CSC671 Program Assignment 2 Report

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1. Alarm is false, infer Burglary and JohnCalls being true

a. [<A,f>][<B,t>]:

table 1.a [<A,f>][<B,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 |
| 100 | 0 | 0.001010101 | 0.000243681 |
| 200 | 0 | 0 | 0.0000302157 |
| 500 | 0.00020 | 0 | 0.0000843752 |
| 1000 | 0 | 0 | 0.0000662128 |
| 10000 | 0.000050115 | 0.00006.0153 | 0.000055943 |
| Exact | 0.000060131 | 0.000060131 | 0.000060131 |

b. [<A,f>][<J,t>]

table 1.a [<A,f>][<J,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0.07 | 0.02 | 0.06 |
| 50 | 0.046 | 0.04612245 | 0.06832642 |
| 100 | 0.04509091 | 0.0590101 | 0.05121299 |
| 200 | 0.05265344 | 0.0561608 | 0.04306063 |
| 500 | 0.04555269 | 0.05890191 | 0.04642987 |
| 1000 | 0.04772889 | 0.04903109 | 0.05346877 |
| 10000 | 0.05046458 | 0.05087379 | 0.05035507 |
| Exact | 0.05 | 0.05 | 0.05 |

2. JohnCalls is true, Earthquake is false, infer Burglary and MaryCalls being true.

a. [<J,t><E,f>][<B,t>]

table 2.a [<J,t><E,f>][<B,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 |
| 100 | 0.0142857 | 0.0166667 | 0 |
| 200 | 0.0111111 | 0.0162338 | 0.0165899 |
| 500 | 0.0161888 | 0.0068966 | 0.0139265 |
| 1000 | 0.0054233 | 0.0136945 | 0.0106443 |
| 10000 | 0.0155823 | 0.0170177 | 0.0171095 |
| Exact | 0.016438 | 0.016438 | 0.016438 |

b. [<J,t><E,f>][<M,t>]

table 2.b [<J,t><E,f>][<M,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0 | 0 | 0 |
| 50 | 0 | 0.02 | 0.0034925 |
| 100 | 0.0111111 | 0.025 | 0.049105 |
| 200 | 0.0211111 | 0.01 | 0.0418664 |
| 500 | 0.0417783 | 0.0339901 | 0.0182046 |
| 1000 | 0.0319535 | 0.0252607 | 0.023289 |
| 10000 | 0.0296332 | 0.0363024 | 0.0303051 |
| Exact | 0.033314 | 0.033314 | 0.033314 |

3. MaryCalls is true, JohnCalls is true, infer Burglary and Earthquake being true.

a. [<M,t><J,t>][<B,t>]

table 3.a [<M,t><J,t>][<B,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0.0144669 |
| 200 | 0 | 0 | 0.0117538 |
| 500 | 0.01 | 0.025 | 0.004515 |
| 1000 | 0 | 0 | 0.0037831 |
| 10000 | 0.0048743 | 0.0076944 | 0.0071548 |
| Exact | 0.0068762 | 0. 0068762 | 0. 0068762 |

b. [<M,t><J,t>][<E,t>]

table 3.b [<M,t><J,t>][<E,t>]

|  |  |  |  |
| --- | --- | --- | --- |
| Num Samples | Prior Sampling | Rejection | LW |
| 10 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0.0082526 |
| 200 | 0 | 0 | 0.004225 |
| 500 | 0 | 0 | 0.0051104 |
| 1000 | 0.0111111 | 0.01 | 0.0087348 |
| 10000 | 0.0055236 | 0.0052509 | 0.0060111 |
| Exact | 0.0056122 | 0. 0056122 | 0. 0056122 |

All of the results show that the likelihood-weighting sampling method is much better than the prior sampling method and the rejection sampling method.