

Evaluation

8.1 Introduction

Due to the nature of the research carried out, evaluation of the project was carried out in two phases.

1. Evaluation of the developed software system (framework)
2. Analysis of the data collected and overall suitability of the parameters used to find emotions.

The evaluation process was carried out in a controlled laboratory environment.

8.2 Evaluation of the framework

The framework developed consists of two major parts, the web application and the desktop application. Interactions capturing subsystem was installed in laboratory desktop computers. The web application was hosted on a web server. The experiment methodology carried out to evaluate the framework is given in section 8.3 below.

8.3 Experiment Methodology

Experiment was carried out in a controlled laboratory environment. The interactions capturing software was developed to be used in such a system since low level event capturing is carried out and administrative privileges are needed for execution.

8.3.1 Introduction

A simulated e-Learning environment was setup at the computer laboratory of University of Moratuwa, Faculty of Information Technology. A set of students who are currently pursuing BSc in Information Technology course was selected as target sample used the system for this evaluation. Their interactions were captured while they were learning. A quiz was provided to obtain the final result. Also a sample survey was carried out to find out responses to emotional and content related parameters. A single lesson was used as the sample subject material. This was selected by the Faculty to be inline with the students' current learning sessions.

8.3.2 Experiment Environment Setup

The laboratory of Faculty of Information Technology was used in the experiment environment facility. Eight computers were used by the students for learning. All the desktop computers could not be utilized due to limitations such as viruses and hardware problems in the computers. E-learning web application was installed in a web server and provided the selected lesson materials to the students.

Following were setup before conducting the experiment.

- E-Learning web application with following information fed into the system
 - o Student details
 - o Subject details – Lesson content in pages, Lesson specific and content specific parameter values, popup details, quiz and answers, as described in the design documents (Chapter 7)
- Interactions capturing sub system was installed in each desktop computer in the lab.

8.3.3 Target sample details

Target samples were decided by the Faculty of Information Technology. This consists of two major categories, students and subjects. Also the laboratory facilities were provided by the faculty.

8.3.3.1 Sample of Students

The students following Object Oriented Programming subject in their first year course was used as the sample set of students for the final experiment. A testing evaluation session was carried out with a set of final year students prior to the final evaluation. During this session, certain bugs were identified and fixed before conducting the final session. Also the feedback obtained from that session was used to enhance the capabilities of the system and the parameters to be tested. The sample size used is 16 due to the limitations in the facility.

8.3.3.2 Sample Subject

A lesson timed for 20 minutes, of the BSc 1st year course of subject object oriented concepts was selected for the experiment. Students are expected to complete studying the lesson within 20 minutes but were not restricted to strictly stop after 20 minutes

Subject content was provided in consecutive pages. Students can navigate through the pages as they wish while studying. As per the nature of the content provided, students were asked feedback questions. These focused on student's emotional state and how the student feels about the material provided. Interactions pertaining to subject specific parameter values, subject content pages specific parameter values were captured. The expected parameter values were later calculated for some parameters and the others were provided by the faculty. The above mentioned, questions and answers; quiz questions and answers were provided by the faculty. Application groups and related times that could be used in the subject were provided by the faculty. Following table shows specific information that is required to calculate the parameter values.

Parameter	Information required
X_1 = Deviation from expected time spent on a content page	Expected time to spend on the page for all pages
X_2 = Deviation from expected time spent using application programs defined for the subject	List of application programs relevant to the subject, expected to be used by the student and expected time to be spent on an application.
X_3 = Relevancy of Applications used	List of application programs relevant to the subject, expected to be used by the student
X_4 = Time spent on Relevant Applications used	List of application programs relevant to the subject, expected to be used by the student
X_5 = Content feedback Index	Feedback questions (MCQ format), answer options and rating for the option which will categorize the student's understanding of the lesson as very good (4), good(3), average (2), poor (1).
X_6 = Emotions feedback index	Student's direct feedback on emotions while studying is obtained at different phases of study. Question formats etc are as above.
X_7 = Deviation from total subject duration	Expected time for lesson (20 Minutes). <i>Students are allowed to take additional time for studying or they may complete before allocated 30 minutes.</i>

Table 8.1: Information required to find parameter values and expected parameter values

The quiz consisted of 05 MCQ questions. All the students will be given the same set of questions. The questions are given in Appendix E.

