Python Project 2023

Στοιχεία Φοιτητή

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Περιεχόμενα

Εισαγωγή

Πριν ξεκινήσω την παρουσίαση του Project της Python, θα ήθελα να σας ενημερώσω πως όλα τα resource files, όπως το Script της Python (script.py), τα .csv αρχεία, το αρχείο SQL, το σχήμα της βάσης, συμπεριλαμβανομένης και αυτής της αναφοράς μπορείτε να τα βρείτε στο παρακάτω Github Repository. Επίσης μπορείτε να δείτε τις αλλαγές που έχουν γίνει από την αρχή δημιουργίας του Project (commits).

Github Repository: https://github.com/CallMeJasonYT/Python-Project-2023

Για το κατέβασμα του αρχείου των δεδομένων και τον έλεγχο ύπαρξης του, χρησιμοποιήθηκαν οι βιβλιοθήκες **urllib** και **os** αντίστοιχα.

Για την σύνδεση με την βάση δεδομένων χρησιμοποιήθηκε η βιβλιοθήκη **sqlalchemy**

Για τα διαγράμματα χρησιμοποιήθηκαν οι βιβλιοθήκες **pandas** και **matplotlib**.

Για την υλοποίηση του GUI χρησιμοποιήθηκε η βιβλιοθήκη **customtkinter**, η οποία είναι μία custom βιβλιοθήκη σαν επέκταση της **tkinter**.

Περισσότερες πληροφορίες για την εγκατάστασή των βιβλιοθηκών και την προέλευσή τους ανατρέξτε στο Παράρτημα 5 και 6

