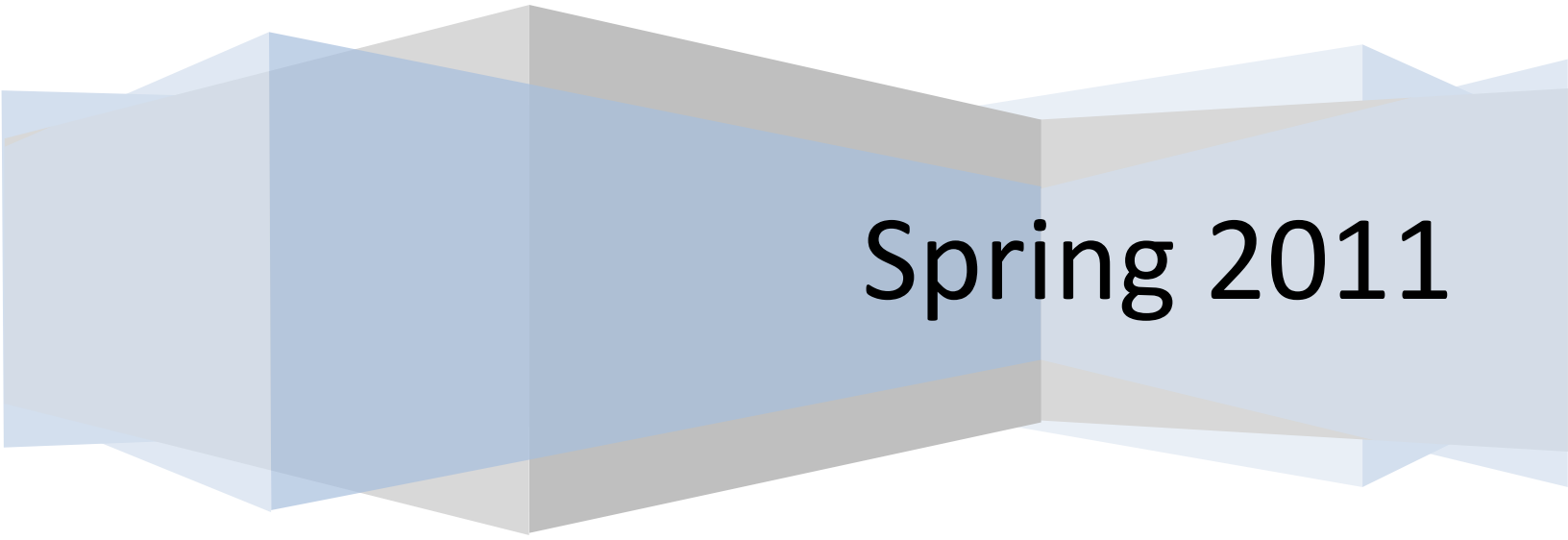
Math 10 – Tuesday Hybrid Class

Average time on Facebook

Hypothesis Testing Project – Single Population Mean

By Murali Velayutham & Kapil Dakhane



Spring 2011

Project Summary

Social Media is revolutionizing the lives of people and how they spend their time. There was one study conducted in Jan 2010, for the first time, shed some light on how much time people spend on online sites like Facebook and others. This study and its claim was the topic for our project.

The study can be found at the following URL

http://mashable.com/2010/02/16/facebook-nielsen-stats/

The article **claims** that the average time a user spends on the Facebook is 14 minutes per day. This is an example of Single Mean Population and will be validating using Single Mean Population Hypothesis Testing. We set up the null and alternate hypothesis for our testing from this claim as following:

Null Hypothesis: The average time a user sends on Facebook is 14 minutes/day

Alternate Hypothesis: The average time a user sends on Facebook is greater than 14 minutes/day.

In order to validate this hypothesis, we had to define the population to collect the sample data. The population we defined was - all my Facebook friends. The questionnaire that was posted on my Facebook account was – "How much time on average per day, do you spend on Facebook?" If all of my Facebook friends responded, we would have had about 200 data values and was planning to use simple random sampling from this to get about 60 sample data. However we only got about 65 responses and so we used this entire set as our sample data set. While organizing the data, we found that people responded the average time, in multiples of 15 minutes, so the frequency table for the data was constructed with 15 minutes interval bin. The distribution of the data closely resembled the bell shaped and was approximated to normal distribution. We used student-t test, since the standard deviation of the population was unknown. The calculation resulted in a sample average of 44.54 minutes and p-value of 0, which is the probability that the average is 44.54 or greater, if the null hypothesis is true. We compared the p-value with 5% significant level and had to reject the null hypothesis.

