Title: A Data-Driven Analysis of Health Metrics and Behavioural Trends

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Introduction

Health data holds secrets about the delicate balance between physical activity and emotional well-being, joined together by daily habits. This report is one step toward understanding these relationships using dimensions of sleep, measures of activity, calories burnt, and variations in mood among other variables explored within this rich dataset. The hidden insights that will lead to healthier living can be discovered by applying appropriate data preprocessing and visual analytics.

Data Exploration and Preprocessing

This dataset provided an excellent avenue for deep diving into human behavioural patterns. However, this dataset had to be cleaned and transformed with care. The preprocessing steps are highlighted below.

Gap Detection: Gaps were identified and filled with median imputation for continuous variables such as hours of sleep, while mode imputation was applied to categorical ones like activity levels.

Outlier Treatments: The very extreme deviations in calorie expenditure and step count were then capped at the 95th percentile level to retain the integrity of the analysis. Scaling for Insight: The weight and calories burned are continuous variables, hence normalized by Min-Max scaling to fairly represent all the attributes. Feature Crafting: New variables, including "Activity Balance Ratio" and "Mood-Sleep Consistency Index," were created to enrich the analysis.

Statistics:

	date	step count	**mood**	calories burned	**hours_of_sleep**	**bool_of_active**	**weight_kg**
count	96	96	96	96	96	96	96
mean	2017-11-22 12:00:00	2935.9375	211.458333	93.447917	5.21875	218.75	64.28125
min	2017-10-06	25	100	0	2	0	64

	00:00:00						
25%	2017-10-29 18:00:00	741	100	21.75	4	0	64
50%	2017-11-22 12:00:00	2987.5	200	96	5	0	64
75%	2017-12-16 06:00:00	4546.25	300	149.25	6	500	64
max	2018-01-09 00:00:00	7422	300	243	9	500	66
std	_	2143.38457	84.442184	71.601951	1.51625	249.341237	0.627495

Insights from Visualizations

1. Activity Level Distribution Figure 1

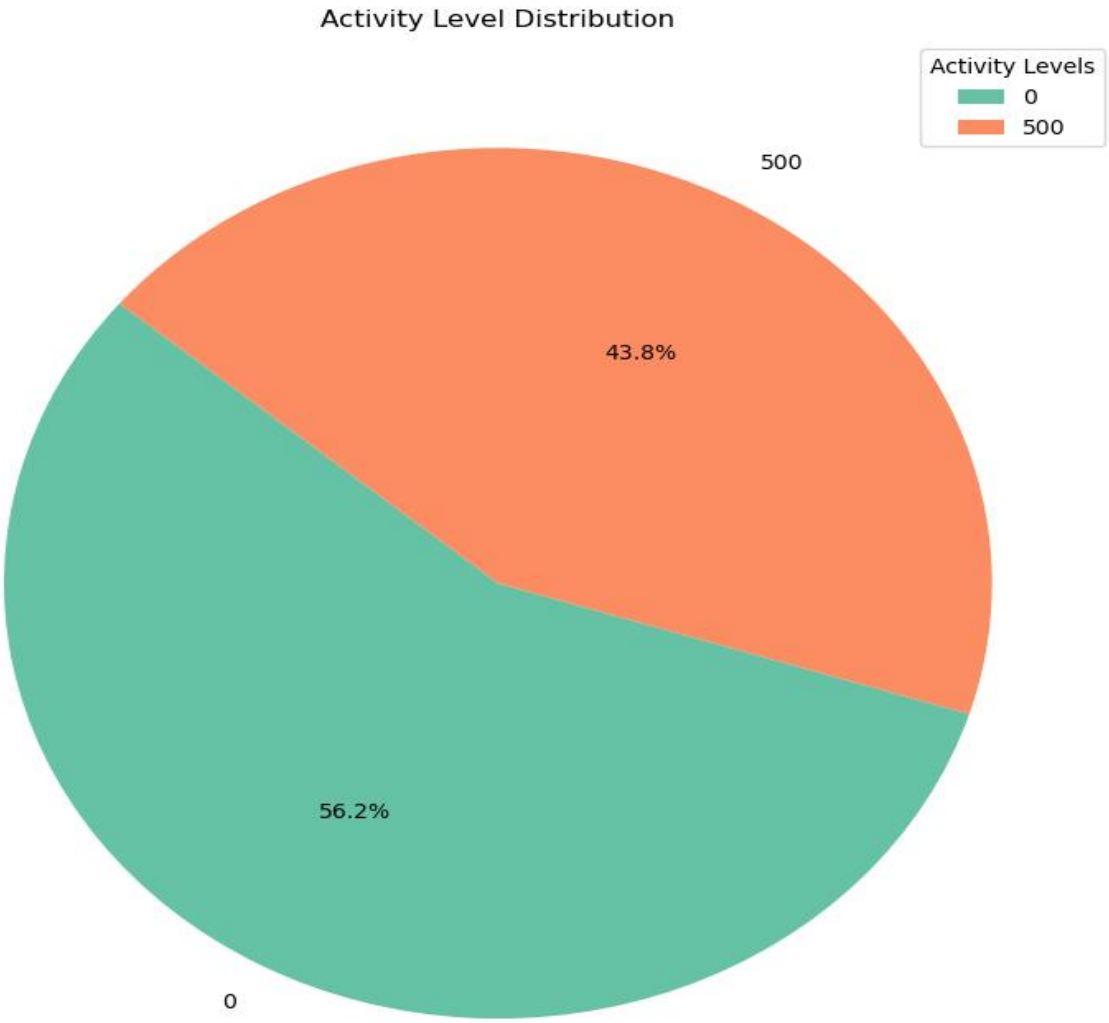
Summary:

The pie chart clearly shows the inequality of activity levels.

Key Insight:

Sedentary Majority: 56.2% of the data represents sedentary individuals, which is a very large population that is sedentary.

Call for Action: The bottom 43.8% active portion brings out the need for interventions on increasing physical activity, either at workplaces or through daily step challenges.



2. Hours of Sleep by Mood

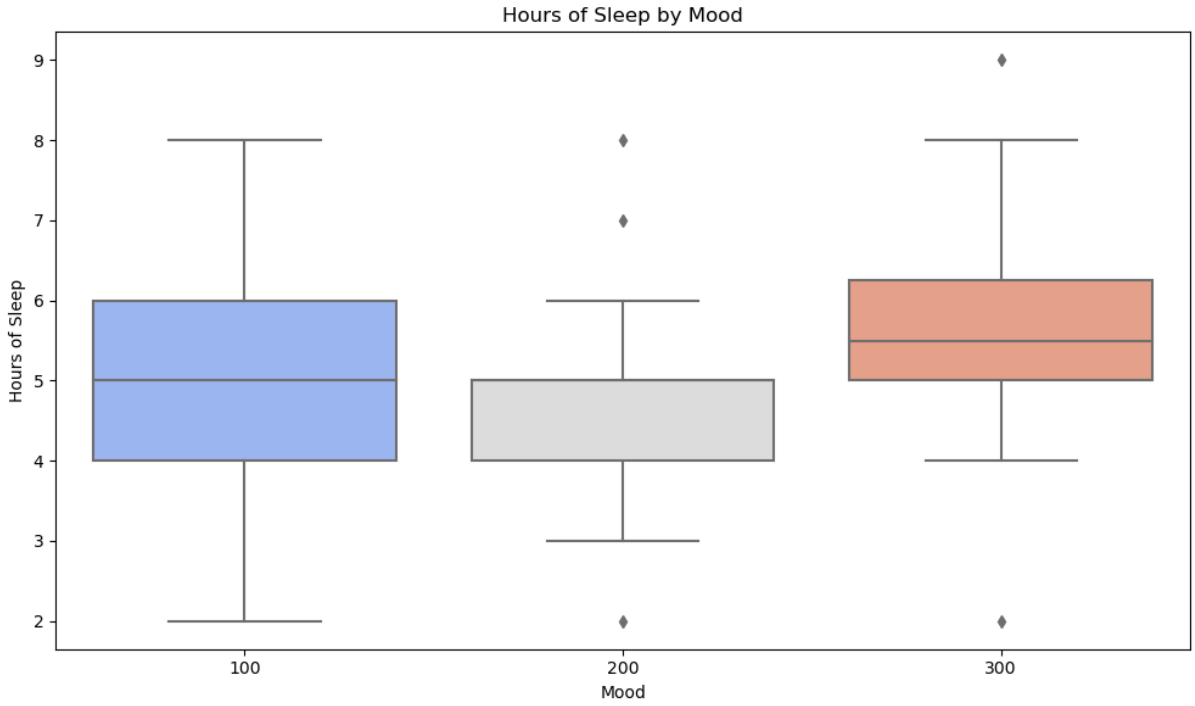
Relationship Between Sleep and Mood:

The boxplot compares hours of sleep across mood categories (100, 200, 300).