Κώδικας Python

```
import customtkinter
import pandas as pd
import matplotlib.pyplot as plt
import urllib.request
import os.path
from sqlalchemy import create_engine

url = "https://www.stats.govt.nz/assets/Uploads/Effects-of-COVID-19-on-trade/Effects-of-COVID-19-on-trade-At-15-December-2021-provisional/Download-data/effects-of-covid-19-on-trade-at-15-december-2021-provisional.csv"
filename = "data.csv"

if not os.path.isfile(filename):
    urllib.request.urlretrieve(url, filename)
else:
    print("File already exists, skipping download.")

# ------------------------ GUI Code ------------------------#
customtkinter.set_appearance_mode("System")
customtkinter.set_default_color_theme("blue")

engine = create_engine(
    "mysql://root:root@localhost/covid_effects"
)  # Engine Creation for SQL Connection
engine.dispose()
```

```
class App(customtkinter.CTk):
    def __init__(self):
        super().__init__()

        # Configure Main window, center it and resize it
        self.title("Project Python 2023.py")
        self.geometry(f"{1280}x{720}")
        screen_width = self.winfo_screenwidth()
        screen_height = self.winfo_screenheight()
        x = (screen_width - 1280) // 2
        y = (screen_height - 720) // 2
        self.geometry("+{}+{}".format(x, y))

        # Configure grid layout
        self.grid_columnconfigure(1, weight=1)
        self.grid_columnconfigure((2, 3), weight=0)
        self.grid_rowconfigure((0, 1, 2), weight=1)

        # Create sidebar frame with Buttons
        self.sidebar_frame = customtkinter.CTkFrame(self, width=140, corner_radius=0)
        self.sidebar_frame.grid(row=0, column=0, rowspan=4, sticky="nsew")
        self.sidebar_frame.grid_rowconfigure(9, weight=1)
        self.logo_label = customtkinter.CTkLabel(
            self.sidebar_frame,
            text="Project Python",
            font=customtkinter.CTkFont(size=20, weight="bold"),
        )
```

```
self.logo_label.grid(row=0, column=0, padx=20, pady=(20, 10))
self.sidebar_button_1 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Profit per Month",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.first_figure,
)
self.sidebar_button_1.grid(row=1, column=0, padx=20, pady=10)
self.sidebar_button_2 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Profit per Country",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.second_figure,
)
self.sidebar_button_2.grid(row=2, column=0, padx=20, pady=10)
self.sidebar_button_3 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Profit per Transport",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.third_figure,
)
```

```
self.sidebar_button_3.grid(row=3, column=0, padx=20, pady=10)
self.sidebar_button_4 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Profit per Day of Week",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.fourth_figure,
)
self.sidebar_button_4.grid(row=4, column=0, padx=20, pady=10)
self.sidebar_button_5 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Profit per Product",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.fifth_figure,
)
self.sidebar_button_5.grid(row=5, column=0, padx=20, pady=10)
self.sidebar_button_6 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="5 Most Profitable Months",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.sixth_figure,
)
```

```
self.sidebar_button_6.grid(row=6, column=0, padx=20, pady=10)
self.sidebar_button_7 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="5 Most Profitable Products",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.seventh_figure,
)
self.sidebar_button_7.grid(row=7, column=0, padx=20, pady=10)
self.sidebar_button_8 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Most Profitable Day per Product",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=self.eighth_figure,
)
self.sidebar_button_8.grid(row=8, column=0, padx=20, pady=10)
self.sidebar_button_9 = customtkinter.CTkButton(
    self.sidebar_frame,
    text="Exit",
    height=(40),
    width=(300),
    font=customtkinter.CTkFont(size=18, weight="bold"),
    command=lambda: [self.destroy(), plt.close("all")],
    fg_color="Red",
```

```
        )
        self.sidebar_button_9.grid(row=9, column=0, padx=20, pady=10)

    # ------------------------ Graphs Functions Code ------------------------#

    def first_figure(self):
        plt.close("all")
        usecols = [
            "Direction",
            "Date",
            "Measure",
            "Value",
            "Year",
        ]  # Define the Used Columns for this Graph
        data = pd.read_csv(
            "data.csv", usecols=usecols
        )  # Read the .csv file and save it in a DataFrame
        data = data[
            data["Direction"] == "Exports"
        ]  # Accept only the 'Exports' Direction
        data["Month"] = pd.to_datetime(data["Date"], format="%d/%m/%Y").dt.strftime(
            "%b"
        )  # Create a new column for short month names
        monthly_data = (
            data.groupby(["Month", "Measure"])["Value"].sum().reset_index()
        )  # Group the data by Year, Month and Measure and sum the Value column for $ and Tonnes measures separately
```

```
    month_order = [
        "Jan",
        "Feb",
        "Mar",
        "Apr",
        "May",
        "Jun",
        "Jul",
        "Aug",
        "Sep",
        "Oct",
        "Nov",
        "Dec",
    ]  # Months Order
    monthly_data["Month"] = pd.Categorical(
        monthly_data["Month"], categories=month_order, ordered=True
    )  # Ordering the Columns By Months

    # Create pivot tables with years as columns, months as rows, and the sum of values as values for $ and Tonnes measures separately
    monthly_dollars = monthly_data[monthly_data["Measure"] == "$"].pivot_table(
        index="Month", values="Value", aggfunc="sum"
    )
    monthly_tonnes = monthly_data[monthly_data["Measure"] == "Tonnes"].pivot_table(
        index="Month", values="Value", aggfunc="sum"
    )

    # Passing the data into the SQL Database
```

```
monthly_data[monthly_data["Measure"] == "$"].to_sql(
    "monthly_profit", con=engine, if_exists="replace", index=False
)
monthly_data[monthly_data["Measure"] == "Tonnes"].to_sql(
    "monthly_profit", con=engine, if_exists="append", index=False
)

# Exporting the data into .csv files
monthly_dollars.to_csv("monthly_dollars.csv")
monthly_tonnes.to_csv("monthly_tonnes.csv")

fig, axs = plt.subplots(
    num="Profit per Month", nrows=2, figsize=(9.39, 6.48)
)  # Create the bar charts as subplots

# Plot the graphs
monthly_dollars.plot(kind="bar", ax=axs[0], legend=False)
axs[0].set_title("Monthly Value by Year ($)")
axs[0].set_xlabel("Month")
axs[0].set_ylabel("Value ($)")

fig.legend(loc="upper right", ncol=len(month_order))
monthly_tonnes.plot(kind="bar", ax=axs[1], legend=False)
axs[1].set_title("Monthly Value by Year (Tonnes)")
axs[1].set_xlabel("Month")
axs[1].set_ylabel("Value (Tonnes)")
```

```
    fig.canvas.manager.set_window_title("Profit per Month")
    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout(pad=3.0)
    plt.show()

def second_figure(self):
    plt.close("all")
    usecols = [
        "Direction",
        "Measure",
        "Value",
        "Country",
    ]  # Define the Used Columns for this Graph
    data = pd.read_csv(
        "data.csv", usecols=usecols
    )  # Read the .csv file and save it
    data = data[
        data["Direction"] == "Exports"
    ]  # Accept only the 'Exports' Direction
    data = (
        data.groupby(["Country", "Measure"])["Value"].sum().reset_index()
    )  # Group the Value by Country and Measure and sum for $ and Tonnes measures separately

    # Make the data names Shorter
    data = data.replace(
        [
```

```
        "East Asia (excluding China)",
        "European Union (27)",
        "Total (excluding China)",
        "United Kingdom",
        "United States",
    ],
    ["EAsia-China", "EU (27)", "Total-China", "UK", "USA"],
)

# Diverse the data based on the Measure Value
dollars_country = data[data["Measure"] == "$"]
tonnes_country = data[data["Measure"] == "Tonnes"]

# Passing the data into the SQL Database
dollars_country.to_sql(
    "country_profit", con=engine, if_exists="replace", index=False
)
tonnes_country.to_sql(
    "country_profit", con=engine, if_exists="append", index=False
)

# Exporting the data into .csv files
dollars_country.to_csv("dollars_country.csv")
tonnes_country.to_csv("tonnes_country.csv")

fig, axs = plt.subplots(
    num="Profit per Country", nrows=2, figsize=(9.39, 6.48)
```

```
    )  # Create the bar charts as subplots

    # Plot the graphs
    dollars_country.plot(
        x="Country", y="Value", kind="bar", ax=axs[0], legend=False
    )
    axs[0].set_title("Summary Value by Country ($)")
    axs[0].set_xlabel("Country")
    axs[0].set_ylabel("Value ($)")
    tonnes_country.plot(x="Country", y="Value", kind="bar", ax=axs[1], legend=False)
    axs[1].set_title("Summary Value by Country (Tonnes)")
    axs[1].set_xlabel("Country")
    axs[1].set_ylabel("Value (Tonnes)")

    fig.suptitle("Profit Per Country", fontweight="bold", fontsize=16)
    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout()
    plt.show()

def third_figure(self):
    plt.close("all")
    usecols = [
        "Direction",
        "Measure",
        "Value",
        "Transport_Mode",
```

```
] # Define the Used Columns for this Graph
data = pd.read_csv(
    "data.csv", usecols=usecols
) # Read the .csv file and save it
data = data[
    data["Direction"] == "Exports"
] # Accept only the 'Exports' Direction
data = (
    data.groupby(["Transport_Mode", "Measure"])["Value"].sum().reset_index()
) # Group the data by Transport_Mode and Measure and sum the Value column for $ and Tonnes measures separately

# Diverse the data based on the Measure Value
dollars_transport = data[data["Measure"] == "$"]
tonnes_transport = data[data["Measure"] == "Tonnes"]

# Passing the data into the SQL Database
dollars_transport.to_sql(
    "transport_profit", con=engine, if_exists="replace", index=False
)
tonnes_transport.to_sql(
    "transport_profit", con=engine, if_exists="append", index=False
)

# Exporting the data into .csv files
dollars_transport.to_csv("dollars_transport.csv")
tonnes_transport.to_csv("tonnes_transport.csv")
```

```
    fig, axs = plt.subplots(
        num="Profit per Transport", nrows=2, figsize=(9.39, 6.48)
    )  # Create the bar charts as subplots
    # Plot the graphs
    dollars_transport.plot(
        x="Transport_Mode", y="Value", kind="bar", ax=axs[0], legend=False
    )
    axs[0].set_title("Summary Value by Transport Mode ($)")
    axs[0].set_xlabel("Transport")
    axs[0].set_ylabel("Value ($)")
    tonnes_transport.plot(
        x="Transport_Mode", y="Value", kind="bar", ax=axs[1], legend=False
    )
    axs[1].set_title("Summary Value by Transport Mode (Tonnes)")
    axs[1].set_xlabel("Transport")
    axs[1].set_ylabel("Value (Tonnes)")

    fig.canvas.manager.set_window_title("Profit per Transport")
