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# Linear Algebra

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# Summary So Far

$$\begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \end{bmatrix} a + \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} b \approx \begin{bmatrix} -1 \\ 0.2 \\ 0.9 \\ 2.1 \end{bmatrix}$$

- Least squares
  - Derivation of normal equation  $\rightarrow A^T A \overset{\downarrow}{\cancel{x}} = A^T b$
  - Case of non-invertible  $A^T A$
- Orthogonal and orthonormal vectors
- Orthogonal and orthonormal basis of a subspace
- Orthogonal projections
- Gram-Schmidt orthogonalization and QR factorization

$$\begin{bmatrix} \text{yellow} & \text{green} & \text{blue} \end{bmatrix} = \begin{bmatrix} \text{blue} & \text{blue} & \text{blue} \end{bmatrix} \begin{bmatrix} \text{yellow} & \text{green} & \text{blue} \\ \text{green} & \text{green} & \text{blue} \\ \text{blue} & \text{green} & \text{blue} \end{bmatrix}$$

$Q$   $R$