Due to the nature of the lesson, the set of students participated in the experiment and by analyzing the data collected; following parameters were removed since they do not contribute to the final result

Parameter	Reason
X_8 = Keyword usage index	Taking notes, etc on subject matter was expected but there was no keywords/ words typed in this session to an extent to provide sufficient data for analysis
X_9 = Profile rating	All students were from the same batch, and were from the same background. Hence there was no way to rate them but to give them the same rating which would not contribute to analysis.

Table 8.2: Excluded Parameters

8.3.4 Experiment execution

Students were provided with their login information when they enter the laboratory. Also a brief introduction about the experiment and what is expected from them were provided before the session. They were informed that their interactions will be captured and will be asked to study in their normal behavior, though these processes are carried out. Computers were be numbered and assigned to a particular student for a particular time slot. A student's interactions capturing was started when he logs into the system.

The students were be given a final quiz upon completing the study material. Once the quiz is started, students were not allowed to refer other material, applications etc.

Two experiment sessions for 8 students each were conducted within the allotted time. Interaction details captured in the desktop computers for each student were collected for analysis after the sessions. Also the rest of the information was tracked from the web application.

8.4 Data collection

The summary of data collected for each student for each parameter is given below.

8.4.1 X_1 : Deviation from expected time spent on a content page

Nineteen content pages were used in the experiment. Actual times spent on a content page in minutes are as follows. Table 8.4 shows a sample of Average of Variance from expected time spent on content page.

Time spent on a page is defined by deducting the time spent on other application programs while using the page. The total time spent on a page is calculated by the duration between entering and exiting a particular page.



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Actual Time Spent on a Content Page in Seconds																			
Student ID	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
BSCSTU06	37	11	14	15	39	31	2	15	13	42	47	42	39	79	41	36	56	64	90
BSCSTU07	25	23	10	20	2	3	16	36	0	0	20	0	28	15	24	28	15	74	39
BSCSTU09	51	32	40	8	84	3	18	80	9	90	50	35	38	27	26	16	30	6	33
BSCSTU10	117	43	4	40	12	13	0	22	52	37	29	4	7	13	16	12	49	2	78
BSCSTU11	15	1	2	11	21	10	4	33	9	28	38	9	23	37	37	22	2	46	18
BSCSTU12	56	48	28	16	56	13	56	48	98	18	13	18	0	1	13	37	22	6	29
BSCSTU13	19	23	7	38	38	19	22	109	54	10	28	36	25	15	21	19	23	10	18
BSCSTU14	28	39	12	9	8	49	21	58	5	27	9	40	22	23	7	2	1	6	108
BSCSTU15	5	29	7	14	4	16	7	31	19	25	10	4	24	9	7	9	63	39	89
BSCSTU16	2	12	9	10	18	42	69	13	131	4	1	4	1	2	1	1	2	44	9
BSCSTU20	136	54	70	33	13	75	47	2	0	8	45	0	41	54	44	9	60	11	61
BSCSTU21	52	59	15	18	62	38	23	13	14	52	14	67	61	12	17	46	31	73	93
BSCSTU22	75	21	32	31	104	57	21	35	22	58	48	46	19	37	19	31	51	58	85
BSCSTU23	17	20	11	6	5	34	31	25	12	35	43	21	19	9	13	10	24	48	64
BSCSTU24	31	43	59	47	48	27	5	28	30	46	13	44	15	78	80	42	57	5	164
BSCSTU25	93	74	79	29	76	43	45	38	25	43	29	11	1	17	32	31	2	20	64
Average Time	47.4	33.3	24.9	21.6	36.9	29.6	24.2	36.6	30.8	32.7	27.3	23.8	22.7	26.8	24.9	21.9	30.5	32.0	65.1