    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout()
    plt.show()

def fourth_figure(self):
    plt.close("all")
    usecols = [
        "Direction",
```

```
    "Date",
    "Measure",
    "Value",
] # Define the Used Columns for this Graph
data = pd.read_csv(
    "data.csv", usecols=usecols
) # Read the .csv file and save it
data = data[
    data["Direction"] == "Exports"
] # Accept only the 'Exports' Direction
data["Day"] = pd.to_datetime(data["Date"], format="%d/%m/%Y").dt.strftime(
    "%a"
) # Create a new column for short day names
daily_data = (
    data.groupby(["Day", "Measure"])["Value"].sum().reset_index()
) # Group the data by Day and Measure and sum the Value column for $ and Tonnes measures separately

day_order = ["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"] # Days Order

daily_data["Day"] = pd.Categorical(
    daily_data["Day"], categories=day_order, ordered=True
) # Ordering the Columns By Days
daily_data = daily_data.sort_values("Day") # Sorting the Columns by Day

# Creating seperate tables for the $ Measure and the Tonnes
dollars_per_day = daily_data[daily_data["Measure"] == "$"]
tonnes_per_day = daily_data[daily_data["Measure"] == "Tonnes"]
```

```
# Passing the data into the SQL Database
dollars_per_day.to_sql(
    "profit_per_day", con=engine, if_exists="replace", index=False
)
tonnes_per_day.to_sql(
    "profit_per_day", con=engine, if_exists="append", index=False
)

# Exporting the data into .csv files
dollars_per_day.to_csv("dollars_per_day.csv")
tonnes_per_day.to_csv("tonnes_per_day.csv")

fig, axs = plt.subplots(
    num="Profit per Day of Week", nrows=2, figsize=(9.39, 6.48)
)  # Create the bar charts as subplots

# Plot the graphs
dollars_per_day.plot(x="Day", y="Value", kind="bar", ax=axs[0], legend=False)
axs[0].set_title("Total Daily Value ($)")
axs[0].set_xlabel("Day")
axs[0].set_ylabel("Value ($)")

tonnes_per_day.plot(x="Day", y="Value", kind="bar", ax=axs[1], legend=False)
axs[1].set_title("Total Daily Value (Tonnes)")
axs[1].set_xlabel("Day")
axs[1].set_ylabel("Value (Tonnes)")
```

```
        mngr = plt.get_current_fig_manager()
        mngr.window.geometry("+661+210")
        plt.tight_layout()
        plt.show()

    def fifth_figure(self):
        plt.close("all")
        usecols = [
            "Direction",
            "Commodity",
            "Measure",
            "Value",
        ]  # Define the Used Columns for this Graph
        data = pd.read_csv(
            "data.csv", usecols=usecols
        )  # Read the .csv file and save it
        data = data[
            data["Direction"] == "Exports"
        ]  # Accept only the 'Exports' Direction
        data = (
            data.groupby(["Commodity", "Measure"])["Value"].sum().reset_index()
        )  # Group the data by Commodity and Measure and sum the Value column for $ and Tonnes measures separately

        # Replace the Long names of the Commodity Values
        data = data.replace(
            [
```

```
        "Milk powder, butter, and cheese",
        "Meat and edible offal",
        "Logs, wood, and wood articles",
        "Fish, crustaceans, and molluscs",
        "Non-food manufactured goods",
        "Mechanical machinery and equip",
        "Electrical machinery and equip",
    ],
    [
        "Dairy",
        "Meat",
        "Wood",
        "Fish",
        "Other Goods",
        "Mech Machines",
        "E-Machines",
    ],
)

# Diverse the data based on the Measure Value
dollars_commodity = data[data["Measure"] == "$"]
tonnes_commodity = data[data["Measure"] == "Tonnes"]

# Passing the data into the SQL Database
dollars_commodity.to_sql(
    "commodity_profit", con=engine, if_exists="replace", index=False
)
```

```
tonnes_commodity.to_sql(
    "commodity_profit", con=engine, if_exists="append", index=False
)

# Exporting the data into .csv files
dollars_commodity.to_csv("dollars_commodity.csv")
tonnes_commodity.to_csv("tonnes_commodity.csv")

fig, axs = plt.subplots(
    num="Profit per Product", nrows=2, figsize=(9.39, 6.48)
)  # Create the bar charts as subplots

# Plot the graphs
dollars_commodity.plot(
    x="Commodity", y="Value", kind="bar", ax=axs[0], legend=False
)
axs[0].set_title("Total Commodity Value ($)")
axs[0].set_xlabel("Commodity")
axs[0].set_ylabel("Value ($)")

tonnes_commodity.plot(
    x="Commodity", y="Value", kind="bar", ax=axs[1], legend=False
)
axs[1].set_title("Total Commodity Value (Tonnes)")
axs[1].set_xlabel("Commodity")
axs[1].set_ylabel("Value (Tonnes)")
```

```
    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout()
    plt.show()

def sixth_figure(self):
    plt.close("all")
    usecols = [
        "Direction",
        "Date",
        "Measure",
        "Value",
    ]  # Define the Used Columns for this Graph
    data = pd.read_csv(
        "data.csv", usecols=usecols
    )  # Read the .csv file and save it

    data = data[
        (data["Direction"] == "Exports") & (data["Measure"] == "$")
    ]  # Accept only the 'Exports' Direction and $
    data["Date"] = pd.to_datetime(data["Date"], format="%d/%m/%Y")

    data = (
        data.groupby(pd.Grouper(key="Date", freq="M"))["Value"].sum().reset_index()
    )
    top_5_months = data.groupby(pd.Grouper(key="Date", freq="M"))["Value"].sum()
    data = data.sort_values(by="Value", ascending=False).head(5)
```

```
    top_5_months = top_5_months.sort_values(ascending=False).head(5)

    # Passing the data into the SQL Database
    data.to_sql("top5_months", con=engine, if_exists="replace", index=False)

    # Exporting the data into .csv files
    top_5_months.to_csv("top_5_months.csv")

    plt.figure(
        figsize=(9.39, 6.48), num="5 Most Profitable Months"
    )  # Create the bar charts as subplots
    plt.bar(top_5_months.index.strftime("%b %Y"), top_5_months.values)
    plt.xlabel("Month", fontsize=14, labelpad=10)
    plt.ylabel("Export Value", fontsize=14, labelpad=20)
    plt.title(
        "Top 5 Most Profitable Months",
        fontweight="bold",
        fontsize=16,
        y=1.05,
    )

    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout()
    plt.show()

def seventh_figure(self):
```

```
plt.close("all")
usecols = [
    "Direction",
    "Country",
    "Commodity",
    "Measure",
    "Value",
]  # Define the Used Columns for this Graph
data = pd.read_csv(
    "data.csv", usecols=usecols
)  # Read the .csv file and save it
data = data[(data["Direction"] == "Exports") & (data["Measure"] == "$")]

# Make the data names Shorter
data = data.replace(
    [
        "East Asia (excluding China)",
        "European Union (27)",
        "Total (excluding China)",
        "United Kingdom",
        "United States",
    ],
    ["EAsia-China", "EU (27)", "Total-China", "UK", "USA"],
)
data = data.replace(
    [
        "Milk powder, butter, and cheese",
```

```
            "Meat and edible offal",
            "Logs, wood, and wood articles",
            "Fish, crustaceans, and molluscs",
            "Non-food manufactured goods",
            "Mechanical machinery and equip",
            "Electrical machinery and equip",
        ],
        [
            "Dairy",
            "Meat",
            "Wood",
            "Fish",
            "Other Goods",
            "Mech Machines",
            "E-Machines",
        ],
    )

    # Grouping the data based on Country and Commodity while calculating the sum of Value and resetting the index
    data = data.groupby(["Country", "Commodity"])["Value"].sum().reset_index()

    # Passing the data into the SQL Database
    data.to_sql("top5_products", con=engine, if_exists="replace", index=False)

    # Group data by country and commodity, and calculate total Value
    top5_products = data.groupby(["Country", "Commodity"])["Value"].sum()
```

```
# Exporting the data into .csv files
top5_products.to_csv("top_5_products.csv")

# Plot the top 5 commodities for each country
countries = top5_products.index.levels[0]
num_plots = len(countries)
num_rows = 3
num_cols = -(-num_plots // num_rows)
fig, axs = plt.subplots(
    num_rows,
    num_cols,
    figsize=(9.39, 6.48),
    num="5 Most Profitable Products",
)
for i, country in enumerate(countries):
    top_commodities = top5_products.loc[country].nlargest(5)
    num_commodities = min(6, len(top_commodities))
    top_commodities = top_commodities[:num_commodities]
    row = i // num_cols
    col = i % num_cols
    ax = axs[row, col]
    ax.set_ylabel("Value ($)")
    ax.set_title(country)
    ax.bar(top_commodities.index, top_commodities.values)
    ax.tick_params(axis="x", rotation=90)

fig.suptitle(
```

```
        "Top 5 Most Profitable Products per Country", fontweight="bold", fontsize=16
    )
    mngr = plt.get_current_fig_manager()
    mngr.window.geometry("+661+210")
    plt.tight_layout()
    plt.show()

def eighth_figure(self):
    plt.close("all")
    usecols = [
        "Direction",
        "Date",
        "Commodity",
        "Measure",
        "Value",
        "Weekday",
    ]  # Define the Used Columns for this Graph
    data = pd.read_csv(
        "data.csv", usecols=usecols
    )  # Read the .csv file and save it
    data = data[(data["Direction"] == "Exports") & (data["Measure"] == "$")]

    # Make the data names Shorter
    data = data.replace(
        [
            "Milk powder, butter, and cheese",
            "Meat and edible offal",
```

```
        "Logs, wood, and wood articles",
        "Fish, crustaceans, and molluscs",
        "Non-food manufactured goods",
        "Mechanical machinery and equip",
        "Electrical machinery and equip",
    ],
    [
        "Dairy",
        "Meat",
        "Wood",
        "Fish",
        "Other Goods",
        "Mech Machines",
        "E-Machines",
    ],
)

best_days = data.loc[
    data.groupby("Commodity")["Value"].idxmax()
]  # Grouping while Identifying the max

best_days_per_product = best_days.loc[:, ["Commodity", "Date", "Value"]]

# Passing the data into the SQL Database
best_days_per_product.to_sql(
    "best_days_per_product", con=engine, if_exists="replace", index=False
)
```

```
# Exporting the data into .csv files
best_days_per_product.to_csv("best_days_per_product.csv")

num_commodities = len(best_days)  # Number of commodities
num_cols = min(num_commodities, 4)
num_rows = (num_commodities + num_cols - 1) // num_cols
fig, axs = plt.subplots(
    num_rows,
    num_cols,
    figsize=(9.39, 6.48),
    num="Most Profitable Day per Product",
)
for i, (commodity, row) in enumerate(best_days.iterrows()):
    ax = axs[i // num_cols, i % num_cols]
    ax.bar(row["Weekday"], row["Value"])
    ax.set_title(row["Commodity"])
    ax.set_ylabel("Value($)")

# Remove any empty plots
for i in range(num_commodities, num_rows * num_cols):
    axs.flat[i].remove()

fig.suptitle("Top Days For Each Commodity", fontweight="bold", fontsize=16)
mngr = plt.get_current_fig_manager()
mngr.window.geometry("+661+210")
plt.tight_layout(pad=2.0)
```

```
        plt.show()


if __name__ == "__main__":
    app = App()
    app.mainloop()
```

