# Smartwatch Data Analysis Project

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## ➢ Objective :

The objective of a smartwatch data analysis project is typically to leverage the data collected by a smartwatch (such as heart rate, steps taken, sleep patterns, calories burned, GPS location, etc.) to gain insights into user behavior, health trends, and overall well-being. Here are some common objectives for such a project:

1. **Health Monitoring and Wellness Insights**: Analyze data from fitness trackers to identify patterns related to exercise, heart rate, sleep quality, and overall activity levels. The goal might be to provide recommendations for improving health and wellness.
2. **Personalized Recommendations**: Using collected data to provide personalized fitness or health recommendations, such as adjusting workout routines, suggesting sleep improvements, or monitoring long-term health trends.
3. **Predictive Analytics for Health Issues**: Using machine learning or statistical models to predict potential health issues, like detecting irregular heartbeats or sleep disorders, before they become serious.
4. **User Behavior Analysis**: Understanding how users engage with their smartwatch over time, including how often they use different features, which functions are most useful, and how activity correlates with mood or health changes.

## ➢ Problem Statement :

With the increasing adoption of smartwatches and wearable fitness devices, a vast amount of personal health data is being generated by users on a daily basis. However, the raw data collected such as heart rate, steps taken, sleep patterns, and activity levels—remains largely underutilized. Most users do not have the tools or expertise to interpret this data in a meaningful way. Additionally, there is a gap in the ability to automatically detect potential health issues or provide personalized, actionable insights based on this data.

- **Data Overload**: Smartwatches generate a large volume of diverse data, making it difficult to extract actionable insights.
- **Data Noise**: The data collected can be noisy or incomplete, requiring sophisticated preprocessing and filtering techniques to ensure quality analysis.
- **Personalization**: Different individuals have different health goals and needs, so providing tailored insights requires developing personalized recommendation systems.

## ➢ Solution :

The goal of the smartwatch data analysis project is to leverage data collected from smartwatches to monitor users' health, detect potential health issues, and provide personalized insights to help users optimize their lifestyle choices. This solution will involve several key steps:

1. Data Collection:
2. Data Preprocessing:
3. Data Analysis:
4. Machine Learning for Prediction and Personalization
5. Real-Time Monitoring and Alerts

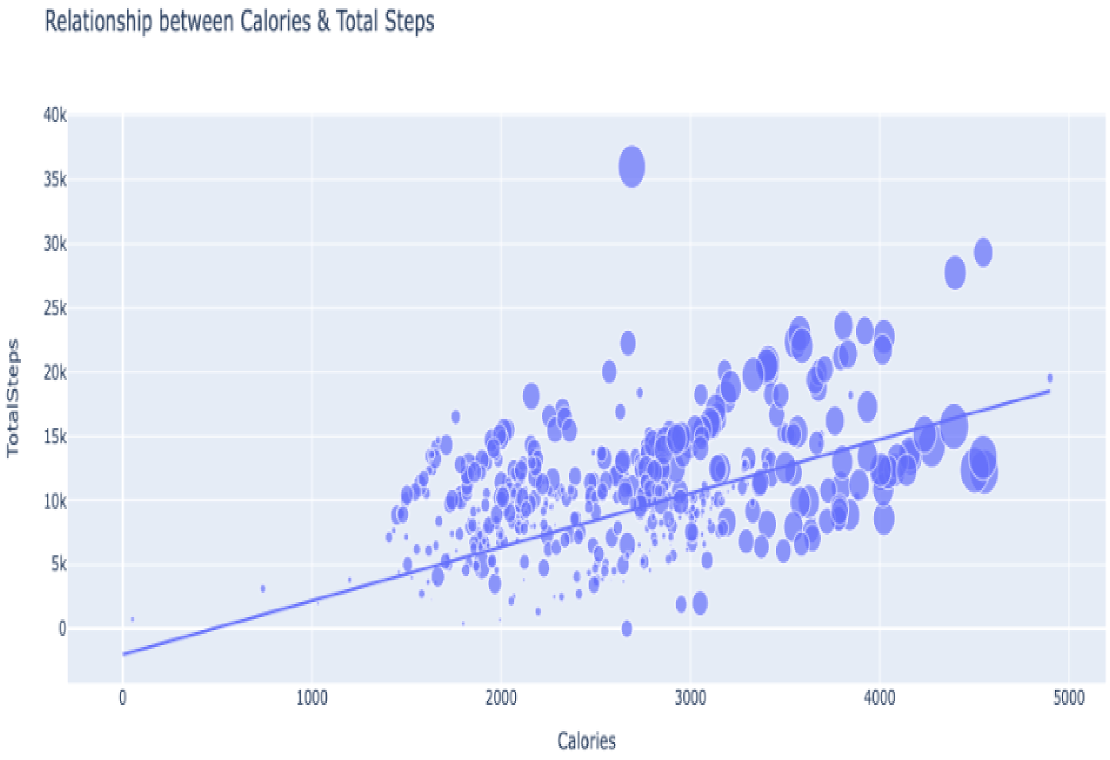
## ➢ Implementation :

