corresponding to the largest eigenvalue  $\lambda_1$ . Also show that optimal value of this problem is equal to  $\lambda_1$ .

Show that the maximizer for this problem is equal to  $v_1$ , where  $v_1$  is the eigenvector

## Solution:

We start by invoking the spectral decomposition of  $\Sigma = V\Lambda V^T$ , which is a symmetric positive semi-definite matrix.