

**SUBJECT: Bayesian Decision and Risk Analysis**  
**SUBJECT CODE: ECS773P**

**Course Work 2: "Too Good to be True"**

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**STUDENT NO: 200434339**

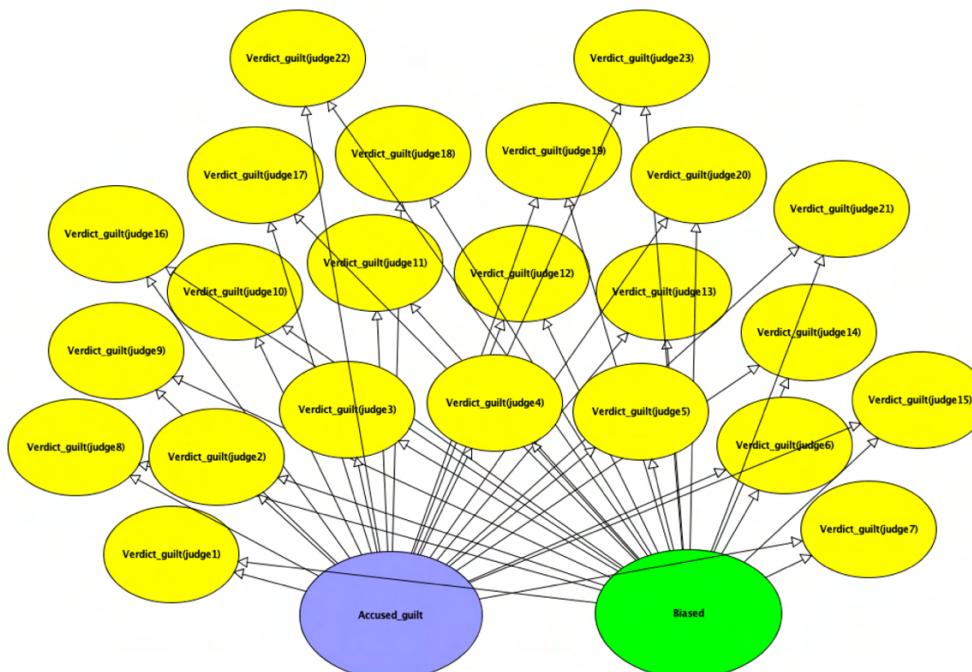
## 1. QUESTION-1a

### SOLUTION:

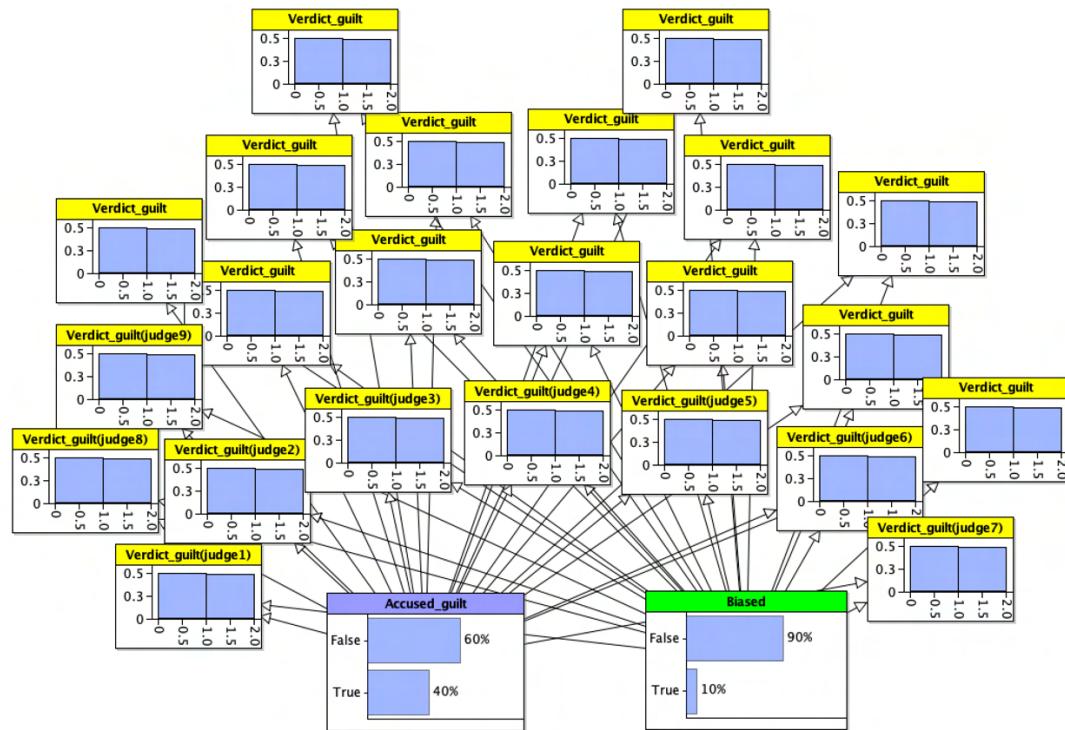
We have designed the model in the following way,

- Accused Guilt, Biased nodes are created using the Boolean node, and the values are assumed as per the question.
- Then, the verdict node has to been created using integer interval node using the partitioned expression.
- In the partitioned expression we have entered the values as per the question using the binomial function in each expression
- The nodes for the judges are created using the trails of Bernoulli nodes, which results in 23 bernoulli nodes. i.e, 23 verdict guilt partitioned nodes.
- Finally the biased node and the accused guilt node is joined with the verdict guilt nodes and the output is observed.

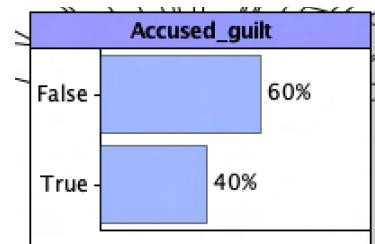
### RISK MAP:



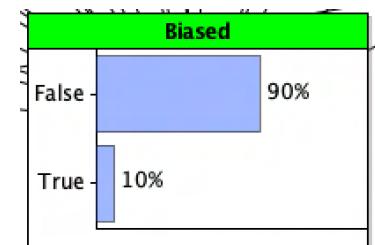
## RISK MAP WITH GRAPHS:



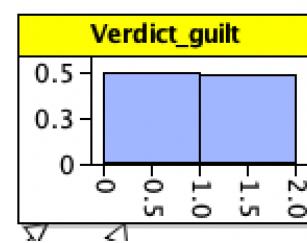
### Accused guilt node:



### Biased node:



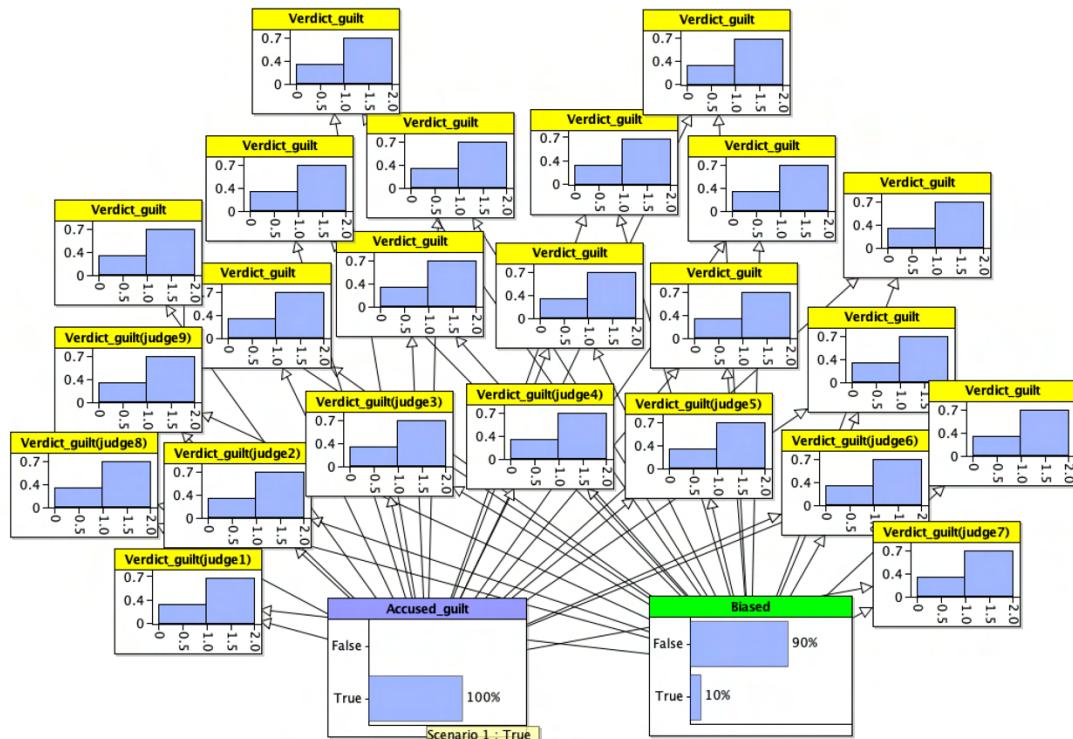
### Verdict guilt node:



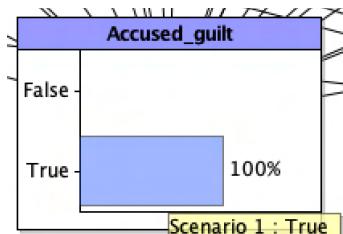
## EXPERIMENTATION:

For P(Accused Guilt=True)

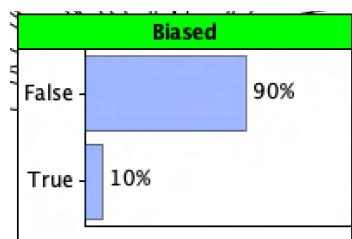
### RISK MAP WITH GRAPHS:



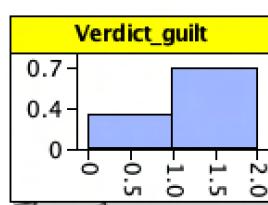
### Accused guilt node:



### Biased node:

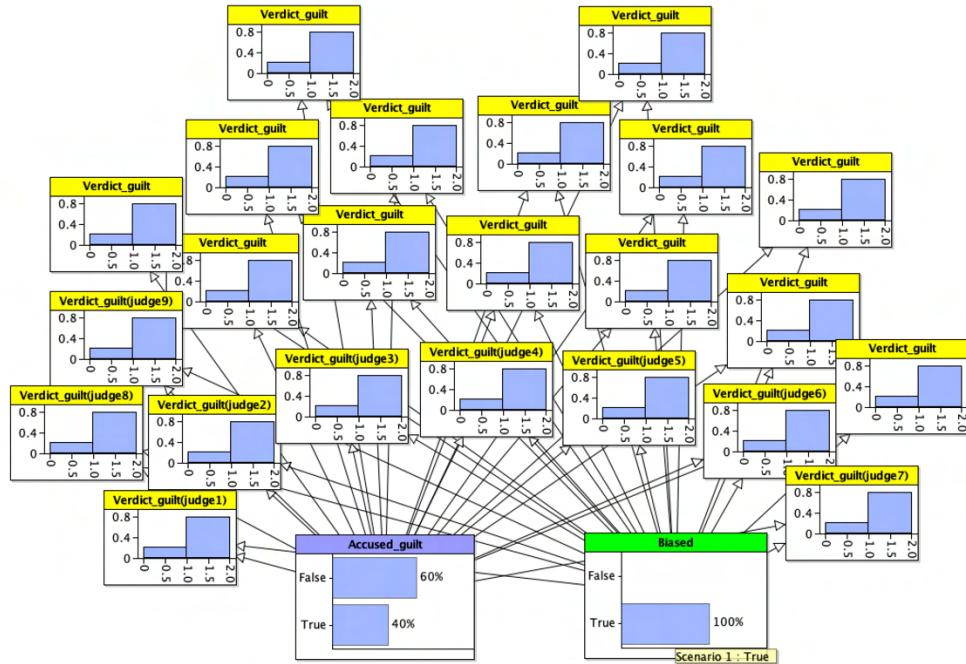


### Verdict guilt node:

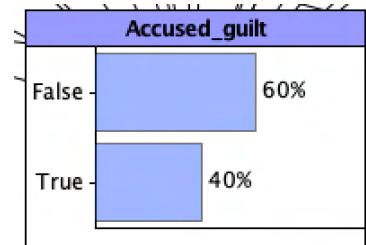


## For P(Biased=True)

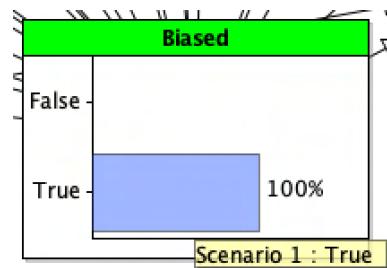
### RISK MAP WITH GRAPHS:



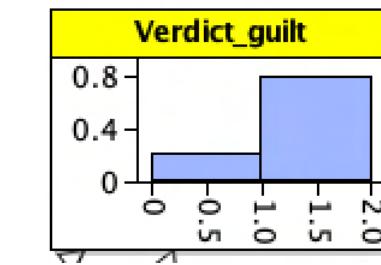
### Accused\_guilt node:



### Biased node:

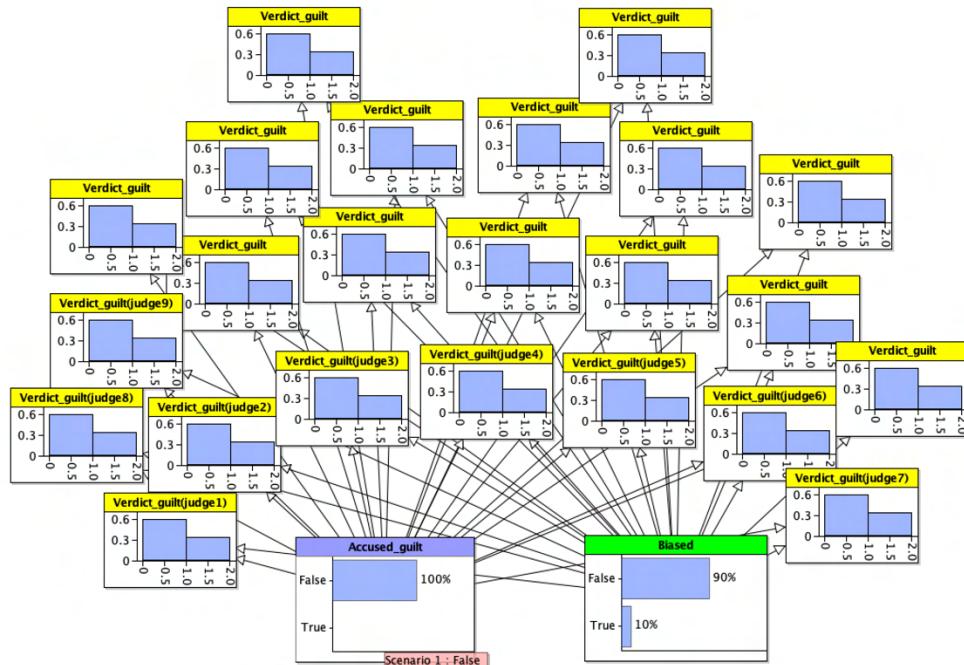


### Verdict\_guilt node:

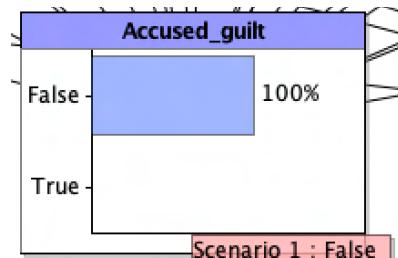


## For P(Accused Guilt=False)

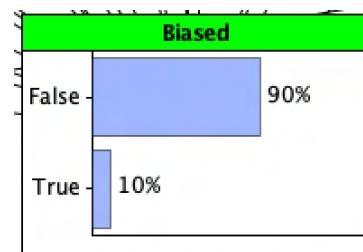
### RISK MAP WITH GRAPHS:



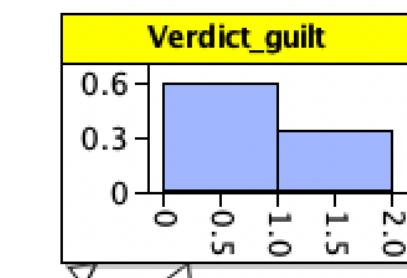
### Accused guilt node:



### Biased node:

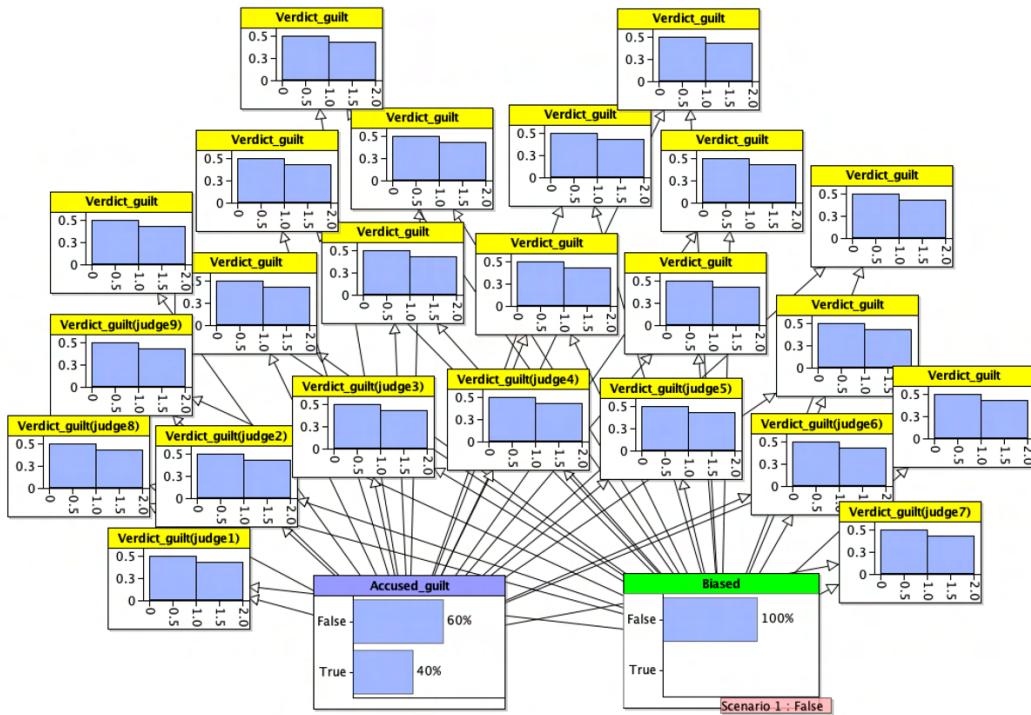


### Verdict guilt node:

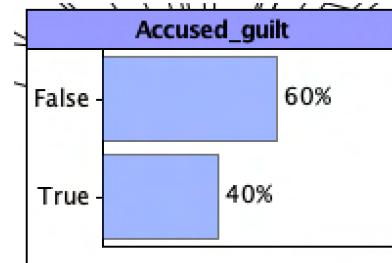


## For P(Biased=False)

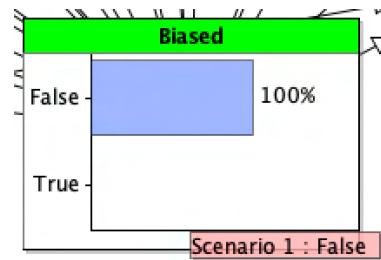
### RISK MAP WITH GRAPHS:



