# **Project Name** - Daily Transactions ( ML _ FA _ DA projects )(Part 1)

**Project Type** - Data Analysis

**Industry** - Unified Mentor

**Contribution** - Individual

**Member Name -** Hare Krishana Mishra

**Task -** 1

# Project Summary -

**Project Description:**

The Daily Transactions Analysis project aims to explore and analyze an individual's daily financial records to uncover spending patterns, income trends, and key financial habits. The dataset contains details of various transactions, including the date, payment mode, category, subcategory, amount, and whether the transaction was income or expense. In the first phase of the project, the focus is on data cleaning and preparation—ensuring the dataset is free from missing or invalid entries, correcting data types, and creating a reliable foundation for subsequent exploratory data analysis (EDA) and visualization.

**Objective:**

- Ensure data quality by handling missing values, removing duplicates, and fixing data types.
- Prepare the dataset for accurate analysis and visualization.
- Establish a clean, consistent, and well-structured financial dataset that reflects real-world daily transactions.
- Set the stage for identifying financial trends, patterns, and anomalies in later stages.

**Key Project Details:**

**Dataset Source**: Daily Household Transactions dataset (personal financial records).

**Data Cleaning Steps Implemented**:

- Filled missing Category values with "Unknown".
- Filled missing Subcategory and Note fields with sensible defaults.
- Dropped rows with missing Date or Amount values.
- Converted Date to datetime format (dayfirst=True) to handle DD/MM/YYYY style entries.
- Converted Amount to numeric format for accurate calculations.
- Removed duplicate records to avoid skewed analysis.
- Reset index for a clean, sequential DataFrame structure.

**Tools & Libraries**: Python, Pandas, NumPy, Matplotlib, Seaborn.

**Outcome of Part 1**: A clean, consistent dataset ready for visualizations and in-depth financial analysis.

# *Let's Begin:-*

### Import Libraries and Load Data

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [ ]:
```
# Load the dataset
df = pd.read_csv('/content/Daily Household Transactions.csv')
```

### Data Cleaning

In [ ]:
```
# Display the first few rows of the dataset
df.head()
```

Out[ ]:

| | Date | Mode | Category | Subcategory | Note | Amount | Incom |
|---|---|---|---|---|---|---|---|
| **0** | 20/09/2018 12:04:08 | Cash | Transportation | Train | 2 Place 5 to Place 0 | 30.0 | |
| **1** | 20/09/2018 12:03:15 | Cash | Food | snacks | Idli medu Vada mix 2 plates | 60.0 | |
| **2** | 19/09/2018 | Saving Bank account 1 | subscription | Netflix | 1 month subscription | 199.0 | |
| **3** | 17/09/2018 23:41:17 | Saving Bank account 1 | subscription | Mobile Service Provider | Data booster pack | 19.0 | |
| **4** | 16/09/2018 17:15:08 | Cash | Festivals | Ganesh Pujan | Ganesh idol | 251.0 | |

In [ ]:
```
# Check for missing values
df.isnull().sum()
```

Out[ ]:

| | 0 |
|---|---|
| **Date** | 0 |
| **Mode** | 0 |
| **Category** | 0 |
| **Subcategory** | 635 |
| **Note** | 521 |
| **Amount** | 0 |
| **Income/Expense** | 0 |
| **Currency** | 0 |

**dtype:** int64

In [ ]:
```
# Fill or drop missing values
df['Category'] = df['Category'].fillna('Unknown')
df.dropna(subset=['Date', 'Amount'], inplace=True)
```

In [ ]:
```
# Convert Date to datetime (handles mixed formats, day first)
df['Date'] = pd.to_datetime(df['Date'], errors='coerce', dayfirst=True)

# Convert Amount to float safely
df['Amount'] = pd.to_numeric(df['Amount'], errors='coerce')

# Drop rows where date or amount could not be parsed
df.dropna(subset=['Date', 'Amount'], inplace=True)
```

In [ ]:
```
df.drop_duplicates(inplace=True)
```

In [ ]:
```
# Verify data types
df.dtypes
```

Out[ ]:

| | 0 |
|---|---|
| **Date** | datetime64[ns] |
| **Mode** | object |
| **Category** | object |
| **Subcategory** | object |
| **Note** | object |
| **Amount** | float64 |
| **Income/Expense** | object |
| **Currency** | object |

**dtype:** object

In [ ]:
```
# Summary statistics
df.describe()
```

Out[ ]:

| | Date | Amount |
|---|---|---|
| **count** | 1303 | 1303.000000 |
| **mean** | 2017-05-12 20:41:38.546431232 | 3076.396892 |
| **min** | 2015-01-13 18:52:47 | 2.000000 |
| **25%** | 2016-12-18 20:18:45.500000 | 30.000000 |
| **50%** | 2017-07-27 20:05:23 | 72.000000 |
| **75%** | 2018-01-30 12:09:30.500000 | 298.500000 |
| **max** | 2018-09-20 12:04:08 | 250000.000000 |
| **std** | NaN | 14608.948853 |

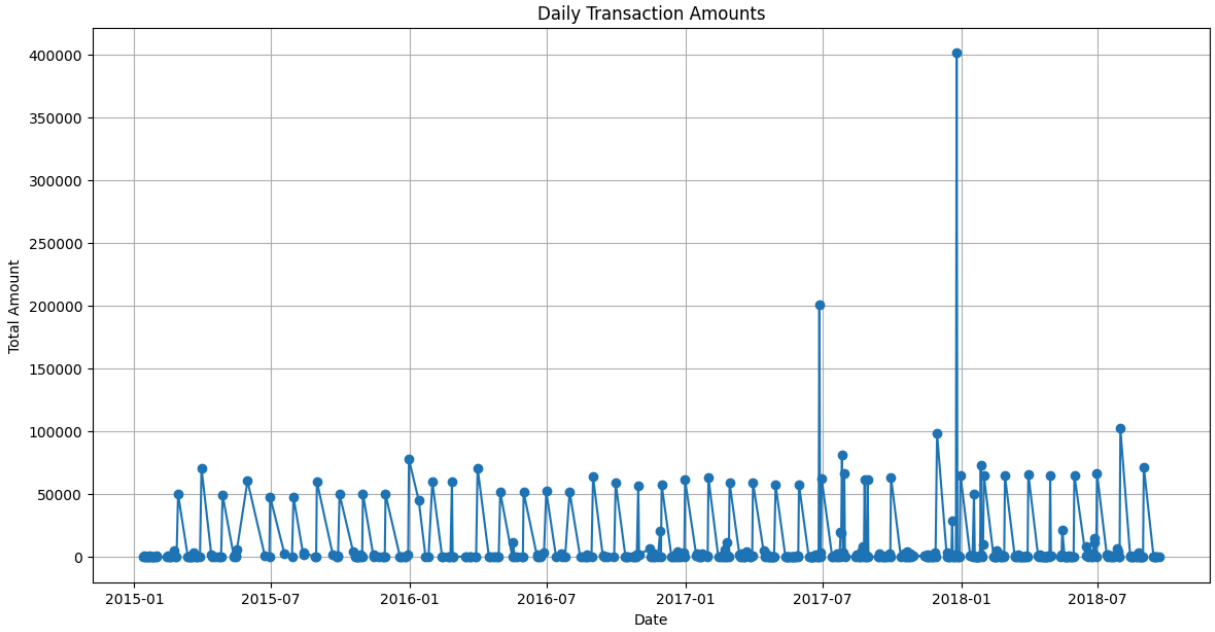
**Exploratory Data Analysis (EDA)**

Time Series Analysis

Daily Spending & Income Trend

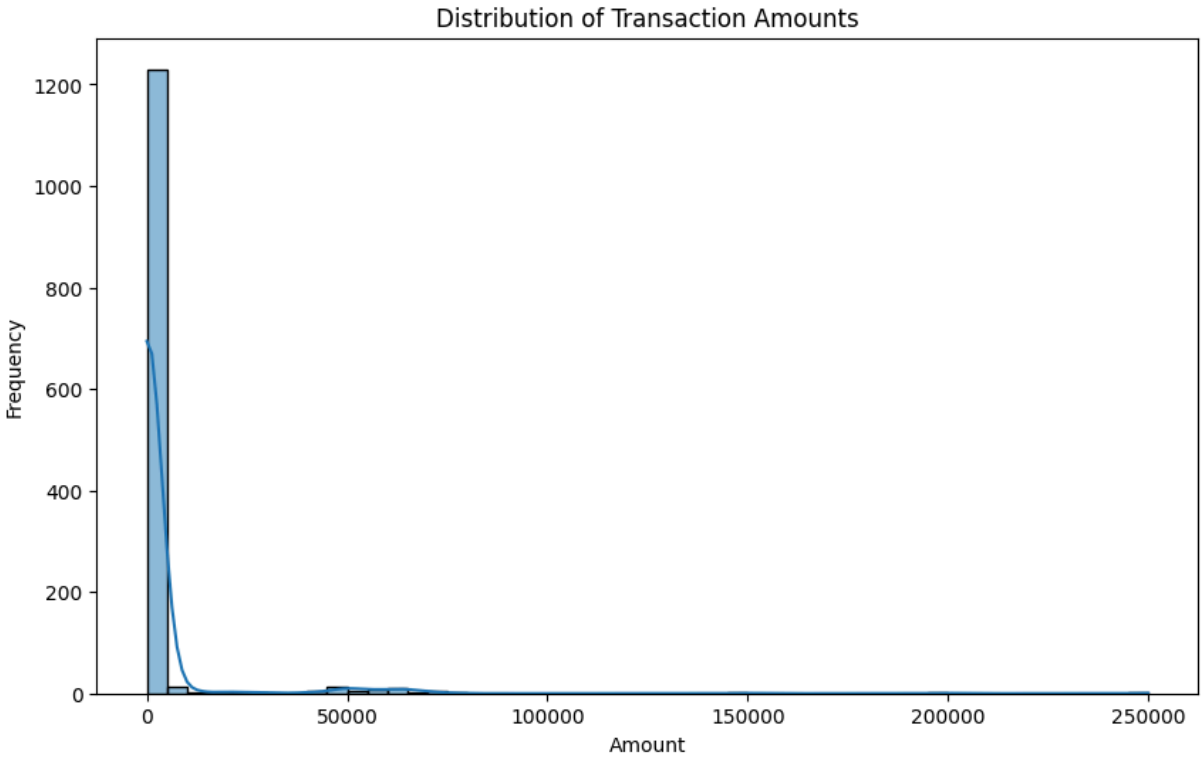
In [ ]:
```
# Daily trends - sum only numeric columns
daily_data = df.groupby(df['Date'].dt.date)['Amount'].sum()

plt.figure(figsize=(14, 7))
plt.plot(daily_data.index, daily_data.values, marker='o')
```

```
plt.title('Daily Transaction Amounts')
plt.xlabel('Date')
plt.ylabel('Total Amount')
plt.grid(True)
plt.show()
```



