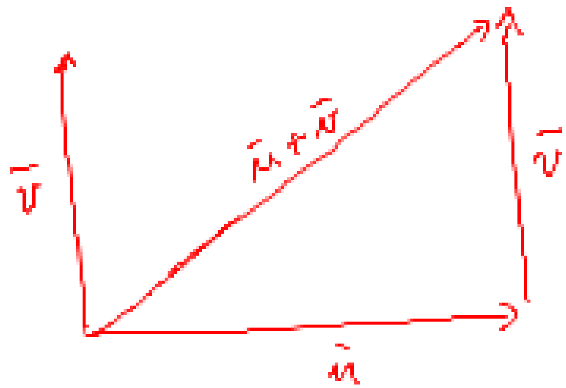

$\vec{v}$
$\vec{u} + \vec{v}$
$\vec{v}$
$\vec{u}$

$$A\bar{x} = \begin{bmatrix} \bar{u}_1 & \cdots & \bar{u}_m \end{bmatrix} \begin{bmatrix} x_1 \\ \vdots \\ x_m \end{bmatrix} = x_1\bar{u}_1 + \cdots + x_m\bar{u}_m$$

$$\{A\bar{x} \mid \bar{x} \in \mathbb{R}^m\} = \mathrm{Col}\ A$$

$A\bar{x} = \bar{b}$ HAR LØSNING HVIS $\bar{b} \in \mathrm{Col}\ A$

ELLERS FIND $\hat{b} \in \mathrm{Col}\ A$ NÆRMEST $\bar{b}$

LØS $A\bar{x} = \hat{b}$

$$A = \begin{bmatrix} 1 & 1 & 0 & 2 \\ 1 & 2 & 3 & 2 \\ 2 & 3 & 3 & 4 \end{bmatrix} \sim \begin{bmatrix} 1 & 1 & 0 & 2 \\ 0 & 1 & 3 & 0 \\ 0 & 1 & 3 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & -3 & 2 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

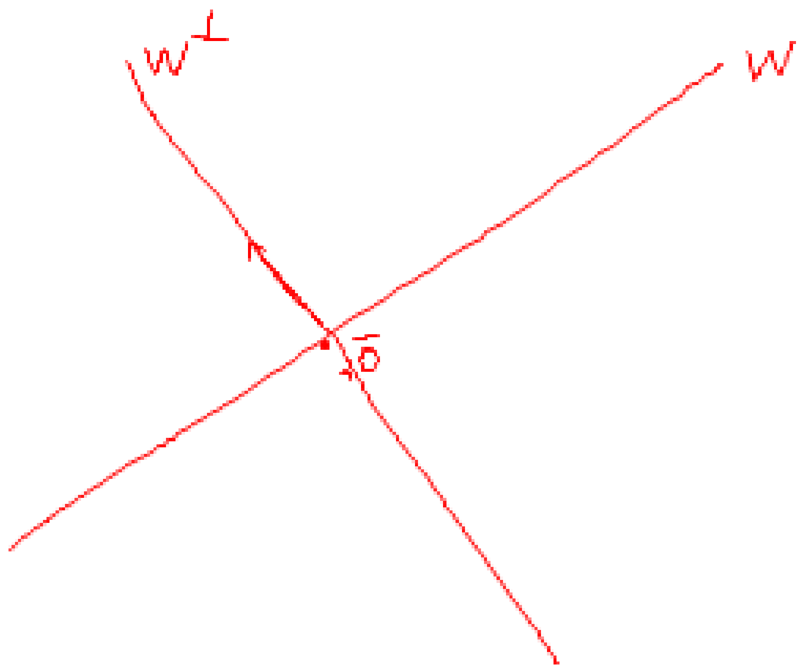
BASIS FOR Col A $\left\{ \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \right\}$

BASIS FOR ROW A = $\left\{ \begin{bmatrix} 1 \\ 0 \\ -3 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 3 \\ 0 \end{bmatrix} \right\}$

Nul A

$$x_1 = 3x_3 - 2x_4$$
$$x_2 = -3x_3$$
$$x_3 = s$$
$$x_4 = t$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 3 \\ -3 \\ 1 \\ 0 \end{bmatrix} s + \begin{bmatrix} -2 \\ 0 \\ 0 \\ 1 \end{bmatrix} t$$



$$(W^\perp)^\perp = W$$

$$W = \mathbb{R}^n \Rightarrow W^\perp = \{\bar{0}\}$$

$$W = \{\bar{0}\} \Rightarrow W^\perp = \mathbb{R}^n$$

$\bar{x} \in \text{Nul } A$

$\Updownarrow$

$$\begin{bmatrix} - & \bar{a}_1 & - \\ & \vdots & \\ - & \bar{a}_m & - \end{bmatrix} \bar{x} = \bar{0}$$