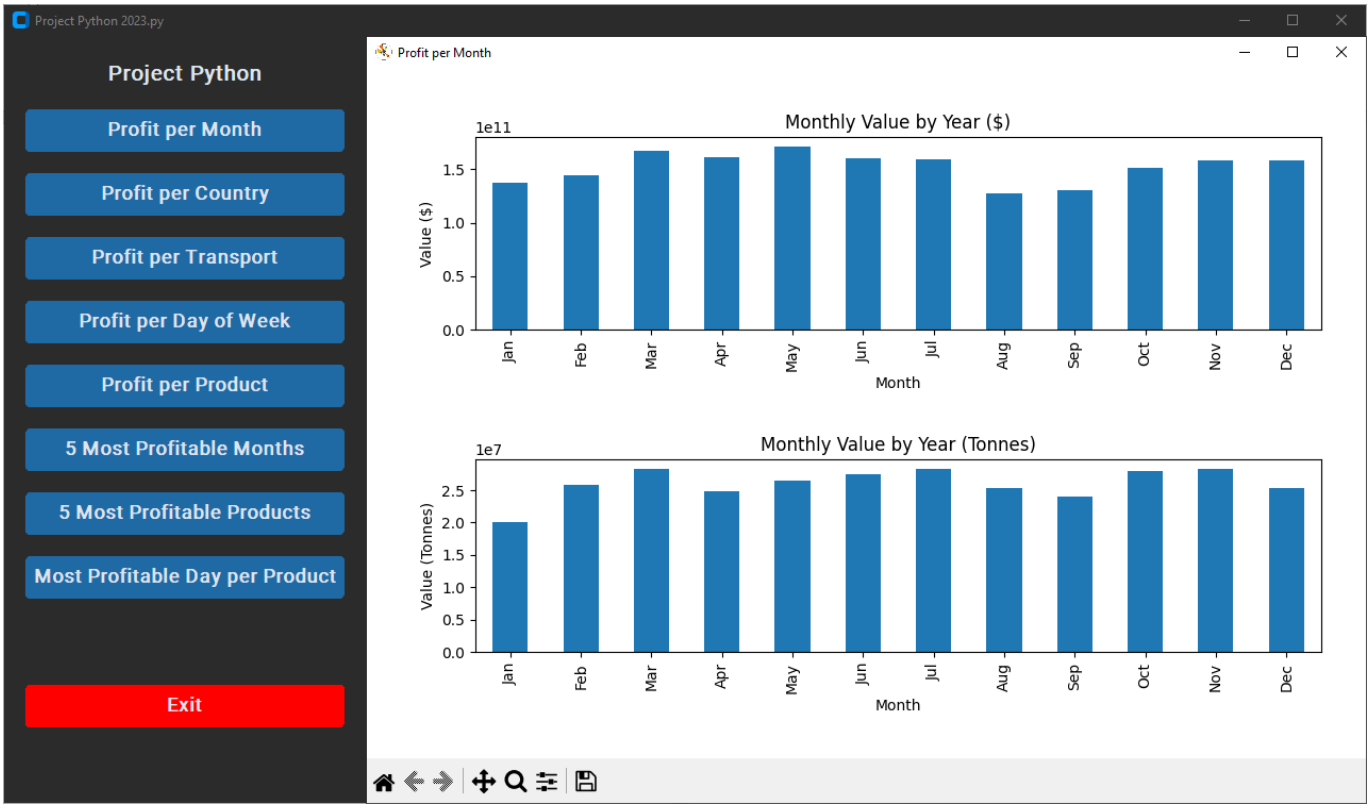
Screenshots Παραδειγμάτων της εφαρμογής και σχήμα Βάσης Δεδομένων

