# INFO-H500
# Module 2 project report
# Image enhancement

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## 1 Introduction

The goal of this project is to enhance an image. It is not specified how it should be done and in what context it should be applied. Consequently, the choice of the domain application is left to the student. In this project, enhancing an image corresponds to improving its visual aspect.

## 2 Features

To enhance an image, some features have been implemented.

- **Noise removal** : If the input image is noisy, the user can use a median filter in order to remove the noise.
- **Gamma correction** : A gamma correction is applied on the image. It automatically defines the gamma parameter if the user did not specify it. However, if the image is not dark enough to use the gamma parameter, corresponding to have a median value (in the HSV space) below a certain threshold, gamma correction is not applied. If the user specify a gamma parameter, the correction is applied even if the image is bright enough.
- **Autolevel** : Autolevel is applied in order to increase the contrast in the image. It applies on the value channel in the HSV space of the image.
- **Equalization** : Equalization is also implemented. It allows to flatten the value histogram (in the HSV space). By default, it is not used because the autolevel is already applied. However, the user can decide to use both. (see "*enhanced_equalization_deep_sea.jpg*")
- **Saturation** : In order to have a better looking image, the saturation can be increased. A factor of the increase is set and can be changed by the user.
- **Vibrance** : Because simply increasing the saturation can lead to unrealistic colors, vibrance can be used. The vibrance is a sort of smart saturation. It should only increase the saturation of dull colors. Like this, the colors are enhanced but stay in a realistic range of saturation. Moreover, the vibrance is often used to increase saturation on an image with people. Increasing the people skin color is unrealistic, that is why it is left as before. To detect whether the saturation has to increase, it also checks that the red value is not greater than the blue and green ones. (see "*enhanced_saturation_foot.jpg*" and "*enhanced_vibrance_foot.jpg*")

**Note** : The example files used are attached to the report and notebook. The enhanced versions of the images have their name starting with "*enhanced_*". When it says "*default*", it means it uses the default values.