

PRP Special Assignment

Probabilistic Model for Lie Detection

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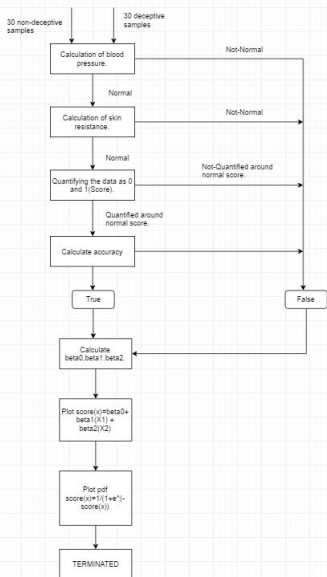
Background

The polygraph test is a significant method for lie detection which is used to determine changes in certain body activities as blood pressure, pulse, breathing, and perspiration, the results of which may be interpreted to indicate the truth or falsity of a person's answers under questioning

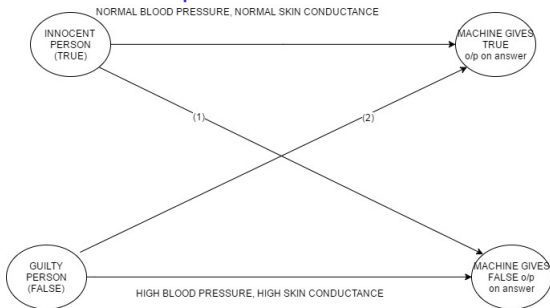
Motivation

Also lie detectors can be used for improving the accuracy in justice. It is fully an uncertain event and probability of truth or false is included in its every decision which includes a number of factors to decide on and it is still not developed with accuracy to give its decisions accurate.

For the probabilistic Model



For the error part



(1) INNOCENT PERSON but still out of stress has high B.P and conductance though he is not guilty(the error of machine)

(2) GUILTY PERSON having normal B.P & skin conductance while answering (deceptive by nature)

Model of score and PDF for deception

- We have considered 2 predictor variables namely Blood Pressure and Skin Conductance and we want $\Pr(\text{deception}/x)$
- So, statistical model for classification of prediction mostly involve the following structure
Response variable = $g(\text{predictor variables})$
- Represent the response variable as an indicator variable y , such that $y = 0$ when the subject is guilty and $y = 1$ when the subject is innocent. So we estimate y on the basis of predictor variables X and the function g , for linear logistic regression models with 2 predictor variables
- $\text{Score}(x) = b_0 + b_1.x_1 + b_2.x_2$ where b_0, b_1, b_2 are constants
Where $x_1 = \text{Blood pressure}$ And $x_2 = \text{skin Conductance}$ And the response of interest would be $\Pr(\text{deception}/x) = \Pr(y/x) = \exp(\text{score}(x)) / (1 + \exp(\text{score}(x)))$

Model of error in giving the judgement

calculating error

Let us assume of taking equal samples of true and innocent people

So $P(\text{TrueP}) = P(\text{FalseP}) = 0.5$

And we have the stat that $P(\text{TrueM}/\text{TrueP}) = 0.82$ and

$P(\text{FalseM}/\text{FalseP}) = 0.98$

So We get $P(\text{TrueM}/\text{FalseP}) = (1 - P(\text{FalseM}/\text{FalseP})) = 0.02$

$P(\text{FalseM}/\text{TrueP}) = (1 - P(\text{TrueM}/\text{TrueP})) = 0.18$

So

$P(\text{machine error}) = P(\text{TrueM}/\text{FalseP}) * P(\text{FalseP}) +$

$P(\text{FalseM}/\text{TrueP}) * P(\text{TrueP}) = 0.02 * 0.5 + 0.18 * 0.5 = 0.1$ (i.e)

machine has an error of 10 percent in the data which it gets

Steps

- 1 Load the data file in matlab
- 2 Declare X as predictor variables and y as binary classification variable
- 3 Plot the data of skin conductance vs blood pressure
- 4 Now we compute the cost and the gradient of our data with all cases and predictor variables
- 5 Then in the cost function we compute the sigmoid function
- 6 Then we compute the the accuracy based on predictions and plot the final PDF

RESULTS and INFERENCES

Accuracy and Beta values

0.4431

0.7693

0.0647

>> accuracy

accuracy =

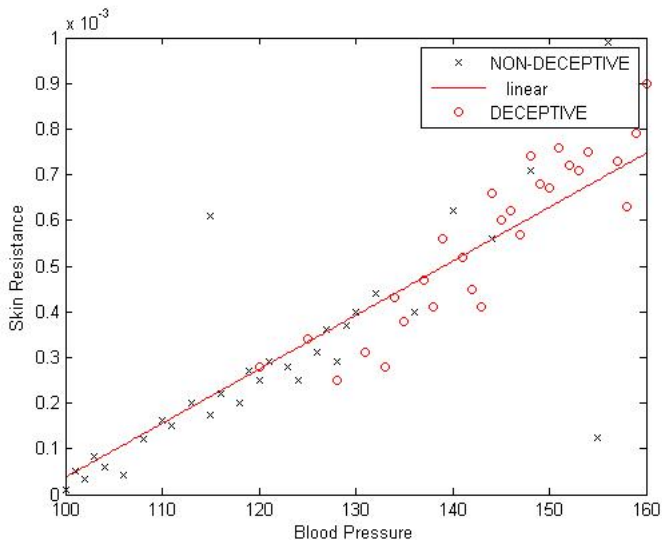
91.9355

f_x >> |

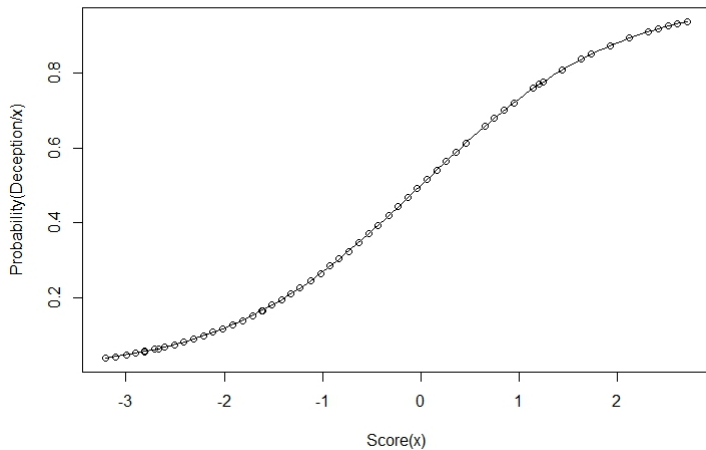
1	12.4917
2	-0.0978
3	-51.3621
4	
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RESULTS and INFERENCES

Score(x)



PDF plot for deception



The future scope

The lie detection theory can be of great help to catch hold of the terrorists and to save huge destruction to occur This would be of great help to the intelligence of any country and the justice department as it provide justice swiftly and with good amount of accuracy..

Here we implemented our model for 2 predictor variables, but we can take n predictor variables and improve the score value.

Thank you . . .