

Empirical Software Engineering (SE-404)

LAB A1-G2

Laboratory Manual



Department of Software Engineering

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Submitted to: -

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S.No.	EXPERIMENT	DATE	REMARKS
10.	Perform a comparison of the following data analysis tools. WEKA, KEEL, SPSS, MATLAB, R.	04-01-2022	
1.	Consider any empirical study of your choice (Experiments, Survey Research, Systematic Review, Postmortem analysis and case study). Identify the following components for an empirical study: a. Identify parametric and nonparametric tests b. Identify Independent, dependent and confounding variables c. Is it Within-company and cross-company analysis? d. What type of dataset is used? Proprietary and open-source software	18-01-2022	
2.	Defect detection activities like reviews and testing help in identifying the defects in the artifacts (deliverables). These defects must be classified into various buckets before carrying out the root cause analysis. Following are some of the defect categories: Logical, User interface, Maintainability, and Standards. In the context of the above defect categories, classify the following statements under the defect categories.	25-01-2022	
3.	Consider any prediction model of your choice. a. Analyze the dataset that is given as a input to the prediction model b. Find out the quartiles for the used dataset c. Analyze the performance of a model using various performance metrics.	25-01-2022	
8.	Why is version control important? How many types of version control systems are there? Demonstrate how version control is used in a proper sequence (stepwise).	01-02-2022	
9.	Demonstrate how Git can be used to perform version control?	01-02-2022	
11.	Validate the results obtained in experiment 3 using 10-cross validation, hold out validation or leave one out cross-validation.	15-02-2022	
4.	Consider defect dataset and perform following feature reduction techniques using Weka tool. Validate the dataset using 10-cross validation. a. Correlation based feature evaluation b. Relief Attribute feature evaluation c. Information gain feature evaluation d. Principle Component	23-02-2022	

5.	<p>Online loan system has two modules for the two basic services, namely Car loan service and House loan service. The two modules have been named as Car_Loan_Module and House_Loan_Module. Car_Loan_Module has 2000 lines of uncommented source code. House_Loan_Module has 3000 lines of uncommented source code. Car_Loan_Module was completely implemented by Mike. House_Loan_Module was completely implemented by John. Mike took 100 person hours to implement Car_Loan_Module. John took 200 person hours to implement House_Loan_Module. Mike's module had 5 defects. John's module had 6 defects. With respect to the context given, which among the following is an INCORRECT statement? Identify the null and alternate hypotheses for the followings options. Justify and Choose one:</p> <ul style="list-style-type: none">a. John's Quality is better than Mike's Qualityb. John's Productivity is more than Mike's Productivityc. John introduced more defects than Miked. John's Effort is more than Mike's Effort.		
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EXPERIMENT 5

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Experiment Objective:- Online loan system has two modules for the two basic services, namely Car loan service and House loan service. The two modules have been named as Car_Loan_Module and House_Loan_Module. Car_Loan_Module has 2000 lines of uncommented source code. House_Loan_Module has 3000 lines of uncommented source code. Car_Loan_Module was completely implemented by Mike. House_Loan_Module was completely implemented by John. Mike took 100 person hours to implement Car_Loan_Module. John took 200 person hours to implement House_Loan_Module. Mike's module had 5 defects. John's module had 6 defects. With respect to the context given, which among the following is an INCORRECT statement? Identify the null and alternate hypotheses for the following options.

Justify and Choose one:

- a. John's Quality is better than Mike's Quality
- b. John's Productivity is more than Mike's Productivity
- c. John introduced more defects than Mike
- d. John's Effort is more than Mike's Effort.

Introduction:- Hypothesis testing in statistics is a way for you to test the results of a survey or experiment to see if you have meaningful results. You're basically testing whether your results are valid by figuring out the odds that your results have happened by chance. If your results may have happened by chance, the experiment won't be repeatable and so has little use. Hypothesis testing can be one of the most confusing aspects for students, mostly because before you can even perform a test, you have to know what your null hypothesis is. Often, those tricky word problems that you are faced with can be difficult to decipher. But it's easier than you think; all you need to do is:

- 1. Figure out your null hypothesis,
- 2. State your null hypothesis,
- 3. Choose what kind of test you need to perform,
- 4. Either support or reject the null hypothesis.

NULL hypothesis: The null hypothesis states that a population parameter (such as the mean, the standard deviation, and so on) is equal to a hypothesized value. The null hypothesis is often an initial claim that is based on previous analyses or specialized knowledge.

Alternate hypothesis: The alternative hypothesis states that a population parameter is smaller, greater, or different than the hypothesized value in the null hypothesis. The alternative hypothesis is what you might believe to be true or hope to prove true.

Result:-

For John,

Size = 3000 LOC

Effort = 200 person-hours Defect = 6

Productivity = size/effort = $3000/200 = 15$ LOC/person-hours

Quality = defect/size = $6 / 3000 = 0.02$ defect/size

For Mike,

Size = 2000 LOC

Effort = 100 person-hours Defect = 5

Productivity = size/effort = $2000/100 = 20$ LOC/person-hours

Quality = defect/size = $5 / 2000 = 0.025$ defect/sizes

Mike implemented Car_Loan_Module having 4000 uncommented SLOC and took 200 person-hours of effort with the final module having 5 defects.

John implemented House_Loan_Module having 5000 uncommented SLOC and took 300 person-hours of effort with the final module having 6 defects.

(a) The quality of the code can be expressed in terms of defect density i.e. number of defects per lines of code.

Mike's code's defect density = $5/4000 = 0.00125$ defects/SLOC

John's defect density = $6/5000 = 0.00120$ defects/SLOC

The higher the defect density, the lower is the quality of the code. So, John's quality is better than Mike's. Hence the null hypothesis is correct.

(b) Productivity = Size/Effort

Mike's productivity = $4000/200 = 20$ SLOC/person-hours

John's Productivity = $5000/300 = 16.667$ SLOC/person-hours

John's productivity is less than Mike's

Hence the null hypothesis is incorrect.

(c) John introduced 6 defects while Mike introduced 5. Clearly, John introduced more defects than Mike. Hence the null hypothesis is correct.

(d) John's effort is 300 person-hours, while Mike's effort is 200 person-hours. Clearly, John's effort is more than Mike's. Hence the null hypothesis is correct.

Learning from experiment:- Through this experiment we were able to learn about Null hypothesis, Alternative hypothesis and Hypothesis Testing.