by reading the lips of the talking person you try to find a section in the audio track which matches with the speech. Here, you can use methods which are developed for lip reading. You can generate a text of the speech and using text to speech, you can end up with a matching audio. Or, you may not need to generate the speech from scratch at all. The audio of the speech is already somewhere in the audio track. All you need to do is to find its exact position and for this, some clues obtained from visual data may be enough.

**5 - Guitar Player Assistant:** Develop a software which recognizes chords and melody of a guitar playing in real time. Your application accepts simple forms of scores. The user, uploads a musical score and tries to play it with a guitar. Your application recognizes the played notes/chords and gives feedback about correctly played and incorrectly played notes/chords.

**6 - Furniture Placement Using Augmented Reality:** Develop a smartphone application which recognizes a room and in it, lets you to place a furniture chosen from a given set of 3d furniture models. The placement will have realistic constraints. This requires you to recognize the floor and the walls.

**7 - Detecting Artificially Generated Bokeh In Images:** Given an image with a blurred background, can you detect if the bokeh is artificially generated or not. You will find artifacts of artificially generated bokeh. This may include object recognition, checking the graduation of the blur or in some cases by just analyzing the image in the frequency domain you can detect artificial bokeh. Here, you will also find the regions in the image which are artificially blurred to give the bokeh effect.

**8 - Accent and Pronunciation Analysis:** Develop a web interface which records spoken words, analyses and compares them with the correct pronunciation.

**9 - Lyric Based Genre Detection of Songs:** Process song lyrics and use machine learning in order to assign a genre to a song.

**10 - Song Popularity Prediction:** Predict the popularity of a song by comparing it to the other songs from the past. Compare by genre, loudness, lyrics, tempo etc..Try to find a pattern(if there is any). Try different machine learning techniques.

**11 - Agar Plates Bacteria Colony Counter:** Design a setup in order to count the bacteria colonies on agar plates using smartphone camera. There are datasets of agar plate images but this project includes additional challenges of overcoming imperfections introduced during capturing images of agar plates using a smartphone camera. You have to collect agar plates from a lab and test your setup.

**12 - Road Type and Condition Detection From Maps and Satellite Imagery:** Using data from vector

maps, trace the roads on satellite images and detect the type of the road. Is it asphalt, gravel, dirt road etc... You are going to do a literature review and implement a map application.

**13 - Automated Recognitions of Money Bills for Visually Impaired:** Try to recognize(real-time) multiple money bills(and coins) through phone camera and generate audio labels

**14 - Lane Tracking and Guiding for a Land Vehicle:** A system which learns how to drive a land vehicle. Steering wheel, various parameters such as speed and lane tracking information can be recorded. Steering wheel movement can be predicted based on the recorded parameters and the learned relation among them. Can be implemented in the form of a computer game which requires a toy steering wheel and other hardware components in order to record and drive the steering wheel.

**15 - Analog Signal Encryption and Scrambling:** Real time encryption and decryption of an analog signal can be challenging(especially for voice data if the bandwidth is limited.) Develop a smartphone app which replaces the default caller app of an android device. If this app is used at both ends of the phone call, the call will be encrypted but the data is still going to be a voice data. The receiving end will decode the encrypted voice data. Encryption should preserve the “voice” attribute of the signal. GSM and other telephony bands are limited and various coding and filtering are done by the assumption that the transmitted signal is a voice signal. So, any alteration which significantly complicates the histogram can be problematic.