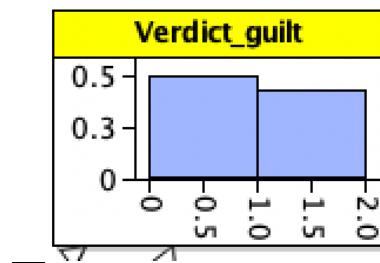
### Accused\_guilt node:



### Biased node:



### Verdict\_guilt node:

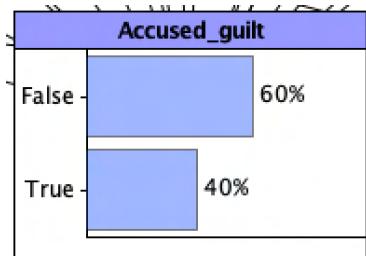


## 1. QUESTION-1b

### SOLUTION:

In this question, all the conditional probability tables of the nodes are shown,

#### For Accused Guilt Node



#### NPT(Conditional Probability Table) for the Accused Guilt Node:

##### **Node Details**

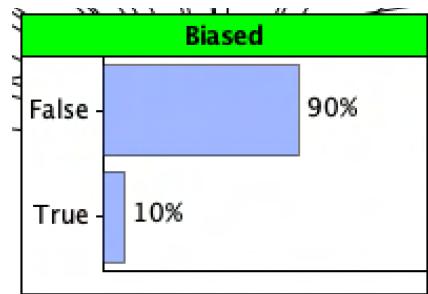
Node Name .....	Accused_guilt
Unique Identifier .....	accused_guilt
Node Type .....	Boolean <input type="button" value="▼"/>
Visible .....	<input checked="" type="checkbox"/>
Input Node .....	<input type="checkbox"/>
Output Node .....	<input type="checkbox"/>

For,  $P(\text{Accused Guilt} = \text{True}) = 0.4$

#### **Node Probability Table**

NPT Editing Mode .....	Manual <input type="button" value="▼"/>				
<table border="1"><tr><td>False</td><td>0.6</td></tr><tr><td>True</td><td>0.4</td></tr></table>		False	0.6	True	0.4
False	0.6				
True	0.4				

## For Biased Node



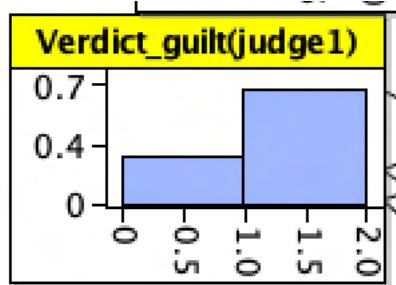
### NPT(Conditional Probability Table) for the Biased Node:

Node Details	
Node Name .....	Biased
Unique Identifier .....	biased
Node Type .....	Boolean <input type="button" value="▼"/>
Visible .....	<input checked="" type="checkbox"/>
Input Node .....	<input type="checkbox"/>
Output Node .....	<input type="checkbox"/>

For,  $P(Biased = True) = 0.1$

Node Probability Table	
NPT Editing Mode .....	Manual <input type="button" value="▼"/>
False	0.9
True	0.1

## For Verdict Guilt Node and sub-partitioned N-judges



### NPT(Conditional Probability Table) for the Verdict Guilt Node:

Node Details	
Node Name .....	Verdict_guilt(judge1)
Unique Identifier .....	judge1_verdictguilt1
Node Type .....	Integer Interval <input type="button" value="▼"/>
Visible .....	<input checked="" type="checkbox"/>
Input Node .....	<input type="checkbox"/>
Output Node .....	<input type="checkbox"/>

### Node states:

Node States		
<input type="checkbox"/>	Make Lower Bound Negative Infinity	
<input type="checkbox"/>	Make Upper Bound Positive Infinity	
<a href="#">Remove all states</a>		
<a href="#">Highlight Invalid States</a>		
Range	Lower Bound	Upper Bound
<input type="checkbox"/>	0	<input type="button" value="Insert Wizard"/>
<input type="checkbox"/>	1	<input type="button" value="Insert Wizard"/>
		<input type="button" value="Insert Wizard"/>

## Conditional Probability Table:

Node Probability Table

NPT Editing Mode .....  Partitioned Expr.

Select the required parents from the list on the left and add them to the list on the right. The list on the right will contain the parents involved in the partitioned table. The order of the parents determines the configuration of states in the table below.

	<input type="button" value="Add &gt;"/> <input type="button" value="Add all &gt;&gt;"/> <input type="button" value="&lt;&lt; Remove all"/> <input type="button" value="&lt; Remove"/>	<b>Accused_guilt</b> Biased
--	--	--------------------------------

Enter a formula for each partition by double-...  
**Accused\_g...**      False      True      True      False      True  
 Biased      False      True      False      True  
**Expressions**      Binomial(1.0,0...      Binomial(1.0,0...      Binomial(1.0,0...      Binomial(1.0,0...      Binomial(1.0,0...

We have used partitioned expression to enter the values of verdict guilt and we have created 23 same node for the judges for the guilty verdict.

For,  $P_i(\text{Verdict Guilt} = \text{True} | \text{Accused Guilt} = \text{False}, \text{Biased} = \text{False}) = 0.3$

Expression parameters take the form of standard mathematical expressions and can include node names (available by right-clicking in the parameter's text field).  
 If a parameter is badly formed, the text field will have a red border. You can find out the problem by holding the mouse over the field.

Expression Type	 <b>Binomial</b> Number of 'successes' in n trials with fixed probability, p, of success
Number of Trials	1.0
Probability of Success	0.3

For,  $P_i(\text{Verdict Guilt} = \text{True} | \text{Accused Guilt} = \text{False}, \text{Biased} = \text{True}) = 0.8$

Expression parameters take the form of standard mathematical expressions and can include node names (available by right-clicking in the parameter's text field).  
 If a parameter is badly formed, the text field will have a red border. You can find out the problem by holding the mouse over the field.

Expression Type	 <b>Binomial</b> Number of 'successes' in n trials with fixed probability, p, of success
Number of Trials	1.0
Probability of Success	0.8

For,  $P_i(\text{Verdict Guilt} = \text{True} | \text{Accused Guilt} = \text{True}, \text{Biased} = \text{False}) = 0.7$

Expression parameters take the form of standard mathematical expressions and can include node names (available by right-clicking in the parameter's text field).  
If a parameter is badly formed, the text field will have a red border. You can find out the problem by holding the mouse over the field.

Expression Type	 Binomial Number of 'successes' in n trials with fixed probability, p, of success	▼
Number of Trials	1.0	
Probability of Success	0.7	

For,  $P_i(\text{Verdict Guilt} = \text{True} | \text{Accused Guilt} = \text{True}, \text{Biased} = \text{True}) = 0.8$

Expression parameters take the form of standard mathematical expressions and can include node names (available by right-clicking in the parameter's text field).  
If a parameter is badly formed, the text field will have a red border. You can find out the problem by holding the mouse over the field.

Expression Type	 Binomial Number of 'successes' in n trials with fixed probability, p, of success	▼
Number of Trials	1.0	
Probability of Success	0.8	

## 2. QUESTION-2a

### SOLUTION:

In this question, we have created 7 scenarios which are,

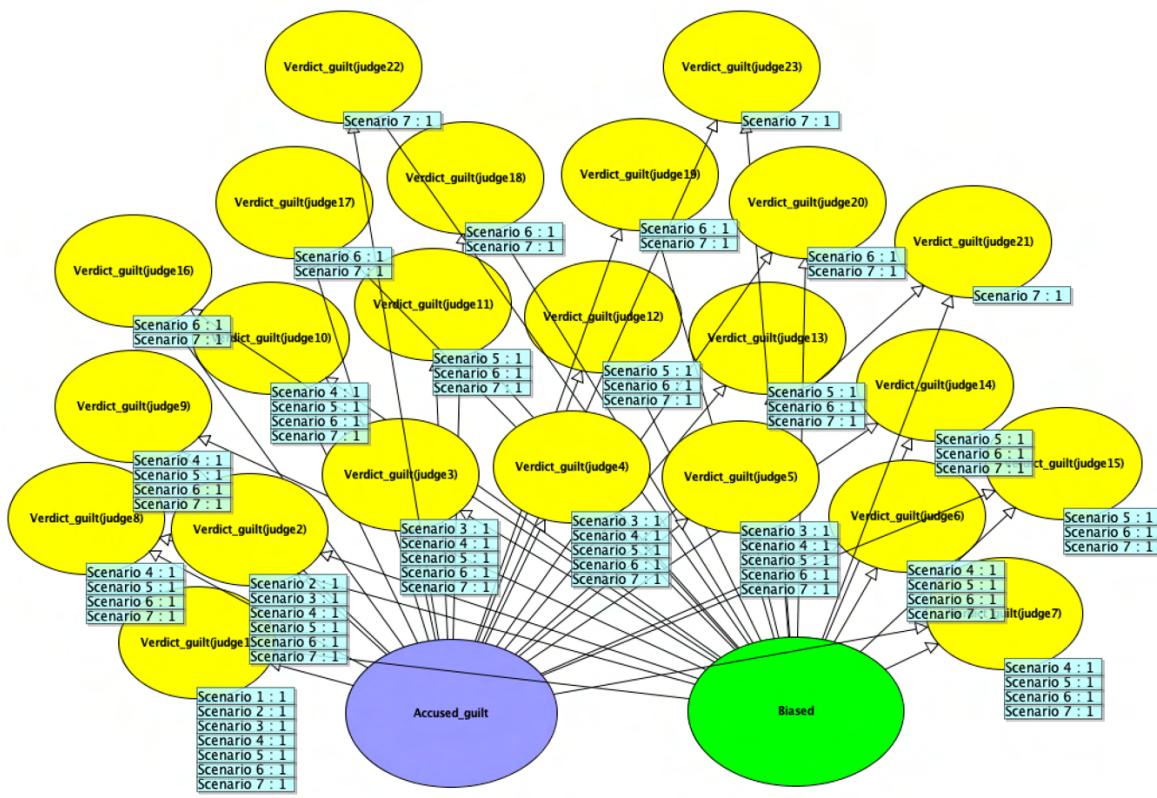
- 1 judge total with 1 guilty verdict and 22 unobserved
- 2 judges total with 2 guilty verdicts and 21 unobserved
- 5 judges total with 5 guilty verdicts and 18 unobserved
- 10 judges total with 10 guilty verdicts and 13 unobserved
- 15 judges total with 15 guilty verdicts and 8 unobserved
- 20 judges total with 20 guilty verdicts and 3 unobserved
- 23 judges total with 23 guilty verdicts and 0 unobserved

### Risk Table with values entered for all scenarios:

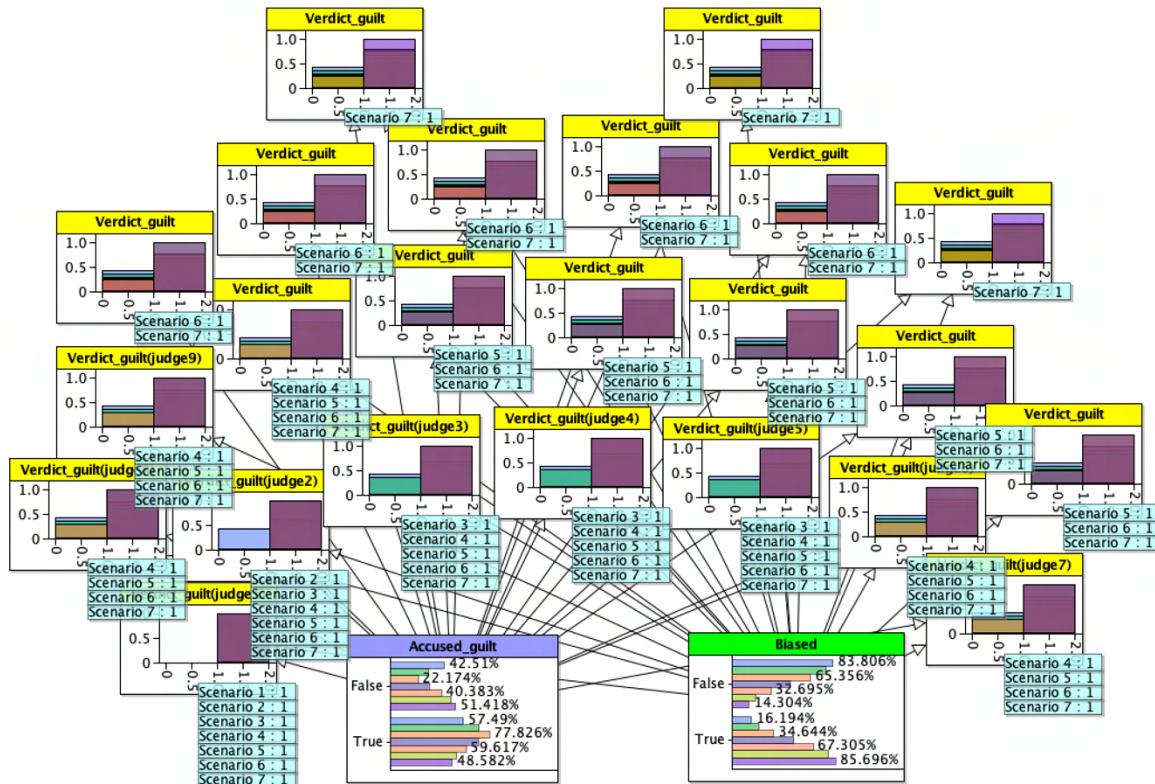
Risk Scenarios		Active Display on Risk Graph	
Scenario 1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

RISK TABLE FOR THE GUILT DATA	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	
Accused_guilt	No Answer	C	No Answer	C	No Answer	C	No Answer	C
Biased	No Answer	C	No Answer	C	No Answer	C	No Answer	C
Verdict_guilt(judge1)	1	1	1	1	1	1	1	
Verdict_guilt(judge2)		1	1	1	1	1	1	
Verdict_guilt(judge3)			1	1	1	1	1	
Verdict_guilt(judge4)			1	1	1	1	1	
Verdict_guilt(judge5)				1	1	1	1	
Verdict_guilt(judge6)					1	1	1	
Verdict_guilt(judge7)					1	1	1	
Verdict_guilt(judge8)					1	1	1	
Verdict_guilt(judge9)					1	1	1	
Verdict_guilt(judge10)						1	1	
Verdict_guilt(judge11)						1	1	
Verdict_guilt(judge12)						1	1	
Verdict_guilt(judge13)						1	1	
Verdict_guilt(judge14)						1	1	
Verdict_guilt(judge15)						1	1	
Verdict_guilt(judge16)							1	
Verdict_guilt(judge17)							1	
Verdict_guilt(judge18)							1	
Verdict_guilt(judge19)							1	
Verdict_guilt(judge20)							1	
Verdict_guilt(judge21)							1	
Verdict_guilt(judge22)							1	
Verdict_guilt(judge23)							1	

## RISK MAP:



## RISK MAP WITH GRAPHS:



## 2. QUESTION-2b

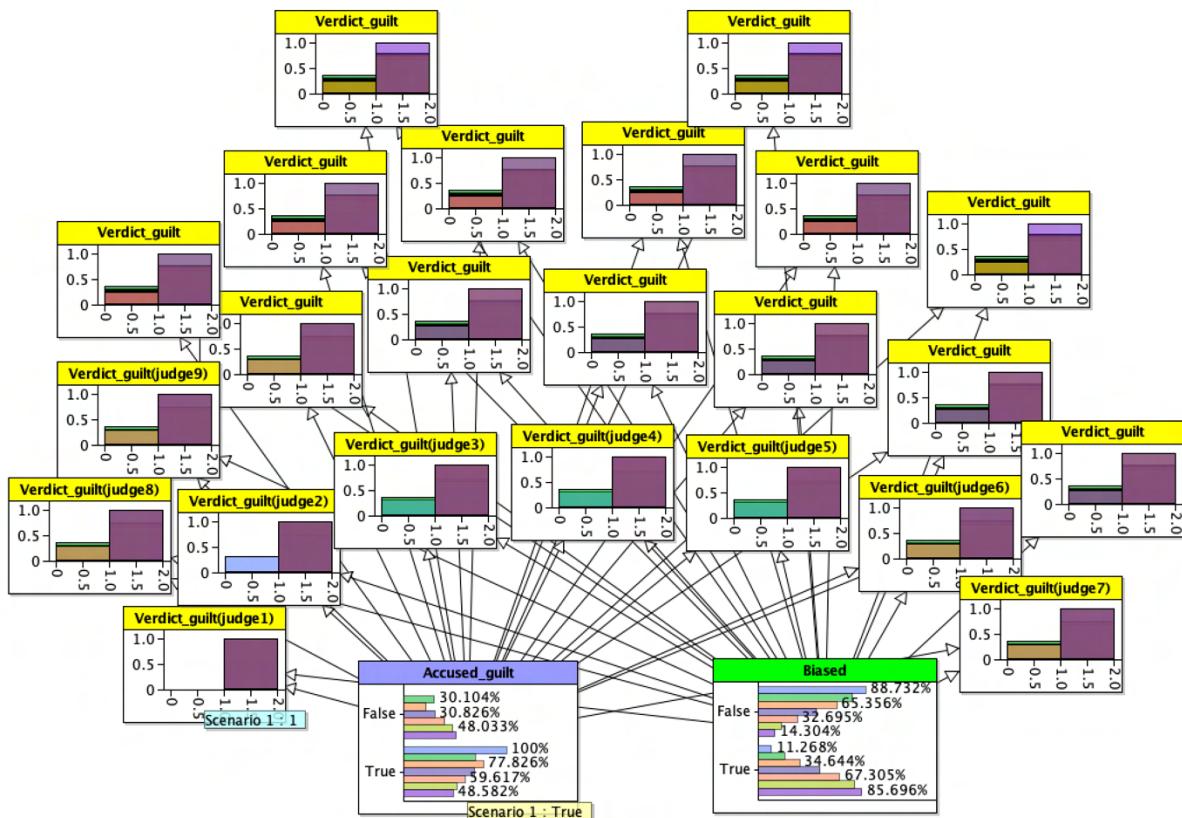
### SOLUTION:

#### CASE-1

For P(Accused Guilt = True| scenario-1)

For scenario\_1 judge total with 1 guilty verdict and 22 unobserved

#### RISK MAP WITH GRAPHS:

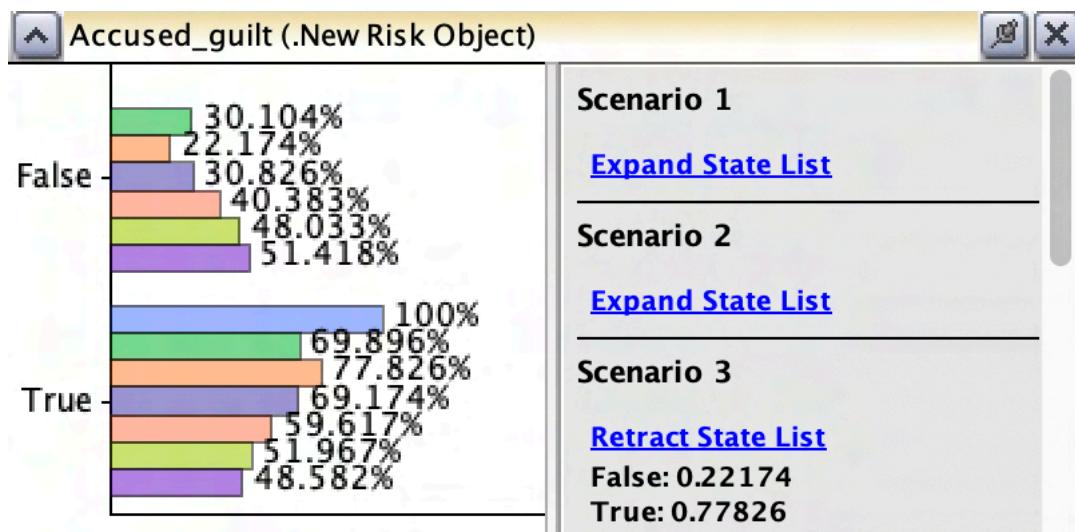


#### Risk Table:

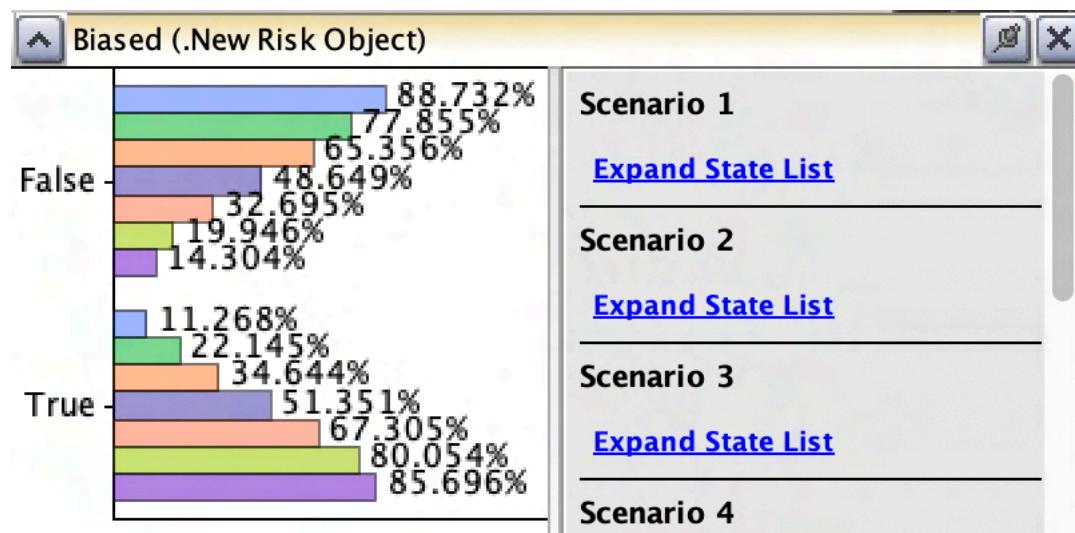
Risk Scenarios		Active	Display on Risk Graph...
Scenario 1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

RISK TABLE FOR THE GUILT DATA	
Accused_guilt	
Biased	
Verdict_guilt(judge1)	
Verdict_guilt(judge2)	
Verdict_guilt(judge3)	
Verdict_guilt(judge4)	
Verdict_guilt(judge5)	
Verdict_guilt(judge6)	
Verdict_guilt(judge7)	
Verdict_guilt(judge8)	
Verdict_guilt(judge9)	
Verdict_guilt(judge10)	
Verdict_guilt(judge11)	
Verdict_guilt(judge12)	
Verdict_guilt(judge13)	
Verdict_guilt(judge14)	
Verdict_guilt(judge15)	
Verdict_guilt(judge16)	
Verdict_guilt(judge17)	
Verdict_guilt(judge18)	
Verdict_guilt(judge19)	
Verdict_guilt(judge20)	
Verdict_guilt(judge21)	
Verdict_guilt(judge22)	
Verdict_guilt(judge23)	

### Accused\_guilt node:

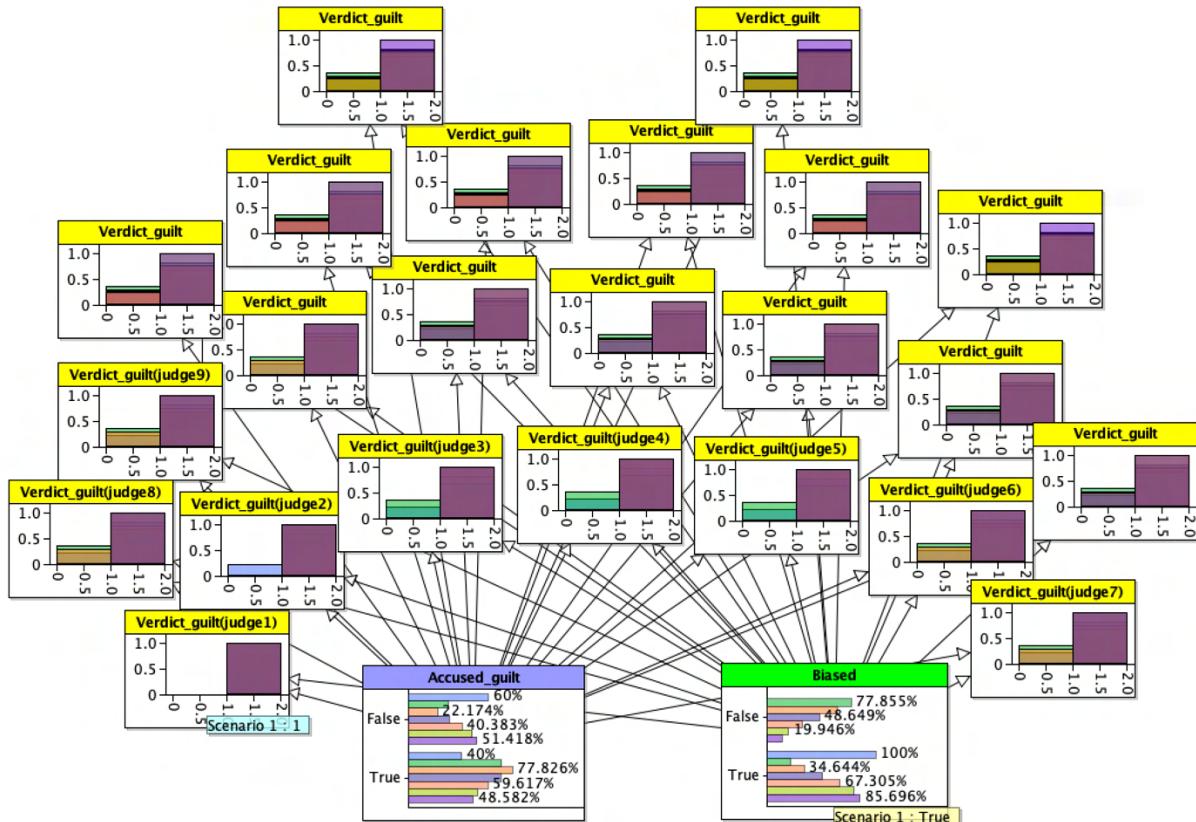


### Biased node:



## For P(All Judges Biased = True| scenario-1)

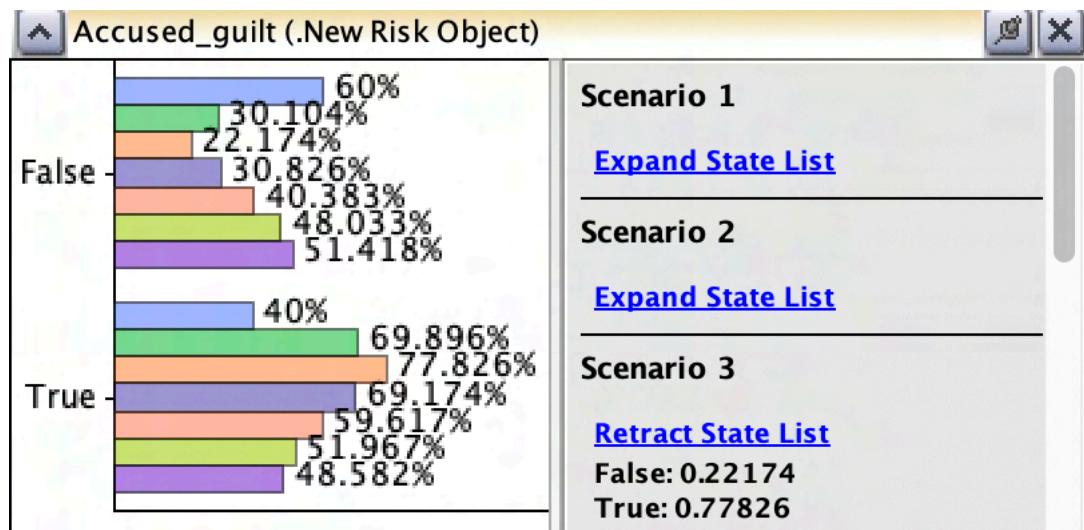
### RISK MAP WITH GRAPHS:



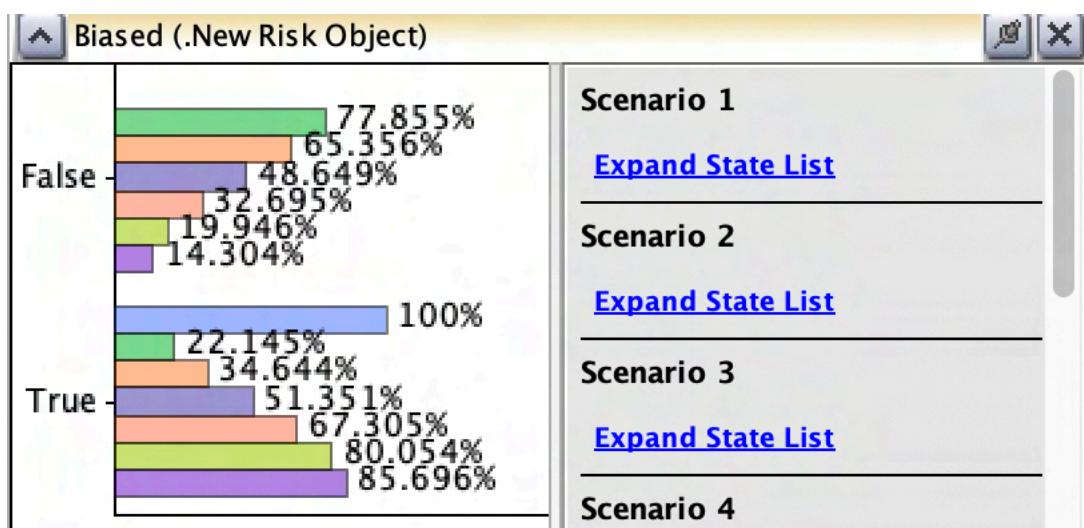
### Risk Table:

RISK TABLE FOR THE GUILT DATA		Scenario 1
Accused_guilt	No Answer	
Biased	True	
Verdict_guilt(judge1)		
Verdict_guilt(judge2)		
Verdict_guilt(judge3)		
Verdict_guilt(judge4)		
Verdict_guilt(judge5)		
Verdict_guilt(judge6)		
Verdict_guilt(judge7)		
Verdict_guilt(judge8)		
Verdict_guilt(judge9)		
Verdict_guilt(judge10)		
Verdict_guilt(judge11)		
Verdict_guilt(judge12)		
Verdict_guilt(judge13)		
Verdict_guilt(judge14)		
Verdict_guilt(judge15)		
Verdict_guilt(judge16)		
Verdict_guilt(judge17)		
Verdict_guilt(judge18)		
Verdict_guilt(judge19)		
Verdict_guilt(judge20)		
Verdict_guilt(judge21)		
Verdict_guilt(judge22)		
Verdict_guilt(judge23)		

### Accused guilt node:



### Biased node:

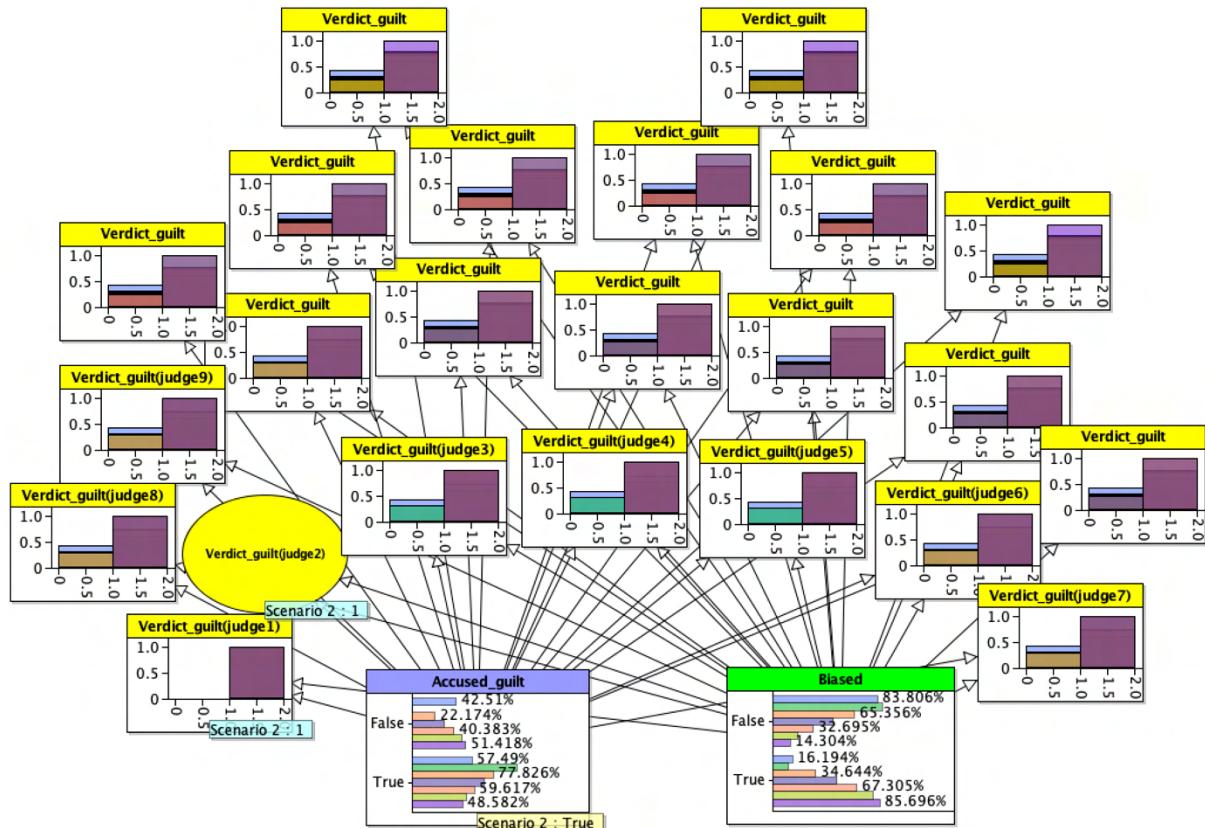


## CASE-2

For P(Accused Guilt = True| scenario-2)

