🧪 A/B Test Analyst Project

📈 Statistical Analysis of Landing Page Performance (Old vs. New Design)

📌 Overview

This project simulates a real-world **A/B Testing scenario** commonly used in product management and data analytics to measure the impact of a new website or app design.

The goal was to determine whether the **new landing page (Group B)** leads to higher **user engagement** and **conversion rates** compared to the **old version (Group A)** using **statistical hypothesis testing**.

🎯 Objective

To evaluate whether the **new page design (B)** performs significantly better than the **old design (A)** in terms of:

- Click-Through Rate (CTR)
- Conversion Rate
- Time Spent on Page

📂 Dataset Details

- **Total Records:** 5000 users
- **Columns:**

Column	Description
`user_id`	Unique identifier for each user
`group`	Experimental group — ‘A’ (old) or ‘B’ (new)
`page_version`	Version of the page shown
`clicked`	Whether user clicked on the CTA button (1 = Yes, 0 = No)
`purchased`	Whether user completed the purchase (1 = Yes, 0 = No)
`time_on_page`	Total time spent on page (in seconds)
`country`	User’s country

🛠️ Tools & Technologies

- **Python** → Data Cleaning, Analysis, Visualization
- **Libraries**: `pandas`, `numpy`, `scipy.stats`, `matplotlib`, `seaborn`
- **Statistical Test Used:** Two-sample **t-test** (Independent samples)

📊 Data Summary

Metric	Group A	Group B
Click-Through Rate (CTR)	25.04 %	30.96 %
Conversion Rate	8.36 %	12.6 %
Avg. Time on Page	40.0 s	44.9 s

📈 Hypothesis Testing

Null Hypothesis (H_0):
There is **no significant difference** between the conversion rates of the old and new designs.

Alternative Hypothesis (H_1):
The **new design (Group B)** leads to a **significantly higher** conversion rate.

Test Used: Two-Sample **t-test** (independent samples)

🔬 Statistical Results

Metric	Result
T-statistic	-4.905
P-value	0.000001
Significance Level (α)	0.05
Conclusion	✅ Statistically significant difference

📝 Interpretation

- Since **p-value < 0.05**, we **reject the null hypothesis**.
- The new design **significantly improves** both user engagement and conversions.
- This improvement is **unlikely due to random chance**.

💡 Insights

1. **Conversion rate** improved by **~50%** (from 8.36% → 12.6%).
2. **Average time on page** increased, suggesting users found the new layout more engaging.
3. Statistically significant results validate that **Group B's performance improvement is real**.
4. The new landing page should be **rolled out site-wide** based on these findings.