

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI – 590 018



Assignment-2

Data Visualization

Submitted By

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Under the Guidance of

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Question 1: Demonstrate Kernel Density Estimation

Code Snippet:

```
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

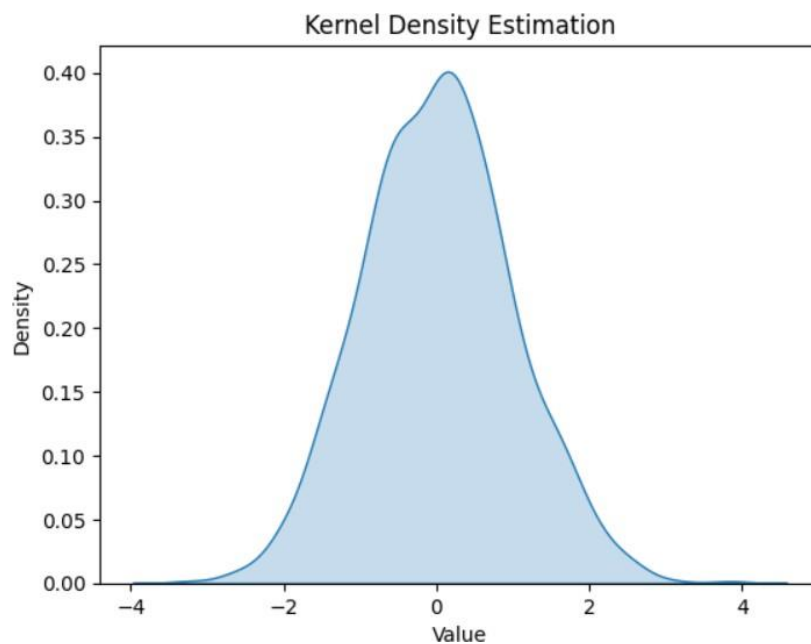
# Generate some random data
np.random.seed(42)
data = np.random.randn(1000)

# Create a KDE plot using seaborn
sns.kdeplot(data, shade=True)

# Customize the plot
plt.title("Kernel Density Estimation")
plt.xlabel("Value")
plt.ylabel("Density")

plt.show()
```

Output:



Question 2: Plot bivariate distribution

Code Snippet:

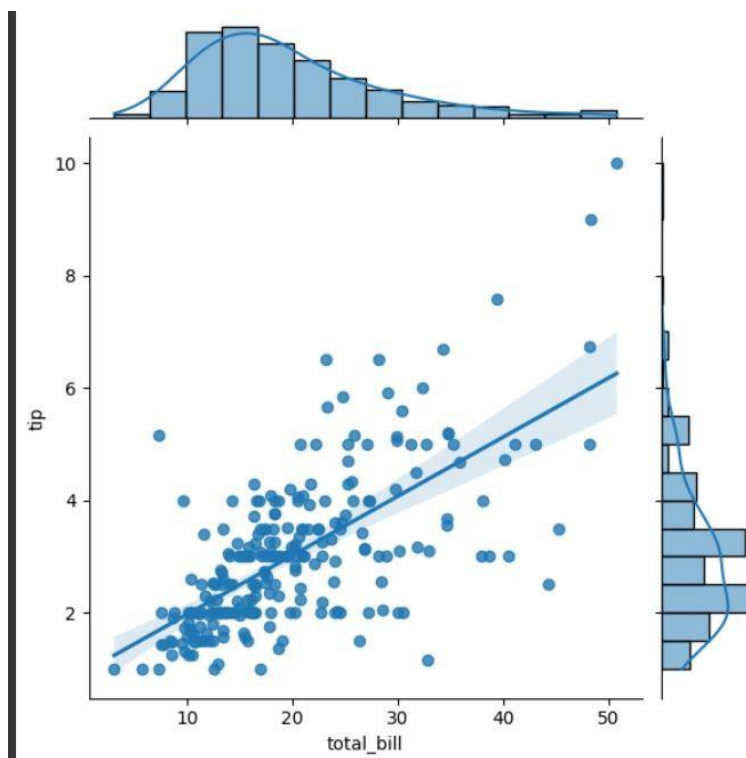
```
import seaborn as sns
import matplotlib.pyplot as plt

# Load the tips dataset
tips = sns.load_dataset("tips")

# Create a jointplot to visualize the relationship between total_bill and tip
sns.jointplot(x="total_bill", y="tip", data=tips, kind="reg")

plt.show()
```