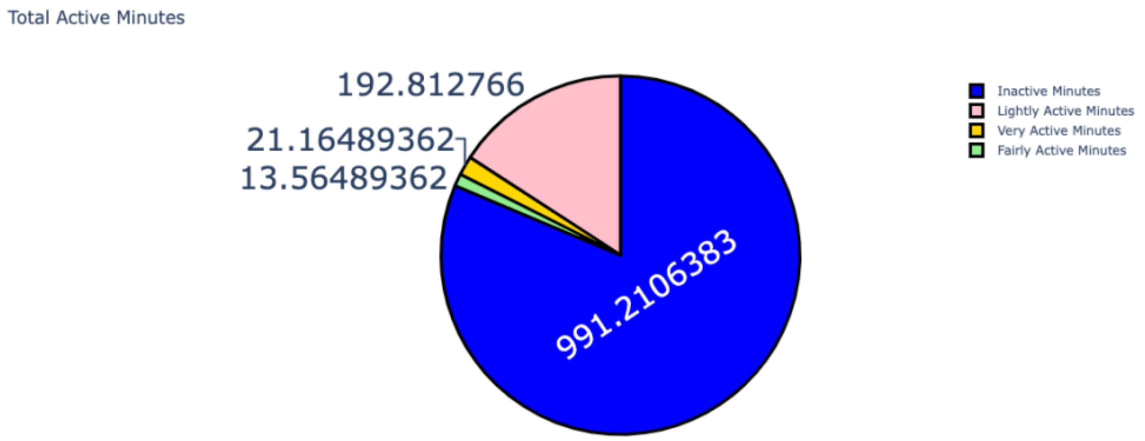
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import plotly.express as px
import plotly.graph_objects as go
data = pd.read_csv("dailyActivity_merged.csv")
print(data.head())
print(data.isnull().sum())
print(data.info())
data["ActivityDate"] = pd.to_datetime(data["ActivityDate"],
                                format="%m/%d/%Y")
print(data.info())
data["TotalMinutes"] = data["VeryActiveMinutes"] + data["FairlyActiveMinutes"] +
data["LightlyActiveMinutes"] + data["SedentaryMinutes"]
print(data["TotalMinutes"].sample(5))
print(data.describe())
figure = px.scatter(data_frame = data, x="Calories",
                    y="TotalSteps", size="VeryActiveMinutes",
                    trendline="ols",
                    title="Relationship between Calories & Total Steps")
figure.show()
label = ["Very Active Minutes", "Fairly Active Minutes",
         "Lightly Active Minutes", "Inactive Minutes"]
counts = data[["VeryActiveMinutes", "FairlyActiveMinutes",
               "LightlyActiveMinutes", "SedentaryMinutes"]].mean()
colors = ['gold','lightgreen', "pink", "blue"]

fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Total Active Minutes')
fig.update_traces(hoverinfo='label+percent', textinfo='value', textfont_size=30,
                  marker=dict(colors=colors, line=dict(color='black', width=3)))
fig.show()
```

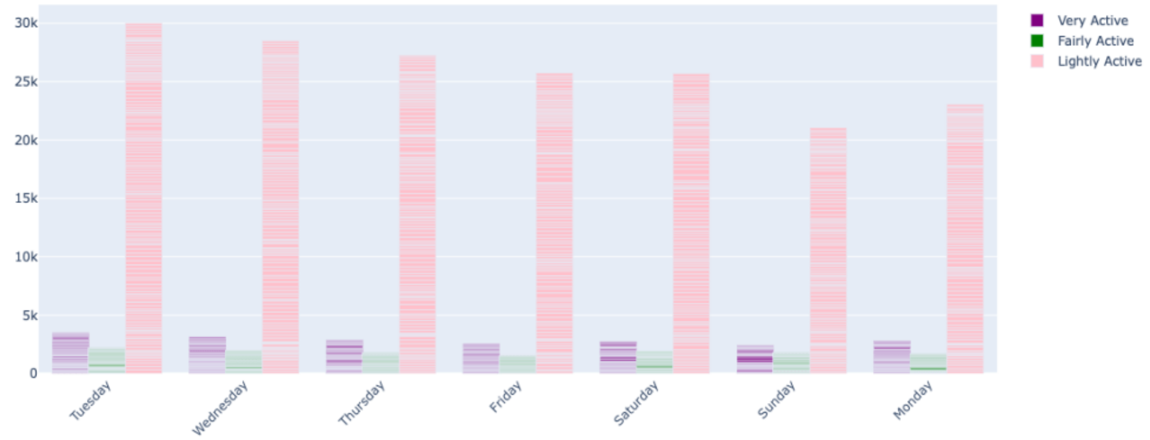
```
data["Day"] = data["ActivityDate"].dt.day_name()
print(data["Day"].head())
fig = go.Figure()
fig.add_trace(go.Bar(
    x=data["Day"],
    y=data["VeryActiveMinutes"],
    name='Very Active',
    marker_color='purple'
))
fig.add_trace(go.Bar(
    x=data["Day"],
    y=data["FairlyActiveMinutes"],
    name='Fairly Active',
    marker_color='green'
))
fig.add_trace(go.Bar(
    x=data["Day"],
    y=data["LightlyActiveMinutes"],
    name='Lightly Active',
    marker_color='pink'
))
fig.update_layout(barmode='group', xaxis_tickangle=-45)
fig.show()
day = data["Day"].value_counts()
label = day.index
counts = data["SedentaryMinutes"]
colors = ['gold','lightgreen', "pink", "blue", "skyblue", "cyan", "orange"]

fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Inactive Minutes Daily')
fig.update_traces(hoverinfo='label+percent', textinfo='value', textfont_size=30,
                  marker=dict(colors=colors, line=dict(color='black', width=3)))
fig.show()
calories = data["Day"].value_counts()
```

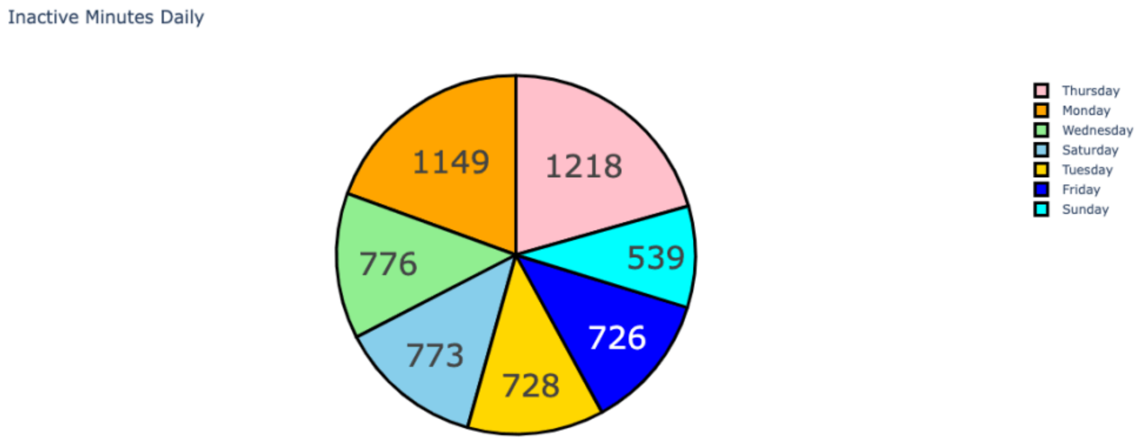
```
label = calories.index
counts = data["Calories"]
colors = ['gold','lightgreen', "pink", "blue", "skyblue", "cyan", "orange"]

fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Calories Burned Daily')
fig.update_traces(hoverinfo='label+percent', textinfo='value', textfont_size=30,
                  marker=dict(colors=colors, line=dict(color='black', width=3)))
fig.show()
```

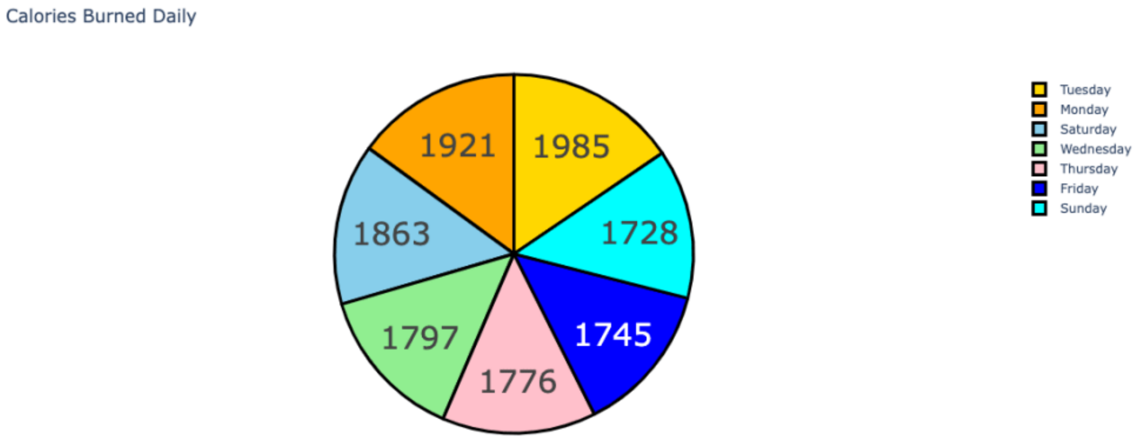
- **Output :**




Total Active Minutes
192.812766
21.16489362
13.56489362
991.2106383
Inactive Minutes
Lightly Active Minutes
Very Active Minutes
Fairly Active Minutes


30k
25k
20k
15k
10k
5k
0
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
Monday
Very Active
Fairly Active
Lightly Active


Inactive Minutes Daily
1149
1218
776
539
773
728
726
Thursday
Monday
Wednesday
Saturday
Tuesday
Friday
Sunday


Calories Burned Daily
1985
1921
1863
1728
1797
1776
1745
Tuesday
Monday
Saturday
Wednesday
Thursday
Friday
Sunday