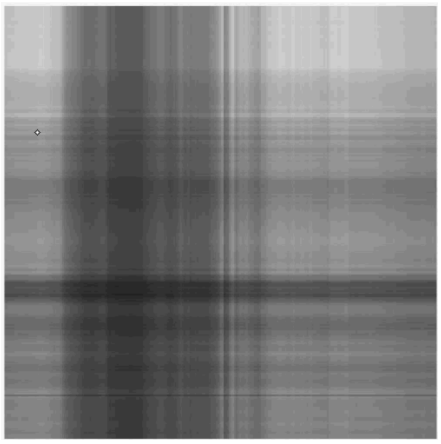
1 4th of October 2018 — F. Poloni

This lecture is about practical usage of the singular value decomposition and takes place almost wholly on Matlab.

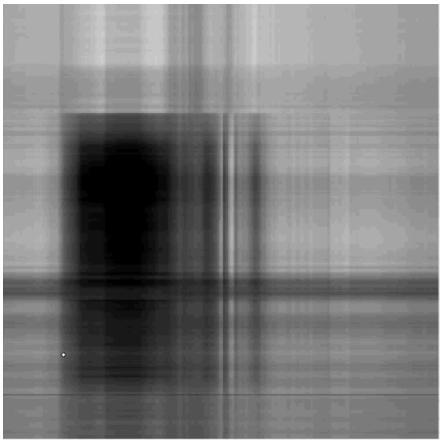
For example, given a certain image, that can be represented as a matrix of values in the range $[0, 255]$, the rank-1 SVD of such image, results in a very abstract picture, see Figure 1.1. The more we increase the rank, the better is the similarity of the approximated image with respect to the original one.

Something on Matlab ...

Given a certain matrix A, we can compute the SVD decomposition using the command `[U, S, V] = svd(A)`



(A) Rank 1



(B) Rank 2

(C) Rank 5

(D) Full rank

FIGURE 1.1: How the approximation of a matrix changes with respect to the different ranks.

Definition 1.1 (Principal component analysis)**.** *Given a matrix A, we term* ***principal component analysis*** *the analysis of features of such matrix via the rows and columns of U and V respectively, where U and V are the matrices of the SVD decomposition.*