

STT 461

In-Class Assignment 7

For the problems below, use the following matrices:

$$A = \begin{bmatrix} 5 & -1 & 5 \\ -1 & 10 & 1 \\ 5 & 1 & -3 \end{bmatrix}$$

$$B = \begin{bmatrix} 5 & 3 & -2 \\ 1 & 1 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}$$

$$x = \begin{bmatrix} 5 \\ 1 \\ 4 \end{bmatrix}$$

1. Define these matrices in R (using whichever technique you prefer).
2. Compute CB .
3. Compute Ax .
4. Find $\det(C)$
5. Calculate B^TB and BB^T . What kind of matrices are these results?
6. Compute x^Tx . Note that this is the square of the norm of x .
7. Solve the following for the unknown y : $Ay = x$.
8. Find the eigenvalues and eigenvectors of A . Note that the eigenvectors are perpendicular (this can be checked by seeing that the inner product is zero).
9. Find the eigenvalues and eigenvectors of A^2 . How do the eigenvalues compare to that of A ?
10. Take a vector $z = (1, -3, 4)$. Re-write z using the eigenvectors of A as the new basis.