Introduction

This research was motivated by a personal desire to understand the factors influencing daily phone usage patterns, with the goal of identifying potential triggers for excessive screen time and developing data-driven strategies for more mindful device usage.

The study examines the relationship between daily screen time and various environmental and behavioral factors: average temperature, precipitation, average distance from home, and total distance traveled. The null hypothesis states that "There is no significant correlation between daily screen time usage and (a) daily average temperature, (b) daily precipitation, (c) daily average distance from home, and (d) daily total distance traveled."

Methodology

The data collection process integrated multiple sources to create a comprehensive dataset. Screen time data was extracted from the iOS Screen Time feature, providing daily usage statistics. Weather information, including daily average temperature and precipitation, was sourced from the Meteostat API. Location data was obtained through Google Timeline, which offers detailed movement tracking and location history.

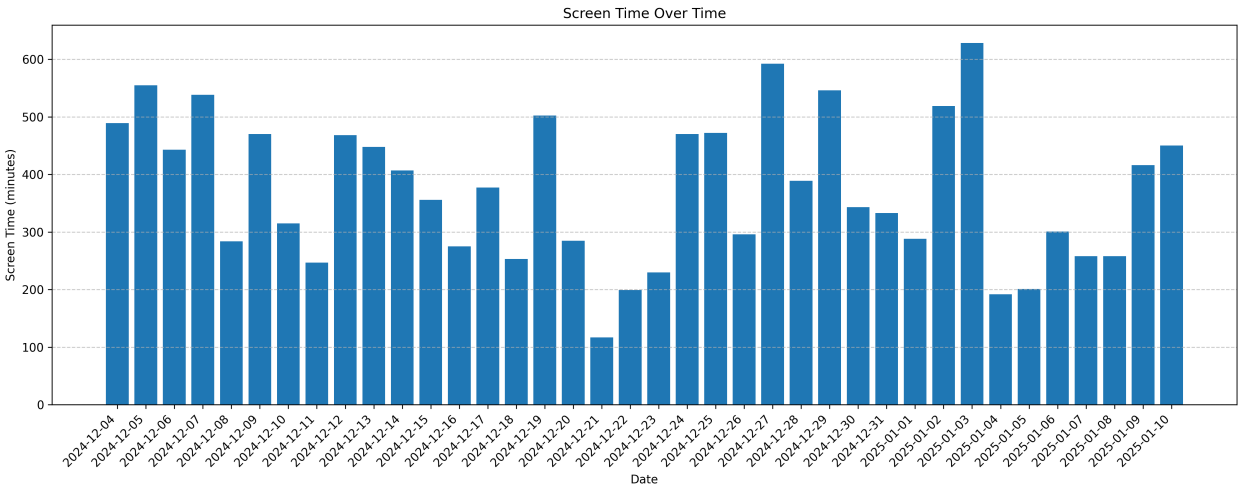
A notable data transformation was performed on the location data. Raw GPS coordinates from Google Timeline were converted into meaningful distance metrics by calculating the average distance from a designated "home" location for each day. This transformation allowed us to quantify daily mobility patterns into a single, analyzable statistic that represents how far from home base an individual spent their time during each day. Additionally, the total distance traveled was computed by summing the distances between consecutive location points throughout each day.

Exploratory Data Analysis

The analysis was conducted on 38 days of data, integrating screen time, location, and weather measurements. Each variable demonstrated distinct patterns and distributions:

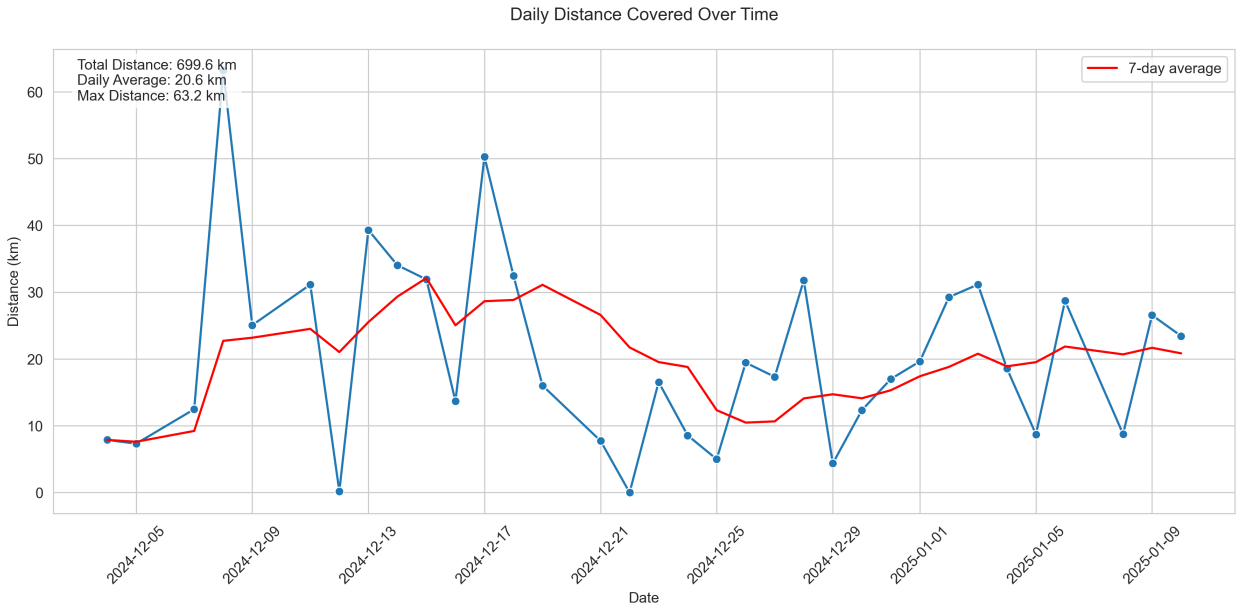
Screen Time Analysis

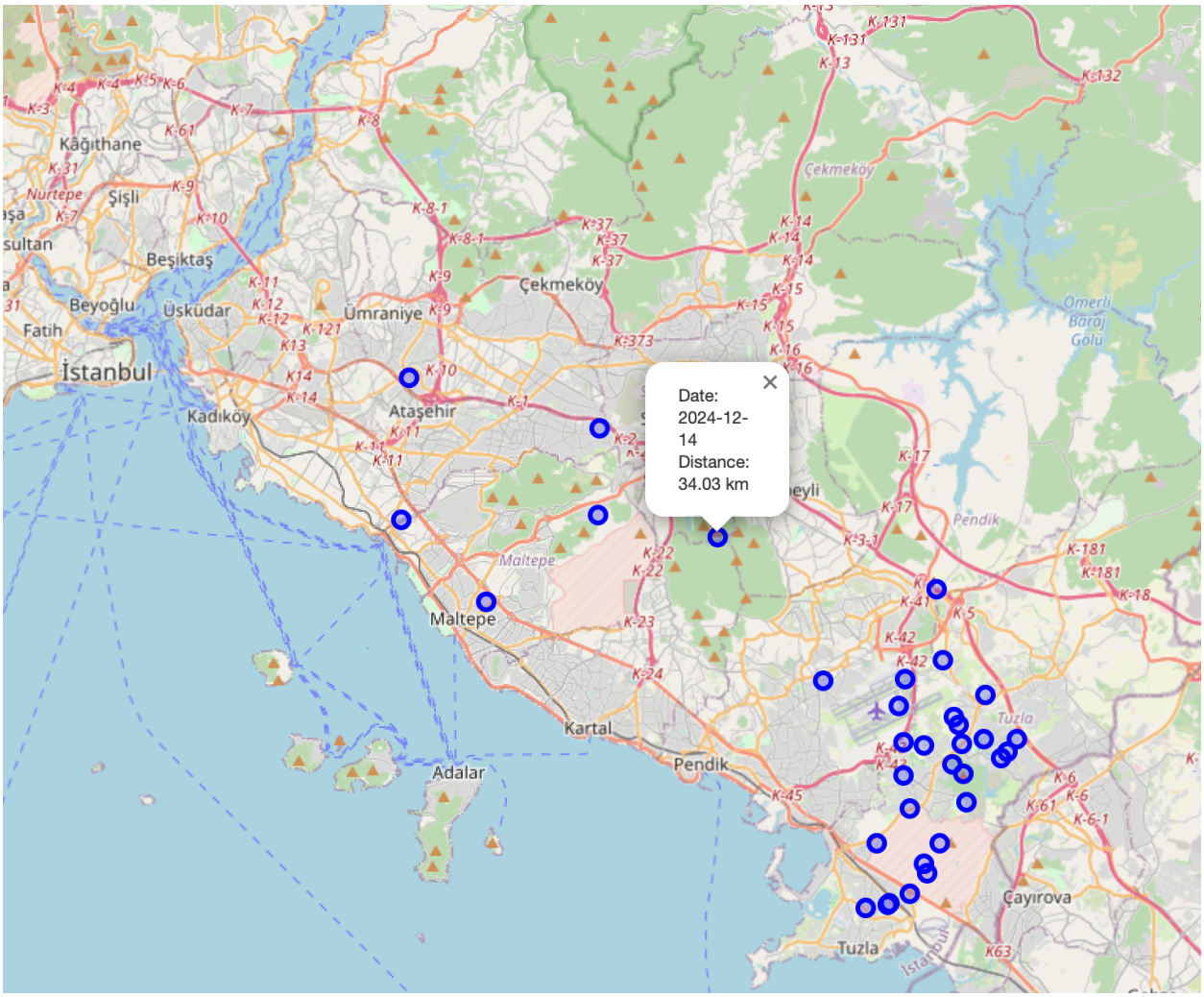
The daily screen time showed considerable variation, averaging 374 minutes (approximately 6.2 hours) per day, with a standard deviation of 127 minutes. Usage ranged from a minimum of 117 minutes (1.95 hours) to a maximum of 628 minutes (10.47 hours) per day. The distribution, as visualized in the bar chart, indicates that most days fell between 277 minutes (25th percentile) and 470 minutes (75th percentile), suggesting relatively consistent daily usage patterns with occasional extreme days.



Mobility Patterns

Daily movement patterns were analyzed through two metrics: total distance traveled and average distance from home. The total daily distance averaged 20.58 kilometers with a standard deviation of 14.11 kilometers, ranging from 0 to 63.17 kilometers. The location data, visualized on a map, showed movement patterns centered around Istanbul (mean coordinates: 40.89°N, 29.31°E), with varying daily mobility ranges.