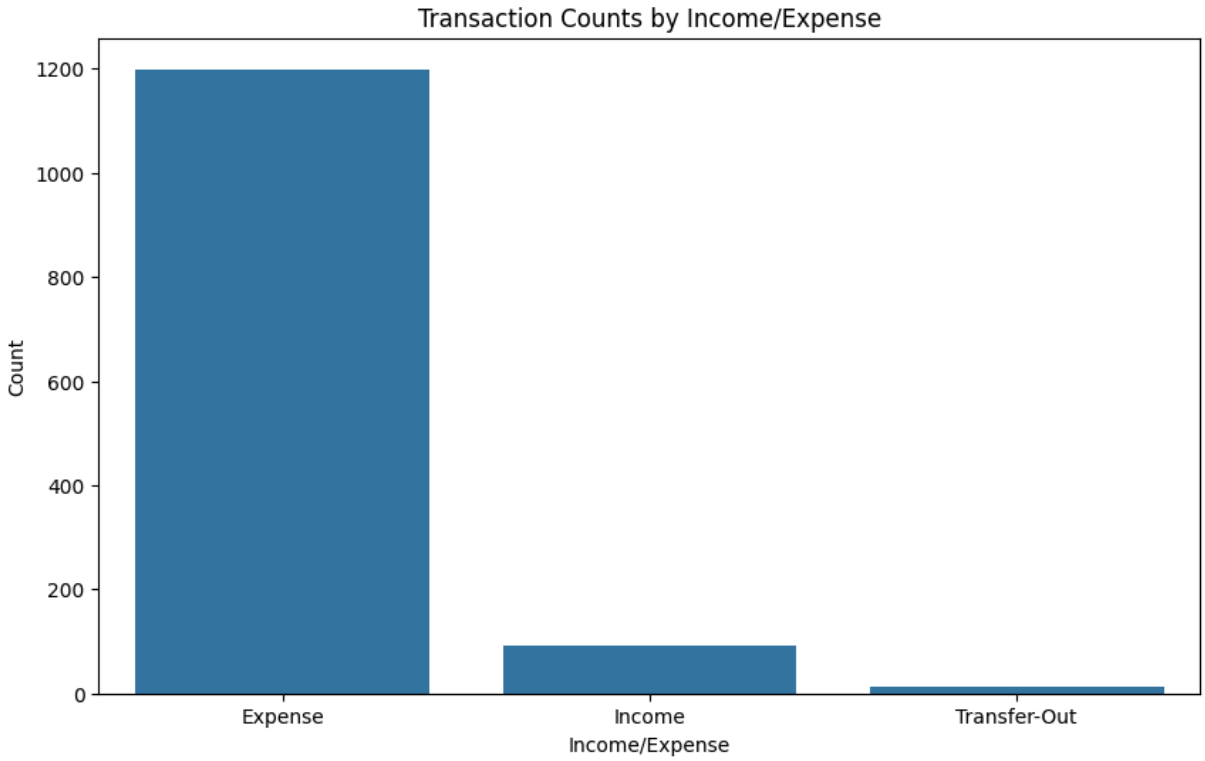

Distribution of Daily Transaction Amounts

In [ ]:
```
# Distribution of transaction amounts
plt.figure(figsize=(10, 6))
sns.histplot(df['Amount'], bins=50, kde=True)
plt.title('Distribution of Transaction Amounts')
plt.xlabel('Amount')
plt.ylabel('Frequency')
plt.show()
```



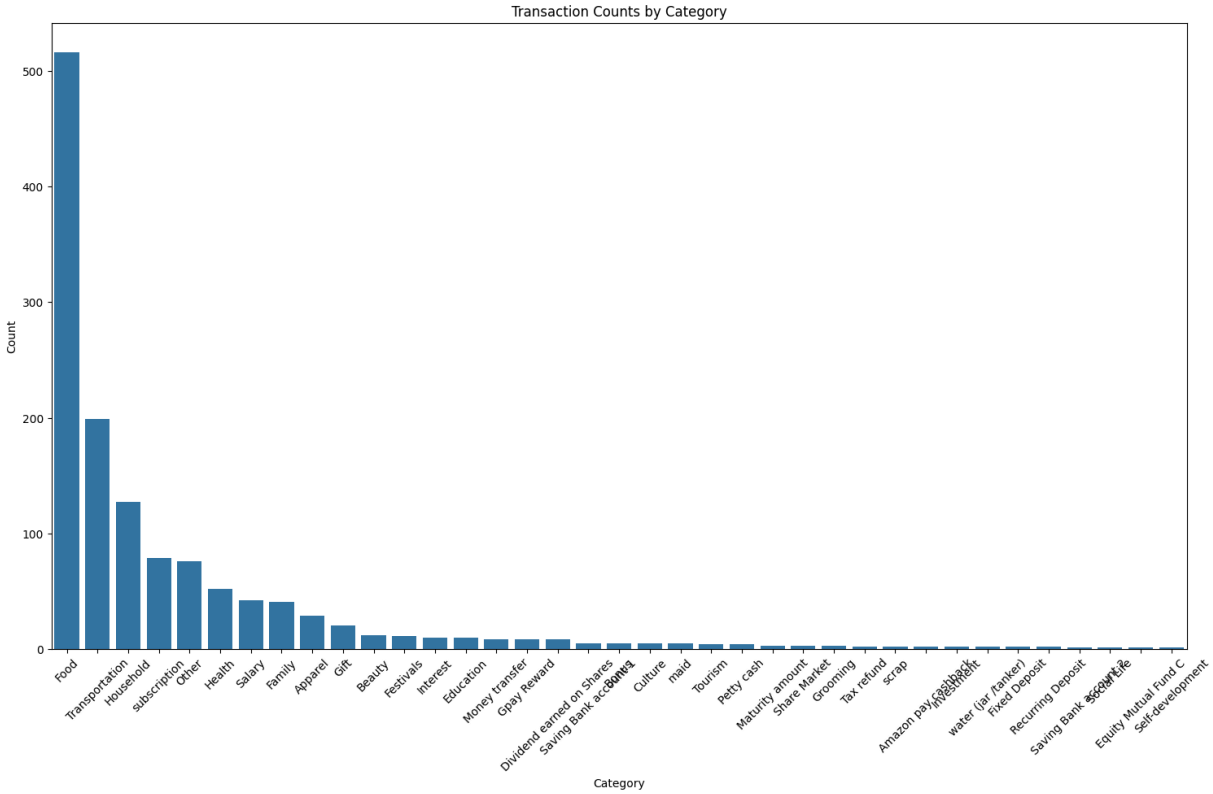

Income vs Expense Transaction Counts

In [ ]:
```
# Transaction counts by Income/Expense type
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='Income/Expense')
plt.title('Transaction Counts by Income/Expense')
plt.xlabel('Income/Expense')
plt.ylabel('Count')
plt.show()
```



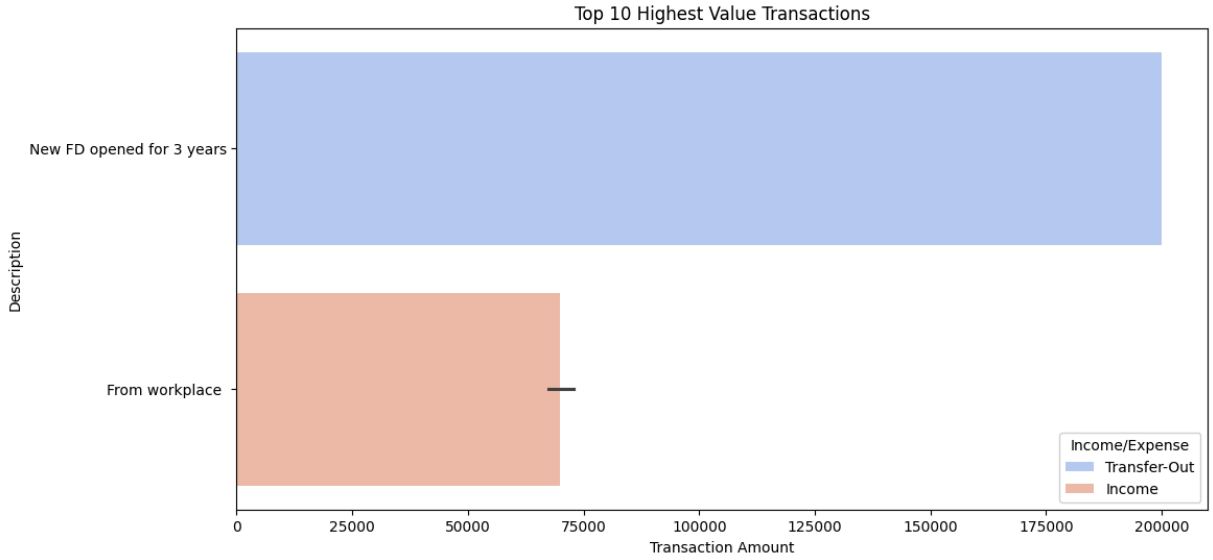

Number of Transactions per Category

In [ ]:
```
# Transaction counts by category
plt.figure(figsize=(18, 10))
sns.countplot(data=df, x='Category', order=df['Category'].value_counts().inc
plt.title('Transaction Counts by Category')
plt.xlabel('Category')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()
```



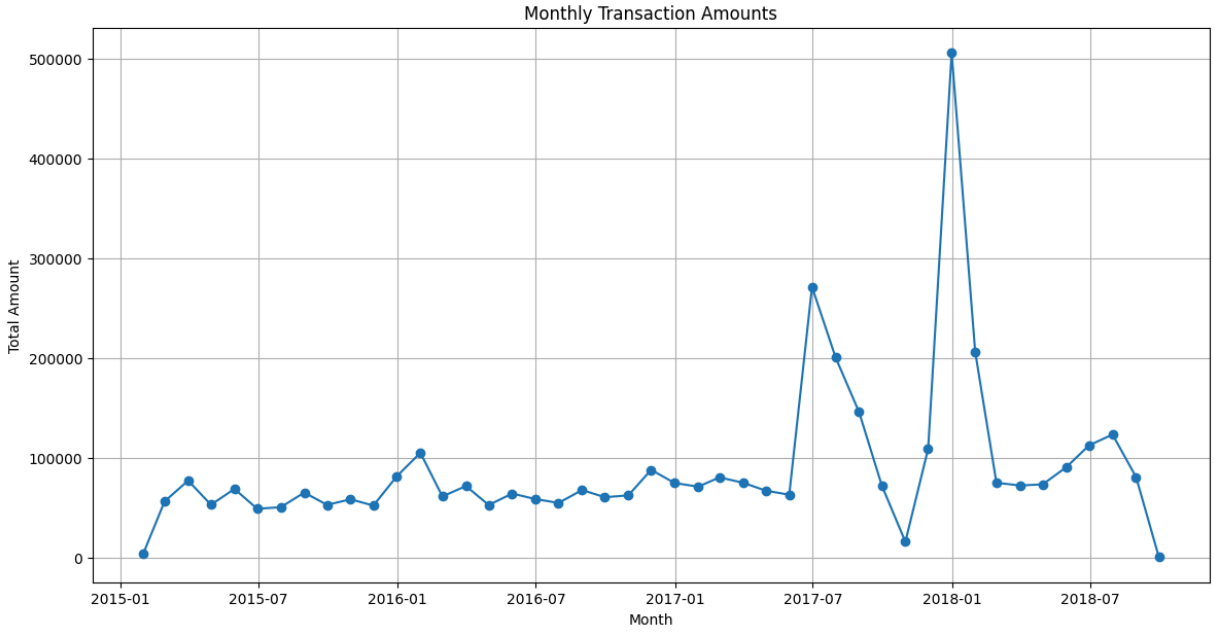

## Top 10 Most Expensive Transactions

In [ ]:
```
top_transactions = df.nlargest(10, 'Amount')

plt.figure(figsize=(12, 6))
sns.barplot(data=top_transactions, x='Amount', y='Note', hue='Income/Expense
plt.title('Top 10 Highest Value Transactions')
plt.xlabel('Transaction Amount')
plt.ylabel('Description')
plt.show()
```



