Exercise

goal: getting a deeper understanding of the meaning of

$$cov(x_1, x_2) = E(x_1 x_2) - E(x_1)E(x_2)$$

and

$$\rho(x_1, x_2) = \frac{cov(x_1, x_2)}{\sqrt{\sigma_{11}^2 \sigma_{22}^2}}$$

task: generate two data sets x_1 and x_2 randomly for different

- noise level
- using different distributions
- using different functions *f* where $x_2 = f(x_1)$

example:

```
x1 = np.random.uniform(0,5,(1000,))
x2 = np.sqrt(x1)
```

summarize your results including plots, discuss how $cov(x_1, x_2)$ and $\rho(x_1, x_2)$ depend on the different settings

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how: 5 teams and separate breakout rooms:

team 1): four completely different functions f where $x_2 = f(x_1)$, low noise level

team 2): a linear function, but for 5 different slopes (including neg), low noise level

team 3): a linear function, 5 different noise levels, slope of 1

team 4): different distributions to generate the data (normal, poisson, uniform etc)

team 5): 5 different scaling factors a where $x_1 \rightarrow ax_1$, two different distributions, low noise

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You can use the google doc here