Table 8.3: Actual time spent on a content page in seconds

Deviation of Time Spent on a Content Page in Seconds

Student ID	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	Average (mins)
BSCSTU06	-10.4	-22.3	-10.9	-6.6	2.1	1.4	-22.2	-21.6	-17.8	9.3	19.7	18.2	16.3	52.3	16.1	14.1	25.5	32.0	24.9	2.0
BSCSTU07	-22.4	-10.3	-14.9	-1.6	-34.9	-26.6	-8.2	-0.6	-30.8	-32.7	-7.3	-23.8	5.3	-11.8	-0.9	6.1	-15.5	42.0	-26.1	-3.3
BSCSTU09	3.6	-1.3	15.1	-13.6	47.1	-26.6	-6.2	43.4	-21.8	57.3	22.7	11.2	15.3	0.3	1.1	-5.9	-0.5	-26.0	-32.1	1.2
BSCSTU10	69.6	9.8	-20.9	18.4	-24.9	-16.6	-24.2	-14.6	21.2	4.3	1.7	-19.8	-15.7	-13.8	-8.9	-9.9	18.5	-30.0	12.9	-0.4
BSCSTU11	-32.4	-32.3	-22.9	-10.6	-15.9	-19.6	-20.2	-3.6	-21.8	-4.7	10.7	-14.8	0.3	10.3	12.1	0.1	-28.5	14.0	-47.1	-3.5
BSCSTU12	8.6	14.8	3.1	-5.6	19.1	-16.6	31.8	11.4	67.2	-14.7	-14.3	-5.8	-22.7	-25.8	-11.9	15.1	-8.5	-26.0	-36.1	-0.2
BSCSTU13	-28.4	-10.3	-17.9	16.4	1.1	-10.6	-2.2	72.4	23.2	-22.7	0.7	12.2	2.3	-11.8	-3.9	-2.9	-7.5	-22.0	-47.1	-0.6
BSCSTU14	-19.4	5.8	-12.9	-12.6	-28.9	19.4	-3.2	21.4	-25.8	-5.7	-18.3	16.2	-0.7	-3.8	-17.9	-19.9	-29.5	-26.0	42.9	-1.6
BSCSTU15	-42.4	-4.3	-17.9	-7.6	-32.9	-13.6	-17.2	-5.6	-11.8	-7.7	-17.3	-19.8	1.3	-17.8	-17.9	-12.9	32.5	7.0	23.9	-3.0
BSCSTU16	-45.4	-21.3	-15.9	-11.6	-18.9	12.4	44.8	-23.6	100.2	-28.7	-26.3	-19.8	-21.7	-24.8	-23.9	-20.9	-28.5	12.0	-56.1	-3.4
BSCSTU20	88.6	20.8	45.1	11.4	-23.9	45.4	22.8	-34.6	-30.8	-24.7	17.7	-23.8	18.3	27.3	19.1	-12.9	29.5	-21.0	-4.1	2.5
BSCSTU21	4.6	25.8	-9.9	-3.6	25.1	8.4	-1.2	-23.6	-16.8	19.3	-13.3	43.2	38.3	-14.8	-7.9	24.1	0.5	41.0	27.9	2.5
BSCSTU22	27.6	-12.3	7.1	9.4	67.1	27.4	-3.2	-1.6	-8.8	25.3	20.7	22.2	-3.7	10.3	-5.9	9.1	20.5	26.0	19.9	4.2
BSCSTU23	-30.4	-13.3	-13.9	-15.6	-31.9	4.4	6.8	-11.6	-18.8	2.3	15.7	-2.8	-3.7	-17.8	-11.9	-11.9	-6.5	16.0	-1.1	-2.3
BSCSTU24	-16.4	9.8	34.1	25.4	11.1	-2.6	-19.2	-8.6	-0.8	13.3	-14.3	20.2	-7.7	51.3	55.1	20.1	26.5	-27.0	98.9	4.3
BSCSTU25	45.6	40.8	54.1	7.4	39.1	13.4	20.8	1.4	-5.8	10.3	1.7	-12.8	-21.7	-9.8	7.1	9.1	-28.5	-12.0	-1.1	2.4

Table 8.4: Deviation of time spent on a content page to – data for parameter X1

8.4.2 X₂: Deviation from expected time spent using application groups defined for the subject

While using the system the students were allowed to use web browsers to browse relevant material, word processors to take notes. These are considered as learning aid. In addition system related applications that are tracked such as start menu programs, desktop, task bar are also treated as allowed software in this analysis since students can not continue their learning process without accessing such utilities. All the other applications used are considered as irrelevant applications.

