**PROJECT REPORT -:**

**PRIME NUMBER GENERATOR AND CHECKER USING PYTHON**

**Name** -: Abhilash Raj

**Roll No** -: 202401100400007

**Section** -: A

**Branch** -: CSE (AI/ML)

**Introduction (in short) -:**

The objective of this project is to develop a Python program that can generate random numbers, identify prime numbers, visualize them in graphs, and allow user input to check whether a given number is prime or not.

**Methodology -:**

The approach involves generating a dataset of random numbers, checking for prime numbers using a mathematical function, visualizing prime and non-prime numbers using bar graphs and scatter plots, and allowing user input for manual prime number checking.

**Code -:**

**import pandas as pd**

**import numpy as np**

**import matplotlib.pyplot as plt**

**# Function to check if a number is prime or not**

**def is\_prime(n):**

**"""**

**This function checks if a number is prime or not.**

**Returns True if prime, else False.**

**"""**

**if n < 2:**

**return False**

**for i in range(2, int(n\*\*0.5) + 1):**

**if n % i == 0:**

**return False**

**return True**

**# Step 1: Generate a Random Dataset**

**# Creating 100 random numbers between 1 to 1000**

**np.random.seed(42)  # For reproducibility**

**data = np.random.randint(1, 1000, size=100)**

**# Step 2: Convert it into a DataFrame**

**df = pd.DataFrame(data, columns=['Number'])**

**# Step 3: Check if the number is prime and add a new column**

**df['Is\_Prime'] = df['Number'].apply(is\_prime)**

**# Step 4: Filter Prime Numbers from Dataset**

**prime\_numbers = df[df['Is\_Prime'] == True]**

**# Step 5: Visualization of Prime Numbers**

**## Bar Graph Showing Prime vs Non-Prime Numbers**

**plt.figure(figsize=(12, 5))**

**plt.bar(df.index, df['Number'], color=['green' if x else 'red' for x in df['Is\_Prime']])**

**plt.title('Prime Numbers vs Non-Prime Numbers')**

**plt.xlabel('Index')**

**plt.ylabel('Number Value')**

**plt.show()**

**## Scatter Plot Showing Prime Numbers**

**plt.figure(figsize=(10, 5))**

**plt.scatter(prime\_numbers.index, prime\_numbers['Number'], color='blue', label='Prime Numbers')**

**plt.title('Prime Numbers Distribution')**

**plt.xlabel('Index')**

**plt.ylabel('Prime Number Value')**

**plt.legend()**

**plt.show()**

**# Step 6: Display Results**

**print("✅ Total Numbers Generated:", len(data))**

**print("✅ Total Prime Numbers Found:", len(prime\_numbers))**

**print("\n📊 Prime Numbers List:")**

**print(prime\_numbers[['Number']])**

**# Step 7: Allow User to Input a Number for Prime Check**

**print("\n🔢 Now you can check if a number is Prime or Not!")**

**user\_number = int(input("👉 Enter a number to check: "))**

**if is\_prime(user\_number):**

**print(f"🎉 Yes! The number {user\_number} is a PRIME number.")**

**else:**

**print(f"❌ No! The number {user\_number} is NOT a prime number.")**

**# Step 8: Optional - Save Result to Excel File (if needed)**

**save\_to\_excel = input("\n💾 Do you want to save prime numbers in an Excel file? (yes/no): ").lower()**

**if save\_to\_excel == 'yes':**

**prime\_numbers.to\_excel("Prime\_Numbers.xlsx", index=False)**

**print("✅ Prime numbers have been saved to 'Prime\_Numbers.xlsx'")**

**Result/Output-:**



