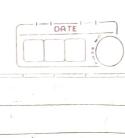


- Signal Sparsity Theorem 11.15 and 11:16 are proportional to Ik in theorem 11.16, there is also a hog (p/k) term which gives a tighter bound.

In Theolom 3, the 1st term of the error borns is inversely proportional to 15, which is the special of the spec > Noise standard deriation. Egn 11.15 & 11.16 are directly proportional to on. In Theorems, the 2nd term with epsilon is directly proportional to o, since Exo. - Des Signal dimension Egn 11.15 & 11.16 are directly proportional to log (p), where p is the signal diviension In Theorem 3, there is no direct relation with signal dimension, but, it is used to get a lower bound for no. of measurements needed for Compressed sensing N > C Log (m (8)110110 μ2 (4, Φ) -> Intuitive Result. Backer Eg " 11.15 & 11.16 are more intention because of the proportionality. Ace to egn 11.15 & 11.16, as no of measurements increases, enou decreases' which seems better than Theorem 3, which suggests otherwise Similarly, 1 lower K(S), intuitively should give lesser error, but it gives higher error according to Theorem 3. Also, the influence of signal dimension is indirect



01c) Equation 11.20 states Cr(v) = 1 11y - X(p\*+v)112 + An 11p\*+v11,

where Now, Let us consider J(p)

J(B) = 1 11y- XB112+ AN 11 B11,

This is minimised by  $\beta = \hat{\beta}$ .

Note that G(y) is nothing but  $J(\beta)$ , but with

V=β-β.

Thus, if J(β) is minimised by β=β, (r(v) is minimised by  $\hat{V} = \hat{\beta} - \beta$ .

Thus, G(v) is minimised by  $\widehat{v} - \widehat{\beta} - \beta^*$   $G(\widehat{v})$  is minimum value for G(v) G(v) + V

· (()) < (r(0).

d) Equation 11.20 states  $C_1(v) = \frac{1}{2N} ||y - X(p^{\alpha} + v)||_2^2 + \lambda_N ||p^{\alpha} + v||_1$ 

laine G(2) < G(0), we get,
G(2) = 1 11 y - XB - XO 1/2 + AN 11 B + VII,

(n(0) = 1 11 y- xp\* 1/22+ An118+11,

8 Also, w=y-XB\*

21 ||w-X0||2+ An1B\*+v||, < 1 ||w||2 + An11B\*H.

Now, ||w-XVII2 = ||w|12 + ||XVII2 - 2wTXV Substituting

1 || w||2+1 || X0||2-wTX0 < 1 || w||2+ 2N (8||8\*11,-118\*+011) " [[XVII22 < WTXV + AN (118" || - 1118" + V || ) This is equation 11.21 Henry Proved e)  $\perp \omega^T X \hat{\mathcal{C}} = 1 \langle X^T \omega, \hat{\mathcal{C}} \rangle$ This is dot product of XTW and v. If we take the largest term of XTW & multiply that with all terms of i, that will be larger than the dot product. Also, sun of all terms of v is less than or equal to the LI norm of v Using 11.21, LHS > 0.

0 < 11 x \(\cdot 11 \) \(\cdot 2 \) < wT x \(\cdot \cdot \lambda \) (11 \(\beta^{\pi} \lambda \), \(\cdot 11 \beta^{\pi} \lambda \), \(\cdot \cdot \cdo < /1xTw/10/10/11 + 1n(118"11, -118"+011) = 11x7w11011, +An118411, -An1184+011, 118+011, > 118011-11811, 1> 11011-11811, -118+011, < 11811; -1011, -10 < (1XTW110-AN | 1VII, +2 AN 118\*11, ( Using 0)

Now, NIXTWILD & IN < - IN 11011, + 20 1N 11 80 11, · = · 20 (-110/11 + 4 11/3/11,) 0 < 1 (-11011, +4118°11,) 00 11VII, 64 118°11, 64R, Eg. 11.22 status
[1] X 3 | 12 & [| X T W | Lo | 10 | 1, + An (| | V2 | 1, - | 1 0 c c | 1, ) Since 1121 = 112 11, + 112 sell, 112 stree - 112 sell, < 11011. : 11XVII2 < 10 11 XTWII 0 11VII, + ANIIVII, = / 1/x Twll = + An ) 11011,  $\leq (\frac{1}{2} + \frac{1}{4} + \frac$ = 6 ANRI

Mence, 11.25 à is proved.

