

MS4105 Project 2016

J. Kinsella

October 17, 2016

- Complete successfully one of the three tasks below for a maximum grade of 20%.
 - Closing date for completed work is Friday 28 Oct (end Week 8).
 - Use the upload system to upload your work as a single archive file.
1. You can download some nice graphics files from <http://jkcray.maths.ul.ie/ms4105/TestPics/>.
 - (a) Choose one or find one of your own (not too big say $\leq 1000 \times 1000$ and inoffensive in content) — call it `mypic.jpg` (or `mypic.png`).
 - (b) Write a Matlab script that reads the file `mypic.jpg` into a multi-dimensional array `A` using the `imread` command.
 - (c) Extend your script so that it displays your matrix as a graphic image using the `image` command.
 - (d) Use the built-in `matlab svd` command to compute the singular values of each colour layer of `A`.
 - (e) Plot the singular value decompositions of each layer and try to predict a reasonable choice of low-rank cutoff r_0 .
 - (f) For (say 10) equally spaced values of `i` from 10 to r_0 , construct the best rank-`i` approximation to `A` and plot them using the `image` command.
 - (g) Use the `subplot` command so that all the plots are displayed in the same Figure, with two columns and as many rows as are needed.
 - (h) Write a short PDF document using \LaTeX that includes your plots, your m-file and a clear explanation with conclusions as appropriate.
 2. Alternatively, read the material on the application of the SVD to error analysis in Section 2.6.1 (Slide 180) of the Notes and write Matlab code to implement and test the ideas discussed. Write a short PDF document using \LaTeX that includes your plots, your m-file(s) and a clear explanation with conclusions as appropriate.

3. Another alternative (more difficult): read the material on the application of the SVD to internet search engines in Section 2.6.2 (Slide 187) of the Notes and write Matlab code to implement and test the ideas discussed. Write a short PDF document using \LaTeX that includes your plots, your m-file(s) and a clear explanation with conclusions as appropriate.