Output :



Question 3: Geospatial data and Bokeh

Code Snippet:

```
import pandas as pd
from bokeh.io import output_notebook, show
from bokeh.models import ColumnDataSource, HoverTool, ColorBar
from bokeh.plotting import figure
from bokeh.transform import linear_cmap
from bokeh.palettes import Viridis256
import numpy as np

# Enable inline plotting in Jupyter Notebook
output_notebook()

# Sample data: Create a simple DataFrame with geographical coordinates and values
data = {
    'name': ['Location A', 'Location B', 'Location C', 'Location D'],
    'latitude': [37.7749, 34.0522, 40.7128, 41.8781],
    'longitude': [-122.4194, -118.2437, -74.0060, -87.6298],
    'value': [10, 20, 30, 40] # Example values for color mapping
}

# Create a DataFrame
df = pd.DataFrame(data)

# Convert Latitude and Longitude to Web Mercator coordinates
df['x'] = df['longitude'] * 20037508.34 / 180
df['y'] = np.log(np.tan((90 + df['latitude']) * np.pi / 360)) / (np.pi / 180)
df['y'] = df['y'] * 20037508.34 / 180

# Create a ColumnDataSource
source = ColumnDataSource(df)

# Create a figure
p = figure(title="Interactive Geospatial Data Visualization",
           tools="pan,wheel_zoom,box_zoom,reset,hover",
           x_axis_label='Longitude', y_axis_label='Latitude')

# Define color mapping
mapper = linear_cmap(field_name='value', palette=Viridis256, low=df['value'].min(), high=df['value'].max())

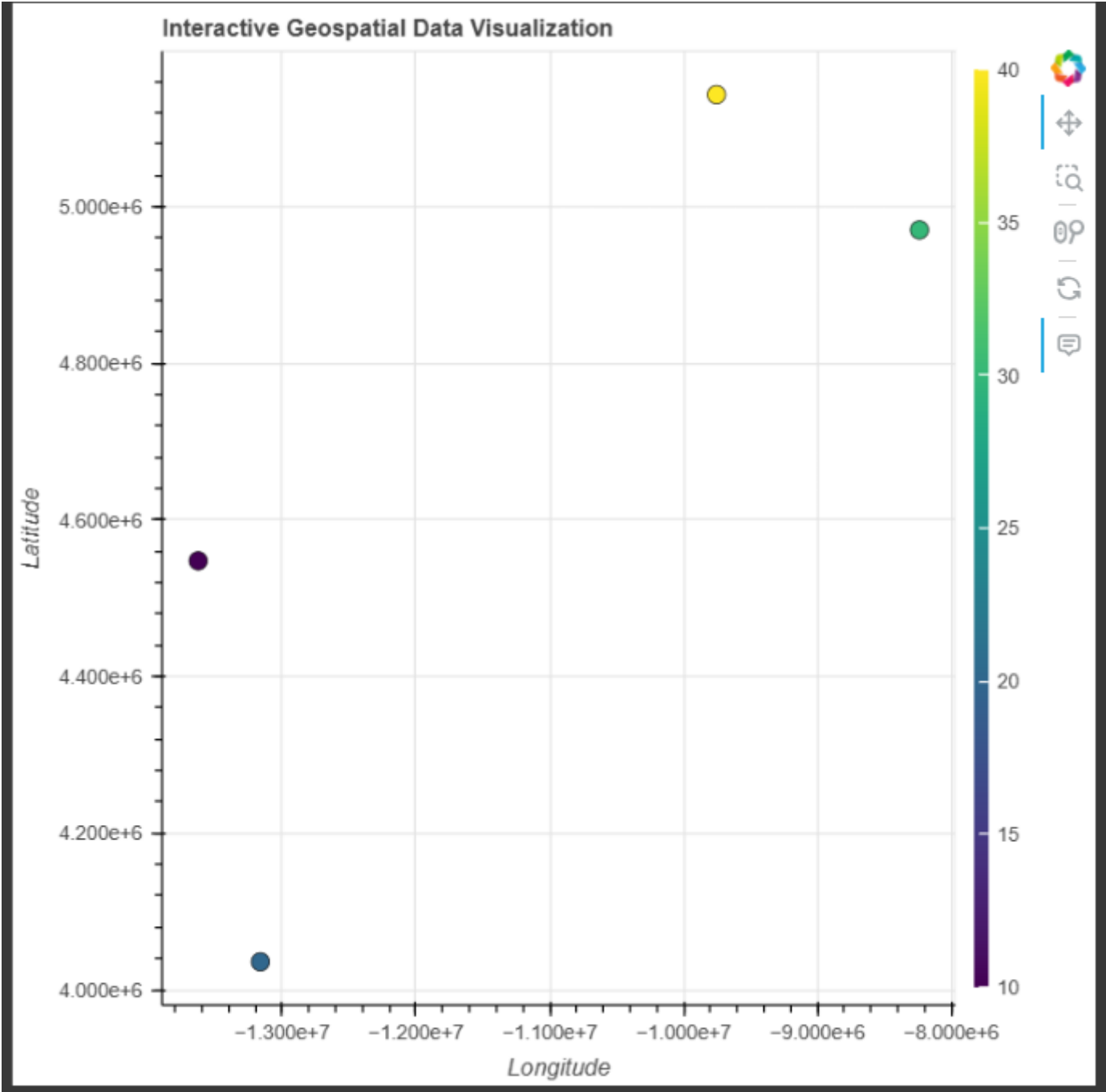
# Add scatter points to the figure
p.scatter(x='x', y='y', size=10, source=source, fill_color=mapper, line_color='black', line_width=0.5)

# Add hover tool
hover = p.select(dict(type=HoverTool))
hover.tooltips = [("Name", "@name"), ("Value", "@value")]

# Add color bar
color_bar = ColorBar(color_mapper=mapper['transform'], width=8, location=(0,0))
p.add_layout(color_bar, 'right')

# Show the plot
show(p)
```