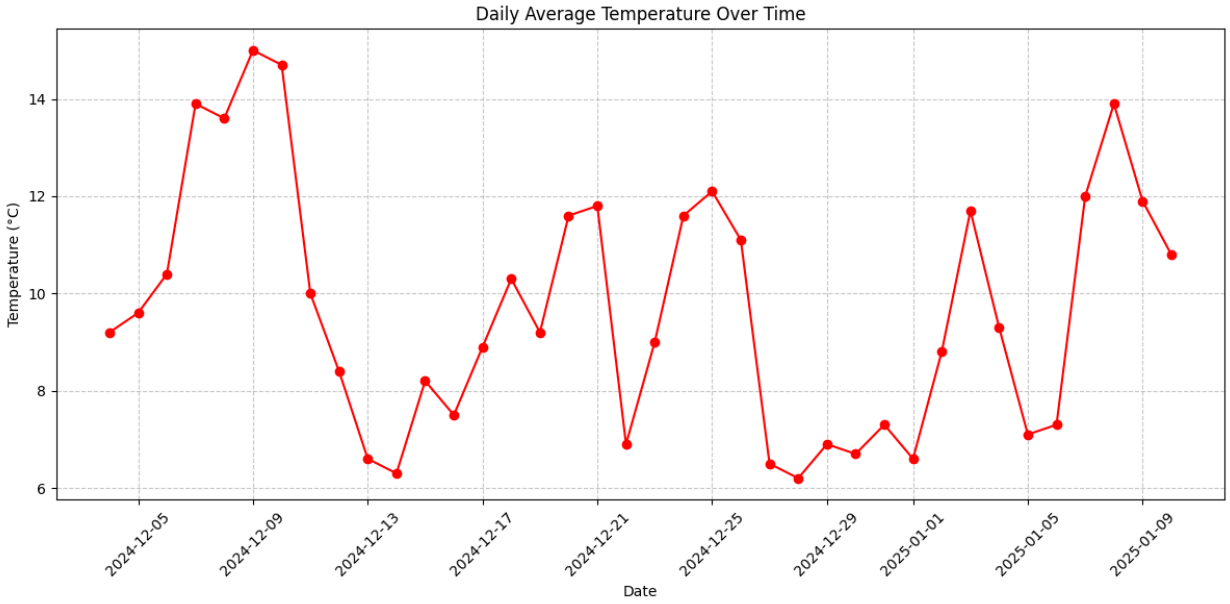


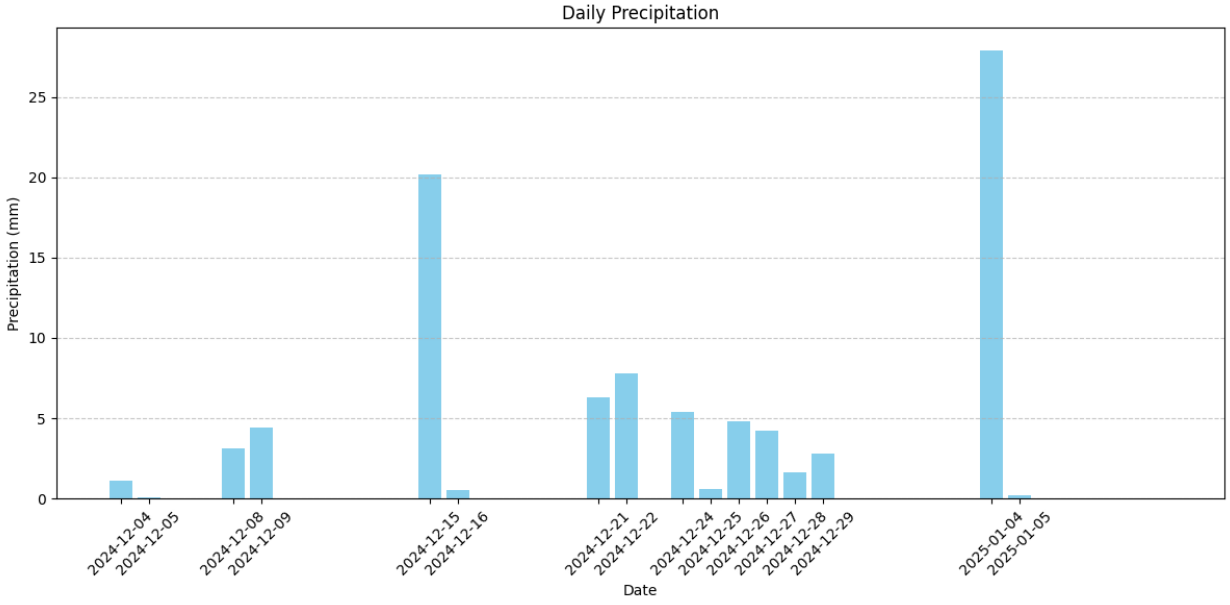


Full Interactive Map

Weather Conditions

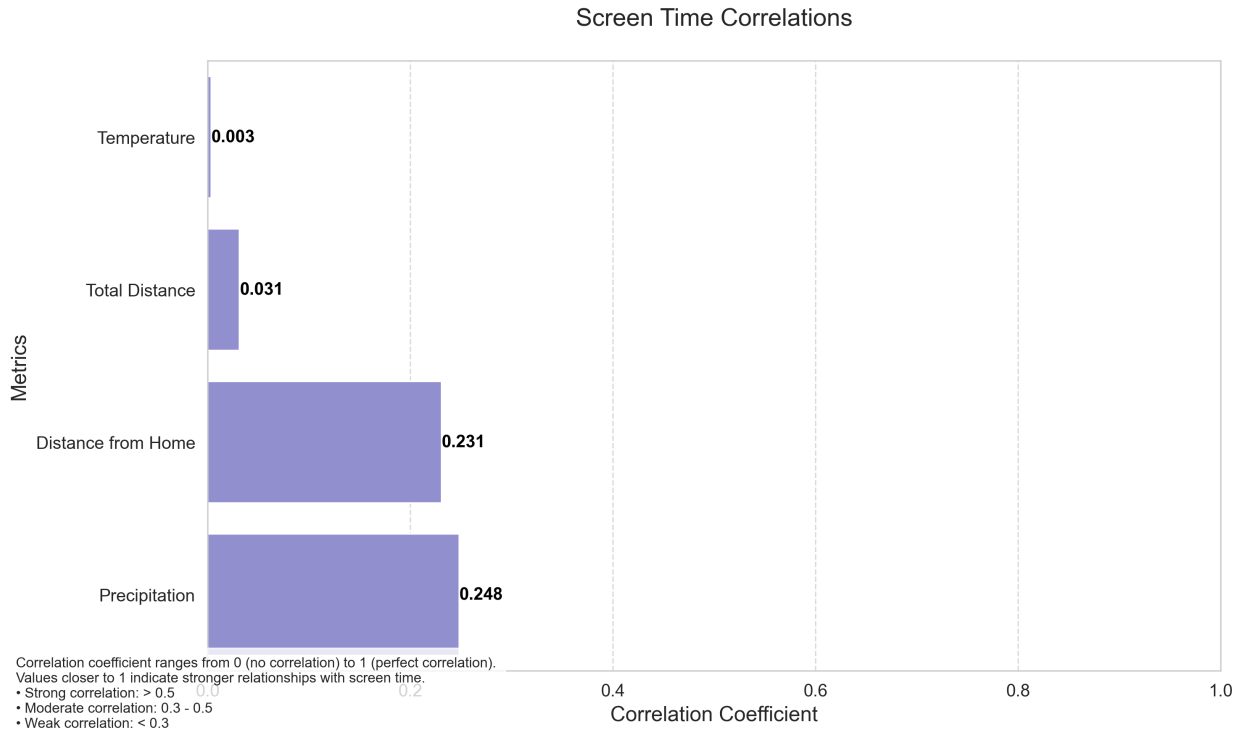
Temperature during the study period remained relatively mild, with an average of 9.71°C and a range of 6.2°C to 15.0°C. The trend chart shows the temperature variations over time. Precipitation patterns were notably skewed, with a median of 0mm and a mean of 2.39mm, indicating many dry days interspersed with occasional rainfall events. The maximum recorded precipitation was 27.9mm.





Correlation Analysis

The correlation analysis revealed weak relationships between screen time and all measured variables:



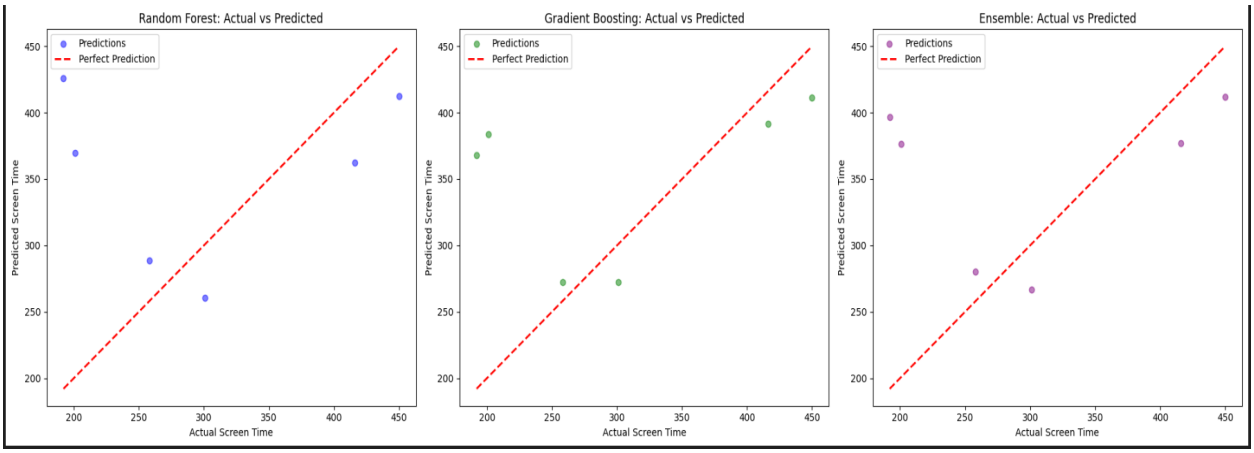
- Precipitation showed the strongest correlation (r = 0.248)
- Distance from home had a similar weak positive correlation (r = 0.231)
- Total distance traveled showed minimal correlation (r = 0.031)
- Temperature demonstrated virtually no correlation (r = 0.003)

These weak correlations, visualized in the correlation bar chart, suggest that none of the measured environmental or mobility factors strongly influence daily screen time usage patterns.

Machine Learning Attempt

Three different algorithms were employed to predict screen time based on the collected environmental and mobility features: Random Forest, Gradient Boosting, and an Ensemble approach. All three models demonstrated poor predictive performance, as evidenced by the scattered predictions shown in the actual vs. predicted plots. The diagonal red line in each plot represents perfect predictions, while the scattered points show significant deviation from this ideal line, indicating weak predictive power.

This poor performance aligns with our correlation analysis findings. With correlation coefficients ranging from 0.003 to 0.248, none of our features showed strong relationships with screen time. The strongest correlations were merely weak positive relationships with precipitation ($r = 0.248$) and distance from home ($r = 0.231$). Such low correlations suggest that daily screen time usage appears to be influenced by factors beyond the environmental and mobility metrics we measured.



Discussion

The lack of strong correlations between environmental/mobility factors and screen time can be attributed to several key limitations and external factors:

1. Schedule-Based Factors: The data doesn't account for work/study hours, meeting schedules, and regular daily routines which likely have a more direct impact on screen time than environmental conditions.
2. Content Consumption Patterns: Gaming sessions and the release of new shows/movies can lead to extended screen time regardless of weather conditions or location. Additionally, a significant confounding factor was identified in the sleep routine - the habit of falling asleep while watching videos (2-3 hours in length) artificially inflated screen time measurements, as the device continued to run despite the user being asleep.

3. Data Collection Limitations:

- The relatively small sample size (38 days) may not capture long-term patterns
- Screen time data doesn't distinguish between active usage and passive video playback
- The data collection period covered limited seasonal variation

These factors suggest that screen time is primarily driven by daily routines, content availability, and usage habits rather than environmental or mobility factors, explaining the weak correlations observed in our analysis.

Conclusion

Based on the comprehensive analysis of 38 days of data, we reject the hypothesis that "There is a significant correlation between daily screen time usage and (a) daily average temperature, (b) daily precipitation, (c) daily average distance from home, and (d) daily total distance traveled." The correlation analysis revealed only weak relationships, with correlation coefficients ranging from 0.003 to 0.248. The strongest correlations were found with precipitation ($r = 0.248$) and distance from home ($r = 0.231$), yet these values are too low to suggest any meaningful relationship.

The attempted machine learning models (Random Forest, Gradient Boosting, and Ensemble) further confirmed this lack of relationship, showing poor predictive performance. This indicates that environmental and mobility factors are not reliable predictors of daily screen time usage.

The findings suggest that screen time is more likely influenced by factors not captured in this study, such as daily routines, work schedules, content availability (like gaming sessions or new shows), and sleep habits - particularly the practice of falling asleep during video playback, which artificially inflates usage metrics. Future research might benefit from including these behavioral factors and implementing more precise active usage tracking methods.