Το πρόγραμμα ενημερώνει εάν το data.csv υπάρχει στην συσκευή:

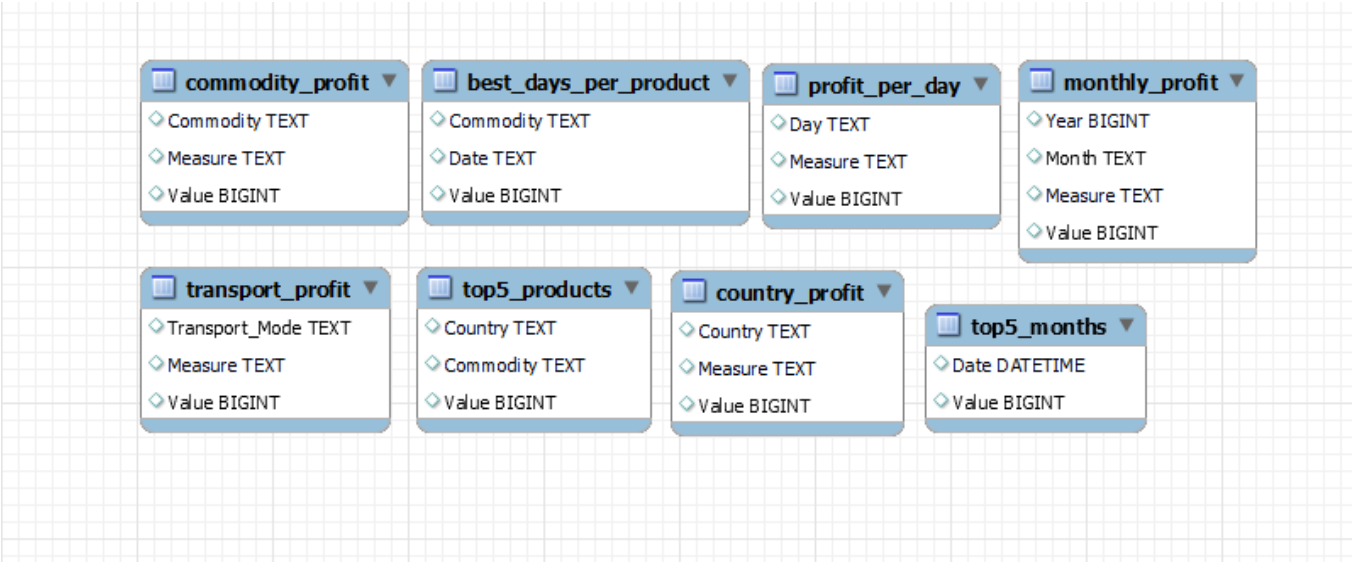
```
[Running] python -u "e:\Jason\Present\Πανεπιστήμιο\Αρχές Γλωσσών Προγραμματισμού και Μεταφραστών\Python-Project-2023\script.py"
File already exists, skipping download.
```