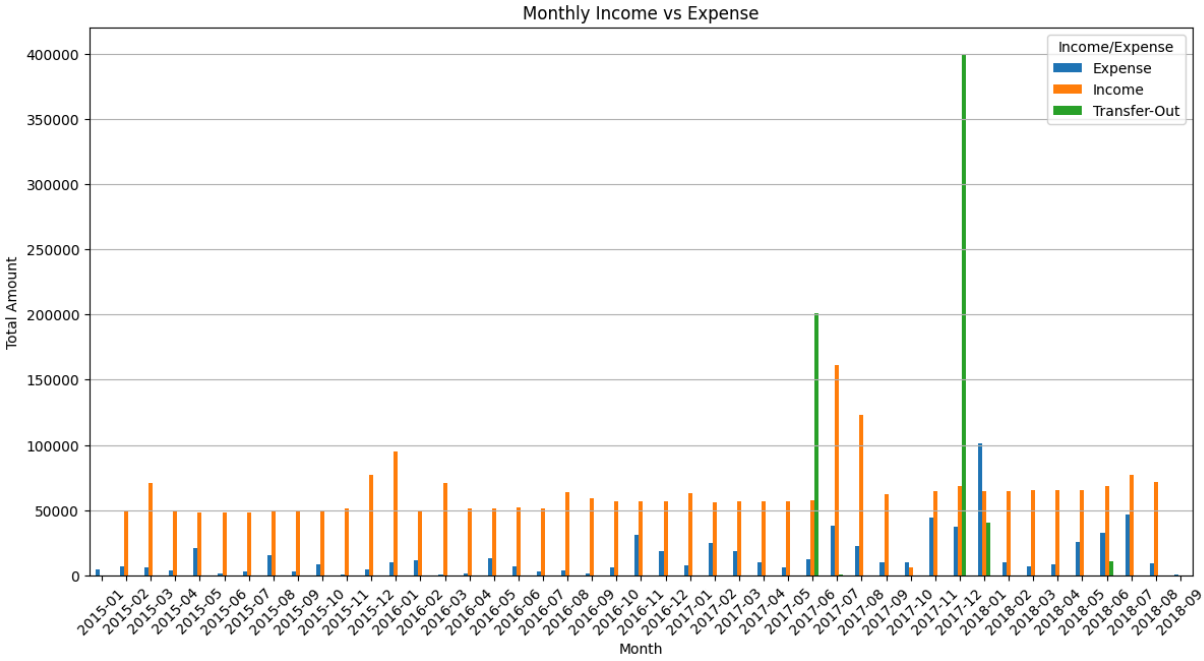

## Total Amount of Transactions per Month

In [ ]:
```
# Resample data to month-end frequency
monthly_data = df.resample('ME', on='Date').sum()

plt.figure(figsize=(14, 7))
plt.plot(monthly_data.index, monthly_data['Amount'], marker='o')
plt.title('Monthly Transaction Amounts')
plt.xlabel('Month')
plt.ylabel('Total Amount')
plt.grid(True)
plt.show()
```




Monthly Income vs Expense Comparison

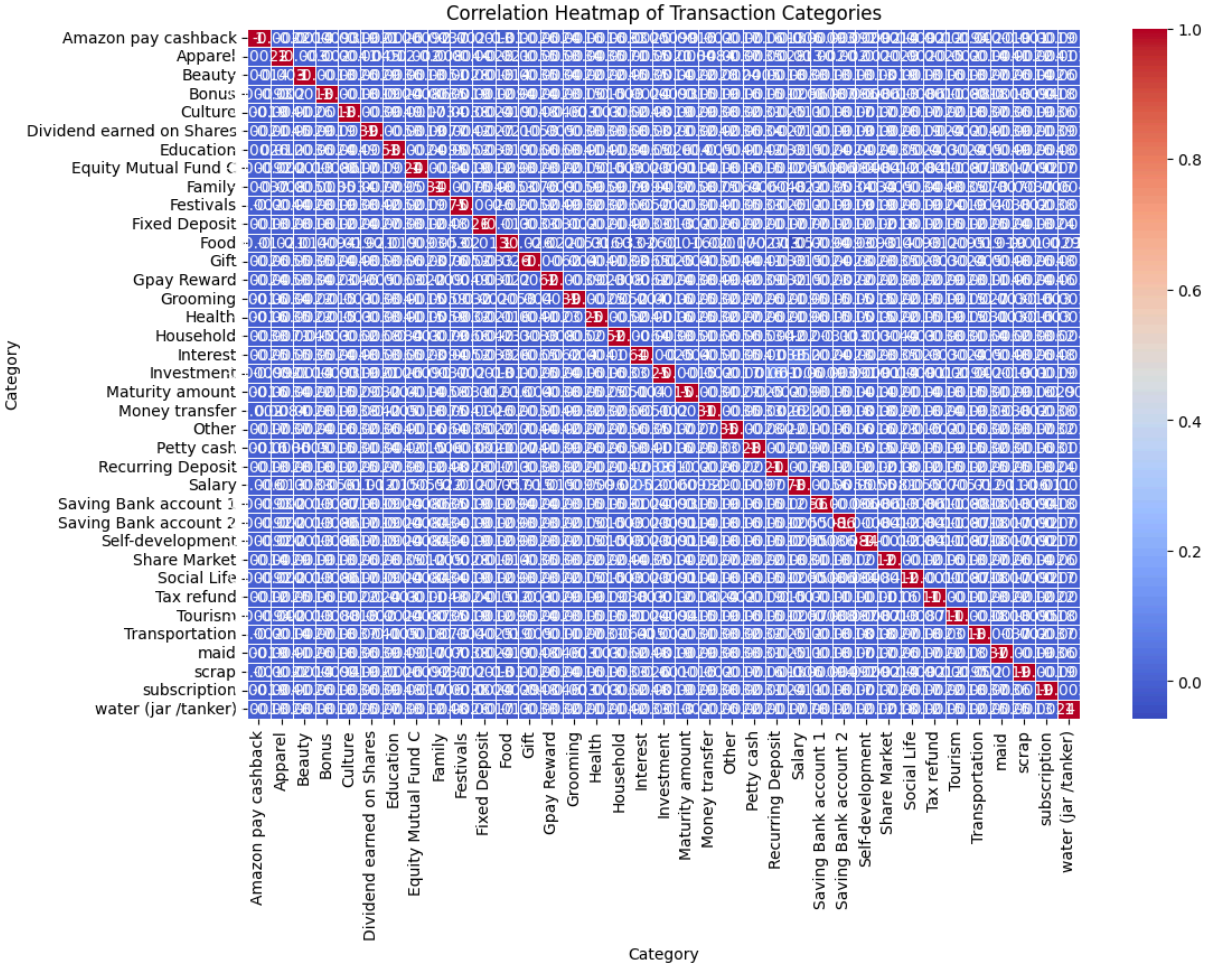
In [ ]:
```
# Create Month-Year column
df['Month'] = df['Date'].dt.to_period('M')

monthly_income_expense = df.groupby(['Month', 'Income/Expense'])['Amount'].s

monthly_income_expense.plot(kind='bar', figsize=(14, 7), stacked=False)
plt.title('Monthly Income vs Expense')
plt.xlabel('Month')
plt.ylabel('Total Amount')
plt.xticks(rotation=45)
plt.grid(axis='y')
plt.show()
```




## Correlation Analysis

In [ ]:
```
# Create a pivot table for correlation analysis
pivot_table = df.pivot_table(index='Date', columns='Category', values='Amour
aggfunc='sum', fill_value=0)

# Calculate correlation matrix
correlation_matrix = pivot_table.corr()
```

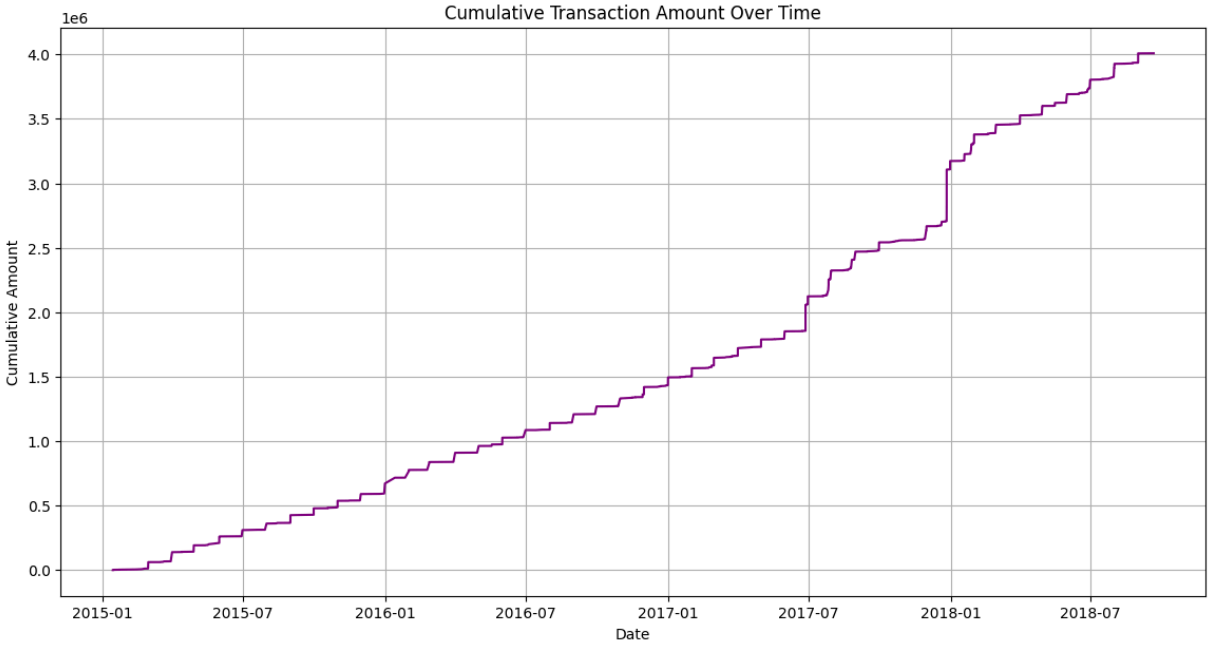
In [ ]:
```
# Plot correlation heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', linewidths=0.5)
plt.title('Correlation Heatmap of Transaction Categories')
plt.show()
```




## Cumulative Spending Over Time

In [ ]:

```
df_sorted = df.sort_values('Date')
df_sorted['Cumulative_Amount'] = df_sorted['Amount'].cumsum()

plt.figure(figsize=(14, 7))
plt.plot(df_sorted['Date'], df_sorted['Cumulative_Amount'], color='purple')
plt.title('Cumulative Transaction Amount Over Time')
plt.xlabel('Date')
plt.ylabel('Cumulative Amount')
plt.grid(True)
plt.show()
```


Cumulative Transaction Amount Over Time
1e6
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Cumulative Amount
2015-01
2015-07
2016-01
2016-07
2017-01
2017-07
2018-01
2018-07
Date

# **Project Name** - Daily Transactions ( ML _ FA _ DA projects )(Part 2)

**Project Type** - Data Analysis

**Industry** - Unified Mentor

**Contribution** - Individual

**Member Name -** Hare Krishana Mishra

**Task -** 2

# Project Summary -

**Project Description:**

The Daily Household Transactions project analyzes a dataset of everyday financial transactions, including purchases, subscriptions, transportation, investments, and income sources. By exploring this data, the project aims to uncover spending patterns, highlight areas for cost optimization, and provide actionable insights for personal finance management. The dataset contains attributes such as transaction date, payment mode, category, subcategory, notes, amount, and whether the transaction is an income or expense.