A sample of such data collected is given in Appendix F

Table 8.5 shows a sample of final results obtained for parameter X₂.

StudentID	Time spent on relevant Application Group(seconds)	Deviation from average (seconds)	Deviation from average (minutes)
BSCSTU06	102.00	61	1.01
BSCSTU07	61.00	102	1.42
BSCSTU09	155.00	8	0.08
BSCSTU10	211.00	(48)	(0.48)
BSCSTU11	101.00	62	1.02
BSCSTU12	328.00	(165)	(2.45)
BSCSTU13	172.00	(9)	(0.09)
BSCSTU14	172.00	(9)	(0.09)
BSCSTU15	277.00	(114)	(1.54)
BSCSTU16	270.00	(107)	(1.47)
BSCSTU20	182.00	(19)	(0.19)
BSCSTU21	319.00	(156)	(2.36)
BSCSTU22	109.00	54	0.54
BSCSTU23	3.00	160	2.40
BSCSTU24	80.00	83	1.23
BSCSTU25	59.00	104	1.44
Average	163		

Table 8.5: Deviation from expected time spent using application programs defined for the subject

8.4.3 X₃: Relevancy of Applications used

Number of relevant application groups used (as mentioned above) was tracked with time stamps and relevancy index was calculated. The details of application groups are discussed in Section 8.4.2 and Table 8.6 shows a sample of final results obtained for parameter X₃.

Student_ID	No Of Relavant App Groups Used	Total No of Apps used	X3
BSCSTU06	2	6	33%
BSCSTU07	2	3	67%
BSCSTU09	2	3	67%
BSCSTU10	2	5	40%
BSCSTU11	1	1	100%
BSCSTU12	2	6	33%
BSCSTU13	2	4	50%
BSCSTU14	2	4	50%
BSCSTU15	2	3	67%
BSCSTU16	2	5	40%
BSCSTU20	2	6	33%
BSCSTU21	2	4	50%
BSCSTU22	2	3	67%
BSCSTU23	2	3	67%
BSCSTU24	1	4	25%
BSCSTU25	2	2	100%

Table 8.6: Relevancy of Applications used

8.4.4 X₄: % Time spent on Relevant Applications used

The time spent on relevant application groups and irrelevant application groups were tracked as above X₂ calculations. Table 8.7 shows a sample of final results obtained for parameter X₄.

Student_ID	Time spent on Relevant Applications used	Time spent on irrelevant Applications used	% Time spent on Relevant Applications used
BSCSTU06	102	306	25%
BSCSTU07	61	12	84%
BSCSTU09	155	8	95%
BSCSTU10	211	211	50%
BSCSTU11	101	-	100%
BSCSTU12	328	821	29%
BSCSTU13	172	184	48%
BSCSTU14	172	126	58%
BSCSTU15	277	31	0%
BSCSTU16	270	34	89%
BSCSTU20	182	182	50%
BSCSTU21	319	264	55%
BSCSTU22	109	11	91%
BSCSTU23	3	56	5%
BSCSTU24	80	101	44%
BSCSTU25	59	-	100%

Table 8.7: % Time spent on Relevant Applications used

8.4.5 X₅: Content feedback Index

Feedback on the content was obtained from students by asking questions. They were given options to choose. The details of the questions asked are given in Appendix E.

Table 8.8 shows the ratings given for understanding content obtained from students.

Ability to understand content	Rating
Very Easy	4
Easy	3
Moderately difficult	2
Very Difficult	1

Table 8.8: Rating given for understanding content feedback

A sample of results obtained for this parameter are given in Table 8.9

Student ID	Content Feedback
BSCSTU06	3
BSCSTU07	2
BSCSTU09	2
BSCSTU10	2
BSCSTU11	2
BSCSTU12	3
BSCSTU13	2
BSCSTU14	2
BSCSTU15	3
BSCSTU16	3
BSCSTU20	4
BSCSTU21	3
BSCSTU22	3
BSCSTU23	3
BSCSTU24	3
BSCSTU25	3

Table 8.9: Content feedback Index

8.4.6 X_6 : Emotions feedback index

Feedback on the emotions while learning was obtained from students by asking questions. They were given options to choose. The details of the questions asked are given in Appendix E. Table 8.10 shows the ratings given for emotional states obtained from students.