The conclusion of our test is that there are sufficient evident from our sample data that Facebook user is spending more than 14 minutes per day and hence reject the claim of the article.

The data actually suggests that Facebook users are spending on an average in-between 36.79 minutes to 52.28 minutes per day and we could state with 95% confidence that the true population mean is within this range. The point estimate of sample was 44.54 minutes

The Social Media landscape is so dynamic and growth in terms of number of users and connectivity devices/technologies are increasing exponentially making it easy for large number of people to stay connected and hence it is not surprising that the results of the study done one year ago, may not be validate anymore. So the result of our study is not unexpected.

Solution Sheet

Hypothesis Testing for Single Mean

a) Ho: $\mu = 14$

b) Ha: $\mu > 14$

c) In words, CLEARLY state what your random variable $\overline{X}$:

$\overline{X}$ = The average time (in minutes per day), a user spends on Facebook

d) State the distribution to use for the test.

Student-t distribution is used since we do not know the population standard deviation. We have n = 65 sample data values, so the degree of freedom (df) = 65-1 = 64

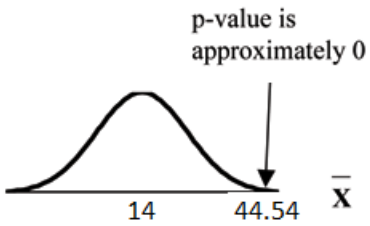
t_{64}

e) Test Statistic: t = 8.5212

f) p-value = 0

If the Ho true, then there is 0 (p-value) probability that the sample mean is greater than 44.54 minutes

g) Use the previous information to sketch a picture of this situation. CLEARLY, label and scale the horizontal axis and shade the region(s) corresponding to the p-value.



h) Indicate the correct decision ("reject" or "do not reject" the null hypothesis) and write appropriate conclusions, using COMPLETE SENTENCES.

Alpha: 0.05

Decision: Reject the null hypothesis (Ho)

R**eason for decision:** p-value is less than alpha.

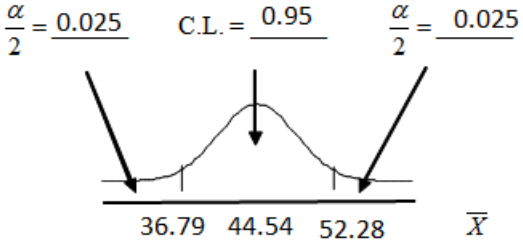
Conclusion: There is sufficient evidence that the average time a user spends on Facebook is greater than 14 minutes/day

i) Construct a 95% Confidence Interval for the true mean or proportion. Include a sketch of the graph of the situation. Label the point estimate and the lower and upper bounds of the Confidence Interval

Confidence Interval: (36.79, 52.28) and EBM = 7.75

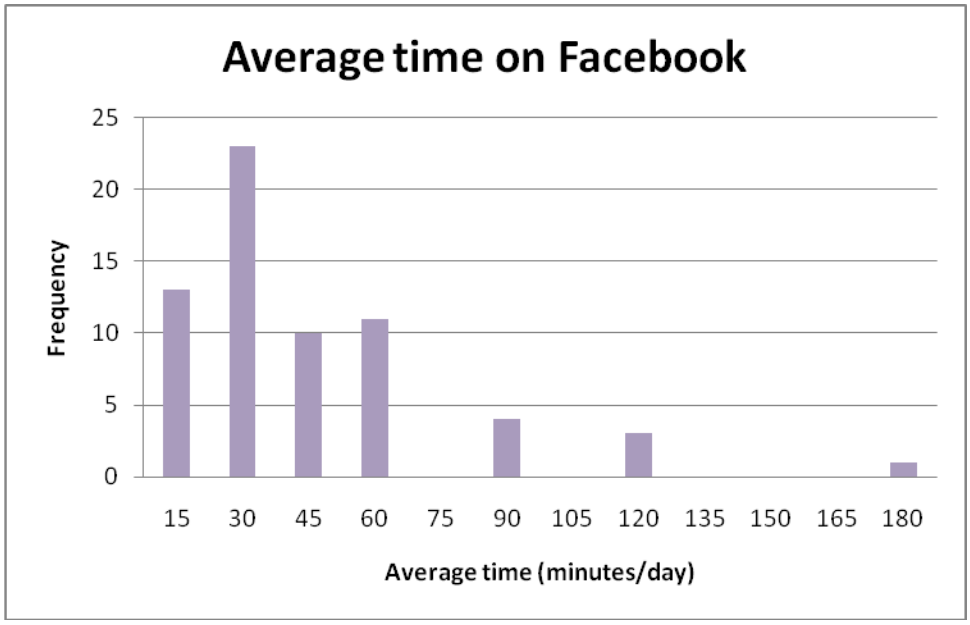
Average time on Facebook

We are 95% confident that the true population mean is between 36.79 and 52.28 minutes.



