Risk Assessment Strategy Performance Measure Using Confusion Matrix

Kunamneni Avinash, Betha Yasaswi, D Naga Malleswari

Abstract— Software Risk Evaluation is a software engineering process for identification, risk estimation and developing mitigation strategies for risks in software intensive system. Risk assessment is incorporation of two tasks risk analysis and risk management, i.e., it identifies risks through systematic processes and as certain the consequences, and then see how to diminish the risks. There are number of risk evaluation methodologies that specialize in various categories of risk andmultiple areas of concern. Risk assessment means to completely learn about the degree of the risks, prioritize the risks and categorize the risks. In this paper we propose a software risk assessment using a machine learning and specifically the problem of statistical classification. We have used a classification model Confusion Matrix because it requires correct description of the target system. We have used the confusion matrix to identify and assess the risk.

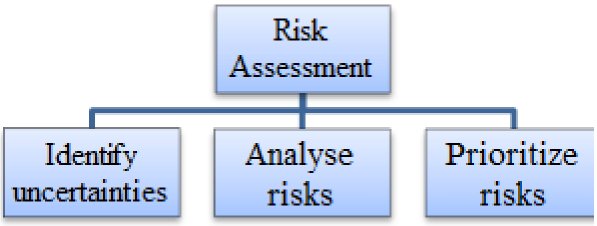
Keywords: Risk, Risk assessment, Risk Management, Confusion Matrix

INTRODUCTION

Risk is a drawback which may or may not occur that will cause in depth losses and threats for various organisational proced- ures. InComputer Science-related fields, risks can come fromnetworks, the Int- ernet, malicious codes or users,loopholes and from physical security. There will be many risks in creating high quality software. Risks may affect many aspects of software like cost, quality, schedule and many. In the field of software engineering,Risk Management is a crucial discipline. The method of riskmanagement embodies the identification, analysis, planning,tracking, and communication of risk. Firstly all possible risks need to be identified. Then the risks have to be analysed for their seriousness and impact on software. After analysis, proper planning needs to be done to assess the risks and apply suitable measures. This does not end the process here but there should be monitoring to have a track of identified risks and assessment process so that upcoming risks can be kept away. Doing risk management gives an idea of chances of uncertainties that may occur in future which will impact the software. It helps to identify risks, understand them and further be able to take care that the risks are reduced and will not hinder the success of the software.

Implementing a systematic risk management can reduce the risks as well as their adverse effect on software. This will help the software to improve its performance, quality and overall aspects of the software.

Risk assessment is a part of risk management. It identifies risks and studies the likelihood, effect of risk on software and how endurable the identified risk is. Then it further helps in taking a measure or action to eliminate or reduce the risk or its impact on software.Risk assessment has three basic elements and they are identify uncertainties, analyse Risks and Prioritize risks.



Elements of Risk Assessment

To identify uncertainties is to take a look at the full software and identify areas of vulnerabilities. Analyse risks is to describe the likelihood of risks occurring and seriousness of the effect of those risks on the software. Prioritise risks is to indicate which risks need immediate attention for removing them completely as they have a possibly severe impact on software, which need normal attention, which need slight attention and can be avoided. Risk assessment helps in risk management so as to minimize the effects of risks on the software, contributing to a quality software.

LITERATURE SURVEY

The Software may have the risks of the below mentioned categories. There may be several categories but in this paper we are discussing some major risks which commonly occur in an organization

Revised Version Manuscript Received on March 08, 2019.

Kunamneni Avinash, Student, Department of Computer Science & Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India (email : avinash.kunamneni@gmail.com)

Betha Yasaswi, Student, Department of Computer Science & Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India

D Naga Malleswari, Assistant. Professor, Department of Computer Science & Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India (email : nagamalleswary@kluniversity.in)

Risk Checklist:

Organization

It includes level of commitment given to project being done. People from management,testing team,QA and other concerned. Major risks that can affect organization have to be seen.

Funding

The funds for project are sufficient is to be seen.Is there accuracy in budget estimate made?

People

Is there sufficient staff there to work?
Is it required to give the staff additional training?
What is their experience in work?
Is staff available when needed?
Time
Is the schedule made practical?
What is the importance of deadline?
How crucial is that the delivery date?
Is there extra time available to make any changes ?
Is there time to redo task due to mistake made?

Business Risks

What if a contestant reaches the market first?
Is there going to be profit ?
Is there guarantee of the value of cash for time and capital cost invested?
If the contract with main suppliers is not possible?

Technical Risks

Is success quantifiable?
Are the requirements clear and under- standing of it is there properly?
Is the time intervals for each development of project short and obstinate

Technological risks

Has the technology been proven?
Are utilise objectives reasonable?
Is success hooked in to new or untried merchandise, services or technologies, new or on trail hardware, software or techniques?

The assessment of all the above mentioned risks are very essential because if they are not assessed and mitigated they might cause a severe damage to thesoftware product and as well as the organization. As the risk assessment is a crucial step in risk management, in this paper we are proposing a method confusion matrix which is also called as error matrix.A confusion matrix is a table that is frequently used to portray the execution of a characterization model (or "classifier") on a lot of test information for which the genuine values are known.

Why Confusion Matrix ?

In normal classification algorithms we get only whether yes or no for a given problem.

But whereas by using the confusion matrix we can get the percentage of happening an event (Accuracy Rate) and the percentage of not happening an event (Error Rate). With the help of these accuracy and error rate we can easily identify the risk present in the software.

