Summary

Screen time usage is becoming an increasingly significant part of modern lifestyles.

With the rise of smartphones, tablets, and computers in daily routines, we aim to understand how much time university students spend on electronic devices, as well as how this relates to their health, habits, and overall digital well-being. We also explore which days tend to have the highest screen time and which types of applications are used the most.

Group 6

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Data Collection

We collected the data with a survey using Google Forms. Our target is people in different age groups. The survey is mostly in Thai and was accepting the result from April 12, 2025 until April 17, 2025, and 57 people responded to the survey.

The survey questions are :

1. What is your age?
2. What is your gender?
3. What is your weight (kg.) ?
4. What is your heart rate while answering the survey?
5. What is your approximate average sleeping duration (Hr.min) ?
6. How much screen duration did you spend on Sunday (Hr.min) ?
7. How much screen duration did you spend on Monday (Hr.min) ?
8. How much screen duration did you spend on Tuesday (Hr.min) ?
9. How much screen duration did you spend on Wednesday (Hr.min) ?
10. How much screen duration did you spend on Thursday (Hr.min) ?
11. How much screen duration did you spend on Friday (Hr.min) ?
12. How much screen duration did you spend on Saturday (Hr.min) ?
13. What is your most used application type?
14. How much notification did you receive on Sunday?
15. How much notification did you receive on Monday?
16. How much notification did you receive on Tuesday?
17. How much notification did you receive on Wednesday?
18. How much notification did you receive on Thursday?
19. How much notification did you receive on Friday?
20. How much notification did you receive on Saturday?
21. What is the current condition of your left eye?
    - 21.1 How is your eyesight (normal, near-sighted, far-sighted or Myopic Presbyopia) ?
        - 21.1.1 If you are near-sighted, how much?
        - 21.1.2 If you are far-sighted, how much?
        - 21.1.3 If you have compound vision, how much?
    - 21.2 Other abnormalities?
22. What is the current condition of your right eye (normal, near-sighted, far-sighted or compound vision) ?
    - 22.1 How is your eyesight (normal, near-sighted, far-sighted or Myopic Presbyopia) ?
        - 22.1.1 If you are near-sighted, how much?
        - 22.1.2 If you are far-sighted, how much?
        - 22.1.3 If you have compound vision, how much?
    - 22.2 Other abnormalities?

After we collected the data, we cleaned up the data. We found that there was data that

had the same answers in every question(both surveys have the same answer and the answers came from the example provided in the form) except gender and age, so we did not use their answers. Another problem is the respondents did not follow the instructions that we provided, so the answers might not be accurate.

We found that most of the respondents were Male with 52.2%, followed by female with 47.8%. Majority of the respondents are 18 19 years old (45.65%), followed by older ages.

If we grouped the data by type of application used the most per day, 58.7% of the respondents spent the most time on entertainment application, followed by social media with 34.8%, education with 4.3% and information reading with 2.2%.

If we grouped the data by day of week that the respondents spend their time on the screen the most, 23.9% of the respondents spent time on their screen on Sunday the most, followed by Thursday Tuesday, Wednesday Friday Saturday and Monday with 15.3%, 13.0% and 6.5% of the respondents respectively.

If we grouped the data by day of week that the respondents spend their time on the screen the least, 28.3% of the respondents spent time on their screen on Monday the least, followed by Thursday Saturday, Wednesday Sunday, Tuesday and Friday with 19.6%, 10.9%, 8.7% and 2.2% of the respondents respectively.

