Introduction to Streamlit

What is Streamlit?

Streamlit is a Python library that makes it easy to create web applications for data science and machine learning projects. It turns data scripts into shareable web apps in minutes, requiring no front-end experience.

Why Streamlit?

- Rapid prototyping
- No web development knowledge required
- Built-in support for data science libraries
- Interactive visualizations
- Easy deployment

Setting Up Your Environment

Installation

```
pip install streamlit
```

Testing Installation

Create a file `test_app.py`:

```python
import streamlit as st

st.title("Hello, Streamlit!")
st.write("Welcome to your first Streamlit app!")
```

Run the app:

```
streamlit run test_app.py
```

Basic Streamlit Components

Text Elements

1. Title and Headers

```python
st.title("Main Title")  # Main title of the app
st.header("Header")     # Section header
st.subheader("Subheader")  # Sub-section header
```

2. Text Display

```python
st.text("Fixed width text")  # Simple text
st.markdown("**Bold** and *italic* text")  # Markdown formatted text
st.write("Automatic formatting based on input type")
```

3. Special Text Elements

```
st.code("print('Hello World')", language='python')  # Code blocks
st.latex("\int_a^b x^2 dx")  # LaTeX equations
```

Interactive Widgets

1. Basic Input Widgets

```
name = st.text_input("Enter your name")
age = st.number_input("Enter your age", min_value=0, max_value=120)
is_happy = st.checkbox("Are you happy?")
```

2. Selection Widgets

```
# Dropdown
option = st.selectbox("Choose an option", ["Option 1", "Option 2", "Option 3"
])

# Radio buttons
gender = st.radio("Select gender", ["Male", "Female", "Other"])

# Multi-select
options = st.multiselect("Select multiple", ["A", "B", "C", "D"])

# Slider
value = st.slider("Select a value", min_value=0, max_value=100)
```

3. File Upload

```
uploaded_file = st.file_uploader("Choose a file", type=['csv', 'xlsx'])
if uploaded_file is not None:
    df = pd.read_csv(uploaded_file)
    st.write(df)
```

Data Display and Input Components

Displaying Data

```
import pandas as pd
import numpy as np

# Create sample data
df = pd.DataFrame({
    'A': np.random.randn(5),
    'B': np.random.randn(5)
})

# Display methods
st.dataframe(df)  # Interactive dataframe
st.table(df)      # Static table
st.json({'foo':'bar'})  # JSON viewer
```

Layouts and Containers

1. Columns

```python
col1, col2 = st.columns(2)
with col1:
    st.header("Column 1")
    st.write("Content for column 1")
with col2:
    st.header("Column 2")
    st.write("Content for column 2")
```

2. Expander

```python
with st.expander("Click to expand"):
    st.write("Hidden content revealed!")
```

3. Sidebar

```python
st.sidebar.title("Sidebar Title")
sidebar_slider = st.sidebar.slider("Sidebar Slider", 0, 100)
```

Data Visualization with Streamlit

Matplotlib Integration

```python
import matplotlib.pyplot as plt

fig, ax = plt.subplots()
ax.plot([1, 2, 3], [1, 4, 9])
st.pyplot(fig)
```

Seaborn Integration

```python
import seaborn as sns

# Sample visualization
fig = plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='A', y='B')
st.pyplot(fig)
```

Interactive Plots

```python
# Interactive line chart
chart_data = pd.DataFrame(np.random.randn(20, 3), columns=['A', 'B', 'C'])
st.line_chart(chart_data)

# Interactive area chart
st.area_chart(chart_data)

# Interactive bar chart
st.bar_chart(chart_data)
```