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NICEN NINN VELJA TWINX f)

$$\left\{ \begin{array}{l} x + by + bz + bw = a \\ x + (1+b)y + (a+b)z + 2bw = a+b \\ 2x + 2by + (a+2b)z + (a+2b)w = 3a \\ 3x + 3by + 3bz + (a+2b)w = 4a+2 \end{array} \right.$$

RREF  $\rightarrow$   $x, y, z, w$   
b' N12 a, b

$$\left( \begin{array}{cccc|c} 1 & b & b & b & a \\ 1 & 1+b & a+b & 2b & a+b \\ 2 & 2b & a+2b & a+2b & 3a \\ 3 & 3b & 3b & a+2b & 4a+2 \end{array} \right) \xrightarrow{R_4 \rightarrow 2R_4 - 3R_3} \left( \begin{array}{cccc|c} 1 & b & b & b & a \\ 1 & 1+b & a+b & 2b & a+b \\ 2 & 2b & a+2b & a+2b & 3a \\ 0 & 0 & -3a - a - 2b & -a + 4 & -a + 4 \end{array} \right)$$

$$\xrightarrow{R_3 \rightarrow R_3 - 2R_1} \left( \begin{array}{cccc|c} 1 & b & b & b & a \\ 1 & 1+b & a+b & 2b & a+b \\ 0 & 0 & a & a & 3a \\ 0 & 0 & -3a - a - 2b & -a + 4 & -a + 4 \end{array} \right) \xrightarrow{\begin{array}{l} R_2 \rightarrow R_2 - R_1 \\ R_4 \rightarrow R_4 + 3R_3 \end{array}} \left( \begin{array}{cccc|c} 1 & b & b & b & a \\ 0 & 1 & a & b & b \\ 0 & 0 & a & a & 3a \\ 0 & 0 & 0 & a-b & 4a+2 \end{array} \right)$$

NINN C' b -1 a δe p'jig 18'IC → 128 (2)  
NINN e' 18'IC → 128 128 (12) 128 128 128 128

n > rank(A) 10'IC  $\Rightarrow$  NINN 128 128 128 128 e'

: RIC Rank(A), n=4

$$a=0, b \in \mathbb{R}$$

$$\left( \begin{array}{cccc|c} 1 & b & b & b & 0 \\ 0 & 1 & 0 & b & b \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b & 2 \end{array} \right)$$

$I = \text{diag } \lambda^2$

$$a = -\frac{1}{2}, b = \frac{1}{2}$$

$$\left( \begin{array}{cccc|c} 1 & -\frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & \frac{1}{2} & -\frac{1}{2} & \frac{3}{2} \\ 0 & 0 & 0 & 0 & 0 \end{array} \right)$$

$I = \text{diag } \lambda^2$

Se posicione en el

•  $\text{rel}(C) \neq \text{rank}(A) \neq \text{rank}(A^*)$  para el

$$a = b + -\frac{1}{2}$$

$$\left( \begin{array}{cccc|c} 1 & b & b & b & a \\ 0 & 1 & a & b & b \\ 0 & 0 & a & a & 3a \\ 0 & 0 & 0 & 0 & 4a+2 \end{array} \right)$$

$a \neq b$ ,  $a \neq -\frac{1}{2}b \neq \frac{1}{2}b$ ,  $a \neq 0$  para

rank(A) = rank(A\*) = 3

$$5^{(\text{rank}(A))} = 5^{(\text{rank}(A^*))} = 125$$

$$40 < 5^{\frac{1}{2}} < 150$$

$$40 < 125 = 5^3 < 150$$

$$\begin{aligned} 4 - \text{rank}(A) &= 3 \\ \text{rank}(A) &= 6 \end{aligned}$$

$$\text{CNN} \rightarrow \text{ReLU} \rightarrow A \begin{pmatrix} 3 \\ 7 \\ 9 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 7 \\ 9 \\ 4 \end{pmatrix}$$

$$A \begin{pmatrix} x \\ y \\ z \\ w \end{pmatrix} = \begin{pmatrix} 3 \\ 7 \\ 9 \\ 4 \end{pmatrix} \quad \text{CNN} \rightarrow \text{ReLU} \rightarrow$$

$$\begin{pmatrix} 1 & \dots \\ \vdots & \ddots \\ 0 & 1 & \dots \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

$\text{rank}(A) \geq 4 - 3 = 1$   
 CNN for SIC, NNC each set 2 e!  
 NNNN & 001'IC e!

$$\begin{cases} x + 4y + 7z = a \\ 2x + 5y + 8z = b \\ 3x + 6y + 9z = c \end{cases} \quad \text{解 } \begin{pmatrix} 3 \\ 8 \\ 7 \end{pmatrix}$$

for 3 K (g) O'IC NNN e'

$$\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix}, \begin{pmatrix} 7 \\ 8 \\ 9 \end{pmatrix} \text{ de NNC}$$