The project involves data cleaning, exploratory data analysis (EDA), visualization, and trend analysis, enabling deeper understanding of financial habits over time.

**Objective:**

- **Identify Spending Patterns** – Detect trends in expenditure and income over time to understand financial behavior.
- **Category Analysis** – Highlight which categories (e.g., Food, Transportation, Household) consume the most budget.
- **Payment Mode Insights** – Analyze the most frequently used payment methods and their contribution to expenses or income.
- **Time Series Analysis** – Evaluate daily and monthly trends to identify peak spending periods.
- **Support Decision-Making** – Provide data-driven recommendations for budgeting, saving, and financial planning.

**Key Project Details:**

**Domain**: Finance Analytics / Personal Finance Management

**Difficulty Level**: Intermediate

**Tools & Technologies:**

Python (Pandas, NumPy, Matplotlib, Seaborn)

Jupyter Notebook / Visual Studio Code

**Dataset Features:**

- Date: Transaction date and time
- Mode: Payment mode (Cash, Bank Account, Credit Card, etc.)
- Category: Main classification of transaction (e.g., Food, Transportation, Investments)
- Subcategory: Detailed transaction type (e.g., Snacks, Train, Netflix)

**Note:** Short description of the transaction

- Amount: Transaction value (numeric)
- Income/Expense: Indicator whether it's an expense or income
- Currency: All transactions recorded in INR
- Dataset Size: 2,461 transactions, 8 columns

# *Let's Begin:-*

**Import Libraries and Load Data**

In [ ]:
```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g.pd.read_csv)
```

In [ ]:
```
import os
for dirname, _, filenames in os.walk('/kaggle/input'):
  for filename in filenames:
    print(os.path.join(dirname, filename))
```

In [ ]:
```
import seaborn as sns
import matplotlib.pyplot as plt
```

In [ ]:
```
df =pd.read_csv("/content/Daily Household Transactions.csv")
```

## Data Handling

In [ ]:
```
df.head() #check the first 5 rows of the dataset
```

Out[ ]:

| | Date | Mode | Category | Subcategory | Note | Amount | Incom |
|---|---|---|---|---|---|---|---|
| **0** | 20/09/2018 12:04:08 | Cash | Transportation | Train | 2 Place 5 to Place 0 | 30.0 | |
| **1** | 20/09/2018 12:03:15 | Cash | Food | snacks | Idli medu Vada mix 2 plates | 60.0 | |
| **2** | 19/09/2018 | Saving Bank account 1 | subscription | Netflix | 1 month subscription | 199.0 | |
| **3** | 17/09/2018 23:41:17 | Saving Bank account 1 | subscription | Mobile Service Provider | Data booster pack | 19.0 | |
| **4** | 16/09/2018 17:15:08 | Cash | Festivals | Ganesh Pujan | Ganesh idol | 251.0 | |

In [ ]:
```
df.shape #get the number of rows and columns in the dataset
```

Out[ ]:
```
(2461, 8)
```

In [ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2461 entries, 0 to 2460
Data columns (total 8 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Date            2461 non-null   object 
 1   Mode            2461 non-null   object 
 2   Category        2461 non-null   object 
 3   Subcategory     1826 non-null   object 
 4   Note            1940 non-null   object 
 5   Amount          2461 non-null   float64
 6   Income/Expense  2461 non-null   object 
 7   Currency        2461 non-null   object 
dtypes: float64(1), object(7)
memory usage: 153.9+ KB
```

In [ ]:
```
df.isnull().sum() #get the null values
```

Out[ ]:

| | 0 |
|---|---|
| **Date** | 0 |
| **Mode** | 0 |
| **Category** | 0 |
| **Subcategory** | 635 |
| **Note** | 521 |
| **Amount** | 0 |
| **Income/Expense** | 0 |
| **Currency** | 0 |

**dtype:** int64

In [ ]:
```
df["Mode"].value_counts()
```

Out[ ]:

| Mode | count |
|---|---|
| **Saving Bank account 1** | 1223 |
| **Cash** | 1046 |
| **Credit Card** | 162 |
| **Equity Mutual Fund B** | 11 |
| **Share Market Trading** | 5 |
| **Saving Bank account 2** | 5 |
| **Recurring Deposit** | 3 |
| **Debit Card** | 2 |
| **Equity Mutual Fund C** | 1 |
| **Equity Mutual Fund A** | 1 |
| **Equity Mutual Fund D** | 1 |
| **Fixed Deposit** | 1 |

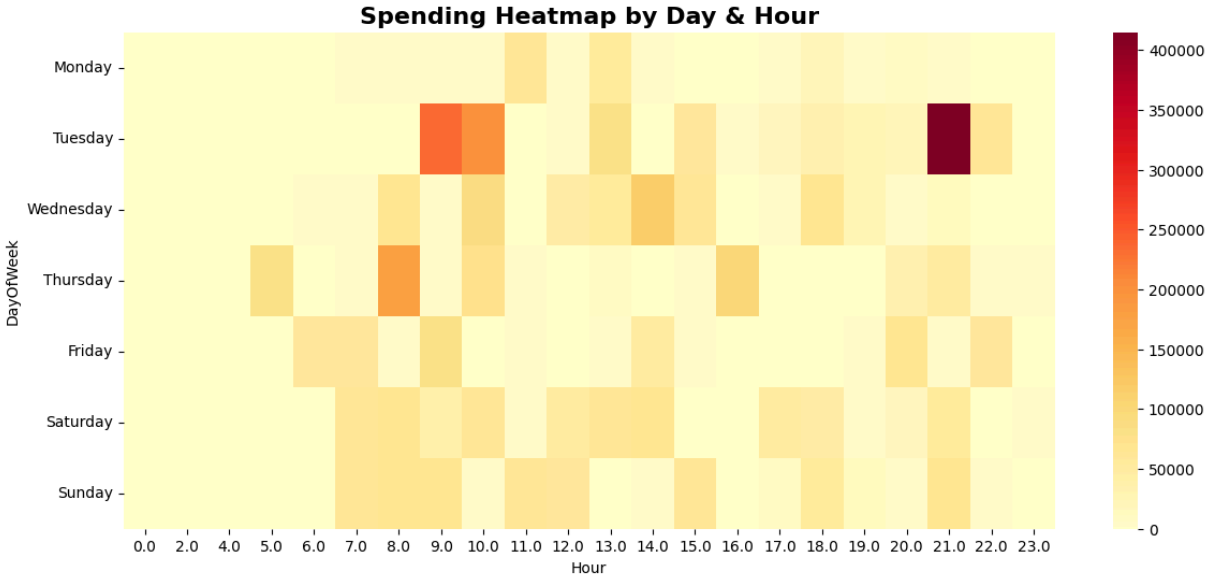
**dtype:** int64

**Exploratory Data Analysis (EDA)**

Weekly Spending Heatmap

In [ ]:
```
# Ensure Date is datetime
df['Date'] = pd.to_datetime(df['Date'], errors='coerce', dayfirst=True)
```

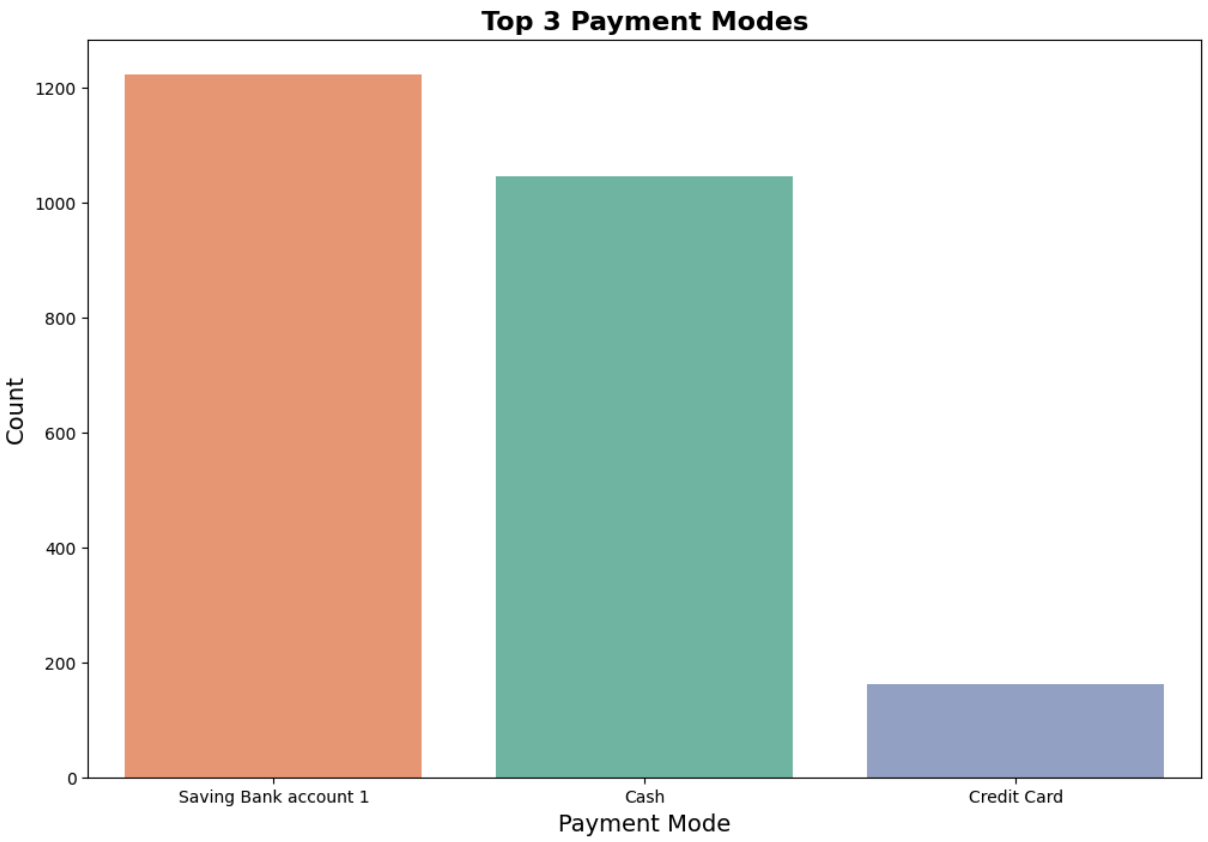
```
# Extract Day & Hour
df['DayOfWeek'] = df['Date'].dt.day_name()
df['Hour'] = df['Date'].dt.hour