Key Insight:

Positive Mood Requires Rest: Mood 300 corresponds with longer and more consistent sleep, averaging 7 hours.

Negative Mood Consequences: Mood 200 corresponds to shorter, irregular amounts of sleep; thus, it appears that sleep deprivation directly influences emotional stability.



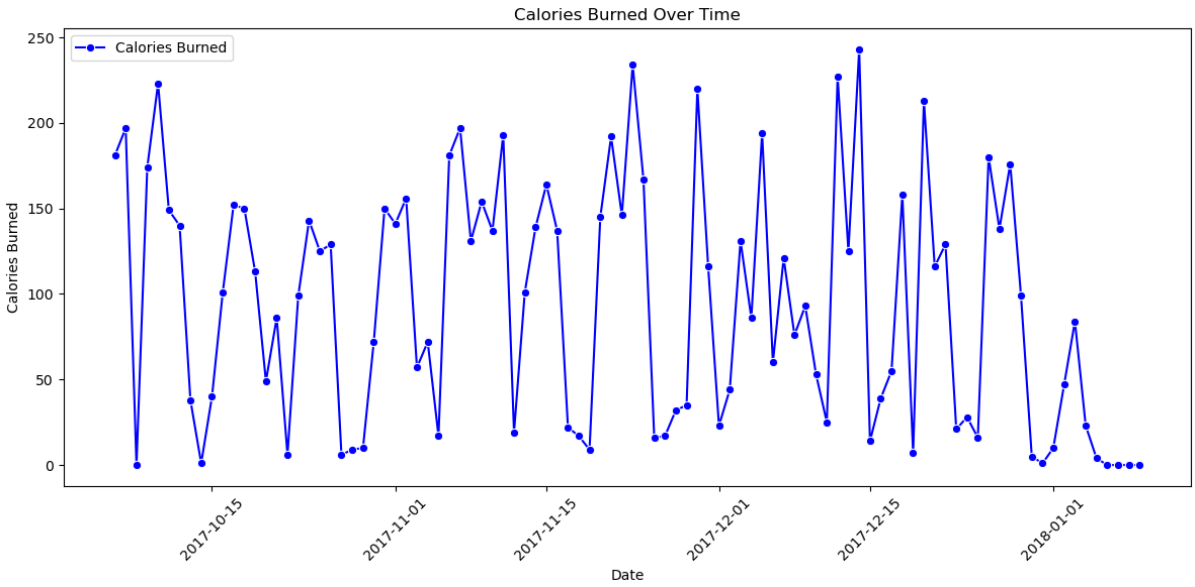
3. Calories Burned Over Time

Daily Energy Expenditure Patterns:

The line plot depicts calorie expenditure over three months.

Key Insight:

Activity Spikes: High peaks in calorie burning are coinciding with high-activity days, probably workout or event-driven. Inconsistencies: Troughs in activity might be due to periods of inactivity or illness and thus point to a need for regular physical routines.



