QR Factorization

Orthonormal Basis

If vectors have unit lengths they are orthonormal.

To find the orthonormal basis of \vec{v} , \hat{v}

$$\hat{v} = rac{1}{||ec{v}||} ec{v}$$

OR Factorization

For a $m \times n$ matrix A linearly independent columns,

$$A = QR$$

Q is an $m \times n$, with columns are an orthonormal basis for ColA. R is $n \times n$, upper triangular, with positive entries on its diagonal.

We can get ${\cal Q}$ using the Gram-Schmidt process.

To find R, we can us $R=Q^TA$ due to $Q^TQ=I$

Properties

Length of the j^{th} column of $R = \text{length of the } j^{th}$ column of A