For scenario, 2 judge total with 2 guilty verdict and 21 unobserved

### RISK MAP WITH GRAPHS:

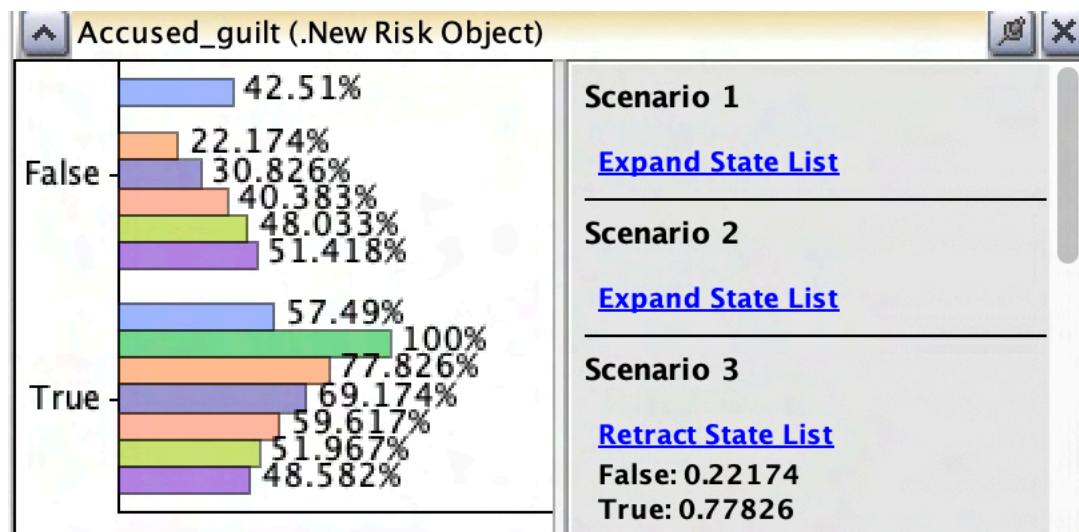


### Risk Table:

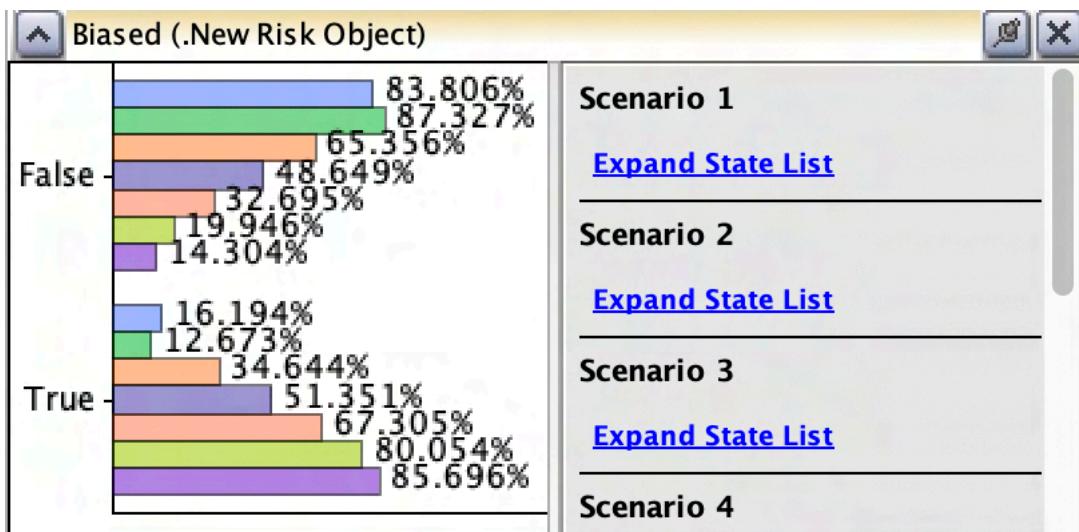
Risk Scenarios		Active Display on Risk Graph...	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Scenario 2
Accused_guilt	True
Biased	No Answer
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	
Verdict_guilt(judge4)	
Verdict_guilt(judge5)	
Verdict_guilt(judge6)	
Verdict_guilt(judge7)	
Verdict_guilt(judge8)	
Verdict_guilt(judge9)	
Verdict_guilt(judge10)	
Verdict_guilt(judge11)	
Verdict_guilt(judge12)	
Verdict_guilt(judge13)	
Verdict_guilt(judge14)	
Verdict_guilt(judge15)	
Verdict_guilt(judge16)	
Verdict_guilt(judge17)	
Verdict_guilt(judge18)	
Verdict_guilt(judge19)	
Verdict_guilt(judge20)	
Verdict_guilt(judge21)	
Verdict_guilt(judge22)	
Verdict_guilt(judge23)	

### Accused guilt node:

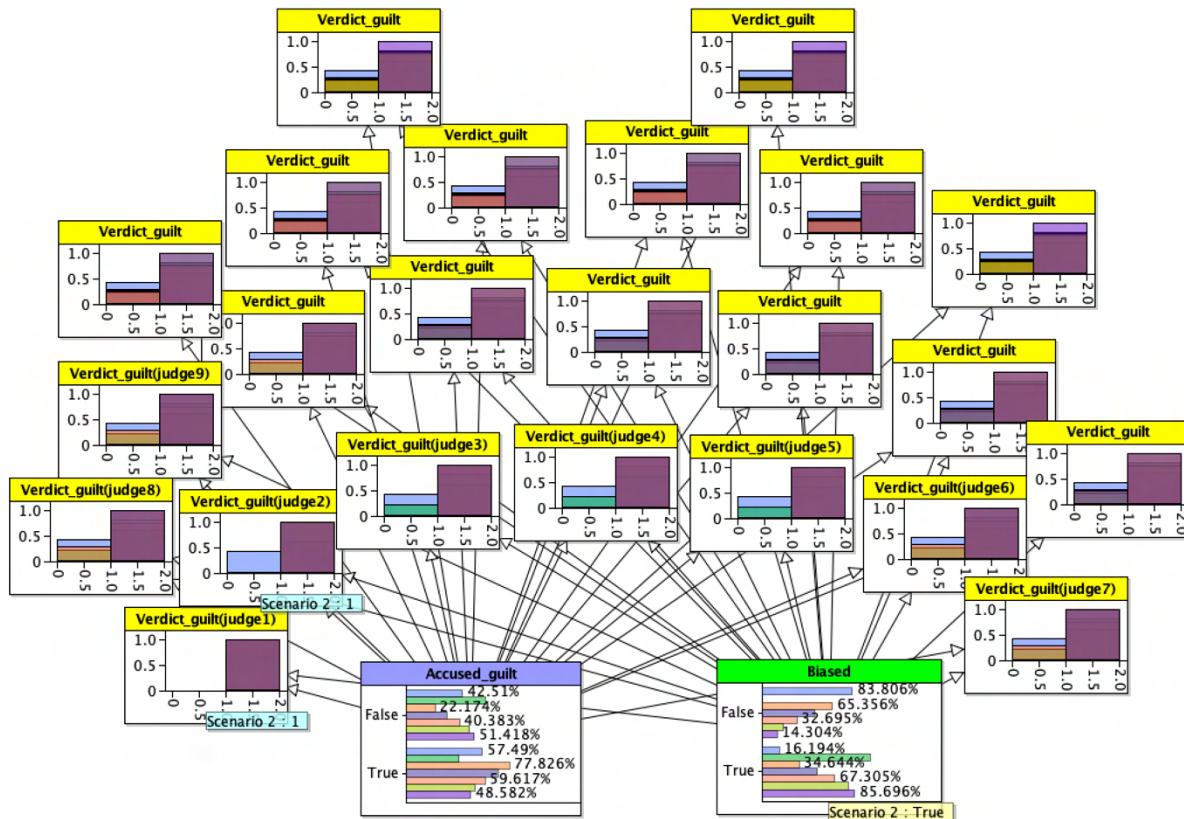


### Biased node:



### For P(All Judges Biased = True| scenario-2)

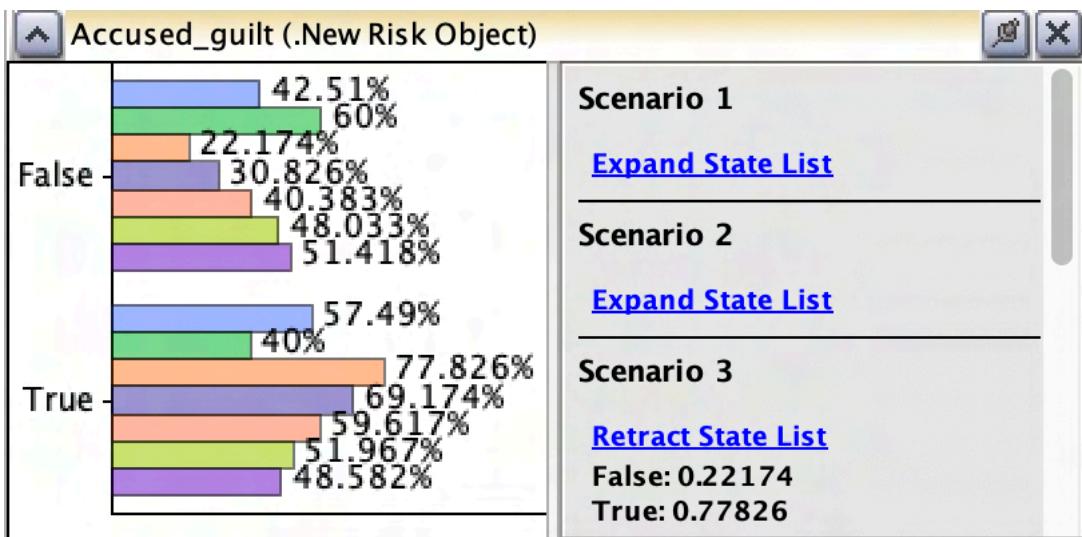
## **RISK MAP WITH GRAPHS:**



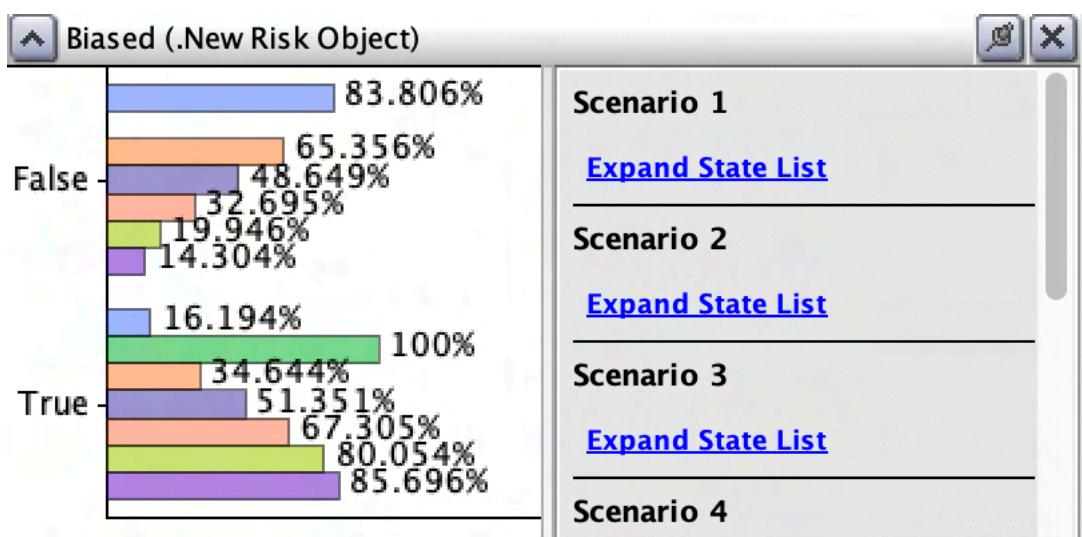
## **Risk Table:**

RISK TABLE FOR THE GUILT DATA	Scenario 2
Accused_guilt	No Answer
Biased	True
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	
Verdict_guilt(judge4)	
Verdict_guilt(judge5)	
Verdict_guilt(judge6)	
Verdict_guilt(judge7)	
Verdict_guilt(judge8)	
Verdict_guilt(judge9)	
Verdict_guilt(judge10)	
Verdict_guilt(judge11)	
Verdict_guilt(judge12)	
Verdict_guilt(judge13)	
Verdict_guilt(judge14)	
Verdict_guilt(judge15)	
Verdict_guilt(judge16)	
Verdict_guilt(judge17)	
Verdict_guilt(judge18)	
Verdict_guilt(judge19)	
Verdict_guilt(judge20)	
Verdict_guilt(judge21)	
Verdict_guilt(judge22)	
Verdict_guilt(judge23)	

### Accused guilt node:



### Biased node:

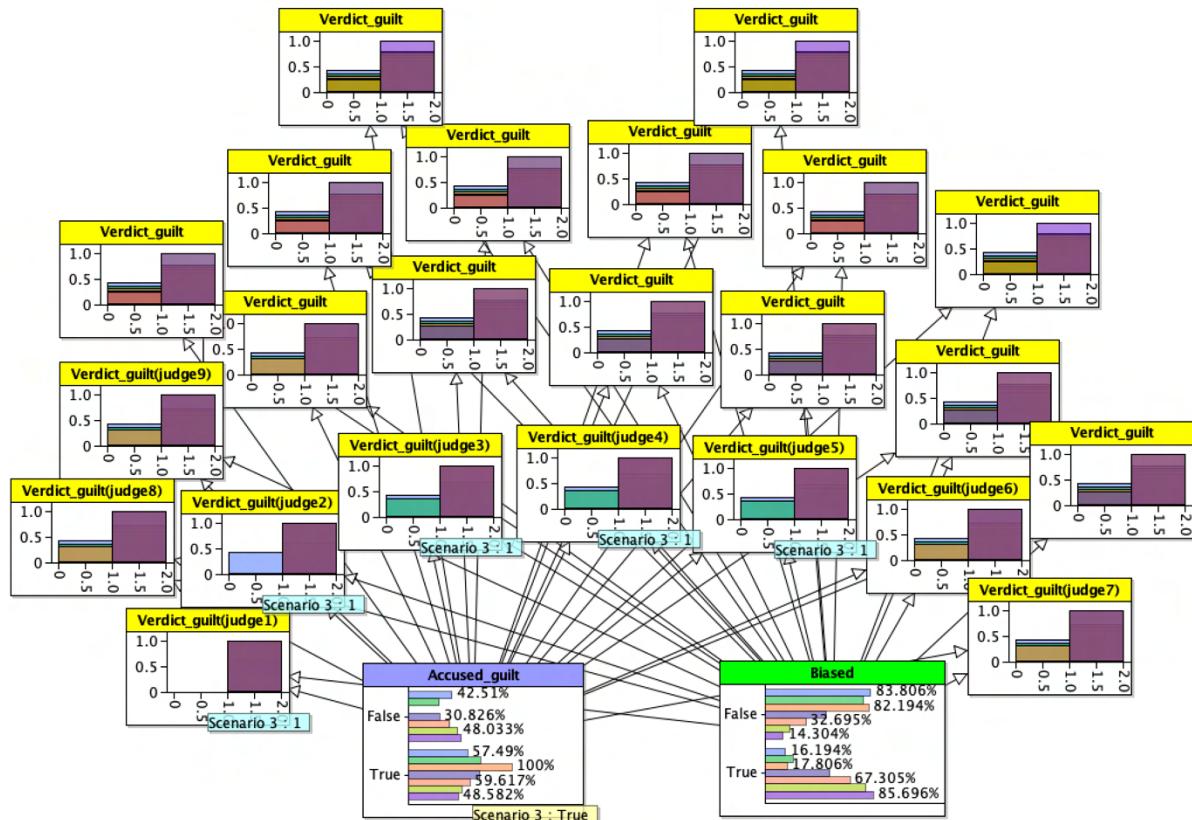


## CASE-3

For P(Accused Guilt = True| scenario-3)

For scenario, 5 judge total with 5 guilty verdict and 18 unobserved

### RISK MAP WITH GRAPHS:

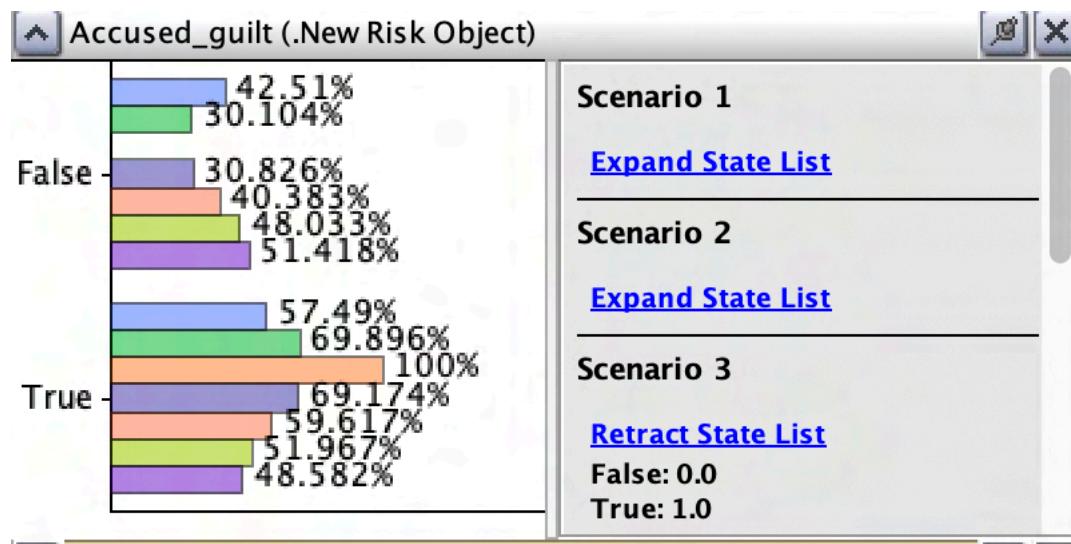


### Risk Table:

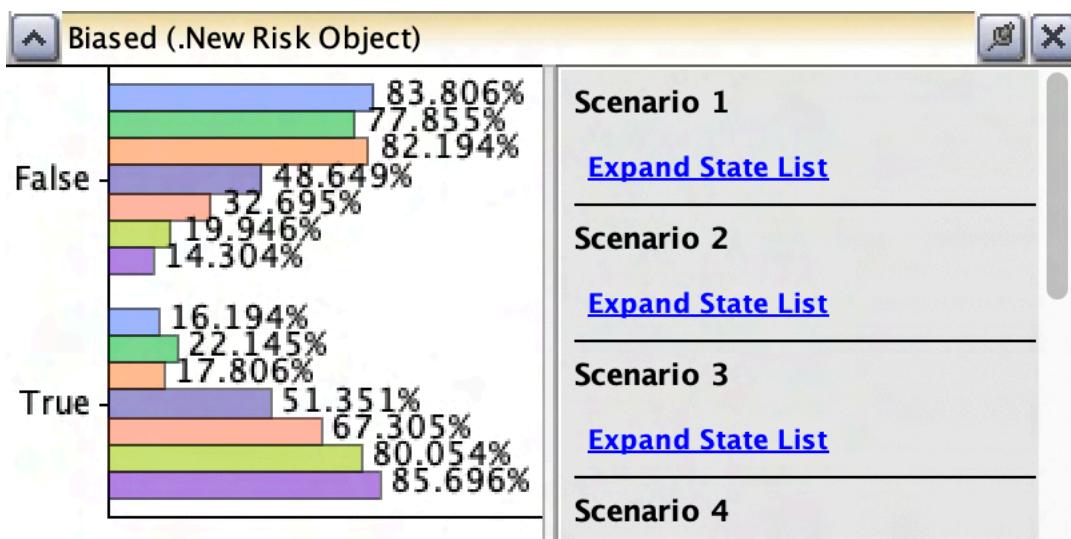
Risk Scenarios		Active Display on Risk Graph...	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