Methodology

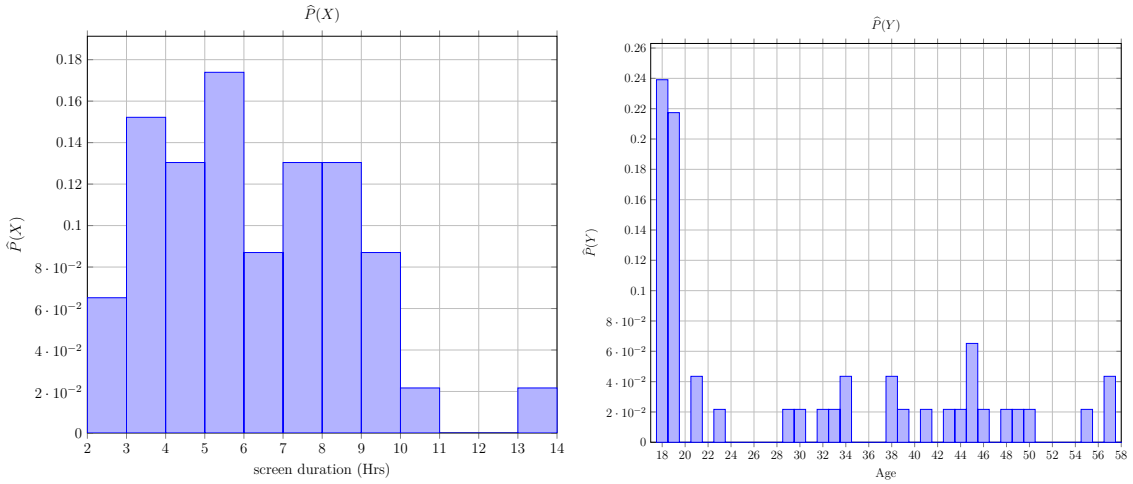
Probability

Screen time vs Age

y \ x	2	3	4	5	6	7	8	9	10	11	12	13	$\widehat{P}(Y)$	$y \cdot \widehat{P}(Y)$
	3	4	5	6	7	8	9	10	11	12	13	14		
18	0.0217	0.0652	0	0.0217	0	0.0217	0.0435	0.0435	0.0217	0	0	0	0.2391	4.3043
19	0	0	0.0217	0.0435	0.0435	0.0217	0.0217	0.0435	0	0	0	0.0217	0.2174	4.1304
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0.0217	0.0217	0	0	0	0	0	0.0435	0.913
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0.0217	0	0	0	0	0	0	0	0	0	0	0	0.0217	0.5
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	0.6304
30	0	0	0	0	0.0217	0	0	0	0	0	0	0	0.0217	0.6522
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0.0217	0	0	0	0	0	0	0	0	0	0.0217	0.6957
33	0	0	0.0217	0	0	0	0	0	0	0	0	0	0.0217	0.7173913
34	0	0	0	0	0	0.0435	0	0	0	0	0	0	0.0435	1.4783
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0.0217	0.0217	0	0	0	0	0	0	0	0	0.0435	1.6522
39	0	0	0	0	0	0.0217	0	0	0	0	0	0	0.0217	0.8478
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0.0217	0	0	0	0	0	0	0	0	0.0217	0.8913
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	0.9348
44	0	0	0	0.0217	0	0	0	0	0	0	0	0	0.0217	0.9565217
45	0	0	0	0.0217	0	0	0.0435	0	0	0	0	0	0.0652	2.9348
46	0	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	1.
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0.0217	0	0	0	0	0	0	0	0	0	0	0	0.0217	1.0435
49	0	0	0.0217	0	0	0	0	0	0	0	0	0	0.0217	1.0652
50	0	0	0	0.0217	0	0	0	0	0	0	0	0	0.0217	1.087
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0.0217	0	0	0	0	0	0	0	0.0217	1.19565217
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0.0217	0.0217	0	0	0	0	0	0	0	0	0	0.0435	2.4783
$\widehat{P}(X)$	0.0652	0.1522	0.1304	0.1739	0.087	0.1304	0.1304	0.087	0.0217	0	0	0.0217	$\widehat{E}(X)$	6.23913
midpoint	2.5000	3.5000	4.5000	5.5000	6.5000	7.5000	8.5000	9.5000	10.5000	11.5000	12.5000	13.5000	$\widehat{E}(Y)$	30.10870
mid $\cdot$ $\widehat{P}(X)$	0.163	0.5326	0.587	0.9565217	0.5652	0.9783	1.1087	0.8261	0.2283	0	0	0.2935		

The individual probability from the table comes from dividing frequency with the number of samples. $P[X]$ comes from summing the data for all columns. $P[Y]$ comes from summing the data for all rows. The expected value of X ($E[X]$) is 6.23913 which is calculated by summing all of $P[X]$ and the expected value of Y ($E[Y]$) is 30.10870 which is calculated by

summing all of $P[Y]$. The correlation coefficient is computed by using the formula $r = \frac{S_{X,Y}}{s_x s_y}$



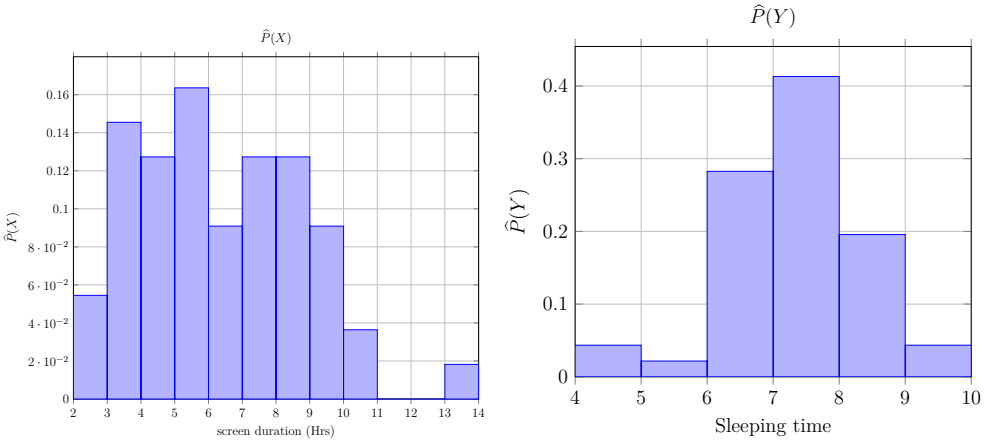
and $S_{X,Y} = \frac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \overline{X}\right)\left(y_i - \overline{Y}\right)$. In this case, $\overline{X} = 6.271, \overline{Y} = 30.1087, n = 46, s_x = 2.4862, s_y = 13.2031$. Therefore, $S_{X,Y} = -10.9625$ and $r = -0.3340$. Thus, the relation between X and Y has a weak negative relationship.

