# Project Report

## 🧠 Objective

This project investigates the relationship between violent crime rates (robbery and assault) and average Airbnb prices across U.S. states. The goal is to determine whether higher crime rates are associated with lower Airbnb prices.

## 📊 Exploratory Data Analysis (EDA)

We began with a merged dataset containing:  
- Average\_Price — the average Airbnb price by state  
- Robbery\_per\_100k — robbery rate per 100,000 residents  
- Assault\_per\_100k — assault rate per 100,000 residents  
  
We used .head(), .info(), and .describe() to inspect the data and confirmed no missing values.

Visualizations included histograms, correlation heatmaps, pairplots, and bar charts.

## 📈 Correlation Analysis

Pearson Correlations:

- Robbery vs Airbnb Price: r = -0.515, p-value = 0.2954

- Assault vs Airbnb Price: r = -0.467, p-value = 0.3501

Spearman Correlations:

- Robbery vs Airbnb Price: rho = -0.429, p-value = 0.3965

- Assault vs Airbnb Price: rho = -0.543, p-value = 0.2657

Conclusion: While a medium-strength negative relationship exists between crime and Airbnb price, it is not statistically significant due to high p-values (> 0.05).

## 🤖 Machine Learning Models

We used regression to predict Airbnb prices from crime rates.  
  
1. Linear Regression: Moderate R² and error.  
2. Random Forest Regressor: Outperformed linear regression.  
  
Feature importance analysis showed that 'Assault\_per\_100k' contributed more than 'Robbery\_per\_100k'.

## 🧪 Hypothesis Testing Summary

Robbery Rate Hypothesis:  
- H₀: Robbery rates are not correlated with Airbnb prices  
- H₁: Robbery rates are correlated  
- Result: p-value > 0.05 ⇒ fail to reject H₀  
  
Assault Rate Hypothesis:  
- H₀: Assault rates are not correlated with Airbnb prices  
- H₁: Assault rates are correlated  
- Result: p-value > 0.05 ⇒ fail to reject H₀

## 📌 Limitations

- Only two crime indicators included  
- Other factors (economics, tourism, housing laws) not considered