SIC NNN e' NNN is LRU  $\leftarrow$  NNN

$$x_0, y_0, z_0 \text{ ON?}$$

$$\begin{aligned} x_0 + 4y_0 + 7z_0 &= a \\ 2x_0 + 5y_0 + 8z_0 &= b \\ 3x_0 + 6y_0 + 9z_0 &= c \end{aligned}$$

$$= x_0 \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} + y_0 \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix} + z_0 \begin{pmatrix} 7 \\ 8 \\ 9 \end{pmatrix} = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix}, \begin{pmatrix} 7 \\ 8 \\ 9 \end{pmatrix} \text{ de NNC } \begin{pmatrix} a \\ b \\ c \end{pmatrix} \text{ SIC}$$

$$\text{הוכחה של } \exists \text{ ב } \mathbb{R}^3 \text{ מושג}: \Rightarrow$$

$$\begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix} \cdot \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$x_0, y_0, z_0 \in \mathbb{R}$  נס'ק

$$x_0 \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} + y_0 \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix} + z_0 \begin{pmatrix} 7 \\ 8 \\ 9 \end{pmatrix} = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$\begin{pmatrix} x_0 \\ 2x_0 \\ 3x_0 \end{pmatrix} + \begin{pmatrix} 4y_0 \\ 5y_0 \\ 6y_0 \end{pmatrix} + \begin{pmatrix} 7z_0 \\ 8z_0 \\ 9z_0 \end{pmatrix} = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$x_0 + 4y_0 + 7z_0 = a$$

$$2x_0 + 5y_0 + 8z_0 = b$$

$$3x_0 + 6y_0 + 9z_0 = c$$

$x = x_0, \quad : \text{נמצא } e' \text{ נורמל נס'ק}$

$$y = y_0,$$

$$z = z_0$$

$a, b, c \neq 0$  then  $\Rightarrow$   
 $\text{Rank } A = \text{Rank } A^* = 3$   
 $\text{Rank } A^* = \text{Rank } A = 3$

$$\begin{cases} x + 2y - 3z = a \\ 3x - 4y + 2z = b \\ x - 5y + 8z = c \end{cases}$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 3 & -4 & 2 & b \\ 1 & -5 & 8 & c \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 0 & -10 & 11 & b-a \\ 1 & -5 & 8 & c \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 0 & -10 & 11 & b-a \\ 0 & -7 & 11 & c-a \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 0 & -7 & 11 & b-a \\ 0 & -7 & 11 & c-a \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 0 & -7 & 11 & b-a \\ 0 & 0 & 0 & b-2a-c \end{array} \right)$$

$$\left( \begin{array}{ccc|c} 1 & 2 & -3 & a \\ 0 & -7 & 11 & b-a \\ 0 & 0 & 0 & b-2a-c \end{array} \right)$$

$$\text{Rank}(A) = 2 > 3 = \text{Rank}(A^*) \{a, b, c | b-2a-c \neq 0\} \text{ i.e. } \downarrow$$

for  $A^*$

$$a=0, b=0, c=0 \text{ i.e. } \downarrow$$

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8. נסמן  $Ax=0$  פורסום.  $A \in \mathbb{Z}^{5 \times 4}$

e)  $Ax=0$  פורסם.  $A \in \mathbb{Z}^{5 \times 4}$

אנו מודים למשתנה.

$$Ax=0$$

$5 \times 4$   $4 \times n$   $5 \times n$

הנחנו  $x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{pmatrix}$  פורסם.  $A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$

$Ax=0$  פורסם כהשורה  $\sum x_i = 0$

2-f נסמן  $Ax=0$  פורסם כהשורה

$$g = A \cdot e \in \mathbb{R}^5$$

$A \cdot e = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \end{pmatrix}$

$$A - g = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$4 - \text{rank}(A) = 3$$

$$\text{rank}(A) = 1$$

8. נסמן  $Ax=0$  פורסם כהשורה

$$\text{rank}(A^*) \neq \text{rank}(A)$$

$A \in \mathbb{R}^{5 \times 4}$   $\text{rank}(A) = 3$

O-N מוגדר כ אינטגרל של  $\|f\|_C$  על  $C$  (2)

אנו נוכיח ש  $\|f\|_C \leq \|f\|_{L^2}$

- אנו נוכיח ש  $\|f\|_C \leq \|f\|_{L^2}$  (2)

$(C \neq 0)$  מוגדר כ אינטגרל של  $\|f\|_C$  על  $C$  (2)

אנו נוכיח ש  $\|f\|_C \leq \|f\|_{L^2}$  (2)

$r(A) \geq r(A^*)$  ו  $r(A) \leq r(A^*)$  (2)

$$\begin{pmatrix} ab & cd \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{pmatrix}$$