Northeastern University
CS6220 – Data Mining Techniques
November 2017, Emily Dutile

HW3 Part 1

1. PCA Eigenvector Orthogonality

$$A\vec{x} = \lambda_1 \vec{x}$$

$$A\vec{y} = \lambda_2 \vec{y}$$

where A is a symmetric matrix, $\vec{x}$ and $\vec{y}$ are the eignvectors that correspond, respectively, to eigenvalues $\lambda 1$ and $\lambda 2$. Show mathematically that $\vec{x}$ and $\vec{y}$ must be orthogonal if the eigenvalues are different

$$\lambda_1 \vec{x^T} = A\vec{x^T}$$

$$\lambda_1 \vec{x^T}\vec{y} = \vec{x^T}A\vec{y} = \vec{x^T}\lambda\vec{y}$$

$$(\lambda_1 - \lambda_2)\vec{x^T}\vec{y} = 0$$

$$\vec{x^T}\vec{y} = 0$$