Screen time vs Sleeping time

y \ x		2	3	4	5	6	7	8	9	10	11	12	13	$\widehat{P}(Y)$	midpoint	mid $\cdot \widehat{P}(Y)$
		3	4	5	6	7	8	9	10	11	12	13	14			
4	5	0	0	0	0	0	0	0	0.0435	0	0	0	0	0.0435	4.5	0.1957
5	6	0	0	0	0.0217	0	0	0	0	0	0	0	0	0.0217	5.5	0.1195652
6	7	0	0.0217	0.0217	0.0435	0.0652	0.0435	0.0652	0	0.0217	0	0	0	0.2826	6.5	1.837
7	8	0.0217	0.0652	0.1087	0.087	0.0217	0.0652	0.0435	0	0	0	0	0	0.413	7.5	3.0978
8	9	0.0435	0.0435	0	0.0217	0	0.0217	0.0217	0.0435	0	0	0	0	0.1956522	8.5	1.6630435
9	10	0	0.0217	0	0	0	0	0	0	0	0	0	0.0217	0.0435	9.5	0.413
$\widehat{P}(X)$		0.0652	0.1522	0.1304	0.1739	0.087	0.1304	0.1304	0.087	0.0217	0	0	0.0217			
midpoint		2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5		$\widehat{E}(X)$	6.2391
mid $\cdot \widehat{P}(X)$		0.163	0.5326	0.587	0.9565217	0.5652	0.9783	1.1087	0.8261	0.2283	0	0	0.2935		$\widehat{E}(Y)$	7.3261

The individual probability from the table comes from dividing frequency with the number of samples. $P[X]$ comes from summing the data for all columns. $P[Y]$ comes from summing the data for all rows. The expected value of X ($E[X]$) is 6.23913 which is calculated by summing all of $P[X]$ and the expected value of Y ($E[Y]$) is 7.3261 which is calculated by summing all of $P[Y]$.

The correlation coefficient is computed by using the formula $r = \frac{S_{X,Y}}{s_x s_y}$ and $S_{X,Y} =$



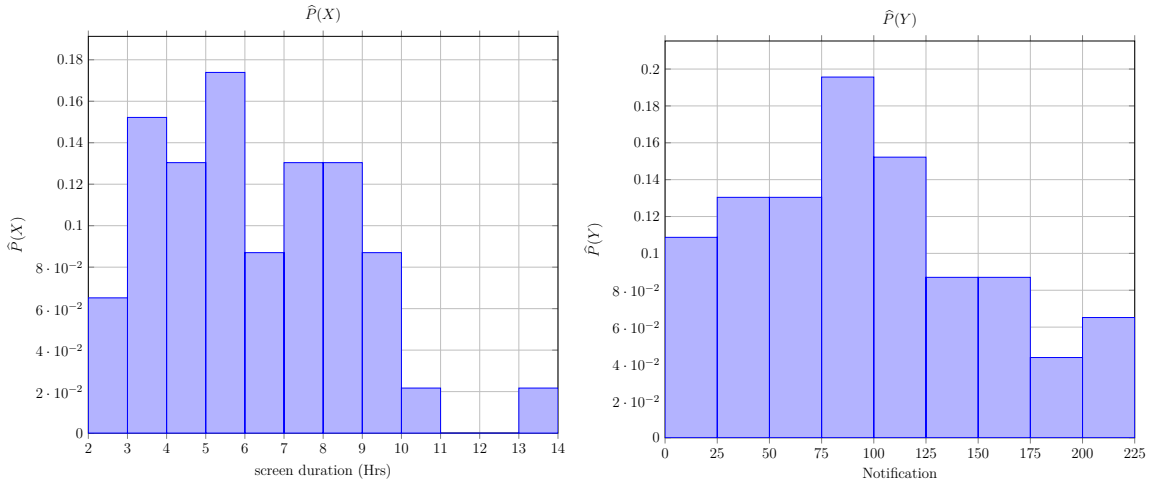
$\frac{1}{n-1}\sum_{i=1}^{n}\left(x_i-\overline{X}\right)\left(y_i-\overline{Y}\right)$. In this case, $\overline{X}=6.271, \overline{Y}=93.7671, n=46, s_x=2.4862, s_y=56.1233$. Therefore, $S_{X,Y}=24.6359$ and $r=0.1766$. Thus, the relation between X and Y has a weak negative relationship.