# Group & Pivot
heatmap_data = df.pivot_table(
    index='DayOfWeek',
    columns='Hour',
    values='Amount',
    aggfunc='sum',
    fill_value=0
)

# Reorder days
days_order = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Satur
heatmap_data = heatmap_data.reindex(days_order)

# Plot Heatmap
plt.figure(figsize=(14,6))
sns.heatmap(heatmap_data, cmap="YlOrRd", annot=False)
plt.title("Spending Heatmap by Day & Hour", fontsize=16, fontweight='bold')
plt.show()
```




Most Frequently Used Payment Modes

In [ ]:
```
plt.figure(figsize=(12,8))
sns.countplot(
    data=df,
    x="Mode",
    hue="Mode",  # tells seaborn to color by Mode
    order=df["Mode"].value_counts().iloc[:3].index,
    palette="Set2",
    legend=False
)
plt.title("Top 3 Payment Modes", fontsize=16, fontweight='bold')
plt.xlabel("Payment Mode", fontsize=14)
```

```
plt.ylabel("Count", fontsize=14)
plt.show()
```




In [ ]:
```
df["Category"].value_counts()
```

Out[ ]:

| Category | count |
|---|---|
| **Food** | 907 |
| **Transportation** | 307 |
| **Household** | 176 |
| **subscription** | 143 |
| **Other** | 126 |
| **Investment** | 103 |
| **Health** | 94 |
| **Family** | 71 |
| **Apparel** | 47 |
| **Recurring Deposit** | 47 |
| **Money transfer** | 43 |
| **Salary** | 43 |
| **Gift** | 30 |
| **Public Provident Fund** | 29 |
| **Equity Mutual Fund E** | 22 |
| **Beauty** | 22 |
| **Gpay Reward** | 21 |
| **Education** | 18 |
| **Saving Bank account 1** | 17 |
| **maid** | 17 |
| **Festivals** | 16 |
| **Equity Mutual Fund A** | 14 |
| **Equity Mutual Fund F** | 13 |
| **Dividend earned on Shares** | 12 |
| **Interest** | 12 |
| **Culture** | 11 |
| **Small Cap fund 2** | 10 |
| **Small cap fund 1** | 10 |
| **Share Market** | 8 |
| **Life Insurance** | 7 |
| **Maturity amount** | 7 |
| **Petty cash** | 6 |

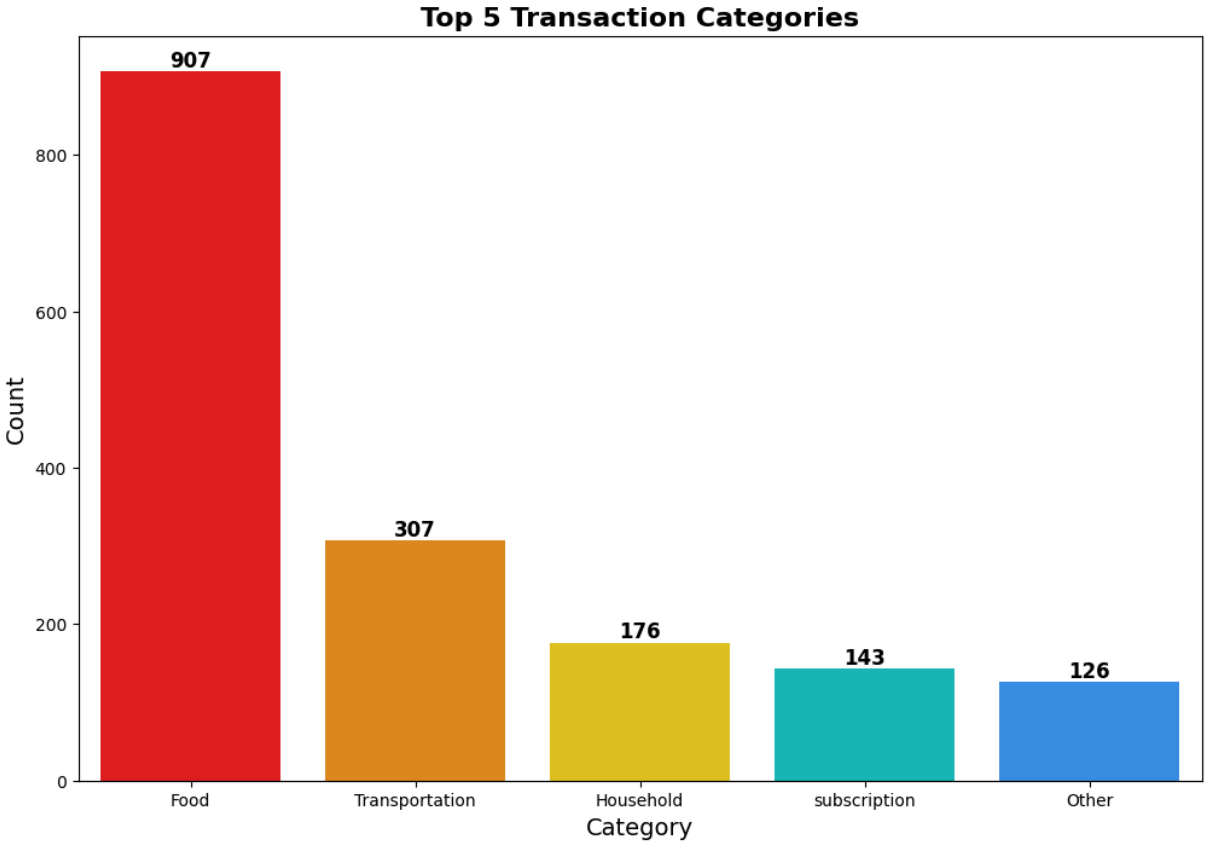
| Category | count |
|---|---|
| **Equity Mutual Fund C** | 6 |
| **Bonus** | 6 |
| **Tourism** | 5 |
| **Rent** | 4 |
| **Cook** | 4 |
| **Grooming** | 4 |
| **Saving Bank account 2** | 3 |
| **water (jar /tanker)** | 3 |
| **Self-development** | 2 |
| **Tax refund** | 2 |
| **garbage disposal** | 2 |
| **Documents** | 2 |
| **Amazon pay cashback** | 2 |
| **scrap** | 2 |
| **Fixed Deposit** | 2 |
| **Social Life** | 1 |
| **Equity Mutual Fund D** | 1 |
| **Equity Mutual Fund B** | 1 |

**dtype:** int64

Top 5 Most Frequent Transaction Categories

In [ ]:
```
bright_colors = ["#FF0000", "#FF8C00", "#FFD700", "#00CED1", "#1E90FF"]

plt.figure(figsize=(12,8))
sns.countplot(
    data=df,
    x="Category",
    order=df["Category"].value_counts().iloc[:5].index,
    palette=bright_colors
)
plt.title("Top 5 Transaction Categories", fontsize=16, fontweight='bold')
plt.xlabel("Category", fontsize=14)
plt.ylabel("Count", fontsize=14)

# Add value labels
for p in plt.gca().patches:
    plt.gca().annotate(
        f'{int(p.get_height())}',
```

```
        (p.get_x() + p.get_width() / 2., p.get_height()),
        ha='center', va='bottom',
        fontsize=12, fontweight='bold'
    )

plt.show()
```



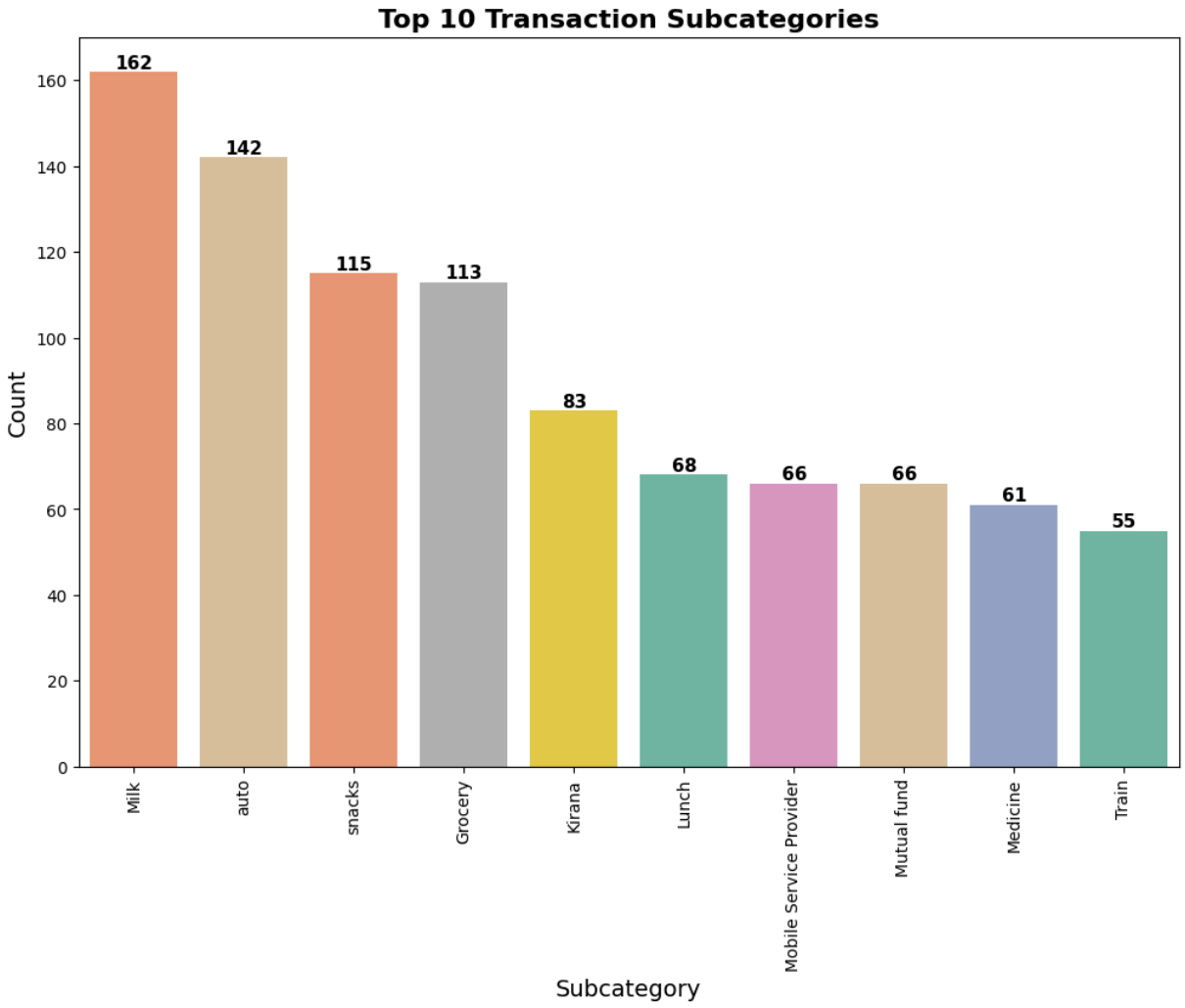

In [ ]:
```
df["Subcategory"].unique()
```

Out[ ]:
```
array(['Train', 'snacks', 'Netflix', 'Mobile Service Provider',
       'Ganesh Pujan', 'Tata Sky', 'auto', nan, 'Grocery', 'Lunch',
       'Milk', 'Pocket money', 'Laundry', 'breakfast', 'Dinner', 'Sweets',
       'Kirana', 'Ice cream', 'curd', 'Biscuits', 'Rajgira ladu',
       'Navratri', 'train', 'Tea', 'flour mill', 'Appliances',
       'home decor', 'grooming', 'Health', 'Clothing', 'clothes', 'Home',
       'chocolate', 'Medicine', 'Eating out', 'Movie', 'vegetables',
       'fruits', 'Potato', 'Onions', 'Taxi', 'Hardware', 'Eggs', 'Bread',
       'Petrol', 'Hospital', 'Mahanagar Gas', 'Lab Tests', 'Bus',
       'Travels', 'Kitchen', 'Footwear', 'Entry Fees', 'gadgets',
       'Accessories', 'misc', 'Stationary', 'Newspaper', 'Toiletries',
       'Bike', 'beverage', 'makeup', 'Books', 'Holi', 'Courier',
       'Leisure', 'Updation', 'Amazon Prime', 'Edtech Course', 'Hotstar',
       'Diwali', 'Wifi Internet Service', 'Trip', 'Furniture', 'Water',
       'Cable TV', 'medicine', 'Mutual fund', 'Public Provident Fund',
       'ropeway', 'RD', 'LIC', 'Saloon', 'gift', 'Rakshabandhan',
       'exam fee', 'Kindle unlimited', 'OTT Platform', 'School supplies',
       'Audible', 'Makeup'], dtype=object)
```

Top 10 Most Frequent Transaction Subcategories

In [ ]:
```
# Decent, muted color palette
decent_colors = sns.color_palette("Set2", 10)  # soft but distinct