Graphic representation of your data

The summarized sample data is plotted as histogram and is shown below. The histogram shape closely resembles the bell shaped distribution but skewed to the right with a long right tail. There could be some potential outliers which is skewing the distribution. However the distribution can be approximated to normal distribution.



Raw data collected AND a table summarizing the sample data

The questionnaire that was post to our Facebook friends was:

"How much time on average per day, do you spend on Facebook?"

We received 65 responses to this questionnaire and the data is shown in the table (tally sheet) below:

Index	Average time (min/day)	Index	Average time (min/day)	Index	Average time (min/day)
1	90	23	10	45	20
2	60	24	30	46	120
3	15	25	15	47	60
4	15	26	60	48	5
5	15	27	120	49	30
6	30	28	45	50	90
7	30	29	30	51	60
8	30	30	90	52	30
9	5	31	60	53	10
10	20	32	45	54	90
11	5	33	120	55	20
12	20	34	20	56	30
13	20	35	60	57	60
14	45	36	15	58	60
15	30	37	20	59	45
16	60	38	15	60	60
17	15	39	45	61	15
18	45	40	180	62	30
19	30	41	30	63	30
20	30	42	30	64	20
21	45	43	60	65	45
22	45	44	45		

Average time on Facebook

The summarized frequency table for the raw data is shown below:

Average time (minutes/day)	Frequency
5	3
10	2
15	8
20	8
30	15
45	10
60	11
90	4
120	3
180	1

In order to plot the above frequency table with a uniform scale, a 15 minutes interval bin is selected. The bin value is set at the upper bound since the actual data value was at the upper bound of the bin. The final summarized table is as follows:

Average time (minutes/day)	Bin Average time (minutes/day)	Frequency
1-15	15	13
16-30	30	23
31-45	45	10
46-60	60	11
61-75	75	0
76-90	90	4
91-105	105	0
106-120	120	3

121-135	135	0
136-150	150	0
151-165	165	0
166-180	180	1

Article for the Project

http://mashable.com/2010/02/16/facebook-nielsen-stats/

The average U.S. Internet user spends more time on Facebook than on Google, Yahoo, YouTube, Microsoft, Wikipedia and Amazon **combined**. Think about that for a moment.

New numbers released by Nielsen today confirm what we've known for a while: Facebook is the web's number-one time sink. What's more interesting, though, is just how much more time we spend on the world's largest social network today than we did six months ago.

Back in June 2009, Nielsen estimated that the average U.S. user spent four hours and 39 minutes on Facebook per month. That's about 9.3 minutes per day in a 30-day month. In August, that number rose to five hours and 46 minutes, or 11.5 minutes per day.

In January 2010, though, the amount of time the average person spent on Facebook **jumped to more than seven hours**. Each American Facebook user spent an average of 421 minutes on Facebook per month, which amounts to more than 14 minutes per day. Even if you lump together the time spent on Google (1:23), Yahoo (2:09), YouTube (1:02), Microsoft/Bing (1:35) Wikipedia (0:15), and Amazon (0:22), it *still* doesn't beat Facebook.

Top 10 Web Brands for January 2010 (U.S., Home and Work)					
RANK	Brand	Unique Audience (000)	Time Per Person (hh:mm:ss)	MOM UA % Change	MOM Time % Change
1	Google	152,708	1:23:54	4.10%	-16.90%
2	Yahoo!	134,561	2:09:14	4.30%	-26.80%
3	Facebook	116,329	7:01:41	5.80%	9.70%
4	MSN/WindowsLive/Bing	109,425	1:35:33	1.20%	-18.10%
5	YouTube	99,525	1:02:27	7.60%	-10.30%
6	AOL Media Network	82,306	1:01:14	-6.80%	-57.80%
7	Wikipedia	64,917	0:15:59	10.70%	-2.70%
8	Fox Interactive Media	62,112	1:23:28	1.00%	-9.10%
9	Amazon	60,772	0:22:34	-8.60%	-32.90%
10	Ask Search Network	57,776	0:12:35	10.70%	-11.40%

Other references to the project article.

http://blog.nielsen.com/nielsenwire/online_mobile/facebook-users-average-7-hrs-a-month-in-january-as-digital-universe-expands/

http://www.briansolis.com/2010/02/time-spent-on-social-networks-up-82-around-the-wrold/