Screen time vs Notification

y \ x		2	3	4	5	6	7	8	9	10	11	12	13	$\widehat{P}(Y)$	midpoint	mid $\cdot\ \widehat{P}(Y)$
		3	4	5	6	7	8	9	10	11	12	13	14			
0	25	0.0217	0	0.0217	0.0652	0	0	0	0	0	0	0	0	0.1087	12.5	1.3587
25	50	0	0	0.0217	0	0.0217	0.0435	0.0217	0	0	0	0	0.0217	0.1304	37.5	4.8913
50	75	0.0217	0.0217	0	0.0435	0	0	0.0435	0	0	0	0	0	0.1304	62.5	8.1522
75	100	0.0217	0.0652	0.0217	0.0435	0.0435	0	0	0	0	0	0	0	0.1956522	87.5	17.1195652
100	125	0	0.0435	0.0217	0.0217	0.0217	0.0217	0	0.0217	0	0	0	0	0.1522	112.5	17.1196
125	150	0	0	0.0217	0	0	0	0.0217	0.0435	0	0	0	0	0.087	137.5	11.95652174
150	175	0	0	0	0	0	0.0652	0	0	0.0217	0	0	0	0.087	162.5	14.1304
175	200	0	0	0	0	0	0	0.0435	0	0	0	0	0	0.0435	187.5	8.1522
200	225	0	0.0217	0.0217	0	0	0	0	0.0217	0	0	0	0	0.0652	212.5	13.8587
$\widehat{P}(X)$		0.0652	0.1522	0.1304	0.1739	0.087	0.1304	0.1304	0.087	0.0217	0	0	0.0217			
midpoint		2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5		$\widehat{E}(Y)$	96.7391
mid $\cdot\ \widehat{P}(X)$		0.163	0.5326	0.587	0.9565	0.5652	0.9783	1.1087	0.8261	0.2283	0	0	0.2935		$\widehat{E}(X)$	6.2391

The individual probability from the table comes from dividing frequency with the number of samples. $P[X]$ comes from summing the data for all columns. $P[Y]$ comes from summing the data for all rows. The expected value of X ($E[X]$) is 6.23913 which is calculated by summing all of $P[X]$ and the expected value of Y ($E[Y]$) is 81.5217 which is calculated by summing all of $P[Y]$.

The correlation coefficient is computed by using the formula $r=\frac{S_{X,Y}}{s_x s_y}$ and $S_{X,Y}=$



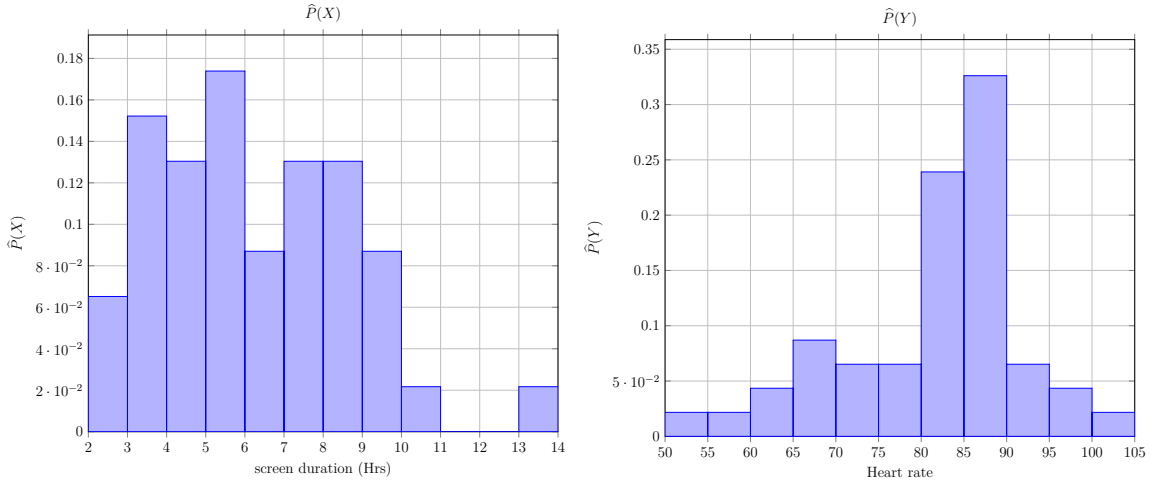
$\frac{1}{n-1}\sum_{i=1}^{n}\left(x_i-\overline{X}\right)\left(y_i-\overline{Y}\right)$. In this case, $\overline{X}=6.271, \overline{Y}=80.7174, n=46, s_x=2.4862, s_y=10.8805$. Therefore, $S_{X,Y}=-1.3246$ and $r=-0.0490$. Thus, the relation between X and Y has a weak negative relationship.