plt.figure(figsize=(12,8))
sns.countplot(
    data=df,
    x="Subcategory",
    hue="Subcategory",  # avoids FutureWarning
    order=df["Subcategory"].value_counts().iloc[:10].index,
    palette=decent_colors,
    legend=False        # hides duplicate legend
)
plt.xticks(rotation=90)

plt.title("Top 10 Transaction Subcategories", fontsize=16, fontweight='bold'
plt.xlabel("Subcategory", fontsize=14)
plt.ylabel("Count", fontsize=14)

# Add value labels
for p in plt.gca().patches:
    plt.gca().annotate(
        f'{int(p.get_height())}',
        (p.get_x() + p.get_width() / 2., p.get_height()),
        ha='center', va='bottom',
        fontsize=11, fontweight='bold'
    )

plt.show()
```

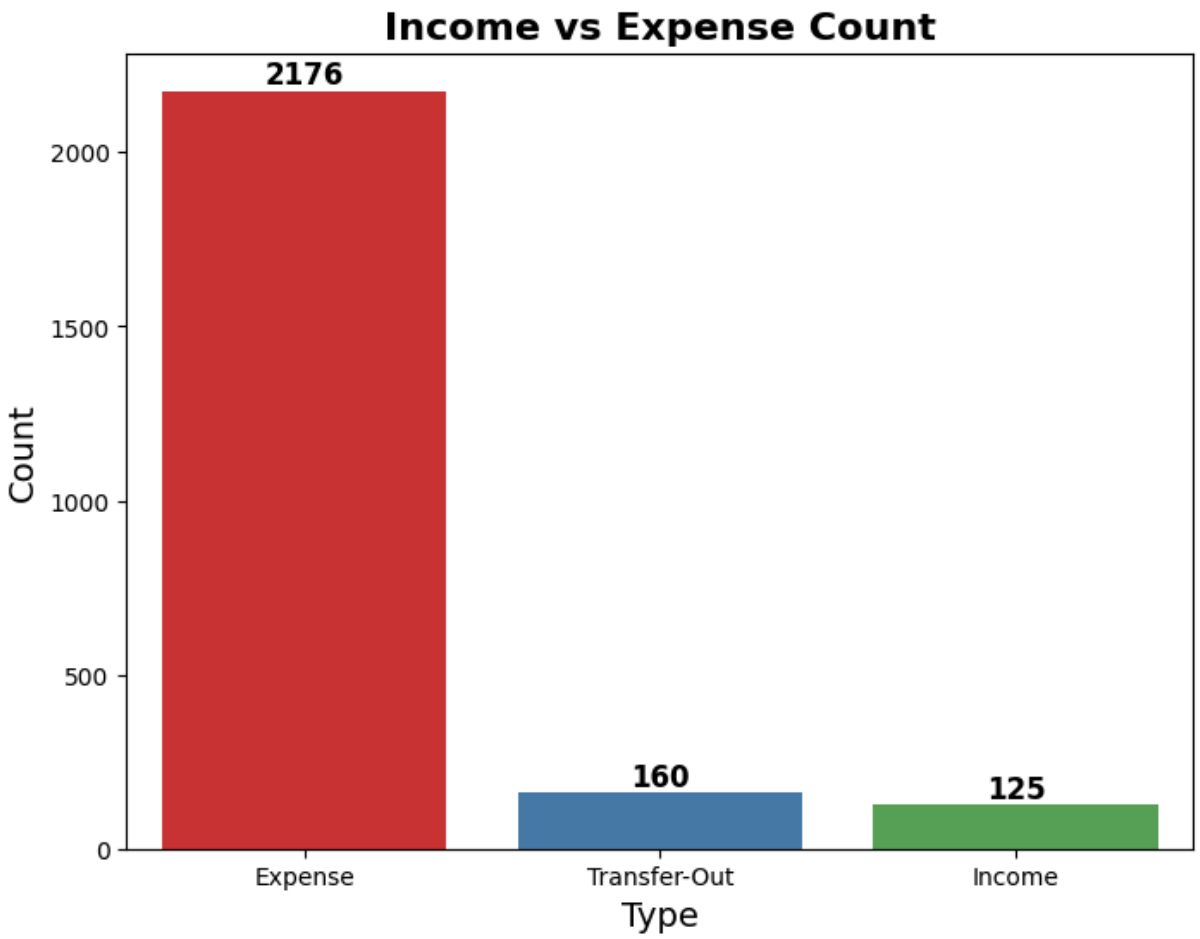
```
/tmp/ipython-input-3823772236.py:5: UserWarning:
The palette list has fewer values (10) than needed (90) and will cycle, whic
h may produce an uninterpretable plot.
  sns.countplot(
```




Comparison of Income and Expense Frequency

In [ ]:
```
# Color palette for all unique Income/Expense values
unique_vals = df["Income/Expense"].nunique()
colors = sns.color_palette("Set1", unique_vals)  # bright but decent

plt.figure(figsize=(8,6))
sns.countplot(
    data=df,
    x="Income/Expense",
    hue="Income/Expense",    # avoids FutureWarning
    palette=colors,
    legend=False             # remove extra legend
)
plt.title("Income vs Expense Count", fontsize=16, fontweight='bold')
plt.xlabel("Type", fontsize=14)
plt.ylabel("Count", fontsize=14)

# Add value labels
for p in plt.gca().patches:
    plt.gca().annotate(
        f'{int(p.get_height())}',
        (p.get_x() + p.get_width() / 2., p.get_height()),
        ha='center', va='bottom',
```

```
        fontsize=12, fontweight='bold'
    )