Αρχικό Παράθυρο GUI

Πατώντας το Button 'Profit per Month'

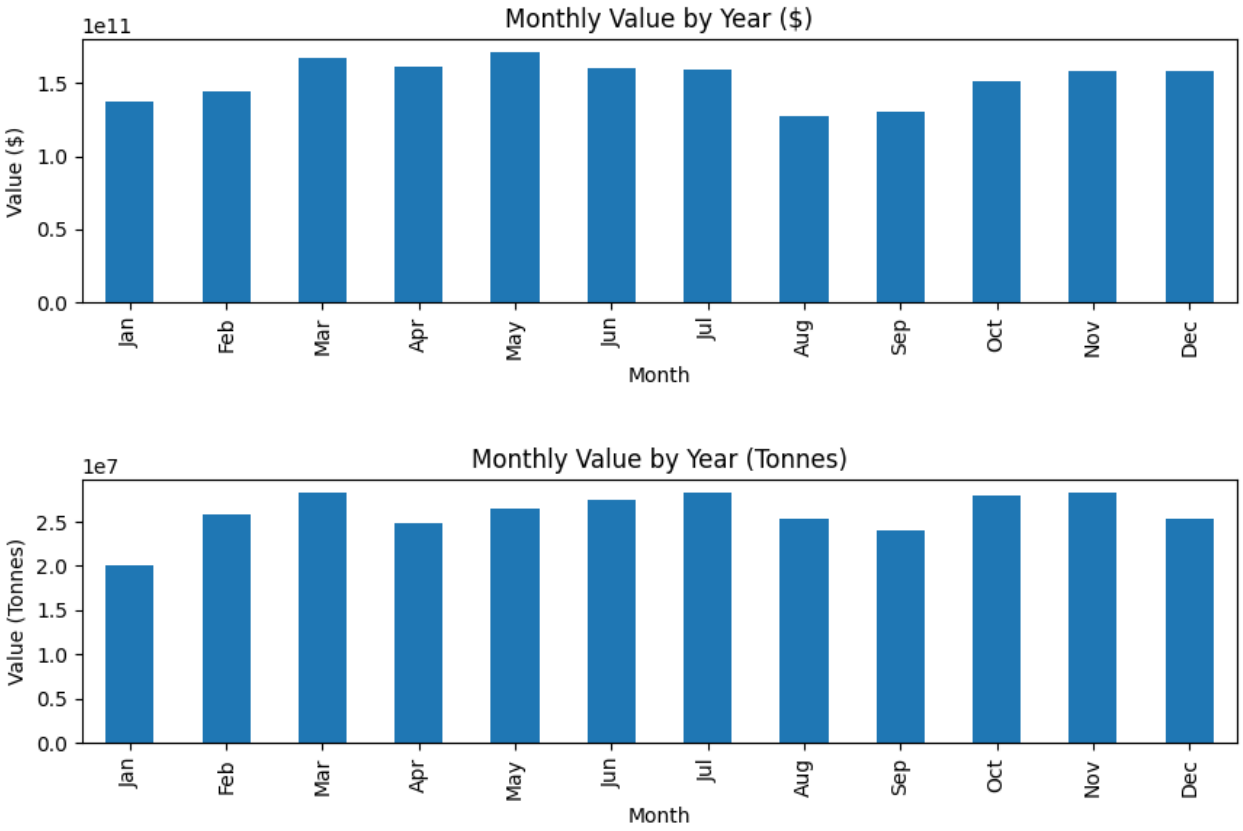


Σχήμα Βάσης Δεδομένων

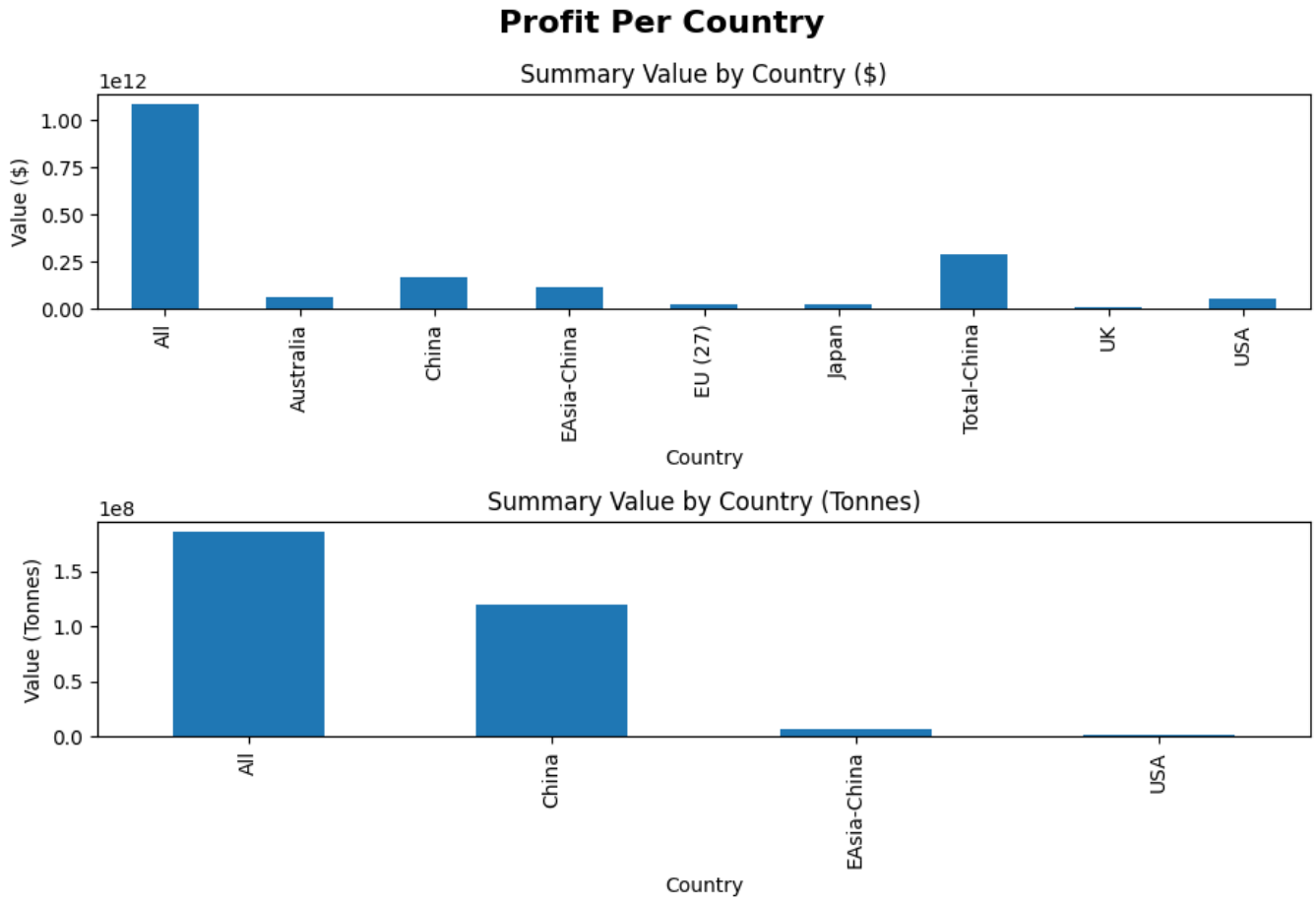


Ζητούμενα Γραφήματα

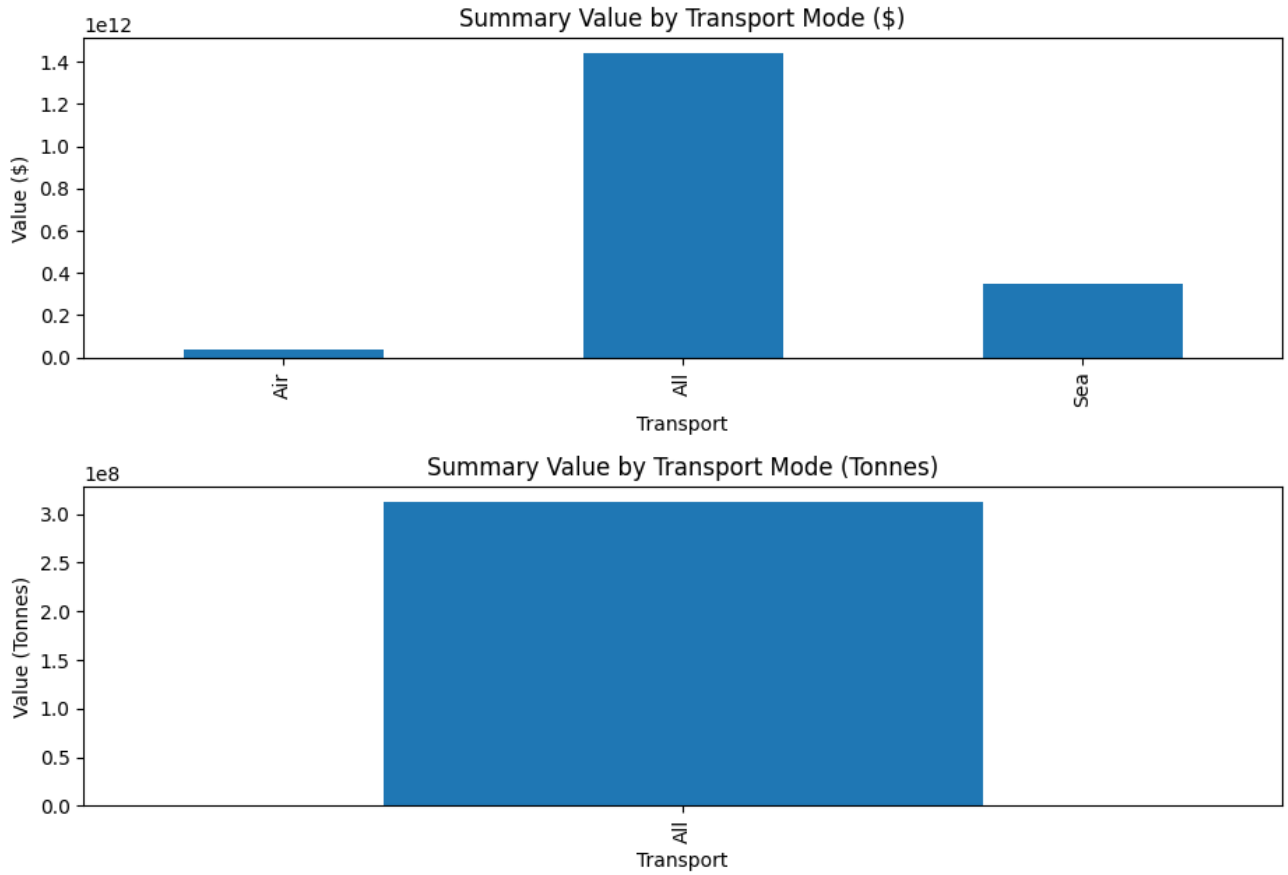
Συνολική παρουσίαση του τζίρου ανά μήνα



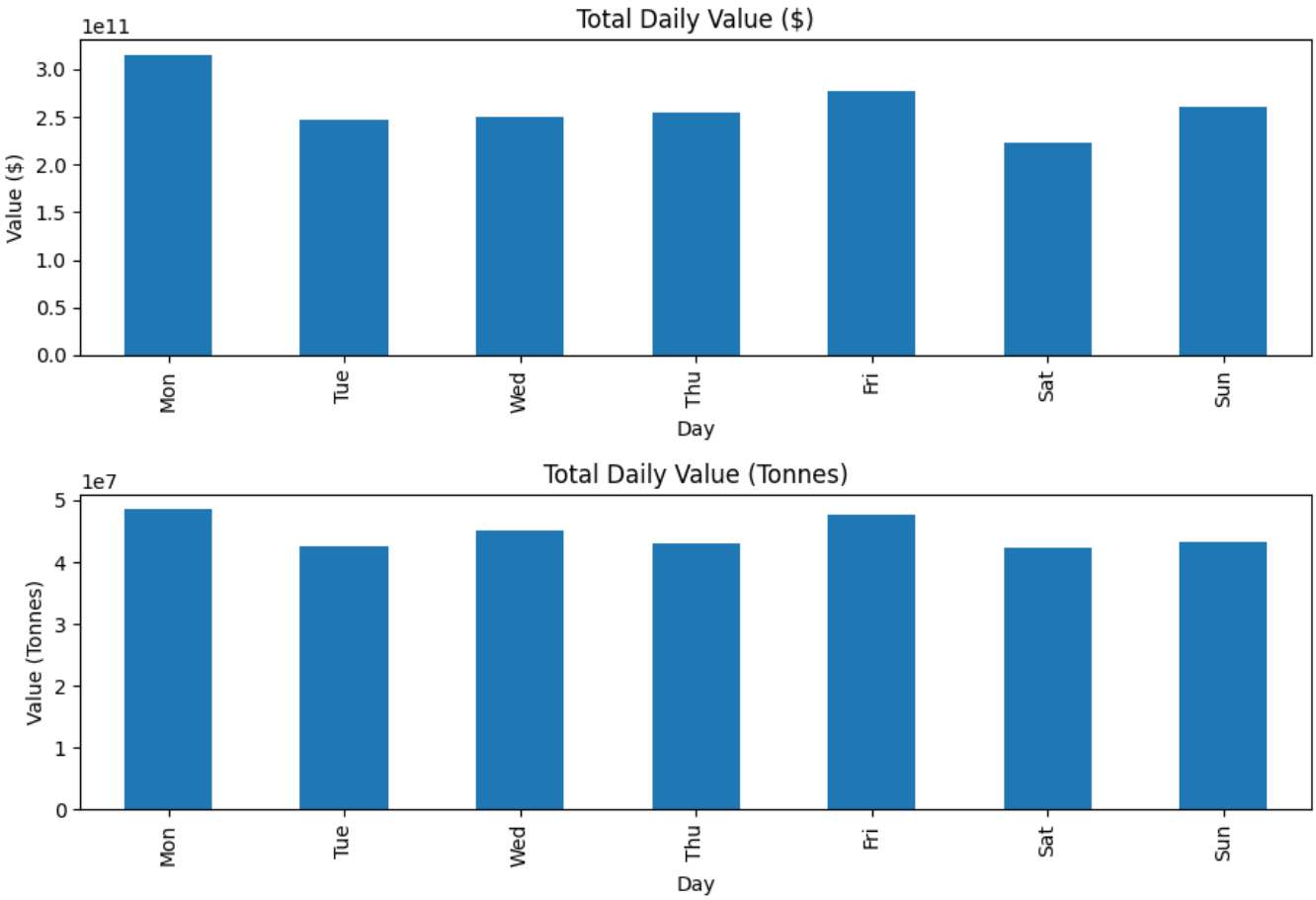
Συνολική παρουσίαση του τζίρου για κάθε χώρα