Screen time vs Heart rate

y \ x		2	3	4	5	6	7	8	9	10	11	12	13	$\widehat{P}(Y)$	midpoint	mid $\cdot \widehat{P}(Y)$
		3	4	5	6	7	8	9	10	11	12	13	14			
50	55	0	0	0	0	0	0	0.0217	0	0	0	0	0	0.0217	52.5	1.1413
55	60	0	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	57.5	1.25
60	65	0	0	0	0	0	0.0435	0	0	0	0	0	0	0.0435	62.5	2.7174
65	70	0	0	0	0	0.0217	0.0217	0.0217	0.0217	0	0	0	0	0.087	67.5	5.8696
70	75	0	0.0217	0	0.0217	0	0	0	0.0217	0	0	0	0	0.0652	72.5	4.7283
75	80	0	0.0435	0.0217	0	0	0	0	0	0	0	0	0	0.0652	77.5	5.0543
80	85	0.0217	0.0435	0.0435	0.0435	0.0217	0.0217	0.0217	0.0217	0	0	0	0	0.2391	82.5	19.72826087
85	90	0.0217	0.0217	0.0435	0.0652	0.0435	0.0435	0.0435	0.0217	0.0217	0	0	0	0.3261	87.5	28.5326
90	95	0	0	0	0.0435	0	0	0.0217	0	0	0	0	0	0.0652	92.5	6.0326
95	100	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	0.0435	97.5	4.2391
100	105	0	0	0.0217	0	0	0	0	0	0	0	0	0	0.0217	102.5	2.2283
$\widehat{P}(X)$		0.0652	0.1522	0.1304	0.1739	0.087	0.1304	0.1304	0.087	0.0217	0	0	0.0217			
midpoint		2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5		$\widehat{E}(X)$	6.2391
mid $\cdot \widehat{P}(X)$		0.163	0.5326	0.587	0.9565	0.5652	0.9783	1.1087	0.8261	0.2283	0	0	0.2935		$\widehat{E}(Y)$	81.5217

The individual probability from the table comes from dividing frequency with the number of samples. $P[X]$ comes from summing the data for all columns. $P[Y]$ comes from summing the data for all rows. The expected value of X ($E[X]$) is 6.23913 which is calculated by summing all of $P[X]$ and the expected value of Y ($E[Y]$) is 61.3043 which is calculated by summing all of $P[Y]$.

The correlation coefficient is computed by using the formula $r = \dfrac{S_{X,Y}}{s_x s_y}$ and $S_{X,Y} = \dfrac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \overline{X}\right)\left(y_i - \overline{Y}\right)$. In this case, $\overline{X} = 6.271, \overline{Y} = 80.7174, n = 46, s_x = 2.4862, s_y = 10.8805$. Therefore, $S_{X,Y} = -1.3246$ and $r = -0.0490$. Thus, the relation between X and Y has a weak negative relationship.

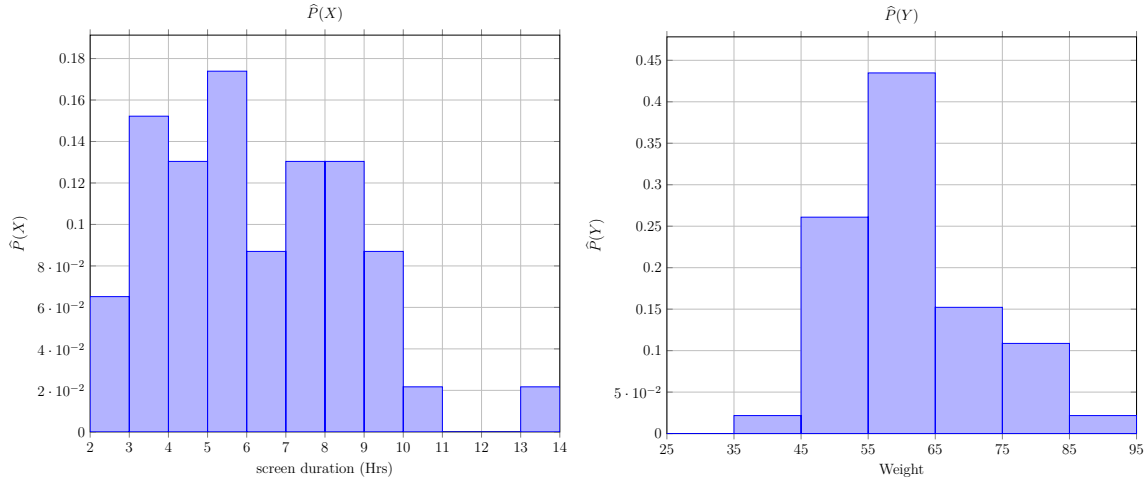


Screen time vs Weight

y \ x		2	3	4	5	6	7	8	9	10	11	12	13	$\widehat{P}(Y)$	midpoint	mid $\cdot \widehat{P}(Y)$
		3	4	5	6	7	8	9	10	11	12	13	14			
25	35	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0
35	45	0	0	0	0	0	0	0.0217	0	0	0	0	0	0.0217	40	0.8696
45	55	0	0.1087	0	0.0652	0	0.0435	0.0217	0.0217	0	0	0	0	0.2609	50	13.0435
55	65	0.0435	0.0217	0.0652	0.087	0	0.0435	0.0652	0.0652	0.0217	0	0	0.0217	0.4348	60	26.087
65	75	0.0217	0	0.0435	0.0217	0.0435	0.0217	0	0	0	0	0	0	0.1522	70	10.6522
75	85	0	0	0.0217	0	0.0435	0.0217	0.0217	0	0	0	0	0	0.1087	80	8.6957
85	95	0	0.0217	0	0	0	0	0	0	0	0	0	0	0.0217	90	1.9565
$\widehat{P}(X)$		0.0652	0.1522	0.1304	0.1739	0.087	0.1304	0.1304	0.087	0.0217	0	0	0.0217			
midpoint		2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5		$\widehat{E}(X)$	6.2391
mid $\cdot \widehat{P}(X)$		0.163	0.5326	0.587	0.9565	0.5652	0.9783	1.1087	0.8261	0.2283	0	0	0.2935		$\widehat{E}(Y)$	61.3043

