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## 2. KS and KL Tests

The problems on this page concern the data set

$$S = \{0.28, 0.2, 0.01, 0.80, 0.1\}.$$

Let  $x_i$  denote the  $i$ 'th element of the data set  $S$ .

### The Empirical CDF

3/3 points (graded)

Let  $F_5(t)$  denote the empirical cdf of the data set above.

What is  $F(0.5)$ ?



What is  $F(0.1)$ ?



What is  $F(1)$ ?



You have used 1 of 3 attempts

---

✓ Correct (3/3 points)

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## QQ Plot

1/1 point (graded)

Consider the QQ-plot of the data set  $S$  against the distribution  $\text{Unif}(0, 1)$ . (You may graph the plot using computational tools.)

How many points in the QQ-plot lie above the line  $y = x$ ?



You have used 3 of 3 attempts

---

✓ Correct (1/1 point)

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## KS Test Statistic

2/2 points (graded)

In this problem, you will test the null and alternative hypotheses

$$H_0 = \text{the data set is distributed as } \text{Unif}(0, 1)$$
$$H_1 = \text{the data set is not distributed as } \text{Unif}(0, 1).$$

What is the value of the Kolmogorov-Smirnov test statistic on the data set  $S$ ? Enter  $T_5^{\text{KS}}/\sqrt{5}$ , the KS statistic without the factor of  $\sqrt{n}$ , below.

$$T_5^{\text{KS}}/\sqrt{5} =$$



Does this test **reject** or **fail to reject** at level  $\alpha = 0.1$ ?

Kolmogorov-Smirnov Tables

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☒ Reject

☐ Fail to reject



Submit

You have used 1 of 3 attempts

✓ Correct (2/2 points)

## KL Test Statistic

2/2 points (graded)

What is the sample mean  $\hat{\mu}$  of the data set  $S$ ?

$\hat{\mu} =$



What is the sample variance  $\hat{\sigma}^2$  of the data set  $S$ ?

(You may use either the unbiased sample variance or the MLE of the variance.)

$\hat{\sigma}^2 =$



Submit

You have used 1 of 3 attempts

✓ Correct (2/2 points)

## KL Test Statistic

2/2 points (graded)

In this problem, you will consider the following null and alternative hypotheses.

$H_0$  = the data set is distributed as a Gaussian distribution (for some choice of mean and variance)

$H_1$  = the data set is not distributed as a Gaussian (for any choice of mean and variance).

What is the Kolmogorov-Lilliefors test statistic evaluated on the data set  $S$ ? Enter  $T_5^{\text{KL}}/\sqrt{5}$ , the KL statistic without the factor of  $\sqrt{n}$ , below.  
(You are encouraged to use computational tools.)

Kolmogorov-Lilliefors Tables

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$T_5^{\text{KL}}/\sqrt{5} =$   ✓

Do you **reject** or **fail to reject**  $H_0$  at level  $\alpha = 0.1$  on the data set  $S$ ?

☐ Reject

☒ Fail to reject



Submit

You have used 2 of 3 attempts

✓ Correct (2/2 points)

## Discussion

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### QQ Plot

discussion posted a day ago by [Disruptive](#)

This is stochastic. I tried a few answers and none of them are accepted. I am doing something crazy here. I even tried by hand, but nothing seems accepted. I mean this id for 5 samples. Just plotting a few examples and you see the issues.

This post is visible to everyone.

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1 response

#### [ShadowHunter](#)

a day ago

I made the mistake of mixing up what each axis represents. Make sure you are using the theoretical quantiles on the x axis and the observed quantiles on the y.

I have the theory on the bottom (x) and the observed (S) on the (y). Here is the really dirty code in python, because I thought this would take 30 seconds.

```
import numpy as np
import matplotlib.pyplot as plt
x = np.random.uniform(0,1,5) # theoretical samples from uniform distribution [0,1]
y = [0.01, 0.1, 0.2, 0.28, 0.8]
plt.figure()
plt.scatter(np.sort(x), np.sort(y))
plt.scatter(np.linspace(0, 1, 100), np.linspace(0, 1, 100), s=1) # y=x
plt.show()
```

posted a day ago by [Disruptive](#)

I think I know what I did, maybe the code might be useful for others!



posted a day ago by [Disruptive](#)

For anyone who wants to run the code above: <https://jupyter.org/try> and then click on Try JupyterLab



posted about 18 hours ago by [p\\_angyan](#)

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