Emotional State	Rating
Interested in the subject	4
Confused about the subject	2
Bored to learn the subject	1
Hopefulness to Research more on subject	3

Table 8.10: Ratings given for feedback on emotional states

A sample of results obtained for this parameter are given in Table 8.11

Student ID	Emotions Feedback
BSCSTU06	4
BSCSTU07	4
BSCSTU09	3
BSCSTU10	3
BSCSTU11	4
BSCSTU12	4
BSCSTU13	3
BSCSTU14	3
BSCSTU15	4
BSCSTU16	2
BSCSTU20	4
BSCSTU21	3
BSCSTU22	3
BSCSTU23	4
BSCSTU24	2
BSCSTU25	4

Table 8.11: Emotions feedback index

8.4.7 X₇: Deviation from total subject duration

Total time allocated for the lesson is 20 minutes by the faculty. The time deviation of students to complete the lesson from this was taken as the final parameter. A sample of results are given in table 8.12.

Student_ID	Actual Time Spent on Lesson (Seconds)	Deviation from Expected time to be spent (Minutes)
BSCSTU06	1,115.00	(1.25)
BSCSTU07	592.00	10.48
BSCSTU09	936.00	4.64
BSCSTU10	793.00	6.87
BSCSTU11	428.00	12.92
BSCSTU12	886.00	5.54
BSCSTU13	795.00	6.85
BSCSTU14	654.00	9.46
BSCSTU15	790.00	6.90
BSCSTU16	540.00	11.00
BSCSTU20	1,121.00	1.59
BSCSTU21	1,460.00	(4.20)
BSCSTU22	1,132.00	1.48
BSCSTU23	720.00	8.00
BSCSTU24	1,359.00	(2.39)
BSCSTU25	1,136.00	1.44

Expected Time to be spent (Minutes)

20.00

Table 8.12: Deviation from total subject duration



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8.5 Data Analysis and Results

A sample of finalized values obtained for each parameter for each student in the experiment is listed in Table 8.13. The regression analysis results are given in Table 8.14.

	X1	X2	X3	X4	X5	X6	X7		Y
Student ID	Average of Variance from expected time spent on content page	Time Deviation from AppGroup	Relevancy of Number of Applications used X3	Time spent on Relevant Applications used	Content feedback Index	Emotions feedback index	Variance from total subject duration		Actual Quiz Mark
BSCSTU06	2.00	1.01	0.33	0.25	3.00	4.00	(1.25)		40%
BSCSTU07	(3.35)	1.42	0.67	0.84	2.00	4.00	(10.08)		40%
BSCSTU09	1.23	0.08	0.67	0.95	2.00	3.00	(4.24)		80%
BSCSTU10	(0.43)	(0.48)	0.40	0.50	2.00	3.00	(6.47)		80%
BSCSTU11	(3.47)	1.02	1.00	1.00	2.00	4.00	(12.52)		20%
BSCSTU12	(0.17)	(2.45)	0.33	0.29	3.00	4.00	(5.14)		80%
BSCSTU13	(0.59)	(0.09)	0.50	0.48	2.00	3.00	(6.45)		40%
BSCSTU14	(1.59)	(0.09)	0.50	0.58	2.00	3.00	(9.06)		80%
BSCSTU15	(3.02)	(1.54)	0.67	-	3.00	4.00	(6.50)		100%
BSCSTU16	(3.38)	(1.47)	0.40	0.89	3.00	2.00	(11.00)		40%
BSCSTU20	2.50	(0.19)	0.33	0.50	4.00	4.00	(1.19)		40%
BSCSTU21	2.47	(2.36)	0.50	0.55	3.00	3.00	4.20		60%
BSCSTU22	4.17	0.54	0.67	0.91	3.00	3.00	(1.08)		60%
BSCSTU23	(2.26)	2.40	0.67	0.05	3.00	4.00	(8.00)		60%
BSCSTU24	4.29	1.23	0.25	0.44	3.00	2.00	2.39		80%
BSCSTU25	2.39	1.44	1.00	1.00	3.00	4.00	(1.04)		80%

