Similarity between signals

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1. Is there a relationship between EEG signals and arm position?
2. Which channel of EEG is most related to arm position?
3. Which features of EEG are related to arm position?
4. Does EMG show signs of Parkinson's disease? Is there a way to assess the severity of Parkinsonian tremor with EMG?
5. How well do blood glucose sensors' current readings track blood glucose levels?
6. How well does the output of a predictive model of arm position match the actual arm position?

Correlation

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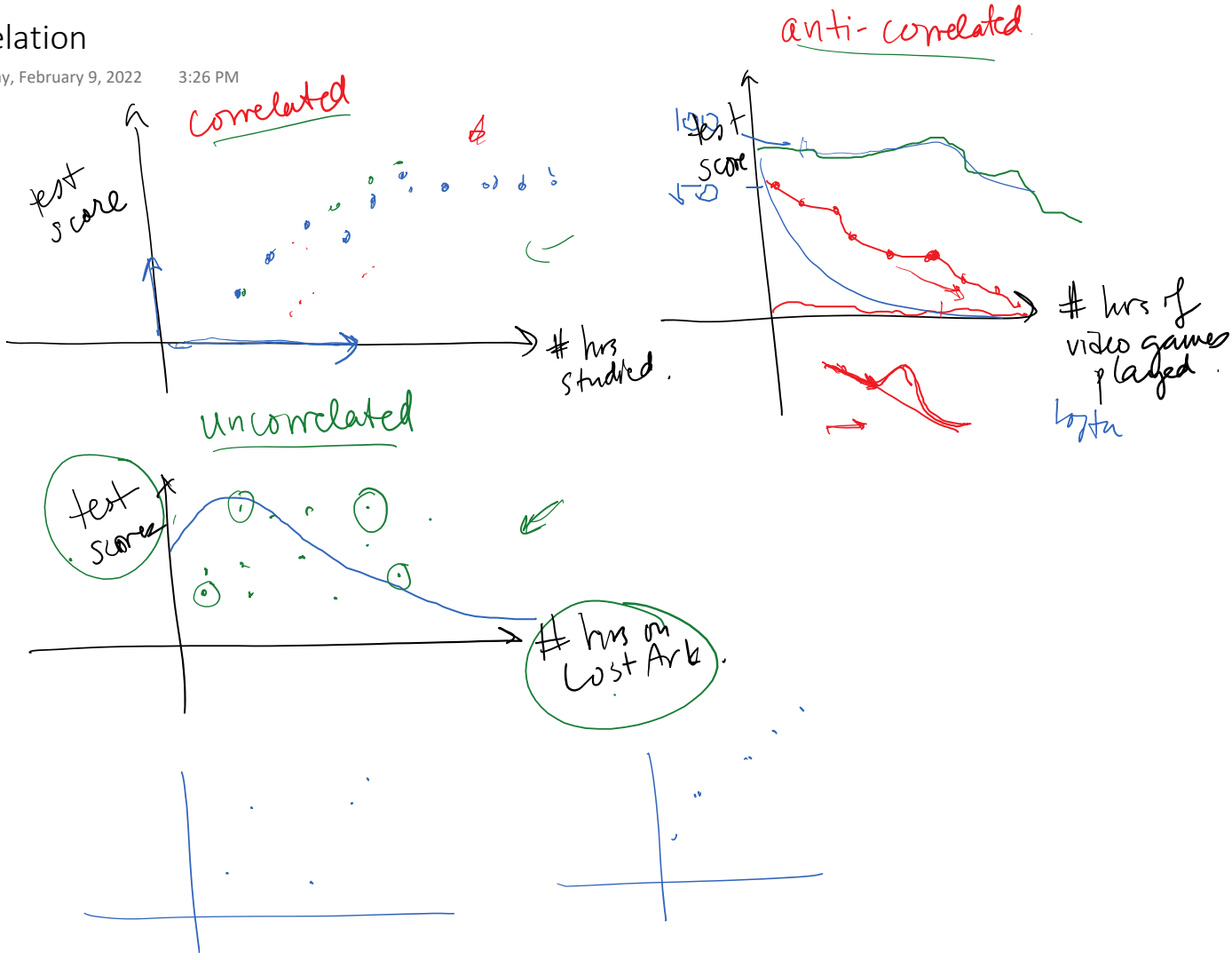

Mathematical definition of correlation

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$$r'_{xy} = \frac{1}{N}\sum_{n}^{N} x[n]\,y[n]$$

$$= \frac{1}{N}\left(x[1]y[1] + x[2]y[2] + \ldots + x[N]y[N]\right).$$

e.g. $x = [1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10]$. $\Rightarrow r'_{xy} = 192.5$

$\rightarrow y = [5\ 10\ 15\ \ldots\ \ldots\ \ldots\ 50]$.

$z = [30\ 15\ 35\ 40\ 25\ 5\ 10\ 20\ 45\ 50]$ $r'_{xz} = 161.5$

✓ $r'_{xz} > r'_{xy}$

✗ $r_{xz} < r_{xy}$ Correct.

$r'_{xz} = r_{xy}$

Interlude: dot product

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