$\Updownarrow$

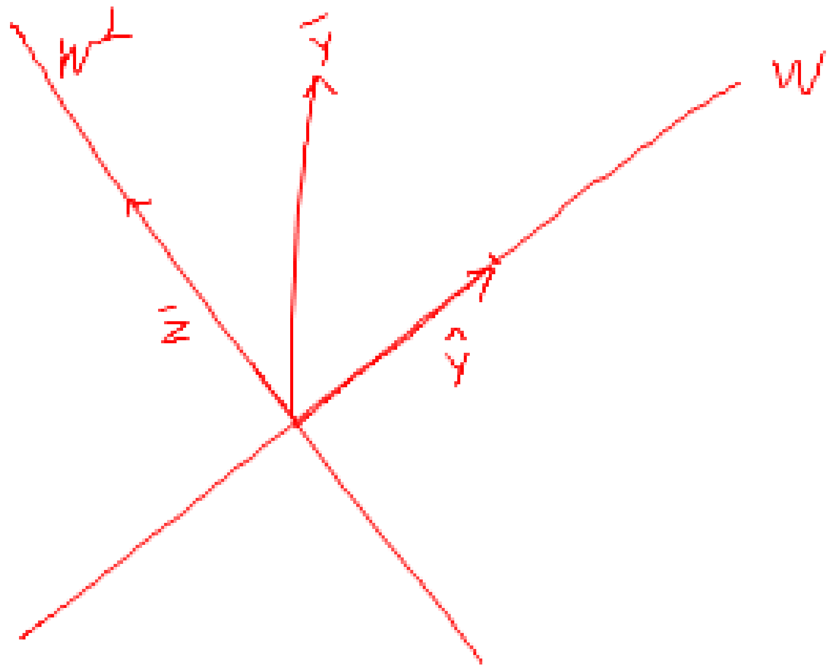
$\bar{a}_1 \cdot \bar{x} = 0 \quad \dots \quad \bar{a}_m \cdot \bar{x} = 0$

$\Updownarrow$

$\bar{x}$ ORTOGONAL PÅ RÆKKERNE

$\Updownarrow$

$\bar{x}$ ORTOGONAL PÅ ROW A $\iff$ $\bar{x} \in (\text{Row } A)^{\perp}$



$$\bar{y} = \hat{y} + \bar{z}$$

$$\hat{y} \in W$$

$$\bar{z} \in W^\perp$$

$$\overline{y} = \hat{y} + \overline{z}$$

$$\hat{y} = c_1 \overline{u}_1 + \dots + c_p \overline{u}_p$$

$$\overline{y} \cdot \overline{u}_1 = (\hat{y} + \overline{z}) \cdot \overline{u}_1 = \hat{y} \cdot \overline{u}_1 + \overline{z} \cdot \overline{u}_1 = \hat{y} \cdot \overline{u}_1 + 0$$

$$= (c_1 \overline{u}_1 + \dots + c_p \overline{u}_p) \cdot \overline{u}_1 = c_1 \overline{u}_1 \cdot \overline{u}_1 + c_2 \overline{u}_2 \cdot \overline{u}_1 + \dots + c_p \overline{u}_p \cdot \overline{u}$$

$$= c_1 \overline{u}_1 \cdot \overline{u}_1 + 0 + \dots + 0 = c_1 \overline{u}_1 \cdot \overline{u}_1$$

$$c_1 = \frac{\overline{y} \cdot \overline{u}_1}{\overline{u}_1 \cdot \overline{u}_1}$$

$$\vec{u} = \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix}$$

$$W = \text{span}\{\bar{u}\}$$

$$\bar{y} = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}$$

$$\hat{y} = \frac{\bar{y} \cdot \bar{u}}{\bar{u} \cdot \bar{u}}\, \bar{u} = \frac{\begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix}}{\begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix}} \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix} = \frac{3}{10} \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix} = \begin{bmatrix} 0,3 \\ 0,9 \\ 0 \end{bmatrix}$$

$$\bar{z} = \bar{y} - \hat{y} = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} - \begin{bmatrix} 0,3 \\ 0,9 \\ 0 \end{bmatrix} = \begin{bmatrix} -0,3 \\ 0,1 \\ -1 \end{bmatrix}$$