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HW11

EE 16A HW 11

1 Mechanical Correlation

A IPython → 40

B IPython $[-6, 6, 10, 22, 18, 6, -6, 10, -22, 18]^T$

2 GPS Receivers

See IPython

3 Finding Signals in Noise

A The largest inner products are MUCH smaller than the normalized inner product with itself.

B Yes, this moves the spike over

C Same, close to zero, but not zero

D Yes, we can clearly see the shift of the spike

E As the noise gets higher, it becomes more difficult to differentiate spikes from noise

F We can only find 1 delay. We need an extra reference point (similar concept as in triangulation)

G Not possible to find $s2$ accurately with such high noise.

H This strategy accurately cancels out the noise.

I This helps as α_0 is insignificant that it does not factor significantly into the correlation

J Estimates are fairly close, as the noise is irregular so cancels out the noise, thus small deleted [illegible]

4 Mechanical Least Squares

A $\frac{\langle a, y\rangle - \langle a, a\rangle}{\langle b, b\rangle} = = \frac{3+12+7}{9+36+49+64} - \frac{6+24+42+64}{} = \frac{22}{43+49+64} = \frac{22}{150}$

$50150+36$

B $\dfrac{\langle b\ b\rangle - \langle b\ a\rangle}{\langle b\ b\rangle} = \dfrac{\overset{22}{\cancel{3^2+6^2+7^2+8^2 - 6\cdot 24\cdot 42\cdot 64}}}{158}$

$\boxed{= \dfrac{22}{158}}$

C The error vector is orthogonal (near orthogonal) to the columns of A as it is argmin $\| B - Ax \|^2$ with s approx 0.
If the inner product of 2 vectors is 0, they are orthogonal.

Therefore, the error vector is very close to being orthogonal to the cols. A

$\Rightarrow$ orthogonal

7. Whole IPython
$\rightarrow$ auto correlation
$\rightarrow$ correlation

8 World alone

5 Inverse Analysis
A $a(x^2 + y^2) + dx + ey = 1$

B $ax^2 + bxy + cy^2 + dx + ey = 1$

C see IPython
D