plt.show()
```




In [ ]:
```
df["Note"].nunique()
```

Out[ ]: 1057

In [ ]:
```
df["Currency"].value_counts()
```

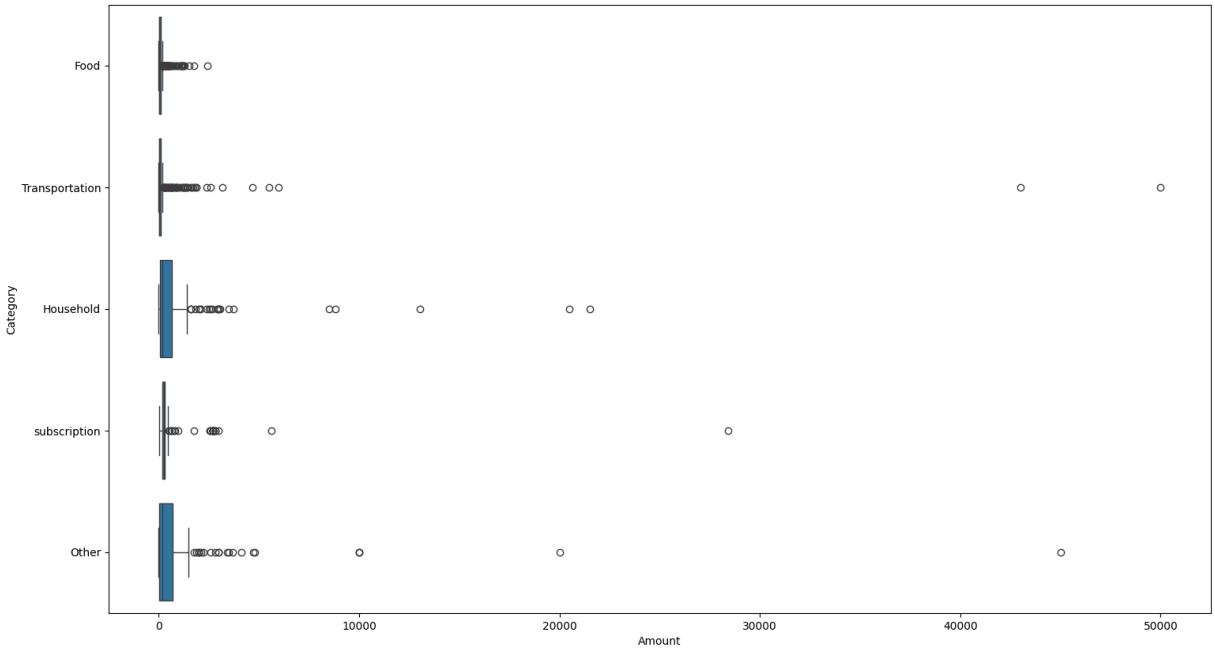
Out[ ]:

| Currency | count |
|---|---|
| INR | 2461 |

**dtype:** int64

Transaction Amount Distribution Across Top 5 Categories

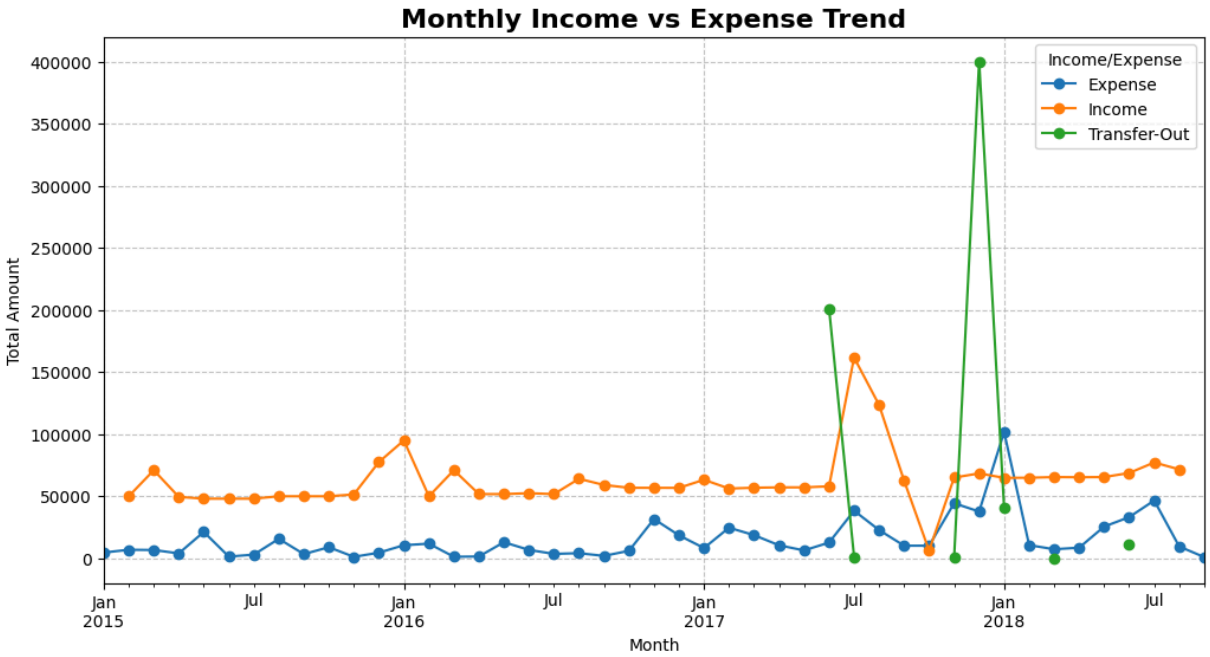
In [ ]:
```
plt.figure(figsize = (18,10))
sns.boxplot(data = df, x = "Amount", y = "Category", order =
df["Category"].value_counts().iloc[:5].index)
plt.show()
```




Monthly Trend of Income vs Expense

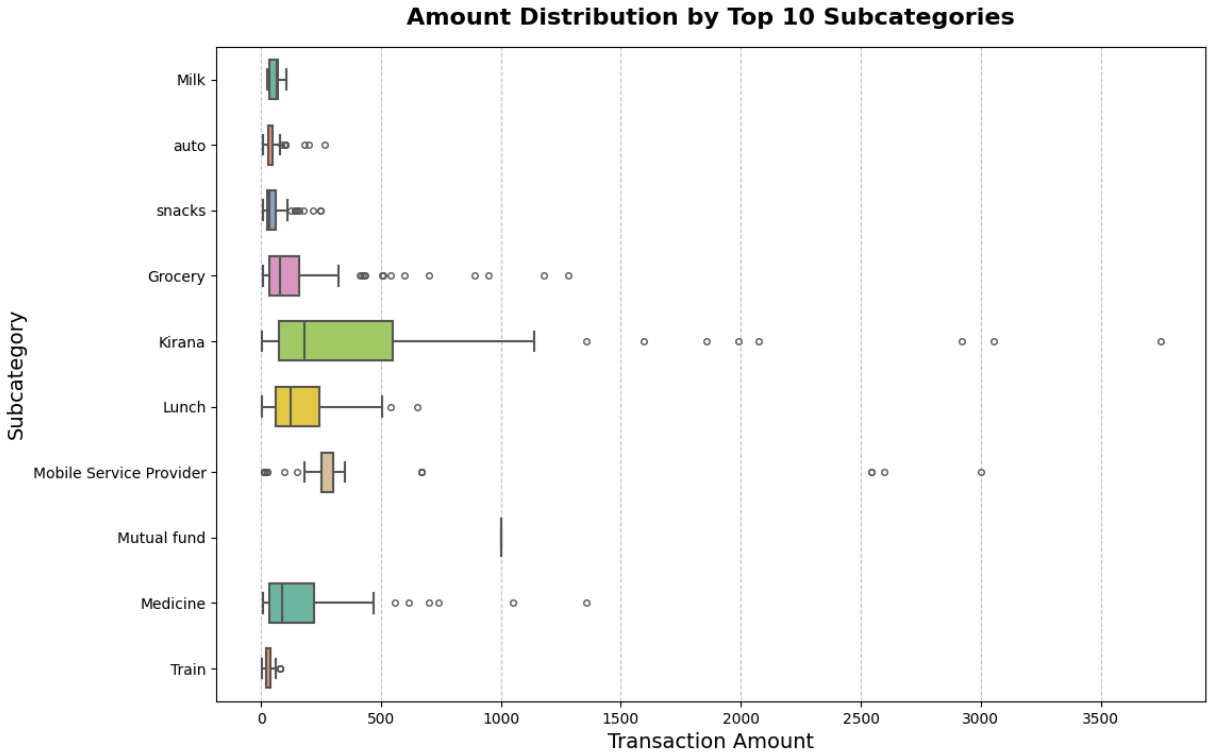
In [ ]:

```
# Convert Date to datetime
df['Date'] = pd.to_datetime(df['Date'], errors='coerce')

# Extract Year-Month
df['YearMonth'] = df['Date'].dt.to_period('M')

# Group by Month & Income/Expense
monthly_trend = df.groupby(['YearMonth', 'Income/Expense'])['Amount'].sum().

# Plot
monthly_trend.plot(kind='line', marker='o', figsize=(12,6))
plt.title("Monthly Income vs Expense Trend", fontsize=16, fontweight='bold')
plt.xlabel("Month")
plt.ylabel("Total Amount")
plt.grid(True, linestyle='--', alpha=0.7)
plt.show()
```



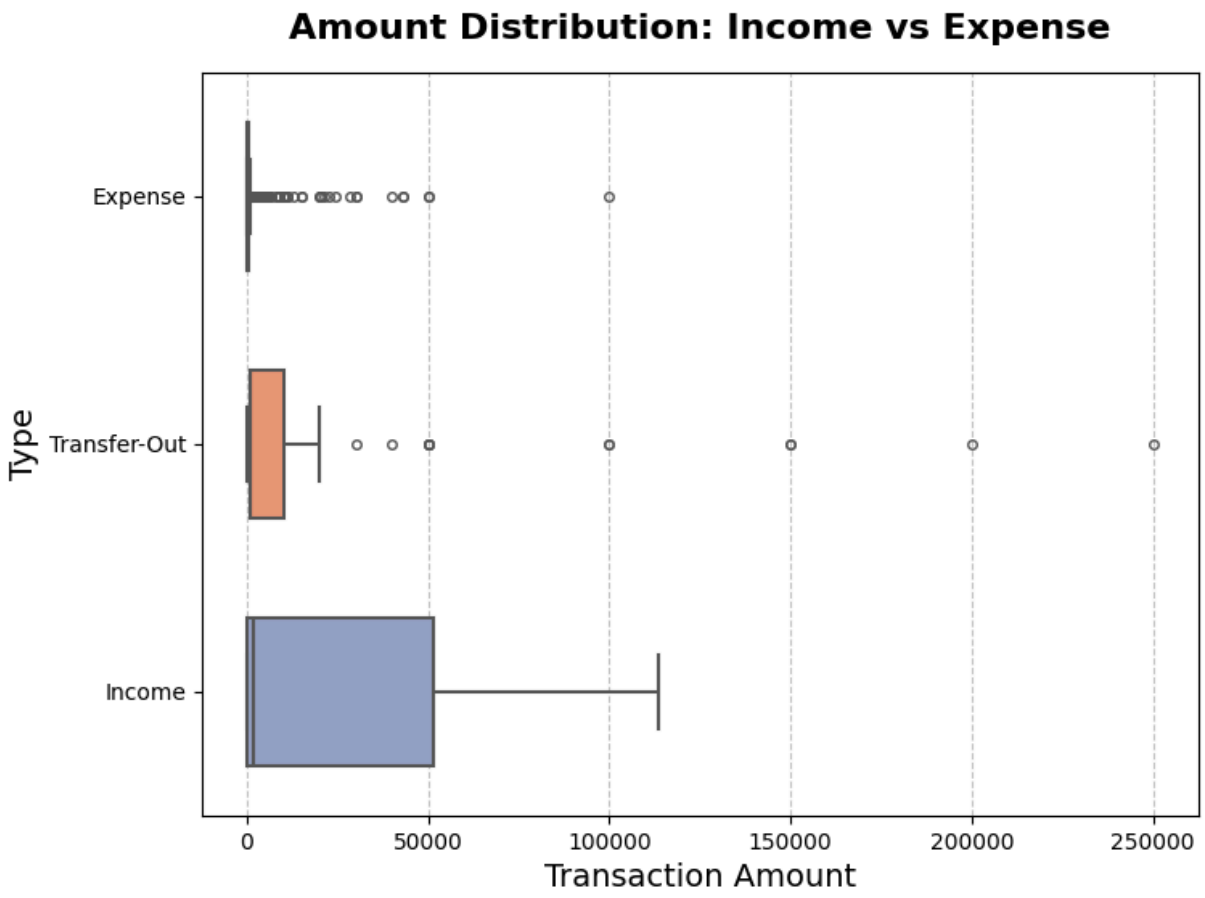

Transaction Amount Distribution Across Top 10 Spending Subcategories

In [ ]:
```
import warnings
warnings.filterwarnings("ignore", category=FutureWarning)

plt.figure(figsize=(12,8))

palette_colors = sns.color_palette("Set2", 10)

sns.boxplot(
    data=df,
    x="Amount",
    y="Subcategory",
    order=df["Subcategory"].value_counts().iloc[:10].index,
    palette=palette_colors,
    width=0.6,
    fliersize=4,
    linewidth=1.5
)

