Literature review:

When talking about this specific object detection problem, which is the Mars Sample Localization, we took some information and initial guidance from the article “Hardware-accelerated Mars Sample Localization via deep transfer learning from photorealistic simulations”, which is mentioned in the website from where we extracted the dataset. (For our project, we only considered relevant the “detection” part of the “Sample Localization” chapter.)

If we take a step back and look at the bigger picture, which is the domain of Object Detection, there are several ways to tackle this problem from. As we began our research, we stumbled across already existing algortithms, which can be divided into two distinct classes: “One-stage” and “Two-stage” object detectors.

Inside the One-stage detectors’ class, we found very well-known and well-established models such as YOLO (You Only Look Once), SSD (Single Shot Detector) and RetinaNET. These One-stage detectors have the ability to produce faster outputs than Two-stage detectors. In this project, YOLO was the model we used to make comparisons with.

Among the Two-stage detectors, we have the R-CNN family with R-CNN, Fast R-RCNN, Faster R-CNN, etc. Even though they are slower than the One-stage methods, they reach better detection accuracy.

It was important to have this kind of informations in mind so we could assess what approach would perform better with the tools we had available to work with, as well as the problem in hands to solve.

One thing we have noticed from all the models mentioned above is that, behind the creation of such architectures, it was needed great computational power and memory. With that said, for anyone that seeks to create a good object detection model on their own with only their personal computers, they are faced with a tricky challenge. That is exactly what we tried to overcome with this project.