

**CS 203: Software Tools & Techniques for AI**  
**IIT Gandhinagar**  
**Sem-II - 2024-25**

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**Lab Assignment 10**

**Total: 10 Marks**

**Submission deadline: Wednesday, 16/04/2025 11:59:59 PM**

**Submission guidelines:**

1. Implement the code in the jupyter notebook and share it during submission.
2. Add all screenshots of the results in a pdf file and share.
3. The deadline will not be extended at any cost.

Note: Submitting this assignment solution confirms that you will follow the IITGN's honor code. We shall strictly penalize the submissions containing plagiarized text/code.

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## Question 1

Z-score: 0.2603976662571061  
P-value: 0.794557042938064

### Conclusion:

Z-score: 0.26 suggests that the difference in click-through rates is small.

P-value: 0.795 indicates no statistically significant difference between the two groups (Top and Side ad positions).

### What Does This Mean for Your A/B Test?

Since the P-value is greater than 0.05, we fail to reject the null hypothesis.

Therefore, based on this analysis, there is no evidence to suggest that the position of the ad (Top vs. Side) has a statistically significant effect on the click-through rate.

In other words, the Top ad position and the Side ad position have similar click-through rates in our data, and the observed difference could easily have occurred by random chance.

These results are **statistically insignificant**.

## Question 2

KS Test for test\_1 vs train:

KS Statistic: 0.0190625, P-value: 0.9721940612395358

KS Test for test\_2 vs train:

KS Statistic: 0.4075, P-value: 7.2019977111245e-96

No covariate shift detected in test\_1.

Covariate shift detected in test\_2.

We know, A covariate shift refers to a situation where the distribution of the input features (covariates) in the test data is different from the distribution in the training data, even though the relationship between the features and the target variable (NO2(GT) in our case) remains the same.

test\_1 shows no covariate shift, meaning its data is similar to what the model saw during training.

test\_2 exhibits covariate shift, meaning the distribution of NO2(GT) in test\_2 is quite different from what was seen in the training data, which could impact model performance.

Hence, based on the results of the Kolmogorov-Smirnov (KS) test, we can ideally use test\_1 for evaluating our model, since test\_1 does not show covariate shift relative to the training dataset.