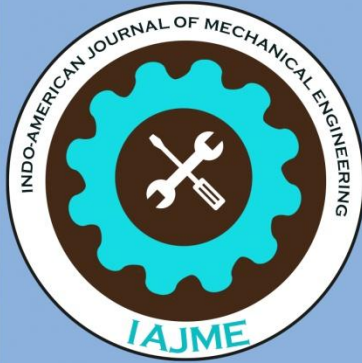




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STATISTICAL ANALYSIS OF VULNERABILITY FOR OBJECT ORIENTED SOFTWARE

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ABSTRACT

Software quality is a critical factor in reducing software vulnerability. Client difficulties are addressed while being dependable, which is especially important for software whose source code should be limited in susceptibility for rebuilding and updating for any framework. Rework in succeeding phases is reduced when vulnerability is minimised at the design stage. There is currently no effective measure, method, or approach available to mitigate susceptibility during the design phase. To solve this issue, we developed an approach based on statistical research that is capable of providing accurate predictions of security vulnerabilities in terms of design attributes.

Keywords: Vulnerability, Software quality, Design Metrics

I INTRODUCTION

When it comes to lowering software vulnerability, software quality is crucial. Client issues are resolved while maintaining dependability, which is critical for applications whose source code should be resistant to rebuilding and upgrading for any framework. When vulnerability is minimised at the design stage, rework in subsequent phases is decreased. At the moment, there is no effective measure, method, or approach for mitigating susceptibility during the design phase. To address this problem, we created a statistically-based technique capable of accurately predicting security vulnerabilities in terms of design attributes.

II MODEL DEVELOPMENT

Three design metrics list measures for estimating external, internal, and quality in usage aspects. A statistical model is a mathematical model that encapsulates a set of statistical hypotheses about the age of some example data and comparison data from a larger population. A statistical model refers to the data-gathering process, which is frequently idealised. Mathematical equations that relate one or more random variables and maybe other non-random variables are frequently used to specify a statistical model. In order to establish the relationship between two separate items, first establish the relationship between two different objects.

Then we'll undertake the statistical analysis to justify it [8].

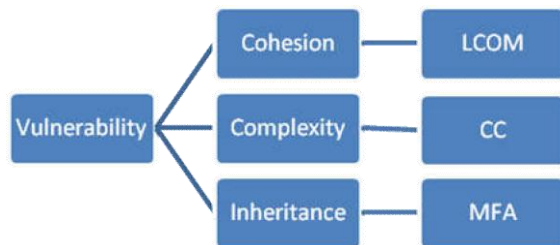


Fig 1 Correlation structure

The structure of the proposed multivariate model is as follows: In order to construct a model for availability, the following multivariate model is proposed:

$$Y = 0 + 1X_1 + 2X_2 + \dots + nX_n$$

Where

- The dependent variable is Y.
- The variables X₁, X₂, X₃, and X_n are all independent variables.
- The regression coefficient of the relevant independent variable is 1, 2,... n.

- The regression intercept is 0

$$CC = 0.560 - 0.475 * LCOM + 0.481 * MFA + 0.117 * Vulnerability$$

2.1 DATA ANALYSIS (1) (2)

Data analysis is a critical component of model evaluation and correctness. The model evaluations used a 1.7 windows project from a variety of sources [7]. The standard values were derived from [2]. In order to assess vulnerability, three suitable measures were used. As a result, the calculated index is displayed in data table 1.

Table 1 Data Analysis

Model	R	R Square	Adjusted Square	Std. Error of the Estimate
a. Predictors: (Constant) MFA, LCOM, CC	.979 ^a	.959	.950	.033950

Table 2 Model Summary

Project	LCO M	MF A	CC	Know n	culated Index
P1	.787	.712	1.50 0	.680	.70 4
P2	.311	.455	.600	.711	.70 1
P3	.883	.442	1.98 0	.501	.58 4
P4	.667	.769	1.40 0	.697	.77 7
P5	1.00 0	.867	.667	.571	.58 0
P6	.625	.860	.857	.783	.77 7
P7	.700	.884	2.66 7	.955	.96 5
P8	.850	.788	1.27 3	.689	.68 4
P9	.925	.481	1.63 4	.449	.54 3
P10	.946	.624	1.37 5	.582	.57 2
P11	.750	.545	.857	.545	.56 6
P12	.815	.692	.800	.501	.60 0
P13	.714	.391	1.26 7	.586	.55 7
P14	.667	.932	2.00 0	.914	.92 6
P15	.873	.607	1.19 2	.531	.57 7
P16	.571	.588	2.95 5	.989	.91 7

P17	.400	.857	1.333	.891	.938
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Descriptive Statistics			
	Mean	Std. Deviation	N
Cal_VUL	.70399	.151914	17
LCOM	.73434	.186437	17
MFA	.65841	.167737	17
CC	1.43269	.660159	17

Table 3 Descriptive Statistics

Table 2 In addition to the 'Coefficients' table, the regression results include three other tables, but we're only interested in the 'Model summary' table, which contains information about the regression line's ability to account for the aggregate variation in the reliant variable. Table3 Descriptive statistics are short descriptive coefficients that condense a provided informational index, which might be a representation of the entire population or a representative sample of it. Measures of focal propensity and measures of fluctuation, or spread, are two types of descriptive statistics [9].

III EMPIRICAL VALIDATION

Empirical evidence is data that verifies if a claim is true (exactly compares to the real

Table 4 Validity Check

	Mean	N	Std. Deviation	Std. Error Mean	P-value
	n				
	valu				

world) or false (mistake). According to empiricists, one can claim to know something only if empirical evidence supports it (albeit a few empiricists trust that there are different methods for picking up knowledge).

This differs from the standard procedure, in which reason or contemplation alone is considered proof of reality or misrepresentation of a few suggestions. Information obtained through sense or experimentation is referred to as empirical proof. Vulnerabilities, according to this investigation, are a critical issue for software products. As a result, we use the 2t test to determine the model's validity.

	e				
Standard vulnerability	.68088	17	.171482	.041591	0.58
Calculated vulnerability	.70399	17	.151914	.036844	

Zero Level Hypotheses: The terms "standard vulnerability" and "calculated vulnerability" are interchangeable.

One Level Hypothesis: The terms "standard vulnerability" and "calculated vulnerability" are interchangeable.

CONCLUSION

We discovered a link between object-oriented metrics and vulnerability in our research. We conducted an empirical study on vulnerability. The following is a summary of the work: We started by establishing a link between design metrics and vulnerability. We used analysis approaches in addition to statistical methods to build a proposed model for vulnerability-prone classes and evaluate their performance. We determined that the metrics LCOM, MFA, and CC are major indicators of vulnerability because they were chosen following feature subset selection for vulnerability minimization.

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