RISK TABLE FOR THE GUILT DATA	True	False
	No Answer	Yes
Accused_guilt		
Biased		
Verdict_guilt(judge1)	1	
Verdict_guilt(judge2)	1	
Verdict_guilt(judge3)	1	
Verdict_guilt(judge4)	1	
Verdict_guilt(judge5)	1	
Verdict_guilt(judge6)	1	
Verdict_guilt(judge7)		
Verdict_guilt(judge8)		
Verdict_guilt(judge9)		
Verdict_guilt(judge10)		
Verdict_guilt(judge11)		
Verdict_guilt(judge12)		
Verdict_guilt(judge13)		
Verdict_guilt(judge14)		
Verdict_guilt(judge15)		
Verdict_guilt(judge16)		
Verdict_guilt(judge17)		
Verdict_guilt(judge18)		
Verdict_guilt(judge19)		
Verdict_guilt(judge20)		
Verdict_guilt(judge21)		
Verdict_guilt(judge22)		
Verdict_guilt(judge23)		

### **Accused guilt node:**

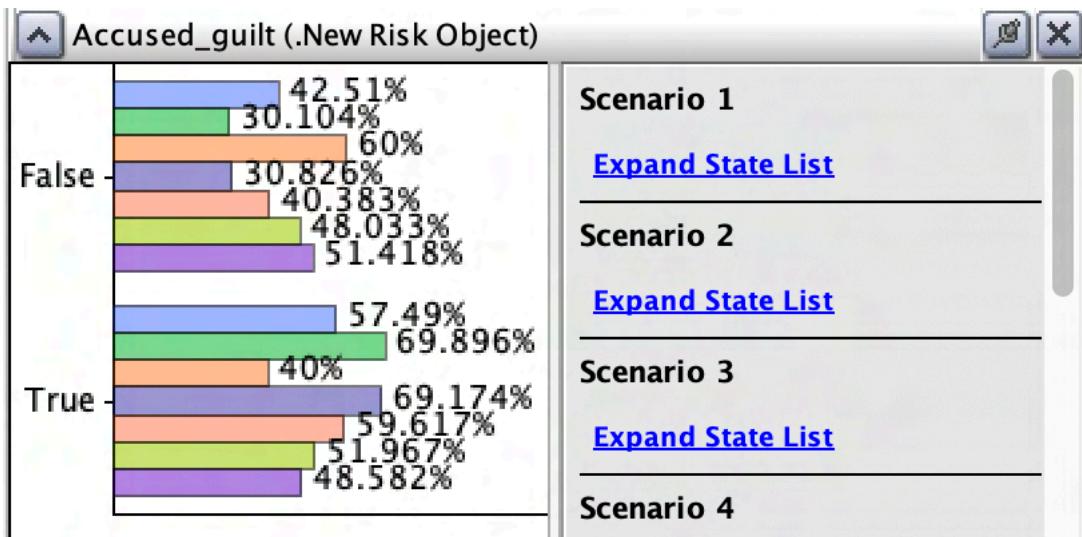


## **Biased node:**

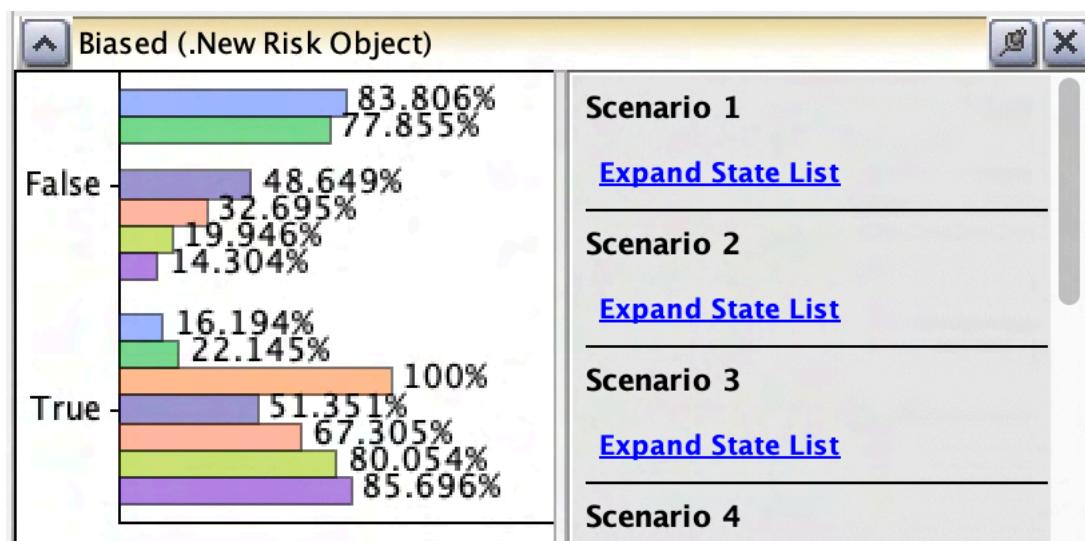




### Accused guilt node:



### Biased node:

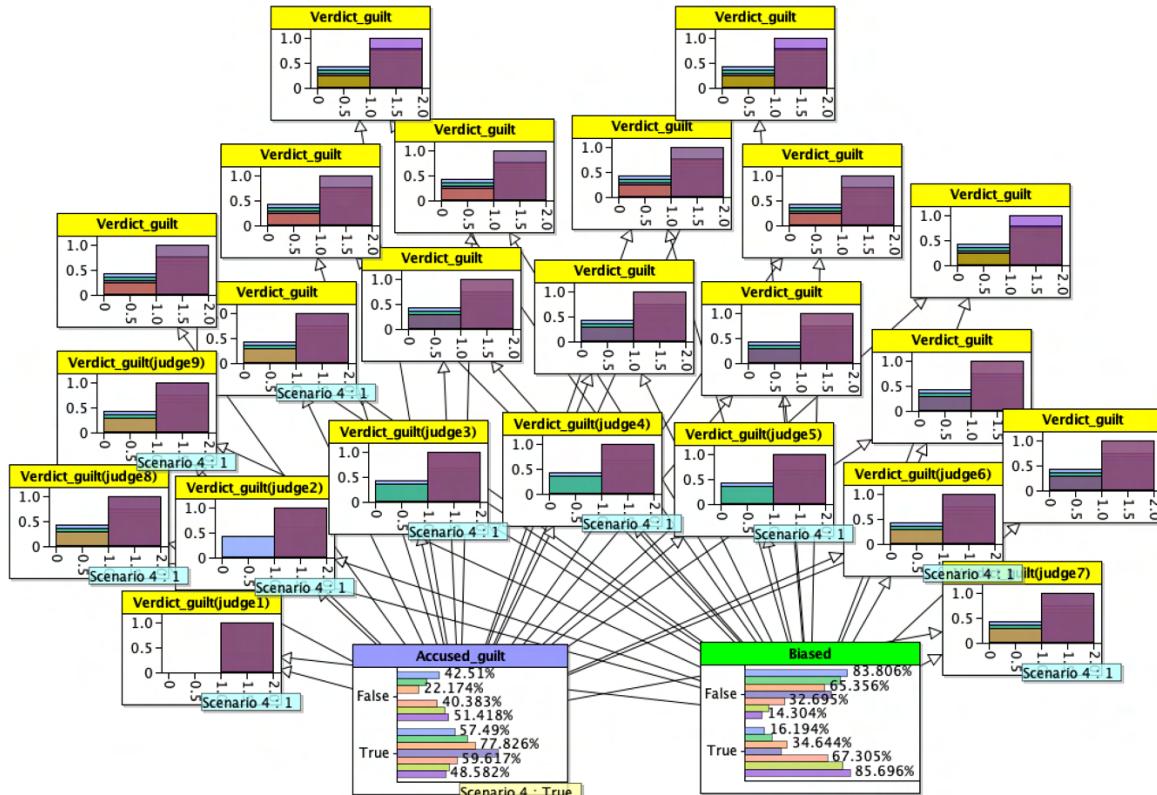


## CASE-4

For P(Accused Guilt = True| scenario-4)

For scenario, 10 judge total with 10 guilty verdict and 13 unobserved

### RISK MAP WITH GRAPHS:

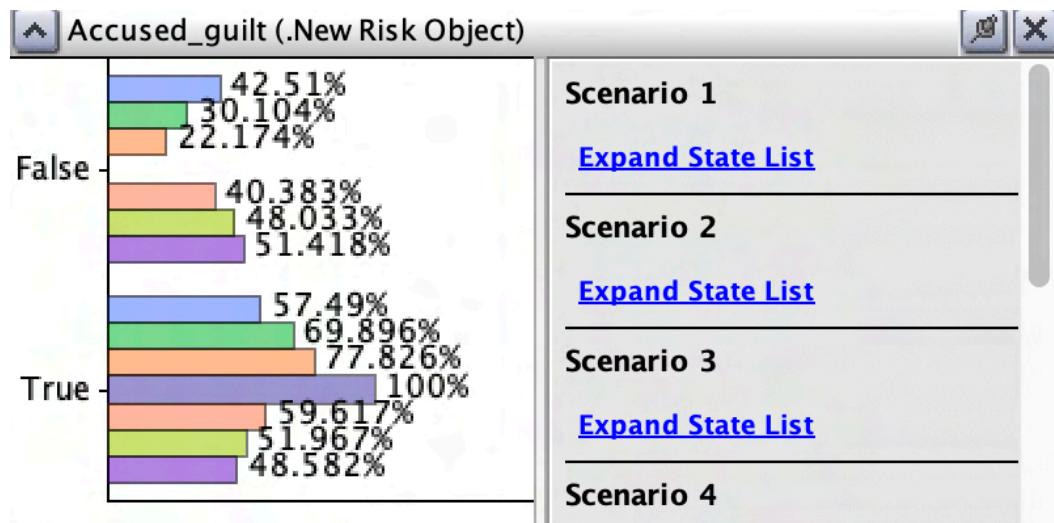


### Risk Table:

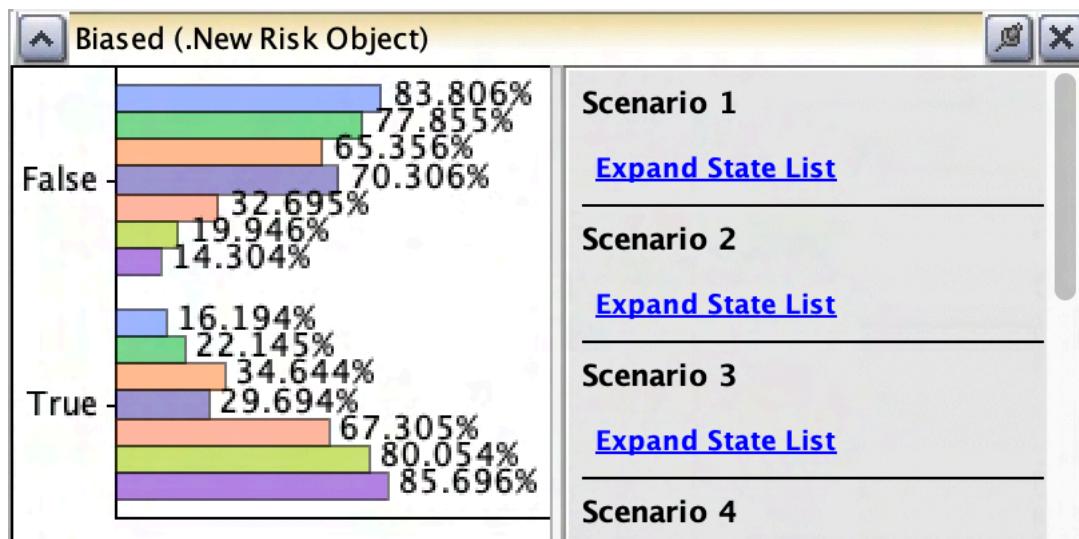
Risk Scenarios		Active Display on Risk Graph...	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Scenario 4
Accused_guilt	True
Biased	No Answer
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	1
Verdict_guilt(judge18)	1
Verdict_guilt(judge19)	1
Verdict_guilt(judge20)	1
Verdict_guilt(judge21)	1
Verdict_guilt(judge22)	1
Verdict_guilt(judge23)	1

### Accused guilt node:

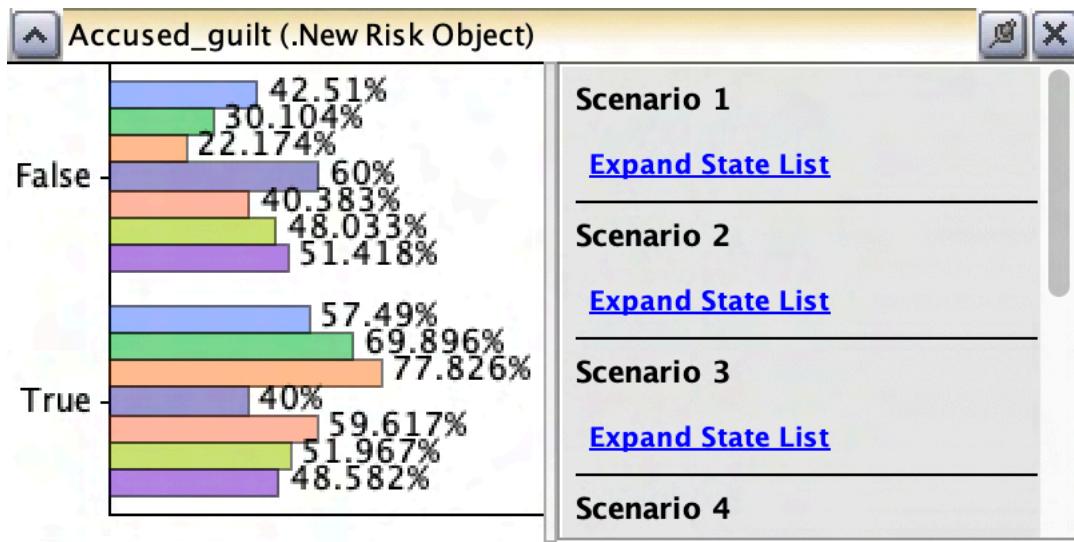


### Biased node:

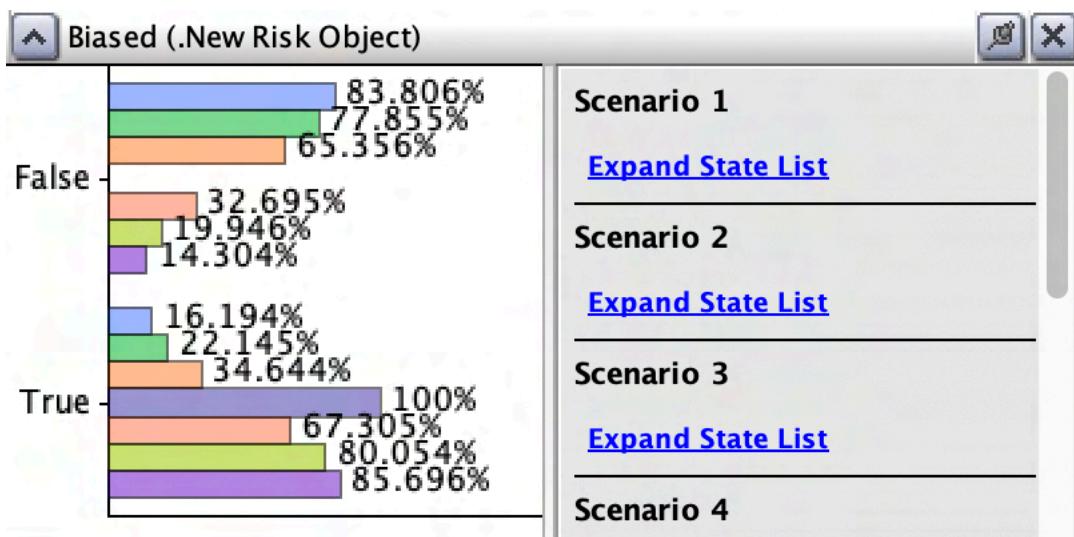




### Accused guilt node:



### Biased node:

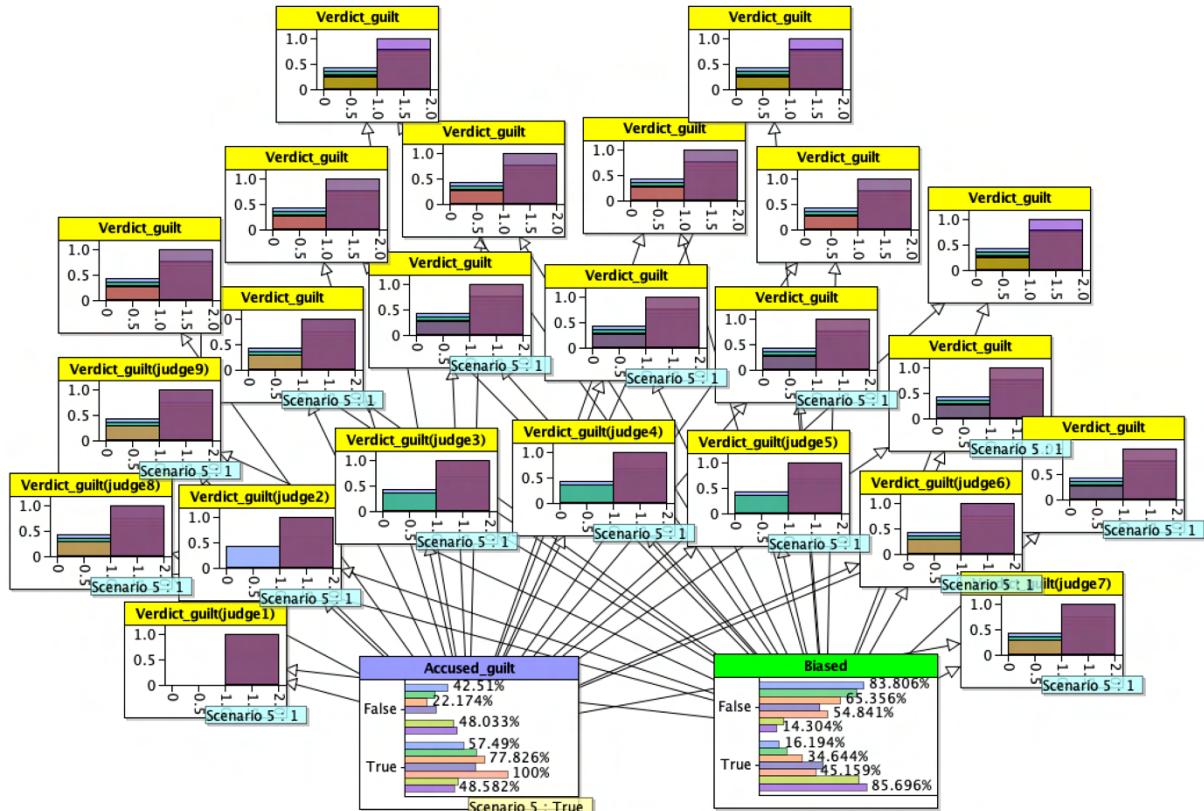


## CASE-5

For P(Accused Guilt = True| scenario-5)