plt.title("Amount Distribution by Top 10 Subcategories", fontsize=16, fontwe
plt.xlabel("Transaction Amount", fontsize=14)
plt.ylabel("Subcategory", fontsize=14)
plt.grid(axis='x', linestyle='--', alpha=0.7)
plt.show()
```



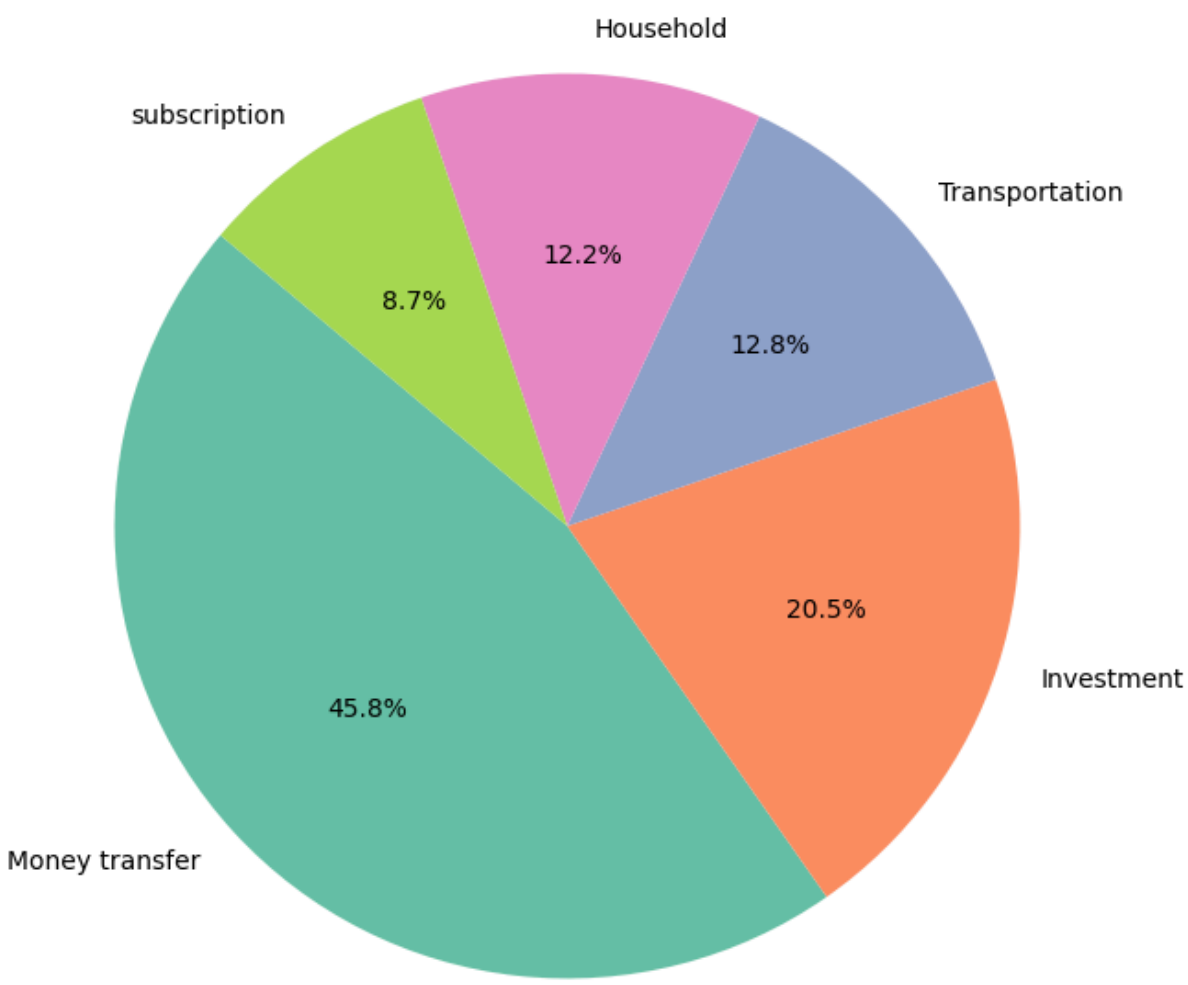

Income vs Expense: Transaction Amount Distribution

In [ ]:
```
# Match colors to unique values
unique_vals = df["Income/Expense"].nunique()
palette_colors = sns.color_palette("Set2", unique_vals)  # auto-generate enc

plt.figure(figsize=(8,6))
sns.boxplot(
    data=df,
    x="Amount",
    y="Income/Expense",
    hue="Income/Expense",       # avoids FutureWarning
    palette=palette_colors,
    width=0.6,
    fliersize=4,
    linewidth=1.5,
    legend=False                # remove duplicate legend
)

plt.title("Amount Distribution: Income vs Expense", fontsize=16, fontweight=
plt.xlabel("Transaction Amount", fontsize=14)
plt.ylabel("Type", fontsize=14)
plt.grid(axis='x', linestyle='--', alpha=0.7)

plt.show()
```



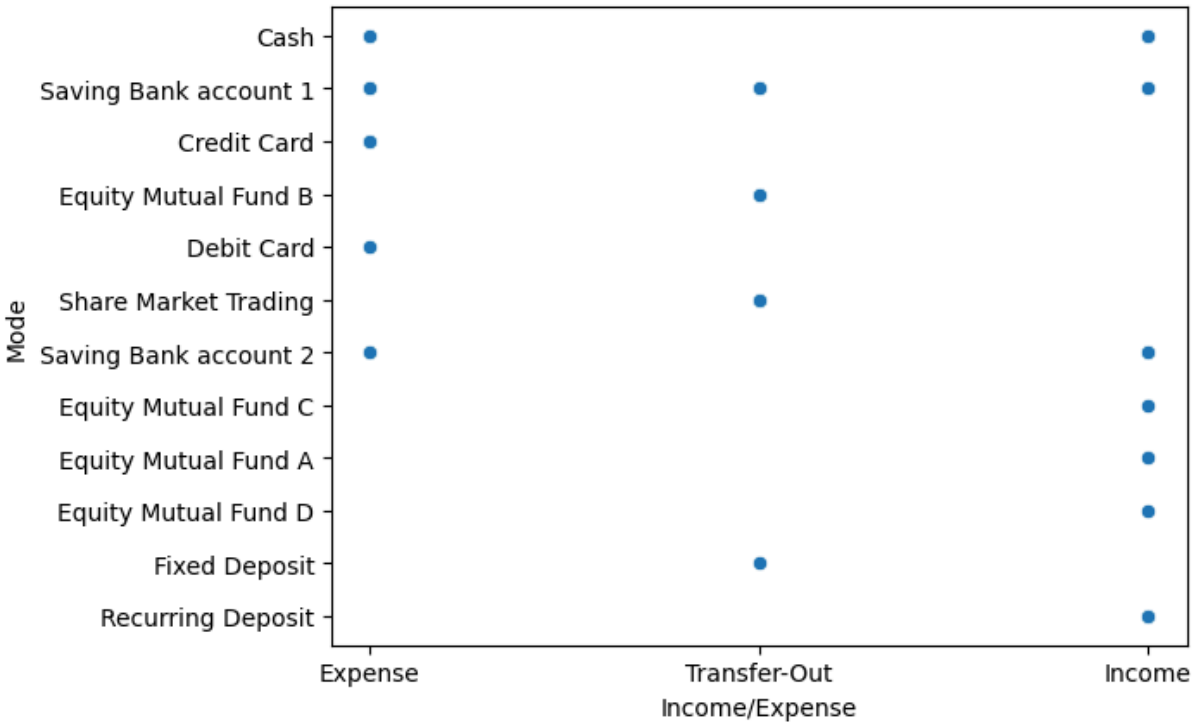

Share of Top 5 Spending Categories

In [ ]:
```
expense_df = df[df['Income/Expense'] == 'Expense']
category_expense = expense_df.groupby('Category')['Amount'].sum().nlargest(5

plt.figure(figsize=(8,8))
category_expense.plot.pie(
    autopct='%1.1f%%',
    startangle=140,
    colors=sns.color_palette("Set2", 5)
)
plt.title("Top 5 Expense Categories Share", fontsize=16, fontweight='bold')
plt.ylabel("")
plt.show()
```




Transaction Modes by Income and Expense

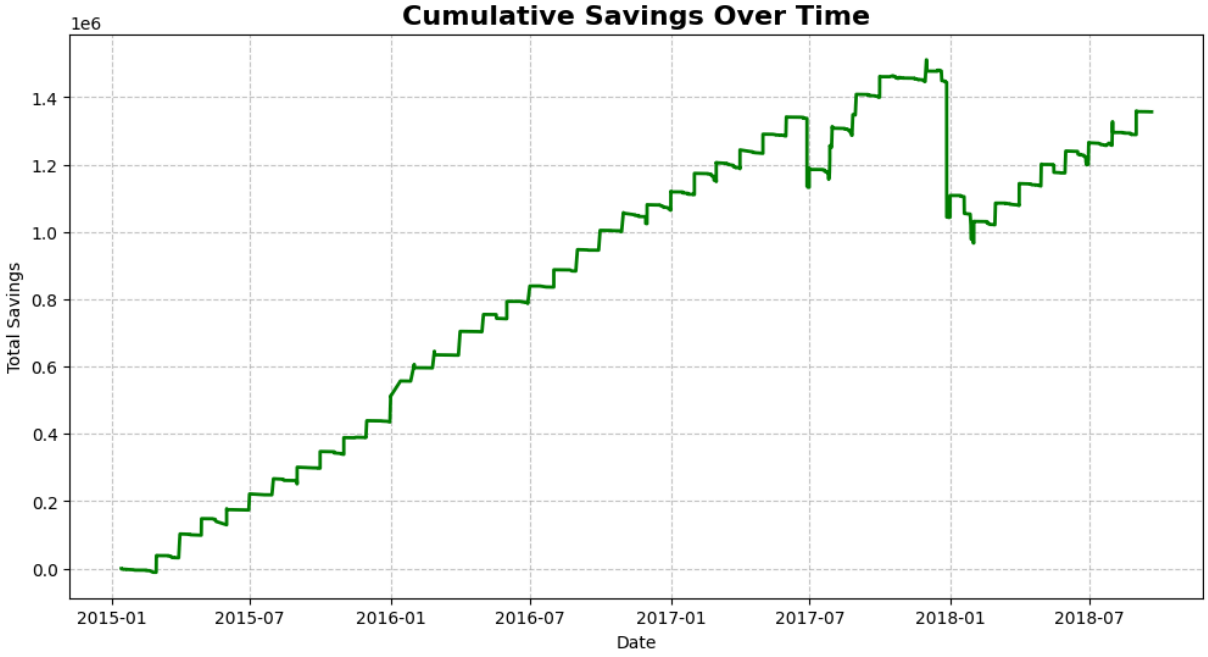
In [ ]:
```
sns.scatterplot(data=df,x="Income/Expense",y="Mode",);
```




Growth of Cumulative Savings Over Time

In [ ]:

```
# Income as positive, Expense as negative
df['NetAmount'] = df.apply(lambda row: row['Amount'] if row['Income/Expense'

# Cumulative sum
df = df.sort_values('Date')
df['CumulativeSavings'] = df['NetAmount'].cumsum()

plt.figure(figsize=(12,6))
plt.plot(df['Date'], df['CumulativeSavings'], color="green", linewidth=2)
plt.title("Cumulative Savings Over Time", fontsize=16, fontweight='bold')
plt.xlabel("Date")
plt.ylabel("Total Savings")
plt.grid(True, linestyle='--', alpha=0.7)
plt.show()
```


Cumulative Savings Over Time
1e6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Total Savings
2015-01
2015-07
2016-01
2016-07
2017-01
2017-07
2018-01
2018-07
Date