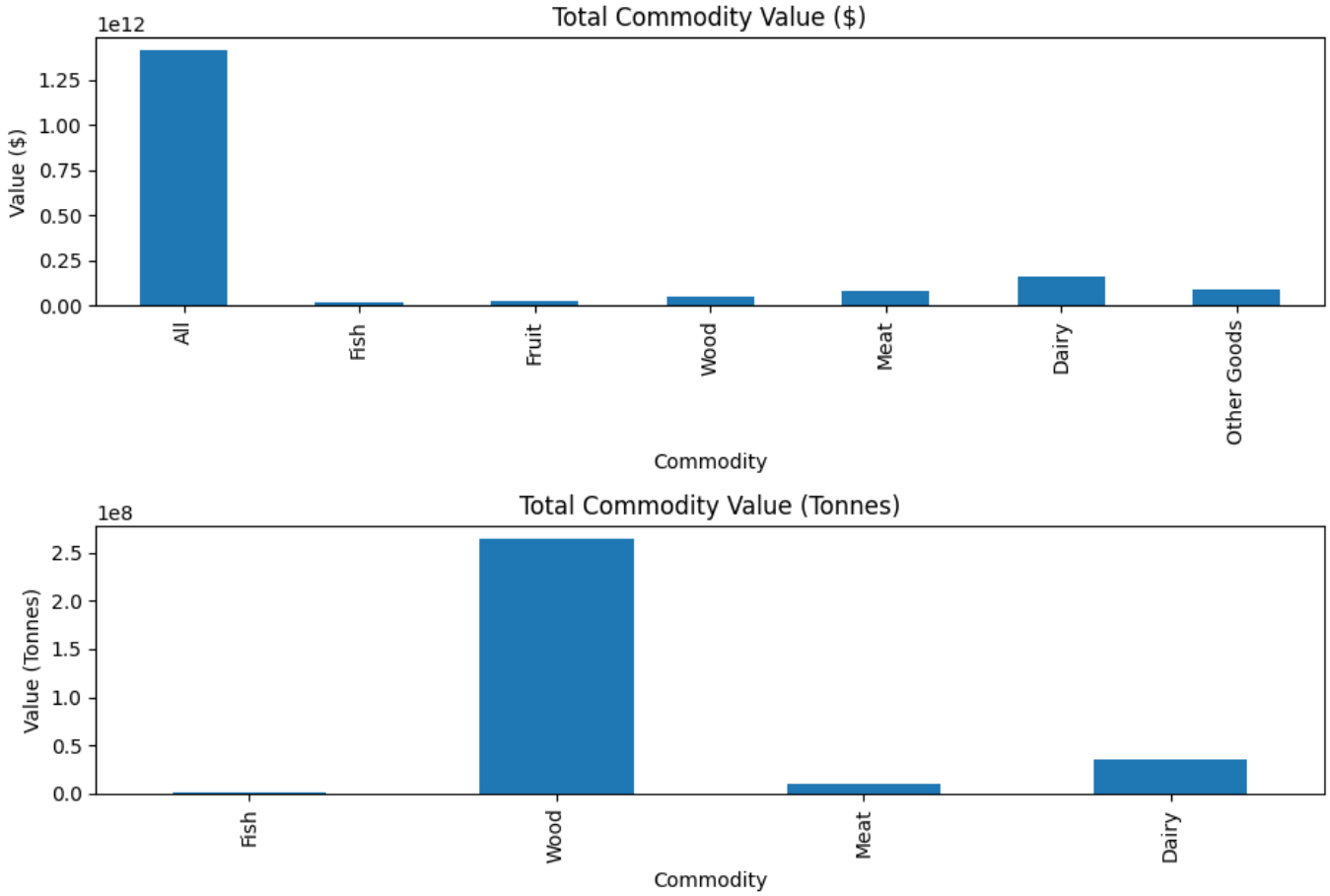
Συνολική παρουσίαση του τζίρου για κάθε μέσο μεταφοράς



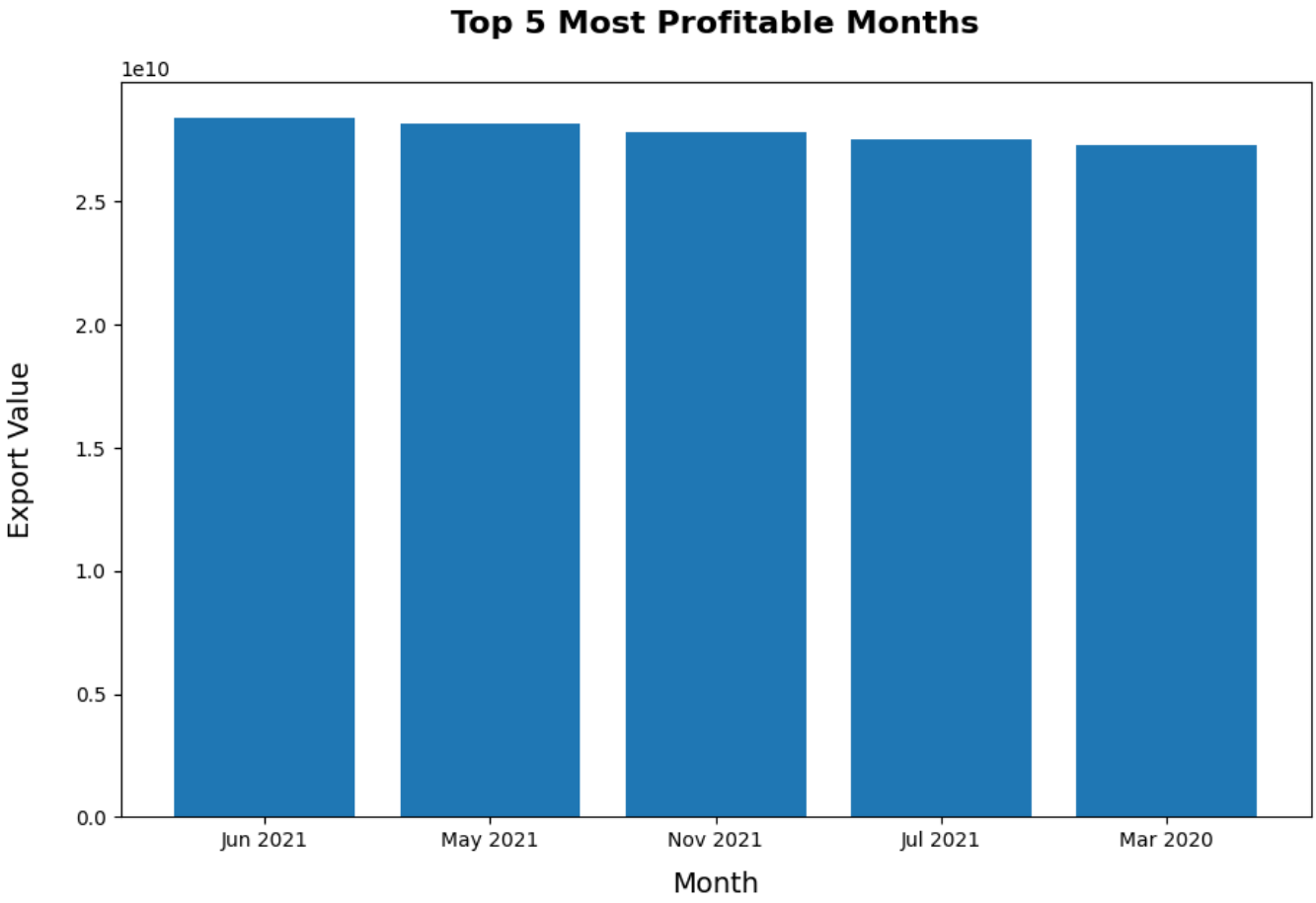
Συνολική παρουσίαση του τζίρου για κάθε μέρα της εβδομάδας