For scenario, 15 judge total with 15 guilty verdict and 8 unobserved

### RISK MAP WITH GRAPHS:

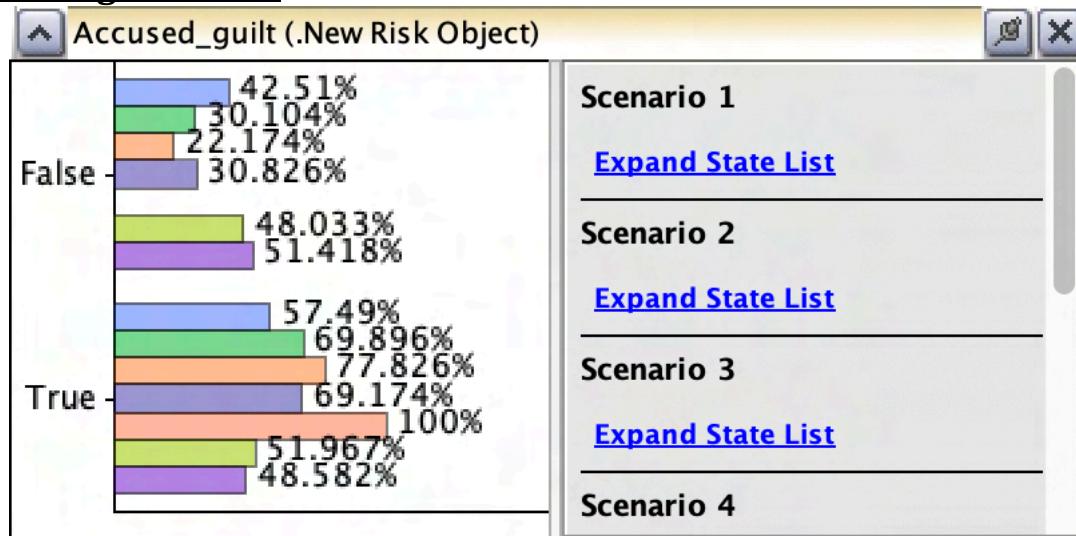


### Risk Table:

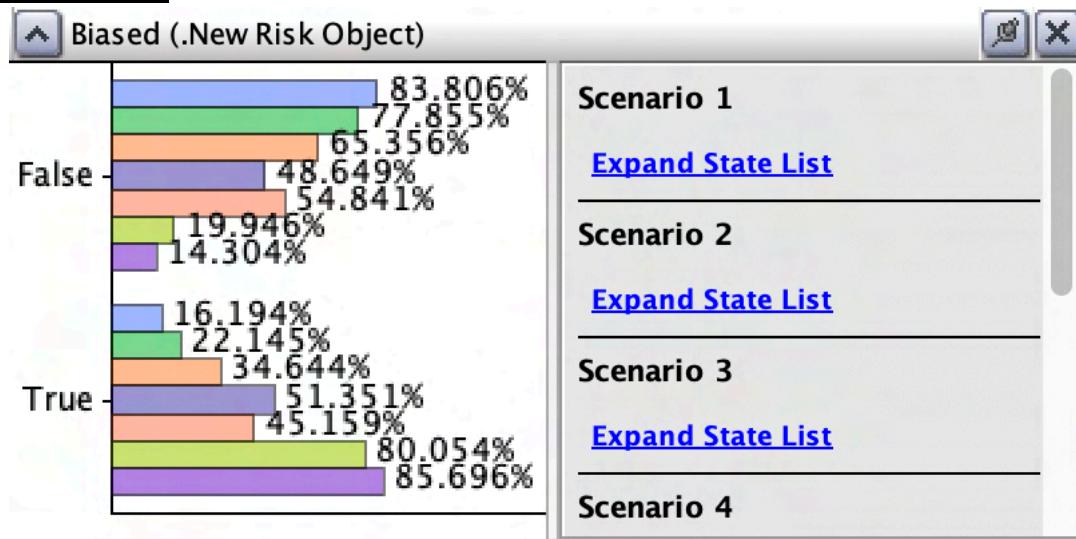
Risk Scenarios		Active Display on Risk Graph	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Scenario 5
Accused_guilt	True
Biased	No Answer
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	
Verdict_guilt(judge18)	
Verdict_guilt(judge19)	
Verdict_guilt(judge20)	
Verdict_guilt(judge21)	
Verdict_guilt(judge22)	
Verdict_guilt(judge23)	

### Accused guilt node:

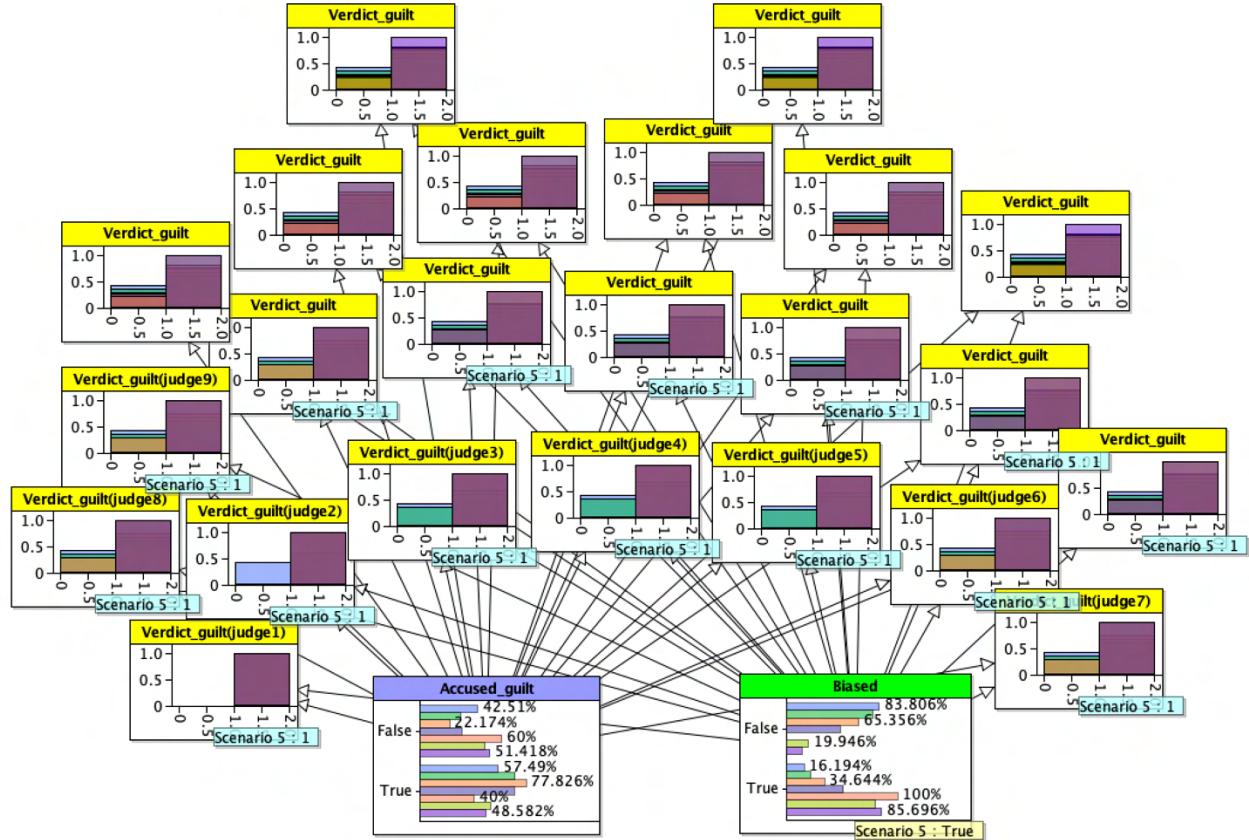


### Biased node:



## For P(All Judges Biased = True| scenario -5)

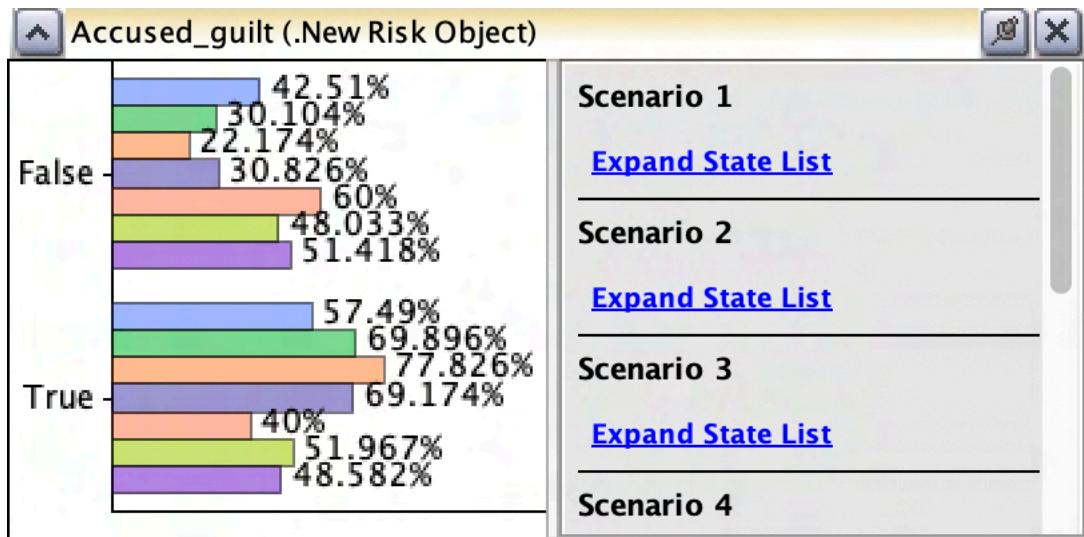
### RISK MAP WITH GRAPHS:



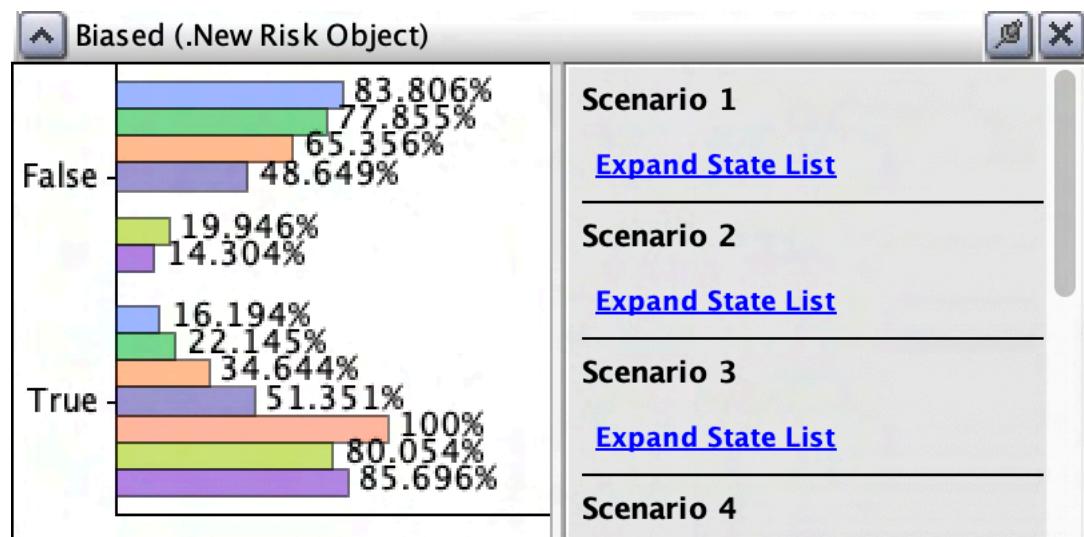
### Risk Table:

RISK TABLE FOR THE GUILT DATA		Scenario 5
Accused_guilt		No Answer
Biased		True
Verdict_guilt(judge1)		1
Verdict_guilt(judge2)		1
Verdict_guilt(judge3)		1
Verdict_guilt(judge4)		1
Verdict_guilt(judge5)		1
Verdict_guilt(judge6)		1
Verdict_guilt(judge7)		1
Verdict_guilt(judge8)		1
Verdict_guilt(judge9)		1
Verdict_guilt(judge10)		1
Verdict_guilt(judge11)		1
Verdict_guilt(judge12)		1
Verdict_guilt(judge13)		1
Verdict_guilt(judge14)		1
Verdict_guilt(judge15)		1
Verdict_guilt(judge16)		
Verdict_guilt(judge17)		
Verdict_guilt(judge18)		
Verdict_guilt(judge19)		
Verdict_guilt(judge20)		
Verdict_guilt(judge21)		
Verdict_guilt(judge22)		
Verdict_guilt(judge23)		

### Accused guilt node:



### Biased node:

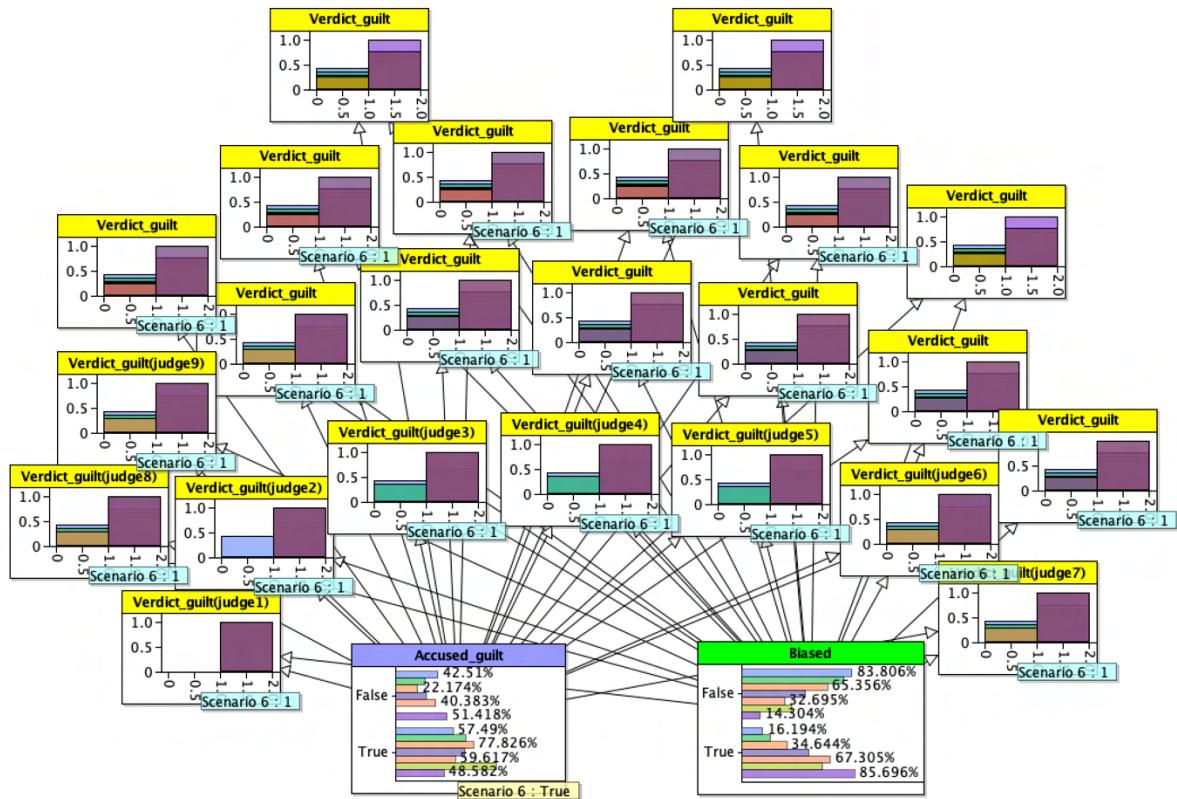


## CASE-6

For P(Accused Guilt = True| scenario-6)