The individual probability from the table comes from dividing frequency with the number of samples. $P[X]$ comes from summing the data for all columns. $P[Y]$ comes from summing the data for all rows. The expected value of X ($E[X]$) is 6.23913 which is calculated by summing all of $P[X]$ and the expected value of Y ($E[Y]$) is 61.3043 which is calculated by summing all of $P[Y]$.

The correlation coefficient is computed by using the formula $r = \frac{S_{X,Y}}{s_x s_y}$ and $S_{X,Y} = \frac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \overline{X}\right)\left(y_i - \overline{Y}\right)$. In this case, $\overline{X} = 6.271, \overline{Y} = 61.0587, n = 46, s_x = 2.4862, s_y = 10.3099$. Therefore, $S_{X,Y} = -0.3518$ and $r = -0.0137$. Thus, the relation between X and Y has a weak negative relationship.



Statistics

Descriptive Statistics

		Age	Weight (kg)	Heart Rate	Sleeping time (Hrs)	Average daily screen time (Hrs)	Average daily notification received
Count		55	55	55	55	55	55
Measure of Centrality	MEAN	29.182	61.97090909	80.89090909	7.310	6.577	103.751
	median	21.000	60	83	7.342	6.202	86.000
	mode	19	62.2	87	7.5	6.202380952	86
Measure of Dispersion	MIN	7.000	25.7	51	4.500	2.236	6.429
	MAX	57.000	111.1	111	10.533	16.671	357.000
	range	50.000	85.400	60.000	6.033	14.436	350.571
	variance	175.4478	194.3140	168.4323	1.4176	7.9495	5585.474088
	SD	13.2457	13.9397	12.9781	1.1906	2.8195	74.7360
	cv	0.4539	0.2249	0.1604	0.1629	0.4287	0.7203
	MAD	11.7752	9.9298	9.9451	0.8687	2.2193	56.00727273
	quartile1 (Q1)	19	52.5	73	6.5	4.569047619	49.14285714
	quartile3 (Q3)	43	67	88	8	8.316666667	146.7142857
	IQR	24	14.5	15	1.5	3.747619048	97.57142857
Outliers	Q1-1.5IQR	-17	30.75	50.5	4.25	-1.052380952	-97.21428571
	Q3+1.5IQR	79	88.75	110.5	10.25	13.93809524	293.0714286
	Outliers (based on IQR) If no outlier, answer None.	None	25.7, 93, 111.1	111	10.417, 10.533	16.671	294.857, 357.000
	MEAN-3SD	-10.5552	20.1519	41.9565	3.7379	-1.8814	-120.4574
	MEAN+3SD	68.9188	103.7899	119.8254	10.8818	15.0355	327.9587
	Outliers (based on SD) If no outlier, answer None.	None	111.1	None	None	16.671	357.000
	Mean after removing outliers based on IQR. If no outlier, type NA	NA	61.12692308	80.3333	7.1904	6.3901	95.367
	SD after removing outliers based on IQR. If no outlier, type NA	NA	10.63094107	12.4173	1.0355	2.4782	61.58689353

Goodness of Fit test

1. **Data set : Average screen duration**

   Type of distribution : Normal distribution

   Known parameter : 0

   Unknown parameter (m) : 2, which are μ, σ

   H_0 : Screen duration is normally distributed with $\mu = 6.2709$ and $\sigma = 2.4862$

   H_a : Screen duration is not normally distributed with $\mu = 6.2709$ and $\sigma = 2.4862$

   Number of cells with the expected number of samples (k) : 6

   Test static $\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} = 2.0956$

   Significant level (α) : 0.05

   Degree of freedom 1 (ν_1) : $k - 1 - m = 6 - 1 - 2 \Rightarrow 3$

   Cutoff of non-rejection region : 7.8147

   Degree of freedom 2 (ν_2) : $k - 1 = 6 - 1 \Rightarrow 5$

   Cutoff of rejection region : 11.070

   Non-rejection regions : $\chi^2 < \chi^2_{0.05,3} = 7.8147$

   Rejection regions : $\chi^2 \geq \chi^2_{0.05,5} = 11.070$

   Rejection decision : Don't need to reject null hypothesis

   Conclusion : Screen duration is normally distributed with $\mu = 6.2709$ and $\sigma = 2.4862$

