



Before

After

## Course overview and step-by-step instructions (version 2021-05-31)

### *ET2584 App development with image applications*

This course starts out with a small literature survey within the area of intensity transformations for image enhancement (step 1-4). Then follows a Matlab part, an Android part and finally an evaluation and finalising a report.

#### **Part 1. Literature survey**

1. Find research papers and other literature describing image enhancement methods, for example histogram equalization methods and other intensity transformations. What techniques are used? Some references to literature will be given in course page on Canvas, but also search your own sources.
2. Image enhancement algorithms can be very advanced, while there are also quite simple methods that can give impressive results. There is one report (*Image enhancement, intro and examples*) provided by the teacher, read this to get examples of some methods to enhance images. Which strategies are used? What kind of enhancements are handled?
3. Find some Android apps to study. Note references to a few examples that you find relevant and add a comment or opinion about them.
4. Send in part 1 of your report. The report should:
  - summarize the survey above
  - suggest in brief words or pseudo-code an algorithm or a way you would like to solve the task of implementing an image enhancer

This report does not need to be very detailed, and can probably fit into about 2-4 pages. This should be done within three weeks in order to be registered as an active student on the course, so send in something! By approval the first part of four is completed.

#### **Part 2. Matlab implementation and evaluation**

5. Choose at least two algorithms to implement in Matlab. Use the knowledge from part one of the course. Also, the teacher can here provide some suggestions regarding algorithms.
6. Install Matlab, with at least the signal processing and image processing toolbox, and make yourself familiar with reading and displaying images. Then implement, test and evaluate your algorithm on different images (low contrast, high contrast, under- or overexposed, foggy, people pictured with the light source behind them, 'normal' picture, etc). Some images are provided by the teacher. Students are encouraged to create own examples as well.
7. Expand your report on the survey to include a description of your Matlab implementations. Elaborate on why you have chosen these and refrained from others. Append the commented and explained Matlab code into the report.

8. Expand your report with a performance evaluation. Compare with an existing method in Matlab. Here you might have different implementations or different versions of your implementation, then compare also these to each other. When comparing, use your own subjective opinion of the improvement but also at least one objective measure such as Median Absolute Deviation (MAD) which estimates the contrast or Absolute Mean Brightness Error (AMBE).
9. Select which algorithm or algorithms you are going to try to implement as an Android app and keep in mind to keep it simple enough. Maybe the simpler algorithm with some simplified key features from the advanced algorithm will do?
10. Send in the complete theoretical report together with your implementation, and motivate your choice of algorithm to implement as an app. Hereby the first two parts of four of the course are completed (when approved).

### **Part 3. Java implementation for Android**

- 11 Ask the teacher to send you the Image Enhancement App framework if it is not already found on the course website.
12. Read the instructions and install the Android Studio environment<sup>1</sup> on your computer. Interact with each other and the teacher for the installation.
13. Test-run the Image Enhancer App included in the framework and get familiar with the code.
14. The framework is prepared to enable inclusion of your implementation. Implement your version and run it. Try to make your implementation as good as possible, test it on several images with different properties. Send the application and the source code with comments to the teacher for evaluation and approval. This completes the third part of four in the course (when approved).

### **Part 4. Final evaluation**

15. Finish your work by expanding your report with a description of your app implementation. Also compare your app performance with an implementation from the teacher (you may ask for it when part 3 is finished) or from existing apps you found in part 1. Make a similar comparison as in step 8, here you may use screenshots for comparison.
16. Iterate the report with the teacher.
17. Book half an hour for a Zoom meeting with the teacher and examiner. Hereby the fourth part of four is completed (when approved).

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<sup>1</sup> Eclipse or other development environments can be used instead of Android Studio if you prefer, please contact the teacher for a dialogue in such case.