Table 8.13: Parameter values for analysis

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.54
R Square	0.29
Adjusted R Square	0.13
Standard Error	0.21
Observations	40

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	7	0.56	0.08	1.84	0.11
Residual	32	1.40	0.04		
Total	39	1.96			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.58	0.24	2.44	0.02	0.10	1.06	0.10	1.06
X Variable 1	(0.00)	0.01	(0.06)	0.95	(0.02)	0.02	(0.02)	0.02
X Variable 2	(0.00)	0.00	(1.36)	0.18	(0.00)	0.00	(0.00)	0.00
X Variable 3	(0.18)	0.24	(0.73)	0.47	(0.68)	0.32	(0.68)	0.32
X Variable 4	0.14	0.13	1.09	0.28	(0.12)	0.40	(0.12)	0.40
X Variable 5	0.03	0.07	0.43	0.67	(0.11)	0.18	(0.11)	0.18
X Variable 6	(0.01)	0.05	(0.27)	0.79	(0.12)	0.09	(0.12)	0.09
X Variable 7	0.01	0.01	1.40	0.17	(0.00)	0.02	(0.00)	0.02

Table 8.14: Regression analysis results

The regression model is given as follows

$$\hat{Y}_i = 0.58 - 0.001X_{1i} - 0.001X_{2i} - 0.179X_{3i} + 0.141X_{4i} + 0.031X_{5i} - 0.013X_{6i} + 0.008X_{7i}$$

8.5.1 Overall effectiveness of X_i in explaining Y_i

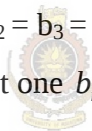
$R^2 = 0.29$ indicates that the model, as a whole, explains 29% of the variation in the dependant variable. This is not a significant value.

F – Statistic is used to test how well a set of independent variables collectively explain the variation in the dependant variable. That is, the F statistic is used to test whether at least one X_i ($i = 1$ to 7) explains a significant portion of the variation of Y_i .

Null hypothesis,

$H_0: b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = 0$ versus alternative hypothesis

H_a : at least one $b_i \neq 0$.



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The decision rule to reject H_0 is $F > F_C$, where F = calculated F value, and F_C = Critical F value from F table. The outcome of the test is as follows.

$$F = 1.84$$

$F_C = 1.91$ at 90% significance level for numerator degrees of freedom = 7 and denominator degrees of freedom = 32,

Since $F < F_C$ the null hypothesis is not rejected at 10% level of significance, i.e., at least one of the seven X_i ($i = 1$ to 7) is significantly not different than 0.

8.5.2 Significance of the individual independent variables

The contribution of individual variables in explaining the dependent variable is indicated by the significance of the slope coefficient. This is tested by the t-statistic.

$H_0: b_i = 0$ versus alternative hypothesis

$H_a: b_i \neq 0$,

for $i = 1$ to 7

The decision rule; to reject H_0 if $t_{b_i} > +t_c$, or $t_{b_i} < -t_c$ where t_{b_i} = calculated t value, and t_c = critical t value from t table.

$t_c = \pm 1.69$ for 10% significant level at 32 degrees of freedom (two tailed test)

The outcome of the test is as follows.

	<i>t Stat</i>	<i>Result</i>	<i>Interpretation</i>
b_0	2.44	> 1.69	Reject H_0
b_1	-0.06	> -1.69	Cannot reject H_0
b_2	-1.36	> -1.69	Cannot reject H_0
b_3	-0.73	> -1.69	Cannot reject H_0
b_4	1.09	< 1.69	Cannot reject H_0
b_5	0.43	< 1.69	Cannot reject H_0
b_6	-0.27	> -1.69	Cannot reject H_0
b_7	1.40	< 1.69	Cannot reject H_0

Table 8.15: t-test results

Hence, it is evident that none of the independent variables have slope coefficients that are significantly different from 0 at the 10% level of significance

But, the intercept term statistically significant.

Tests for Serial correlation, Heteroskedastisity and Multicolenearity were not carried out since the model is statistically not significant for the experimental data.

8.6 Analysis conclusion

The model with the tested parameters statistically does not show a significant correlation to marks and hence it can not be concluded that they can be used as parameters to identify emotions in e-Learning environment with the collected set of data.



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