Συνολική παρουσίαση του τζίρου για κάθε κατηγορία εμπορεύματος

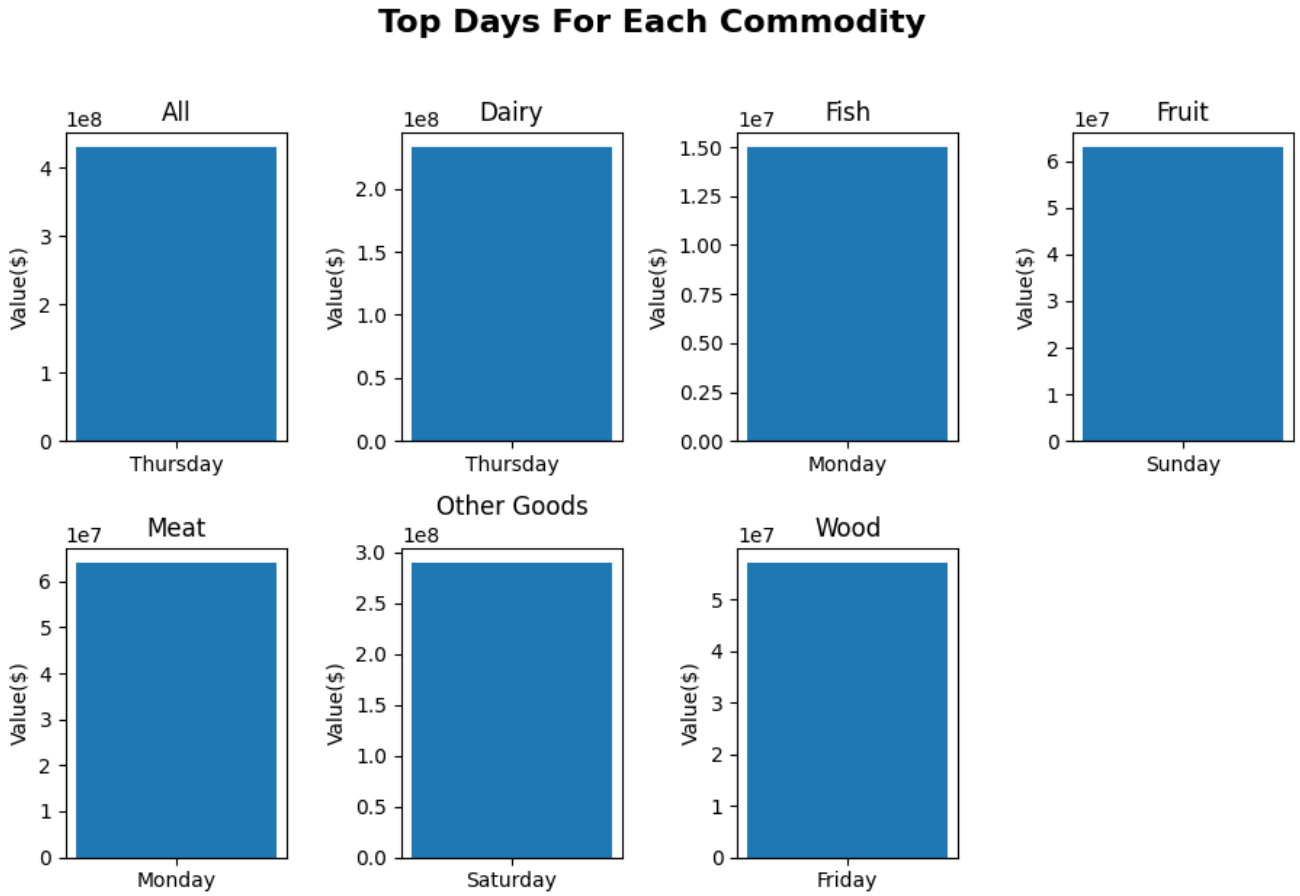


Παρουσίαση των 5 μηνών με το μεγαλύτερο τζίρο, ανεξαρτήτως μέσου μεταφοράς και είδους ανακυκλώσιμων ειδών



Παρουσίαση των 5 κατηγοριών εμπορευμάτων με το μεγαλύτερο τζίρο, για κάθε χώρα

Παρουσίαση της ημέρας με το μεγαλύτερο τζίρο, για κάθε κατηγορία εμπορεύματος



Σχόλια-Παραδοχές Υλοποίησης

Για την υλοποίηση του Project και των ζητουμένων, θεώρησα τα εξής:

- Για να μπορέσετε να τρέξετε το Script της Python θα χρειαστεί να τρέξετε τα εξής commands στο command line:
    1. pip install customtkinter (Για την βιβλιοθήκη customtkinter)
    2. pip install pandas (Για την βιβλιοθήκη pandas)
    3. pip install matplotlib (Για την βιβλιοθήκη matplotlib)
    4. pip install sqlalchemy (Για την βιβλιοθήκη sqlalchemy)
    5. pip install mysqlclient (Για τα dependencies της sqlalchemy)
- Για την βελτίωση της ταχύτητας φόρτωσης των δεδομένων κατά την δημιουργία των διαγραμμάτων, χρησιμοποιώ κάθε φορά μόνο τις στήλες με τα δεδομένα που μου χρειάζονται.
- Τα κέρδη υπολογίζονται μόνο από τα δεδομένα των γραμμών των οποίων η στήλη “Direction” έχει την τιμή “Export”, με την λογική ότι τα Έσοδα υπολογίζονται από την Εξαγωγή Προϊόντων.
- Τα ονόματα των ημερών, μηνών, χωρών και των τροφίμων, έχουν αλλάξει με της ίδιας σημασίας ονομασίες, αλλά πιο μικρές, ώστε τα διαγράμματα να είναι πιο ευανάγνωστα.
- Η μέγιστη βαρύτητα δόθηκε στην λειτουργικότητα του κώδικα, στην ακρίβεια των δεδομένων και στην εμφάνιση του προγράμματος για να είναι φιλικό προς τον χρήστη.
- Τέλος, για την βάση δεδομένων, δημιούργησα 8 πίνακες (όσοι και τα ζητούμενα), οι οποίοι δεν έχουν καμία σύνδεση μεταξύ τους και είναι απλά για την αποθήκευση των επεξεργασμένων δεδομένων.

Βιβλιογραφία Παραπομπές

- GitHub Link for customtkinter: https://github.com/TomSchimansky/CustomTkinter