For scenario, 20 judge total with 20 guilty verdict and 3 unobserved

### RISK MAP WITH GRAPHS:

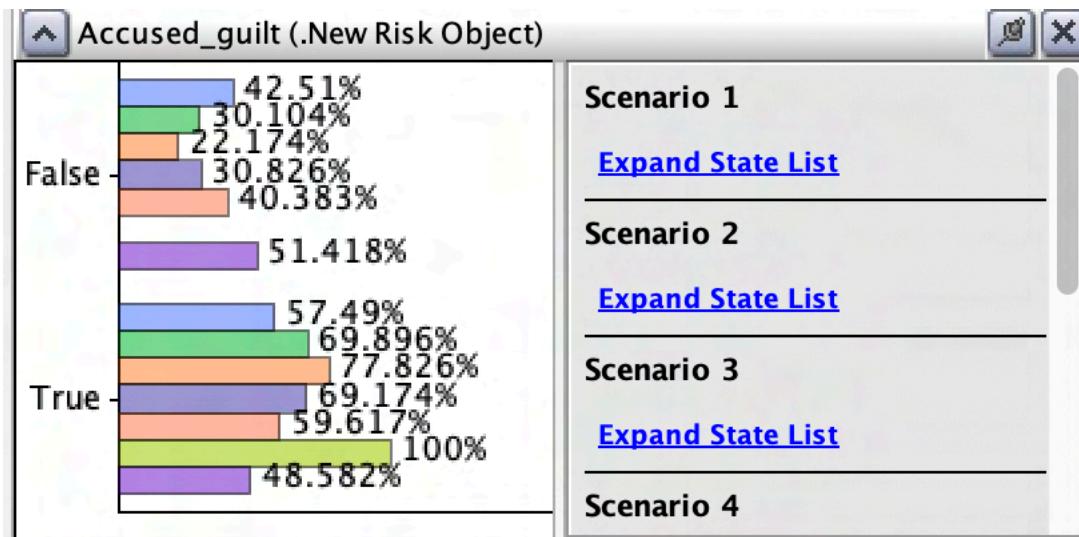


### Risk Table:

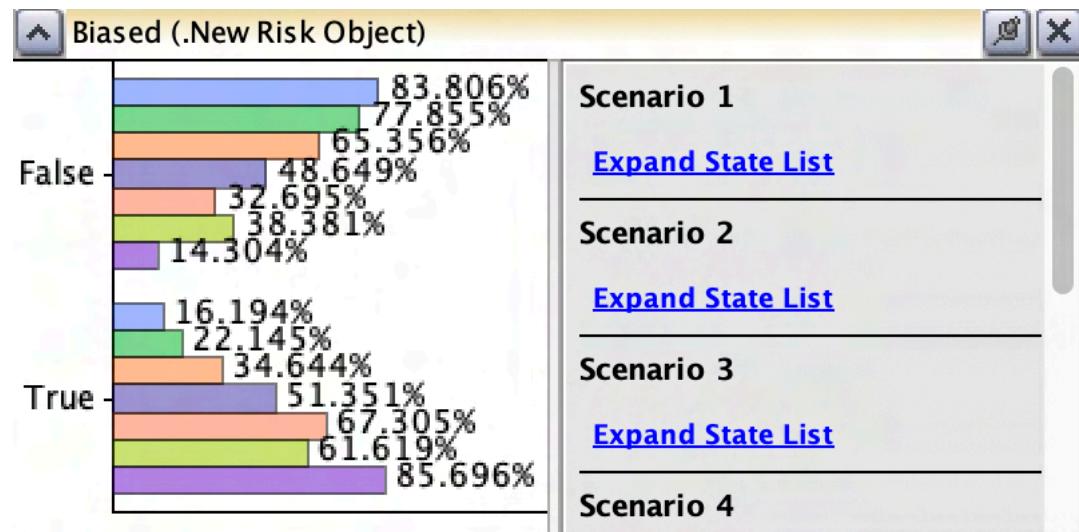
Risk Scenarios		Active Display on Risk Graph	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Scenario 6
Accused_guilt	True
Biased	No Answer
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	1
Verdict_guilt(judge18)	1
Verdict_guilt(judge19)	1
Verdict_guilt(judge20)	1
Verdict_guilt(judge21)	1
Verdict_guilt(judge22)	1
Verdict_guilt(judge23)	

### Accused\_guilt node:

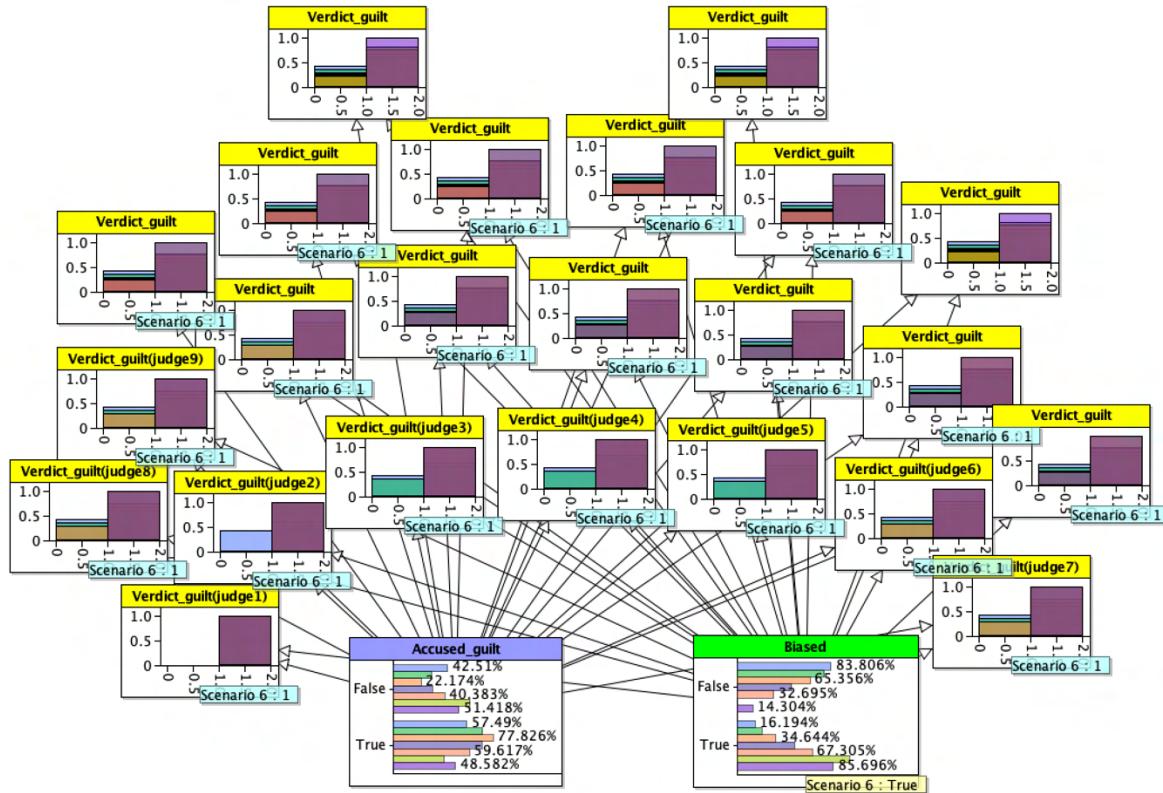


### Biased node:



## For P(All Judges Biased = True| scenario -6)

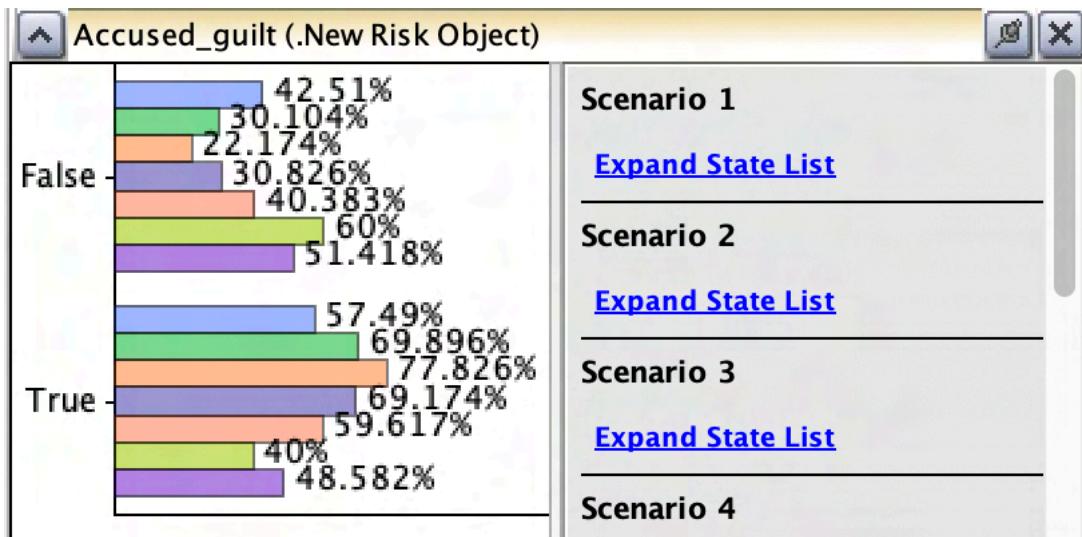
### RISK MAP WITH GRAPHS:



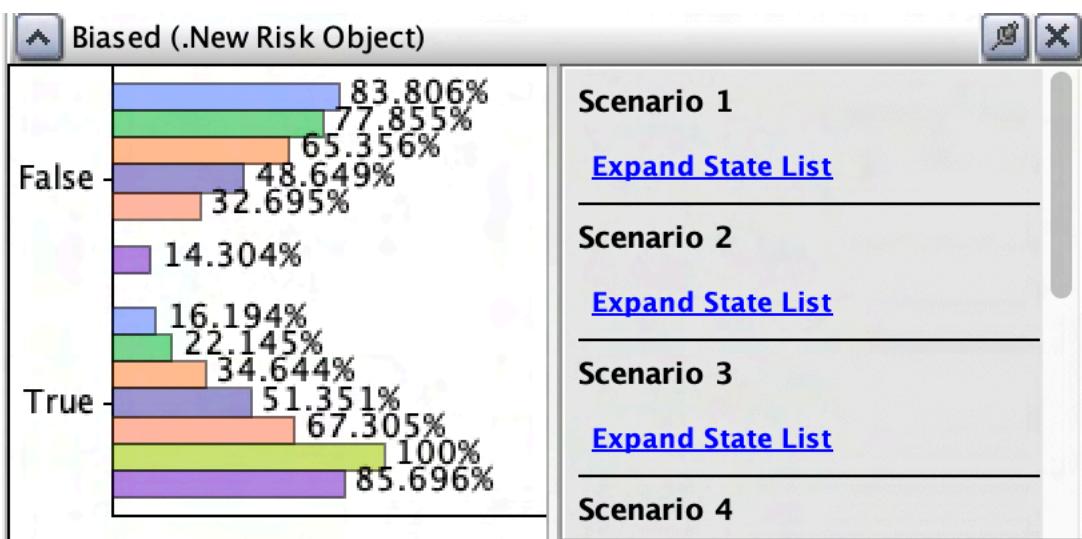
### Risk Table:

	Scenario 6
No Answer	0
True	1
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	1
Verdict_guilt(judge18)	1
Verdict_guilt(judge19)	1
Verdict_guilt(judge20)	1
Verdict_guilt(judge21)	1
Verdict_guilt(judge22)	1
Verdict_guilt(judge23)	1

### Accused guilt node:



### Biased node:

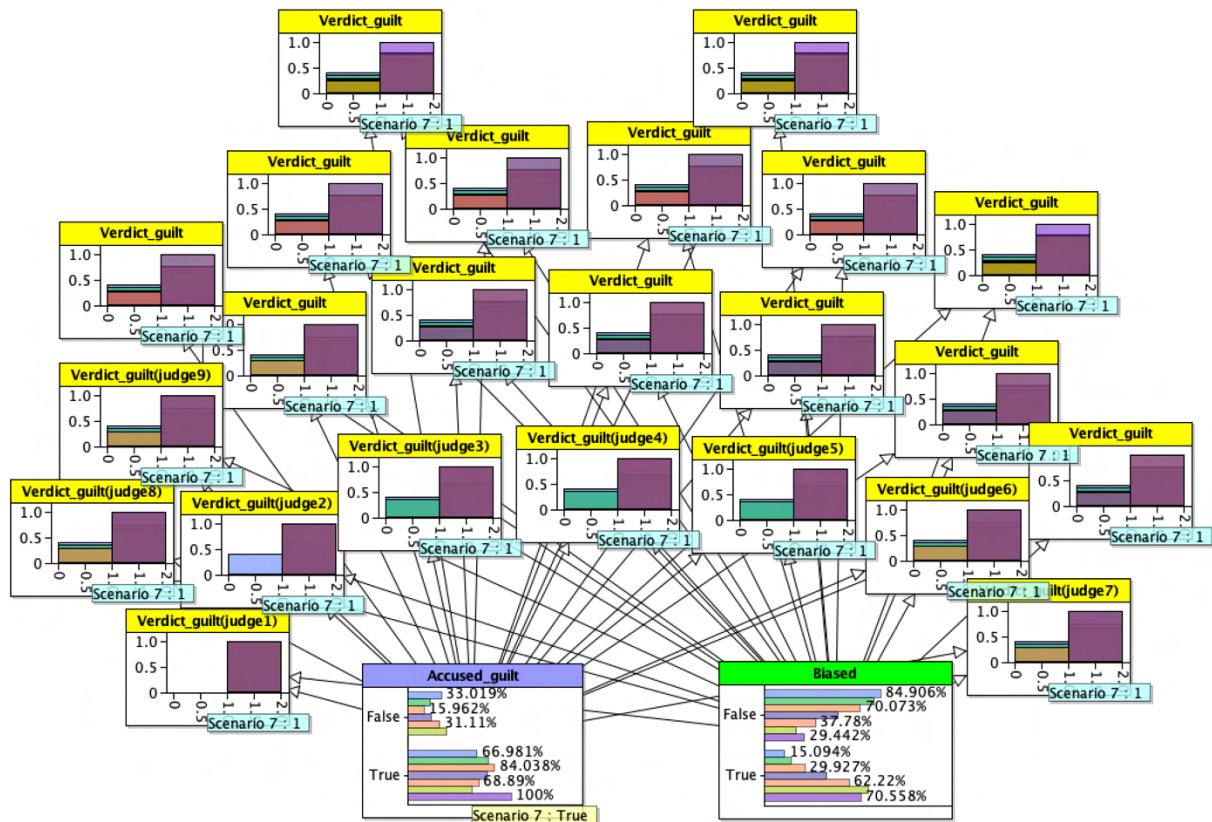


## CASE-7

For P(Accused Guilt = True| scenario-7)

For scenario, 23 judge total with 23 guilty verdict and 0 unobserved

### RISK MAP WITH GRAPHS:

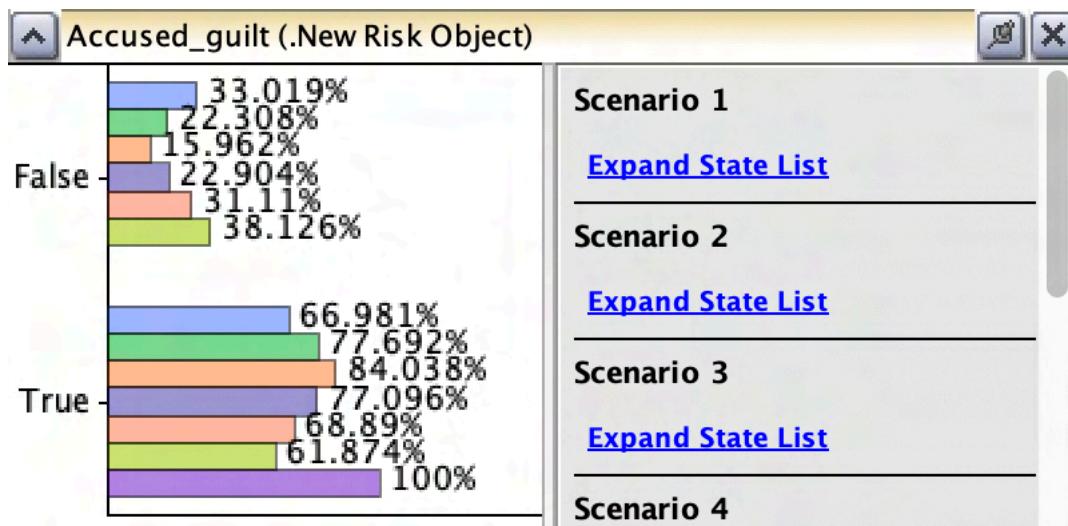


### Risk Table:

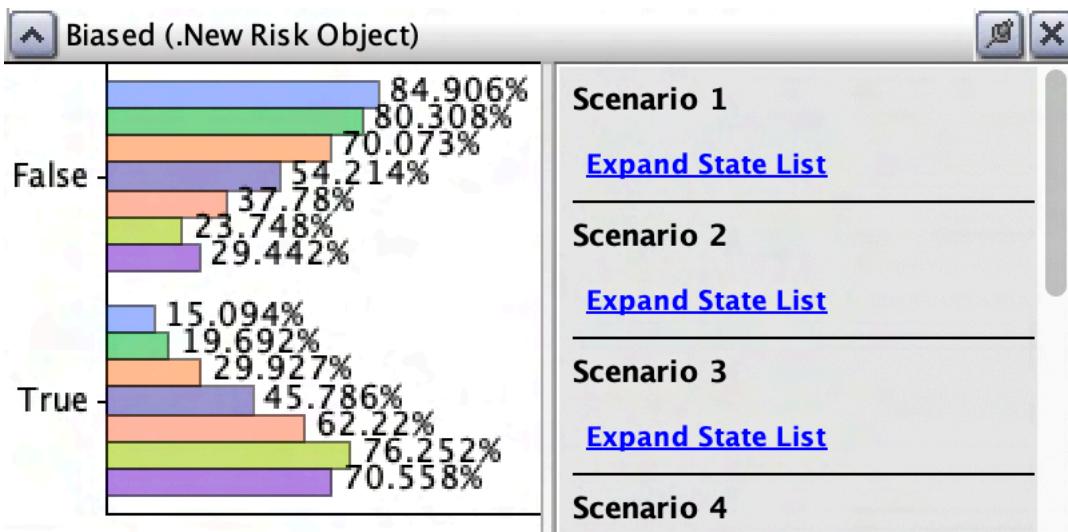
Risk Scenarios		Active Display on Risk Graph...	
Scenario 1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 2		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 3		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 4		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 5		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 6		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scenario 7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

	Scenario 7
Accused_guilt	True
Biased	No Answer
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	1
Verdict_guilt(judge18)	1
Verdict_guilt(judge19)	1
Verdict_guilt(judge20)	1
Verdict_guilt(judge21)	1
Verdict_guilt(judge22)	1
Verdict_guilt(judge23)	1