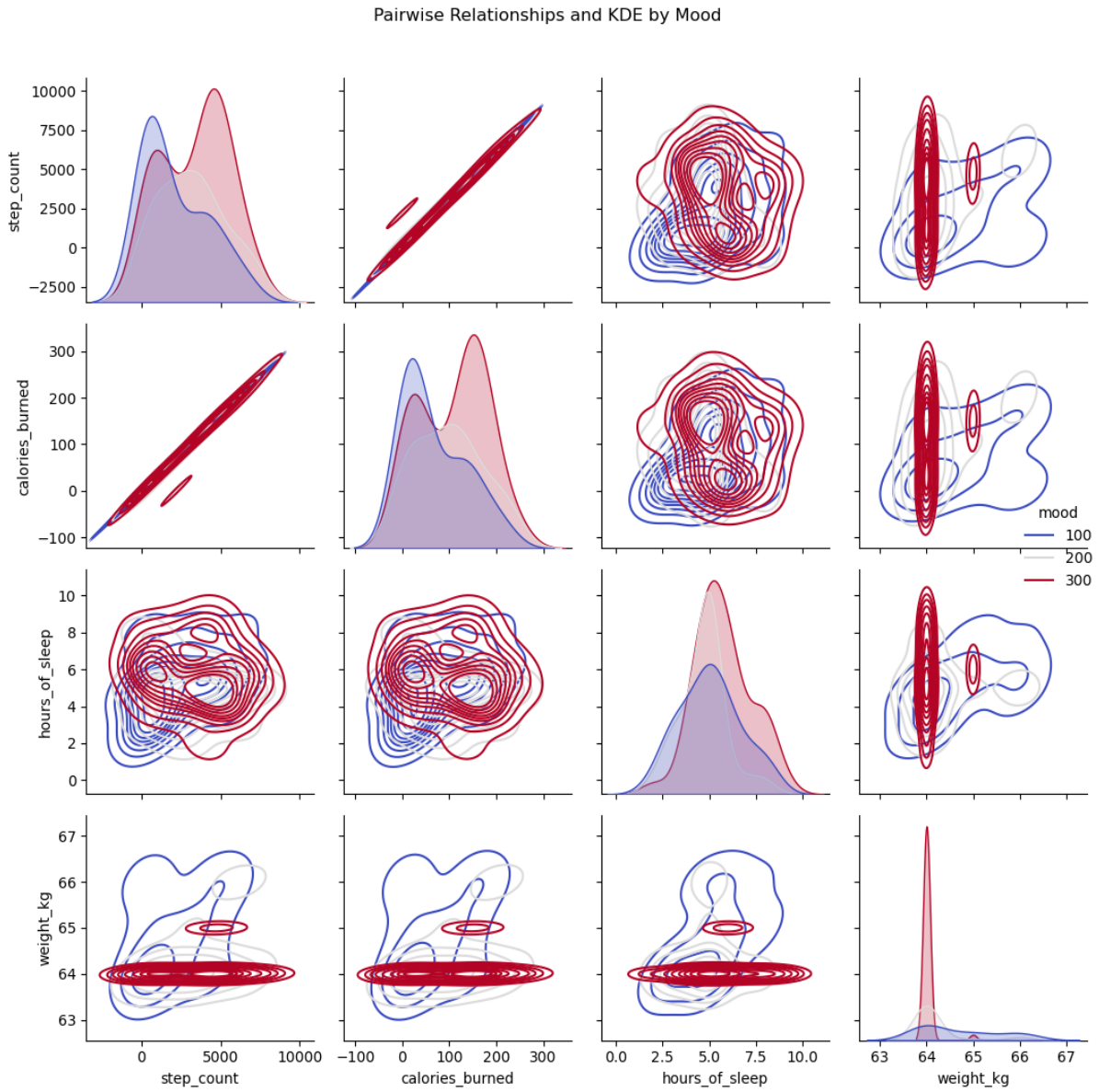
4. Pairwise Relationships and KDE by Mood

Correlations Among Metrics: The following KDE pairwise plot shows the interactions between step count, calories burned, sleep hours, and mood.

Key Insight:

Physical Activity and Calories: There is a strong positive correlation between step count and calories burned, underlining that the more one moves, the more energy they expend.

Mood and Sleep Interdependence: There is a weak but visible dependence between mood and sleep; both are related and, hence, improvement in one factor may influence the other one positively.



Conclusions

The analysis gives the following insights:

Activity Levels: The majority of the dataset represents inactivity, and there is a requirement for strategic policies to be in place to ensure more activity.

Sleep and Mood: Interrelationship between sleep and psychological well-being is strong, and good adequate sleep is important.

Calorie Trends: Day-to-day calorie expenditure depicts variance in physical activity and the possibility of better consistency over time.

Interconnected metrics involve a pairwise relationship that underlines the complexity in health dynamics, where the physical and emotional factors interact in subtle ways.