QR Factorization

Orthonormal Basis

If vectors have unit lengths they are orthonormal.

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

$$\hat{v} = \frac{1}{||\vec{v}||}\vec{v}$$

> ✏ **QR 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 $\text{Col}A$.
> R is $n \times n$, upper triangular, with positive entries on its diagonal.

We can get Q using the Gram-Schmidt process.
To find R, we can us $R = Q^T R$ due to $Q^T Q = I$

Properties

Length of the jth column of $R = $ length of the jth column of A