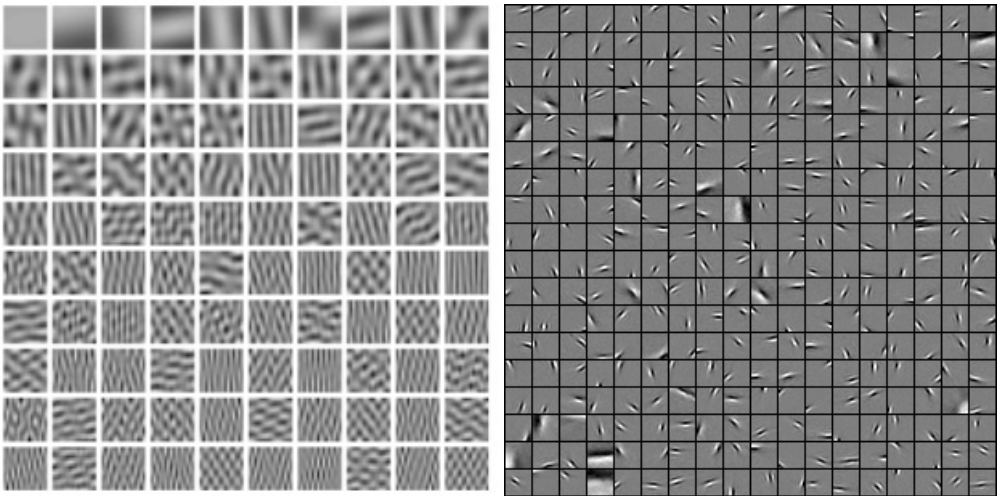
Computer Vision – Homework/Project 2

Implement, in Matlab, an algorithm to generate a basis set of kernels from the set of images of natural scenes provided in Carmen. Your algorithm should automatically extract a number of windows of *p*-by-*p* pixels to create a set $\{\boldsymbol{w}_1, \dots, \boldsymbol{w}_n\}$, with $\boldsymbol{w}_i \in \mathbb{R}^{p^2}$, then use: a. Principal Components Analysis (PCA) to obtain the basis vectors (i.e., eigenvectors of the covariance matrix) that best describe this image set, and b. the sparseness method described in class to obtain a different set of basis vectors. Finally, visualize these basis vectors sets by reshaping them as images. An example (not the only option) of output results is shown below. Experiment with different values for *p*, and different values for the regularizing term.

Upload your algorithm and a 1-page report in Carmen by the deadline. Your report should provide a brief description of what your algorithm, an example output output (e.g., as in the image below), and a shirt description of what happens when you change the parameter *p* and the regularizer.



Project Submission Requirements:

1) Please make sure to submit your MATLAB scripts in a .zip file entitled with your last name and the project number; example: "yourlastname_project2.zip".
2) Once your project is extracted it should be able to run without any modifications. (When referencing the data set in MATLAB do not use the absolute path. Refer to the data using the relative path with respect to your project. An example "./../Natural_Scenes/".
3) In the submission .zip file do not copy the data set. Assume your project folder is next to the data set folder; e.g.,