Output:



Question 4 : Plot network and interconnection using geospatial data

Code Snippet:

```
import geopandas as gpd
import folium

# Load the GeoJSON data for US States
gdf = gpd.read_file("https://raw.githubusercontent.com/plotly/datasets/master/geojson-counties-fips.json")

# Create a Folium map
m = folium.Map(location=[37.0902, -95.7129], zoom_start=5)

# Add the GeoJSON Layer to the map
folium.GeoJson(
    gdf,
    style_function=lambda x: {'fillColor': 'lightblue', 'color': 'black', 'weight': 1}
).add_to(m)

import geopandas as gpd
import folium

# Load the GeoJSON data for US States
gdf = gpd.read_file("https://raw.githubusercontent.com/plotly/datasets/master/geojson-counties-fips.json")

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# Add the GeoJSON Layer to the map
folium.GeoJson(
    gdf,
    style_function=lambda x: {'fillColor': 'lightblue', 'color': 'black', 'weight': 1}
).add_to(m)

# Sample network data
network_data = [
    [(-95, 37), (-90, 40)],
    [(-90, 40), (-85, 45)],
    [(-95, 37), (-100, 35)]
]

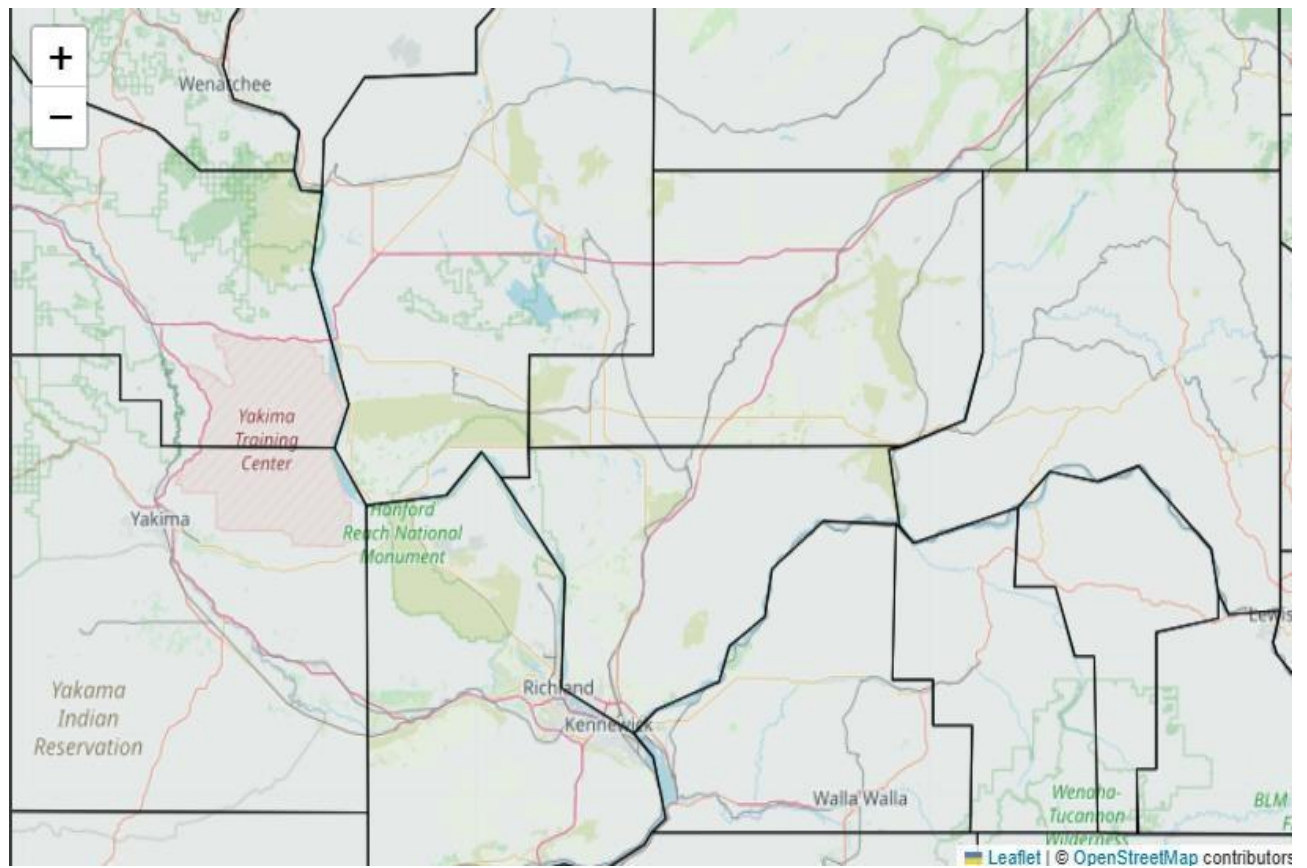
# Add network lines to the map
for line in network_data:
    folium.PolyLine(line, color='red', weight=2).add_to(m)

network_data = [
    [(-95, 37), (-90, 40), {'color': 'red', 'weight': 3}],
    [(-90, 40), (-85, 45), {'color': 'blue', 'weight': 1}],
    [(-95, 37), (-100, 35), {'color': 'green', 'weight': 2}]
]

for line in network_data:
    folium.PolyLine(line[:2], color=line[2]['color'], weight=line[2]['weight']).add_to(m)

# Display the map
m
```


Output:



Question 5: Retrieving image over HTTP, parsing HTML and scraping web

```
import requests
from bs4 import BeautifulSoup
import urllib.request

def download_image(url, filename):
    response = requests.get(url, stream=True)
    with open("images.jpg", 'wb') as out_file:
        for chunk in response.iter_content(1024):
            if not chunk:
                break
            out_file.write(chunk)

def parse_html(html_content):
    soup = BeautifulSoup(html_content, 'html.parser')
    # Find all image tags with 'src' attribute
    images = soup.find_all('img', src=True)
    for image in images:
        image_url = image['src']
        # Download the image
        download_image(image_url, f"image_{image_url.split('/')[-1]}")

def scrape_webpage(url):
    response = requests.get(url)
    html_content = response.text
    soup = BeautifulSoup(html_content, 'html.parser')

    # Find the desired text (adjust the selector as needed)
    text_elements = soup.find_all('p') # Find all paragraph elements

    for text in text_elements:
        print(text.text.strip())

# Example usage:
url = "https://www.nasa.gov/" # Replace with the desired URL
scrape_webpage(url)
```


Output:

Digital content creators are invited to register to attend the launch of NASA's SpaceX Crew-10 mission that will carry astronauts to the International Space Station.

NASA Accelerates Space Exploration, Earth Science for All in 2024

NASA's Hubble Celebrates Decade of Tracking Outer Planets

NASA Researchers Discover More Dark Comets

Hubble Spots a Spiral in the Celestial River

NASA Invites Media to Panama, Austria Artemis Accords Signings

NASA to Test Technology for X-59's Unique Shock Wave Measurements

NASA's PACE, US-European SWOT Satellites Offer Combined Look at Ocean

What's Up: December 2024 Skywatching Tips from NASA

The Artemis II test flight will be NASA's first mission with a crew under the Artemis campaign and will pave the way to land astronauts on the Moon on Artemis III and future missions.

For more than 50 years, NASA satellites have provided data on Earth's land, water, air, temperature, and climate. NASA's Earth Information Center allows visitors to see how our planet is changing in six key areas: sea level rise and coastal impacts, health and air quality, wildfires, greenhouse gases, sustainable energy, and agriculture.

Mary W. Jackson Portrait Revealed

A portrait of Mary W. Jackson is seen after it was unveiled, Friday, Dec. 6, 2024, at the NASA Headquarters Mary W. Jackson Building in Washington. Mary W. Jackson was a pioneering aerospace engineer and mathematician at NASA's Langley Research Center. Stay up-to-date on the latest news from NASA—from Earth to the Moon, the Solar System and beyond.

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NASA explores the unknown in air and space, innovates for the benefit of humanity, and inspires the world through discovery.

Question 6: Web services including eXtensible Markup Language

```
import xml.etree.ElementTree as ET

# Simple XML-based "database" of book information
book_database = {
    "1": {"title": "Harry Potter", "author": "J.K. Rowling", "year": "1997"},
    "2": {"title": "Lord of the Rings", "author": "J.R.R. Tolkien", "year": "1954"},
    "3": {"title": "The Hobbit", "author": "J.R.R. Tolkien", "year": "1937"}
}

class BookWebService:
    def get_book_by_id(self, book_id):
        """
        Retrieve book information and return as XML
        """
        book = book_database.get(book_id)

        if not book:
            # Create XML for error response
            root = ET.Element('book-response')
            error = ET.SubElement(root, 'error')
            error.text = f"No book found with ID {book_id}"
            return ET.tostring(root, encoding='unicode')

        # Create XML response
        root = ET.Element('book-response')
        book_elem = ET.SubElement(root, 'book')

        # Add book details to XML
        for key, value in book.items():
            elem = ET.SubElement(book_elem, key)
            elem.text = value

        # Convert XML to string
        return ET.tostring(root, encoding='unicode')

def main():
    # Create web service instance
    book_service = BookWebService()

    # Demonstrate XML service calls
    print("Book 1 XML Response:")
    print(book_service.get_book_by_id("1"))

    print("\nBook 2 XML Response (Non-existent):")
    print(book_service.get_book_by_id("2"))

if __name__ == "__main__":
    main()
```

Output :

```
Book 1 XML Response:
<book-response><book><title>Harry Potter</title><author>J.K. Rowling</author><year>1997</year></book></book-response>

Book 2 XML Response (Non-existent):
<book-response><book><title>Lord of the Rings</title><author>J.R.R. Tolkien</author><year>1954</year></book></book-response>
```

GitHub link : <https://github.com/Uzi0312/Data-Visualization-A-2>