

# Machine Learning — Programming Assignment

## Rock-paper-scissors

Deadline 7/7/2021, 16.00

### 1 Problem definition and data

*Rock Paper Scissors* is a two-players game in which each player simultaneously forms one of three shapes with an outstretched hand. The shapes are “rock” (a closed fist), “paper” (a flat hand), and “scissors” (the index and middle fingers extended to form a “V”). The combination of the shapes formed by the two players determines the winner and the loser. A draw is also a possible outcome.

We want to build a system that uses digital cameras to acquire images of the hands of the players. Images will be then automatically classified in the three forms “rock”, “paper”, and “scissors”.

A data set has been collected by taking 2188 samples of the three forms. It is divided into a training (1888), a validation (150) and a test (150) set. The data set is organized in three directories (`train`, `validation` and `test`) each one including a subdirectory for each of the three classes. Each image has a resolution of  $224 \times 244$  pixels in the RGB color space.



### 2 Assignment

The goal is to build a classifier that is able to recognize the three forms. For the programming assignment you are expected to:

1. analyze and comment the data;
2. design and implement a suitable data pre-processing procedure (if needed);
3. implement, train and evaluate one or more classification models;
4. use suitable data processing and visualization techniques to analyze the behavior of the trained model(s); in particular you can use any of the scripts and tools we used for the lab activities.

All the above should be implemented as scripts in the Python programming language. Any machine learning library (included `pvm1`) can be used.

### 3 Report

Prepare a report of three to five pages documenting all your work. Provide detailed instructions on how to reproduce the results. The report must be in the PDF format. Include your name in the report and conclude the document with the following statement: “I affirm that this report is the result of my own work and that I did not share any part of it with anyone else except the teacher.”

Make a ZIP archive with the report and the Python scripts, and submit it from the course web page. To keep the size of the submission manageable, **do not include files containing the original data, the features etc.**