2. **Data set : Average Sleeping Duration**

   Type of distribution : Normal distribution

   Known parameter : 0

   Unknown parameter (m) : 2, which are μ, σ

   H_0 : Screen duration is normally distributed with $\mu = 7.2178$ and $\sigma = 1.0068$

   H_a : Screen duration is not normally distributed with $\mu = 7.2178$ and $\sigma = 1.0068$

   Number of cells with the expected number of samples (k) : 4

   Test static $\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} = 1.3428$

   Significant level (α) : 0.05

   Degree of freedom 1 (ν_1) : $k - 1 - m = 4 - 1 - 2 \Rightarrow 1$

   Cutoff of non-rejection region : 3.8415

   Degree of freedom 2 (ν_2) : $k - 1 = 4 - 1 \Rightarrow 3$

   Cutoff of rejection region : 7.8147

   Non-rejection regions : $\chi^2 < \chi^2_{0.05,1} = 3.8415$

   Rejection regions : $\chi^2 \geq \chi^2_{0.05,3} = 7.8147$

   Rejection decision : Don't need to reject null hypothesis

   Conclusion : Screen duration is normally distributed with $\mu = 7.2178$ and $\sigma = 1.0068$

3. **Data set : Weight**

Type of distribution : Normal distribution

Known parameter : 0

Unknown parameter (m) : 2, which are μ, σ

H_0 : Screen duration is normally distributed with $\mu = 61.0587$ and $\sigma = 10.3099$

H_a : Screen duration is not normally distributed with $\mu = 61.0587$ and $\sigma = 10.3099$

Number of cells with the expected number of samples (k) : 6

Test static $\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} = 3.1761$

Significant level (α) : 0.05

Degree of freedom 1 (ν_1) : $k - 1 - m = 6 - 1 - 2 \Rightarrow 3$

Cutoff of non-rejection region : 7.8147

Degree of freedom 2 (ν_2) : $k - 1 = 6 - 1 \Rightarrow 5$

Cutoff of rejection region : 11.070

Non-rejection regions : $\chi^2 < \chi^2_{0.05,3} = 7.8147$

Rejection regions : $\chi^2 \geq \chi^2_{0.05,5} = 11.070$

Rejection decision : Don't need to reject null hypothesis

Conclusion : Screen duration is normally distributed with $\mu = 61.0587$ and $\sigma = 10.3099$

4. **Data set : Average Notification**

Type of distribution : Normal distribution

Known parameter : 0

Unknown parameter (m) : 2, which are μ, σ

H_0 : Screen duration is normally distributed with $\mu = 93.7671$ and $\sigma = 56.1233$

H_a : Screen duration is not normally distributed with $\mu = 93.7671$ and $\sigma = 56.1233$

Number of cells with the expected number of samples (k) : 6

Test static $\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} = 1.4815$

Significant level (α) : 0.05

Degree of freedom 1 (ν_1) : $k - 1 - m = 6 - 1 - 2 \Rightarrow 3$

Cutoff of non-rejection region : 7.8147

Degree of freedom 2 (ν_2) : $k - 1 = 6 - 1 \Rightarrow 5$

Cutoff of rejection region : 11.070

Non-rejection regions : $\chi^2 < \chi^2_{0.05,3} = 7.8147$

Rejection regions : $\chi^2 \geq \chi^2_{0.05,5} = 11.070$

Rejection decision : Don't need to reject null hypothesis

Conclusion : Screen duration is normally distributed with $\mu = 93.7671$ and $\sigma = 56.1233$

Hypothesis Test

1. **Data set : Average screen duration**

Test hypothesis claims that *average screen duration* is greater than 7 Hrs.

Collect data from 55 people. Sample mean sample standard deviation : 6.5771 & 2.8195 Hrs respectively.

Case of Hypothesis test : Large sample size

Upper-tailed, lower-tailed or two-tailed test : upper-tailed

7 steps test

1.1 Choose parameter of interest (μ)

Parameter : μ

1.2 Specify null value (μ_0) and null hypothesis (H_0)

$$\begin{aligned} \mu &: \text{average screen duration} \\ \mu_0 &: 7 \\ H_0 &: \mu = 7 \end{aligned} \tag{1}$$

1.3 State alternative hypothesis (H_a)

$$H_a : \mu > 7 \tag{2}$$

1.4 Compute test statistic (z)

$$z = \frac{\overline{X} - \mu_0}{\frac{S}{\sqrt{n}}} = \frac{6.2709 - 7}{\frac{2.4862}{\sqrt{46}}} \Rightarrow -1.989 \tag{3}$$

1.5 Indicate significance level (α) and find rejection region (z_a)

$$\begin{aligned} \alpha &: 0.05 \\ 1 - \alpha = 1 - 0.05 \quad &= 0.95 \\ z_a = z_{0.05} \quad &= 1.6449 \\ z &\geq 1.6449 \end{aligned} \tag{4}$$

1.6 Determine whether we reject null hypothesis or not

Test static does not fall inside the rejection region. Null hypothesis is not rejected.