### Accused guilt node:

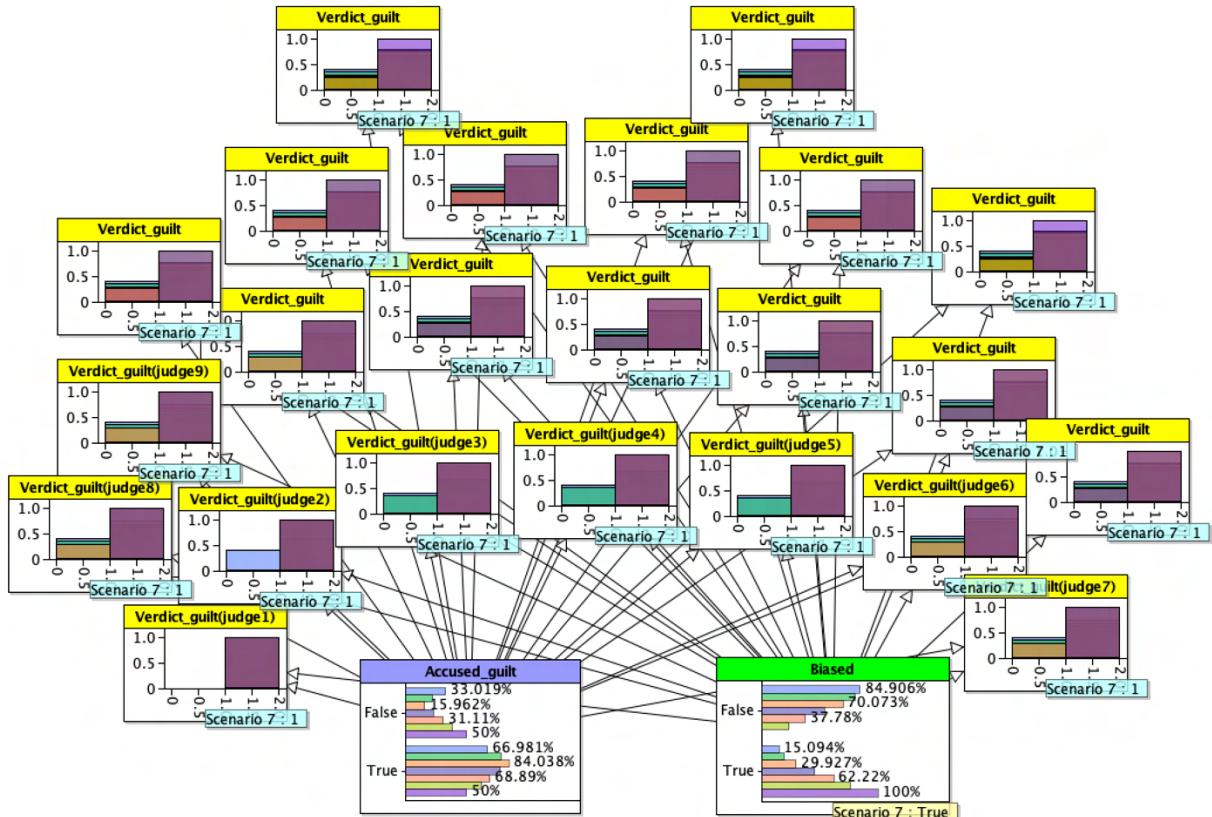


### Biased node:



## For P(All Judges Biased = True| scenario -7)

### RISK MAP WITH GRAPHS:

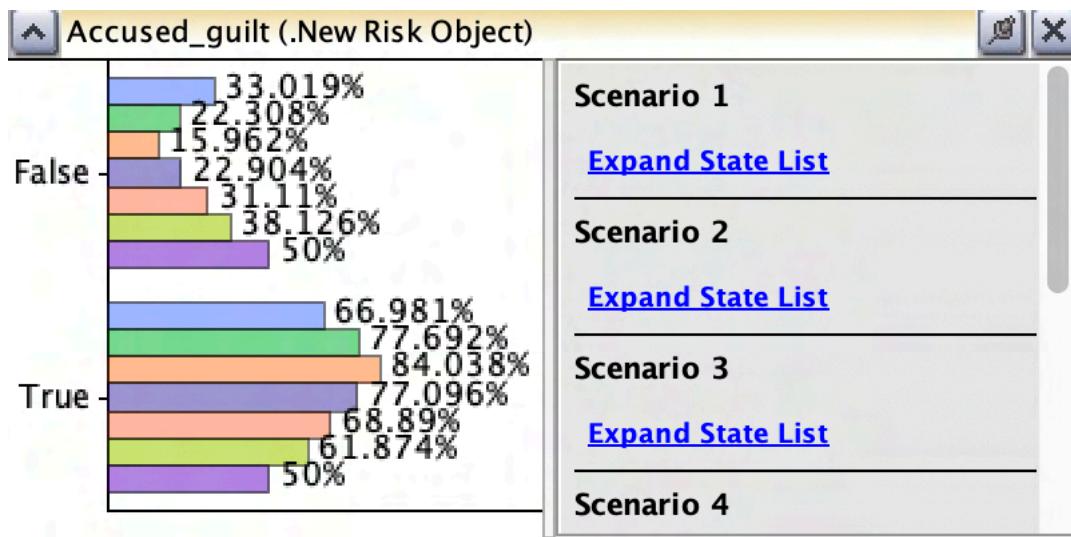


### Risk Table:

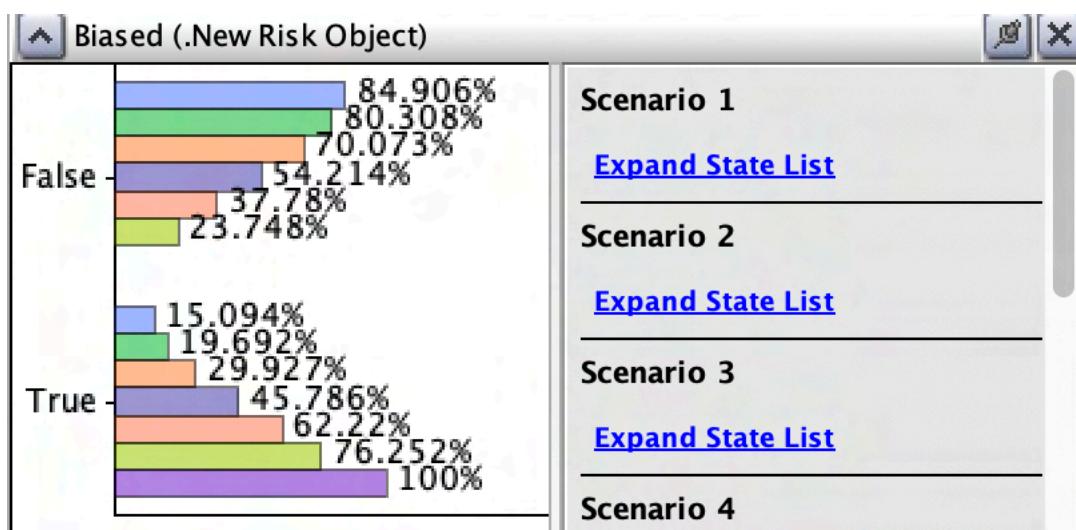
RISK TABLE FOR THE GUILT DATA

	Scenario 7
Accused_guilt	
Biased	
Verdict_guilt(judge1)	1
Verdict_guilt(judge2)	1
Verdict_guilt(judge3)	1
Verdict_guilt(judge4)	1
Verdict_guilt(judge5)	1
Verdict_guilt(judge6)	1
Verdict_guilt(judge7)	1
Verdict_guilt(judge8)	1
Verdict_guilt(judge9)	1
Verdict_guilt(judge10)	1
Verdict_guilt(judge11)	1
Verdict_guilt(judge12)	1
Verdict_guilt(judge13)	1
Verdict_guilt(judge14)	1
Verdict_guilt(judge15)	1
Verdict_guilt(judge16)	1
Verdict_guilt(judge17)	1
Verdict_guilt(judge18)	1
Verdict_guilt(judge19)	1
Verdict_guilt(judge20)	1
Verdict_guilt(judge21)	1
Verdict_guilt(judge22)	1
Verdict_guilt(judge23)	1

### Accused\_guilt node:



### Biased node:



## 2. QUESTION-2c

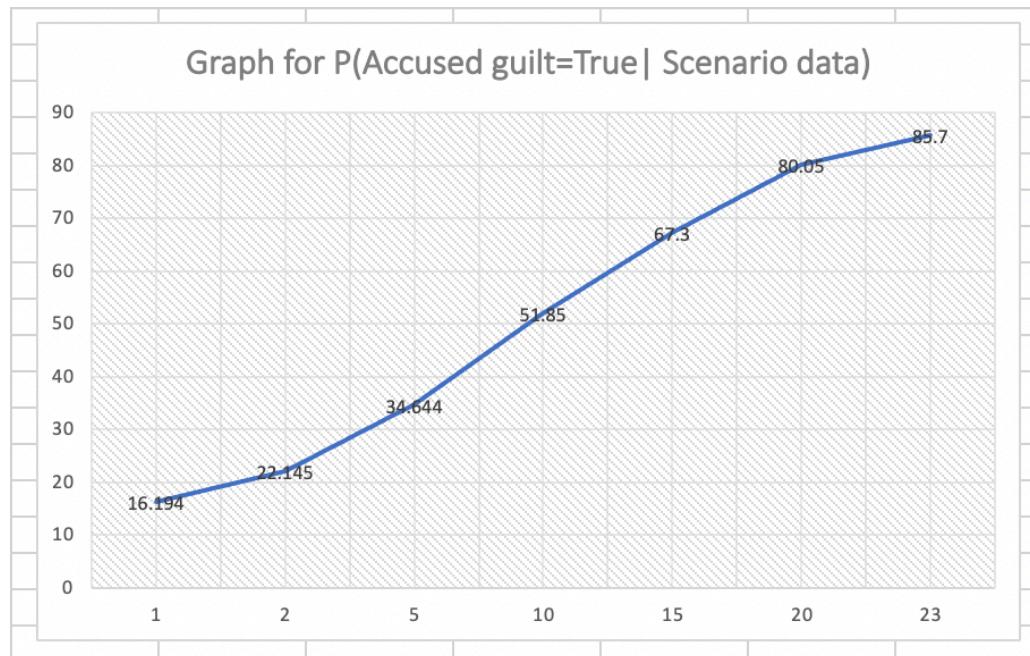
### SOLUTION:

- We have plotted the probability of accused guilt=True vs scenario data and biased =True vs scenario data.
- For this, we have used Excel to plot the graph, basic line graph is used and the plots are shown below,

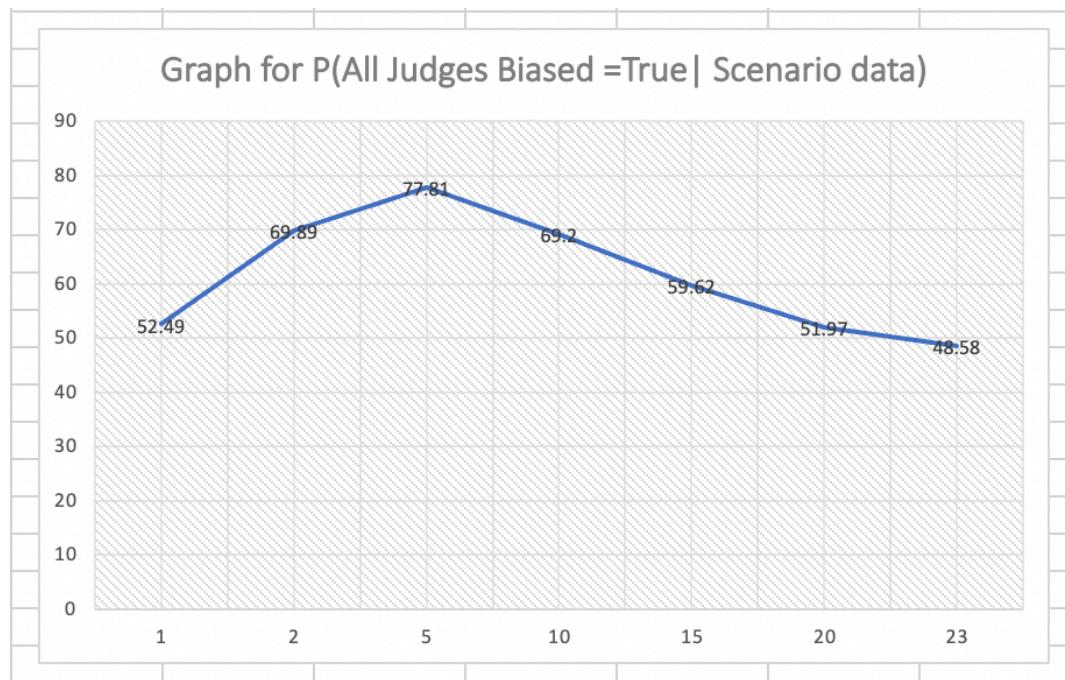
Value table for plotting the graph

A	B	C	D
1	Axis	No of Judges Y1	Y2
2	10	1	52.49
3	20	2	69.89
4	30	5	77.81
5	40	10	69.2
6	50	15	59.62
7	60	20	51.97
8	70	23	48.58

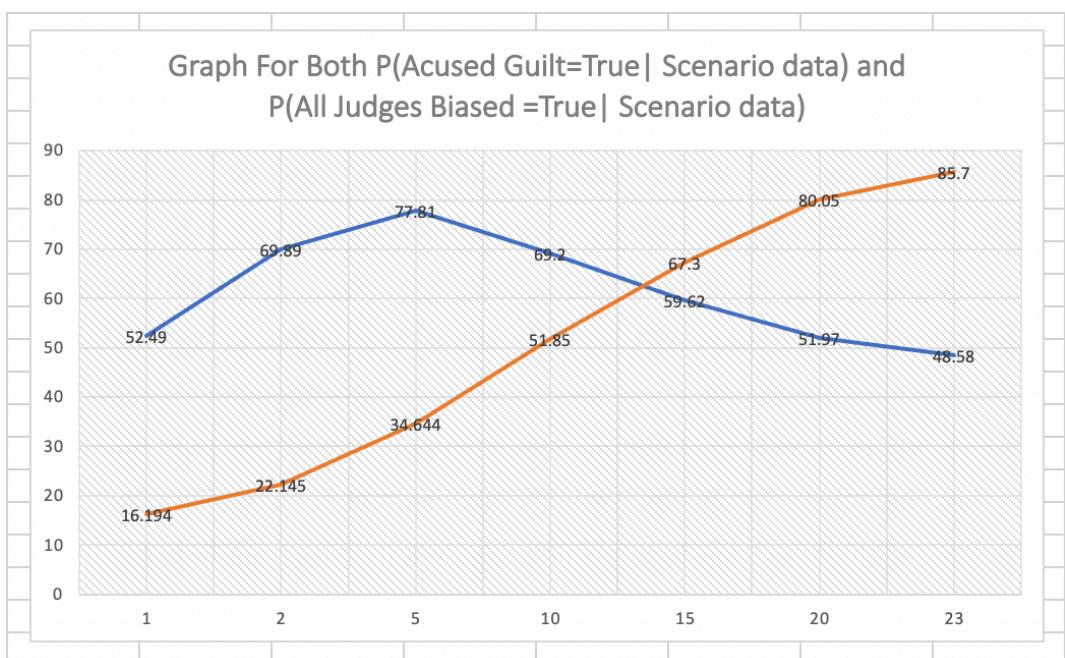
For P(Accused Guilt = True| scenario data)



For  $P(\text{All Judges Biased} = \text{True} | \text{scenario data})$



For  $P(\text{Accused Guilt} = \text{True} | \text{scenario data})$  and  $P(\text{All Judges Biased} = \text{True} | \text{scenario data})$



## **2. QUESTION-2d-1**

### **ANSWER:**

- The posterior belief of the guilt is at maximum in scenario 3, when the 5 judges gives 5 guilty verdict and 18 are unobserved.
- The approximate value ranges from 70-75 for the maximum posterior belief of the guilt.

## **QUESTION-2d-2**

### **ANSWER:**

- The posterior belief of the Biased is greater than the posterior belief of the guilt in the scenario 6 and scenario 7, when the 20 judges gives 20 guilty verdicts, 3 unobserved and 23 judges gives 23 guilty verdicts and 0 unobserved.
- The approximate value of the bias ranges from 75-80 for the scenario 6 and 7 which is greater than the posterior probability of the guilt.

## **2. QUESTION-2e**

### **ANSWER:**

- As per to the Question 2C, we have created 7 scenarios of data for the posterior marginals of Guilty verdict for the judges.
- The seven scenarios are,
  - 1) 1 judge total with 1 guilty verdict and 22 unobserved
  - 2) 2 judges total with 2 guilty verdicts and 21 unobserved
  - 3) 5 judges total with 5 guilty verdicts and 18 unobserved
  - 4) 10 judges total with 10 guilty verdicts and 13 unobserved
  - 5) 15 judges total with 15 guilty verdicts and 8 unobserved
  - 6) 20 judges total with 20 guilty verdicts and 3 unobserved
  - 7) 23 judges total with 23 guilty verdicts and 0 unobserved
- Finally we have calculated the posterior marginals for accused guilt=true and biased= true for each scenario.
- From that we can infer that, posterior belief of the guilt is at maximum in scenario 3(i.e, when 5 judges gives 5 guilty verdict). and the posterior belief of the Biased is greater than the posterior belief of the guilt in the scenario 6 and scenario 7(i.e, when 20 judges gives 20 guilty verdict, when 23 judges gives 23 guilty verdict).
- The verdicts of the judges may not be independent because, for each scenario data there are different number of guilty verdicts and the unanswered verdicts, nextly, all the node of judges which are the verdict nodes are joined with the bias Boolean node. also, the series of Bernoulli trials, i.e, partitioned data of guilty verdicts of judges are connected in series with the Boolean node, i.e, biased node. So the result mainly depends on the biased node. since that the verdict of judges are not independent.

## **2. QUESTION-2f**

### **ANSWER:**

- The area which is identified by me is "**Handling the Transgender in southern parts of India**", this falls under the social category.
- Poetically, I can say that these transgenders are the typo in the essay of God and I term them as God's own people.
- Almost all of us are of the opinion, their birth and their being is not their fault, it is the chromosomal(hormone imbalance) defect which cannot be reasoned.
- The way these God's own people are treated happens to be heartening. They need to be provided systematic bias which makes them psychologically stable and give them the guts to be one among the society.