A/B TESTING: ONLINE ADVERTISING CAMPAIGN

SCENARIO:A digital marketing team is running two different Facebook ads to see which one gets more clicks

a . Ad A: Simple text and image
b. Ad B: Includes a video

GOAL: **Does the video ad increase click through rates (CTR)?**

```
# Generate 8000 AD impressions with random click probabilities
import pandas as pd
import numpy as np
import scipy.stats as stats
import matplotlib.pyplot as plt

#Set seed for reproducibility
np.random.seed(42)

#Generate 8000 samples
 n=8000
groups=np.random.choice(['A','B'],size =n, p=[0.5,0.5])
clicks= np.where(groups=='A',
          np.random.binomial(1,0.03,n),       #3% CTR for A- Basic Ad
          np.random.binomial(1,0.05,n))       # 5% CTR for B -Video Ad

#Create DataFrame
df=pd.DataFrame({'Ad Version': groups, 'Clicked':clicks})
print(df.head())
```

```
  Ad Version  Clicked
0          A        0
1          B        0
2          B        0
3          B        0
4          A        0
```

 # Perform Chi- square test to check if the CTR difference is statistically sign

```
#Create a contingency table
contingency_table=pd.crosstab(df['Ad Version'],df['Clicked'])
print(contingency_table)

#Perform chi-square test
chi2, p_value,dof,expected= stats.chi2_contingency(contingency_table)

print(f"Chi-Square statistic:{chi2: .2f}") print(f"P_value: {p_value: .4f}")

# Interpret the p-value
 if p_value < 0.05:
print("Conclusion: Video ads work better (statistically significant).")
else:
print("Conclusion: No significant difference; video ads have no advantage.")
```

```
Clicked        0    1
Ad Version
A           3933  113
B           3726  228
Chi-Square statistic: 42.60
P_value:  0.0000
Conclusion: Video ads work better (statistically significant).
```

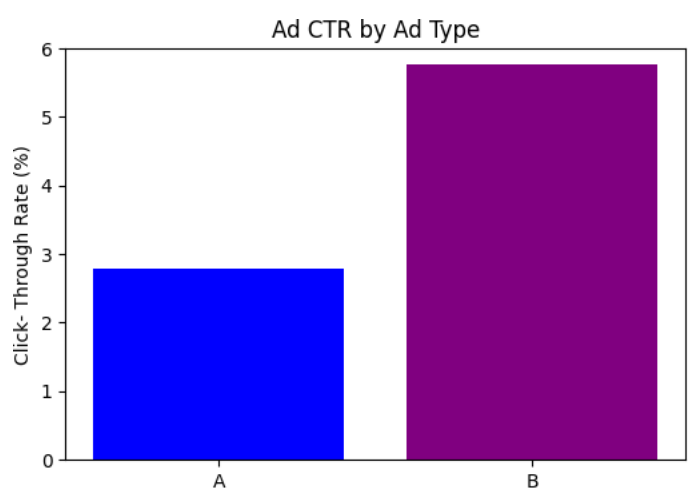
 # Visualize the results

```
#Calculate the CTR per group
ctr=df.groupby('Ad Version')['Clicked'].mean()

#Plot
plt.figure(figsize=(6,4))
plt.bar(ctr.index, ctr.values*100, color=['blue','purple'])
plt.ylabel('Click- Through Rate (%)')
plt.title('Ad CTR by Ad Type')
plt.ylim(0,6)


# Add interpretation based on p-value
if p_value < 0.05:
conclusion_text = "Conclusion: Video ads perform better!"
color = "green"
else:
conclusion_text = "Conclusion: No significant advantage of video ads."
color = "red"

# Add conclusion as a footnote
plt.figtext(0.5, -0.1, conclusion_text, fontsize=12, color=color, ha='center', weight='bold')
plt.show()
```



Conclusion: Video ads perform better!