1.7 Conclude the problem

We do not reject the null hypothesis. Average screen duration is 7 Hrs.

2. **Data set : Average notification**

Test hypothesis claims that *average notification* is greater than 100 times.
Collect data from 55 people. Sample mean sample standard deviation : 103.7506 & 74.7360 times respectively.

Case of Hypothesis test : Large sample size

Upper-tailed, lower-tailed or two-tailed test : upper-tailed

7 steps test

2.1 Choose parameter of interest (μ)

Parameter : μ

2.2 Specify null value (μ_0) and null hypothesis (H_0)

$$\begin{aligned} \mu &: \text{average notification} \\ \mu_0 &: 100 \\ H_0 &: \mu = 100 \end{aligned} \tag{5}$$

2.3 State alternative hypothesis (H_a)

$$H_a : \mu > 100 \tag{6}$$

2.4 Compute test statistic (z)

$$z = \frac{\overline{X} - \mu_0}{\frac{S}{\sqrt{n}}} = \frac{93.7671 - 100}{\frac{56.1233}{\sqrt{46}}} \Rightarrow -0.7532 \tag{7}$$

2.5 Indicate significance level (α) and find rejection region (z_a)

$$\begin{gathered} \alpha : 0.01 \\ 1 - \alpha = 1 - 0.05 \quad = 0.99 \\ z_a = z_{0.01} \quad = 2.3263 \\ z \geq 2.3263 \end{gathered} \tag{8}$$

2.6 Determine whether we reject null hypothesis or not

Test static does not fall inside the rejection region. Null hypothesis is not rejected.

2.7 Conclude the problem

We do not reject the null hypothesis. Average notification is 100 times.

Conclusion

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Appendix

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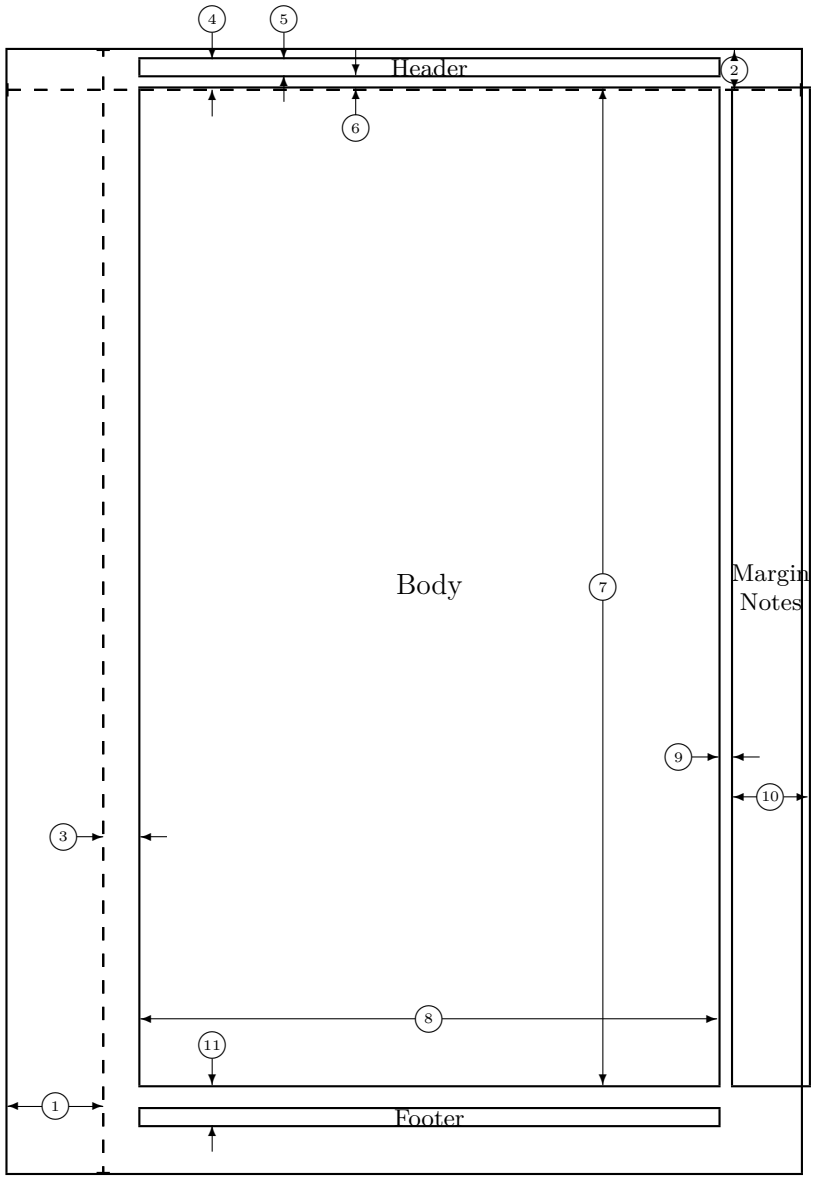

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