METHODOLOGY: CONFUSION MATRIX

The confusion matrix is the one amongst the foremost and wide used performance measuring techniques for classification models. It is super easy to understand; tough its terminology is a bit confusing.A confusion matrix is also be called an error matrix.There are 2 types of classifications: "yes" and "no." If we've got to predict the presence of a happening, then "yes" would mean that that event has occurred, and "no" would mean the opposite, i.e. it didn't happen.

		Actual Value	
		Positives	Negatives
Predicted Value	Positives	**TP** **True Positive**	**FP** **False Positive**
	Negatives	**FN** **FalseNegative**	**TN** **TrueNegative**

Definition Of Trems:

Positive (P) : Observation is positive (for example: is a car).
True Negative (N) : Perception is not positive(for example: is not a car).
True Positive (TP) : Perception is posit- ive, and is foretold to be positive.
False Negative (FN) : Perception is posit- ive , but is foretold negative.
True Negative (TN) : Perception is negat- ive, and is foretold to be negative.
False Positive (FP) : Perception is negat- ive, but is foretold positive.

Let us consider an example for the better understanding of the terms and complete meaning of the terms used in confusion matrix

EXAMPLES AND RESULT

Let us consider an example of fire alarm
True Positive(TP): If a fire alarm turns on in case of fire.
False Positive(FP): If a fire alarm turns on in case there is no fire. [Type 1 Error]

False Negative(FN): If a fire alarm doesn’t turn on in case there is a fire. [Type 2 Error]

True Negative(TN): If a fire alarm remains off in case there is no fire.

Accuracy Rate can be calculated with the help of below formulae i.e,

Accuracy Rate = (TP+TN)/Total

Error Rate can be calculated with the help of below formulae i.e,

Error Rate = (FP+FN)/Total

For the risk analysis using confusion matrix we have to fix the prior threshold value. There are many approaches for selecting thresholds, and ROC analysis is a quite powerful methodology.

ROC Analysis:

ROC analysis is particularly useful for threshold selection if your classes each have different misclassification costs, e.g. in medical fields false positive classifications are more tolerable than false negatives. ROC analysis can easily let you do cost-sensitive threshold selection that will let you select your threshold optimally for accuracy.

The receiver operating characteristic (ROC)curve could be a 2 dimensional graph inside which the false positive rate is plotted on the X hub and furthermore the genuine positive rate is plotted on the Y axis.In a Receiver operating Characteristic (ROC) curve the true positive rate (Sensitivity) is plotted against the false positive rate (Specificity) for various cut-off points.

Every point on the roc curve represents a sensitivity/specificity combine equivalent to a specific call threshold.

CONCLUSION

One of the most important task regarding software to be taken care is risk assessment and risk management. Identifying risks is the initial step so we here consider some categories of risks and then proceed. There are different methods to assess risk like precision and recall, logistic regression, Classification and regression and few others . In this paper we are using confusion matrix to assess the risk quantitatively. Confusion matrix is a widely used method for measuring performance and is very easy to understand. It helps to get an idea of risksoccurring easily. It gives a superior thought of what is going on right and alongside that what blunders are happening. So this method facilitates to understand and determine the performance of the software.

REFERENCES

1. Maruf Pashal, Ghazia Qaiser1, Urroj Pasha2 “ A critical Analysis of Software Rsk Management Techniques in Large Scale Systems” 2169-3536© 2018 IEEE.
2. Mohd. Sadiql, Mohd. Wazih Ahmad Md. Khalid Imam Rahmani “Software Risk Assessment and Evaluation Process (SRAEP) using Model BasedApproach” 201O International Conference on Networking and Information Technology
3. Barbara Kitchenham, Stephen Link ma n,"Estimates, Uncertainty and Risk”, IEEE Software, pp.69-74,1997.
4. Burairah Hussian, and Norhaziah Md Salleh. “Top Fifty Software Risk Factors and the Best Thirty Risk Mangement Techniquesin software Development Lifecycle for Successful Software Projects” International Journal of Hybrid Information Technology 9.6(2016):11-32.
5. Sangaiah, Arun Kumar,et al.”Towards an efficient risk assessmentin software projects-Fuzzy reinforcement paradigm.” Computers & Electrical Engineering(2017).
6. Huang, Shi-Ming, et al.”Assessing risk in ERP Projects:identify and prioritize the factors.” Industrial management & data systems 104.8 (2004):681-688.
7. Roberts, Martha Grabowski Karlene (1997).”Risk Mitigation in Large-Scale Systems:Leassons from High Reliability Organizations”.
8. Xin He;Brandom D.Gallas;Eric C.Frey “Three-Class ROC Analysis Toward a General Decision Theoretic Solution: IEEE
9. Thomas C.W. Landgrebe ; Robert P.W. Duin “Efficient Multiclass ROC Approx imation by Decomposition via Confusion Matrix Perturbation Analysis” IEEE
10. Ronaldo Cristiano Prati ; Gustavo Enrique Almeida Prado Alves Batist a ; Maria Carolina Monard” Evaluating Classifiers Using ROC Curves”
11. Boehm, Barry W. "Software risk management: principles and practices." IEEE software 8.1 (1991): 32-41.
12. Mohamed Ghazouani, Sophia Faris, Hicham Medromi, Adil Sayouti,” Information Security Risk Assessment- A Practical Approach with a Mathematical Formulation of Risk” International Journal of Computer Applications(0975-8887) Volume 103- No.8,2014
13. Abdullahi Mohamud Sharif, Shuib Basri, “Software risk assessment: A review on small and medium software projects, International conference on software engineering and computer systems