COMS 4701 - Homework 2 - Written

Uriel (Shaun), Stoll uds2104

February 12, 2020

Question 1

|  |  |
| --- | --- |
| **Advantages** | **Disadvantages** |
| 1. No Need to maintain a search tree   Only need to store the current state or several current states.   1. Use very little memory   Not having to store a search tree keeps the memory requirements very low.   1. Can often find good enough solutions in continuous or large spaces   Local searches can yield adequate solutions while many other searches would either take too long or cannot find any solution. | 1. They are not definitively optimal   Since they are local, it may not find the best solution for the entire problem.   1. Their use involves substantial parameter tuning   While trying to get the optimal solution, the algorithm often requires many different features.   1. They lack strong terminating conditions.   Since they do not always terminate on the optimal answer, weaker conditions must be set for the program to terminate. |

Question 2

1. 66 = 46,656 total states
2. 6\*5 = 30 successor states for each for each state
3. 3 + 3 + 3 = 9
4. Mutation—randomly change one queen position on the board

Question 3

1. MinSupp = 50%

|  |  |  |  |
| --- | --- | --- | --- |
| **C1** | | **F1** | |
| **Itemset** | **Support** | **Itemset** | **Support** |
| diapers | 4/6 = 67% | diapers | 4/6 = 67% |
| beer | 5/6 = 83% | beer | 5/6 = 83% |
| water | 2/6 = 33% | coffee | 4/6 = 67% |
| coffee | 4/6 = 67% | milk | 6/6 = 100% |
| milk | 6/6 = 100% |

|  |  |  |  |
| --- | --- | --- | --- |
| **C2** | | **F2** | |
| **Itemset** | **Support** | **Itemset** | **Support** |
| diapers, beer | 4/6 = 67% | diapers, beer | 4/6 = 67% |
| diapers, coffee | 3/6 = 50% | diapers, coffee | 3/6 = 50% |
| diapers, milk | 4/6 = 67% | diapers, milk | 4/6 = 67% |
| beer, coffee | 3/6 = 50% | beer, coffee | 3/6 = 50% |
| beer, milk | 5/6 = 83% | beer, milk | 5/6 = 83% |
| coffee, milk | 4/6 = 67% | coffee, milk | 4/6 = 67% |

|  |  |  |  |
| --- | --- | --- | --- |
| **C3** | | **F3** | |
| **Itemset** | **Support** | **Itemset** | **Support** |
| diapers, beer, coffee | 3/6 = 50% | diapers, beer, coffee | 3/6 = 50% |
| diapers, beer, milk | 4/6 = 67% | diapers, beer, milk | 4/6 = 67% |
| diapers, coffee, milk | 3/6 = 50% | diapers, coffee, milk | 3/6 = 50% |
| beer, coffee, milk | 3/6 = 50% | beer, coffee, milk | 3/6 = 50% |

|  |  |  |  |
| --- | --- | --- | --- |
| **C4** | | **F4** | |
| **Itemset** | **Support** | **Itemset** | **Support** |
| diapers, beer,  coffee, milk | 3/6 = 50% | diapers, beer,  coffee, milk | 3/6 = 50% |

1. MinConf = 80%

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Itemset** | **Rule #** | **Rule** | **Confidence** | **Strong?** |
| diapers, beer | 1  2 | d -> b  b -> d | 4/4 = 100%  4/5 = 80% | yes  yes |
| diapers, coffee | 3  4 | d -> c  c -> d | 3/4 = 75%  3/4 = 75% | no  no |
| diapers, milk | 5  6 | d -> m  m -> d | 4/4 = 100%  4/6 = 67% | yes  no |
| beer, coffee | 7  8 | b -> c  c -> b | 3/5 = 60%  3/4 = 75% | no  no |
| beer, milk | 9  10 | b -> m  m -> b | 5/5 = 100%  5/6 = 83% | yes  yes |
| coffee, milk | 11  12 | c -> m  m -> c | 4/4 = 100%  4/6 = 67% | yes  no |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Itemset** | **Rule #** | **Rule** | **Confidence** | **Strong?** |
| diapers, beer, coffee | 13  14  15 | db -> c  dc -> b  bc -> d | 3/4 = 75%  3/3 = 100%  3/3 = 100% | no  yes  yes |
| diapers, beer, coffee | 16  17  18 | d -> bc  b -> dc  c -> db | 3/4 = 75%  3/5 = 60%  3/4 = 75% | no  no  no |
| diapers, coffee, milk | 19  20  21 | dc -> m  dm -> c  cm -> d | 3/3 = 100%  3/4 = 75%  3/4 = 75% | yes  no  no |
| diapers, coffee, milk | 22  23  24 | d -> cm  c -> dm  m -> dc | 3/4 = 75%  3/4 = 75%  3/6 = 50% | no  no  no |
| diapers, beer, milk | 25  26  27 | db -> m  dm -> b  mb -> d | 4/4 = 100%  4/4 = 100%  4/5 = 80% | yes  yes  yes |
| diapers, beer, milk | 28  29  30 | d -> bm  b -> dm  m -> db | 4/4 = 100%  4/5 = 80%  4/6 = 67% | yes  yes  no |
| beer, coffee, milk | 31  32  33 | bc -> m  bm -> c  cm -> b | 3/3 = 100%  3/5 = 60%  3/4 = 75% | yes  no  no |
| beer, coffee, milk | 34  35  36 | b -> cm  c -> bm  m -> bc | 3/5 = 60%  3/4 =75%  3/6 = 50% | no  no  no |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Itemset** | **Rule #** | **Rule** | **Confidence** | **Strong?** |
| diapers, beer,  coffee, milk | 37  38  39  40 | dbc -> m  dbm -> c  dcm -> b  bcm -> d | 3/3 = 100%  3/4 = 75%  3/3 = 100%  3/3 = 100% | yes  no  yes  yes |
| diapers, beer,  coffee, milk | 40  41  42  43  44  45 | db -> cm  dc -> bm  dm -> bc  bc -> dm  bm -> dc  cm -> db | 3/4 = 75%  3/3 = 100%  3/4 = 75%  3/3 = 100%  3/5 = 60%  3/4 = 75% | no  yes  no  yes  no  no |
| diapers, beer,  coffee, milk | 46  47  48  49 | d -> bcm  b -> dcm  c -> dbm  m -> dbc | 3/4 = 75%  3/5 = 60%  3/4 = 75%  3/6 = 50% | no  no  no  no |

Question 4.

a) 412 = 16777216

Each of the 12 variable squares has the number 1, 2, 3, or 4.

(Note: This is the state space where every variable contains a value that is not empty. If we include blanks before a variable is filled in, then the state space is 512).

b) Any Square must equal either 1, 2, 3, or 4

c) I, J

d)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** | **L** |
| 1, 3 | 1, 2 | 1, 2, 3 | 1, 2, 3 | 1, 3 | 1, 2 | 1, 3 | 1, 4 | 1 | 1 | 1, 4 | 1, 2 |
| 1, 3 | 1, 2 | 2, 3 | 2, 3 | 1, 3 | 1, 2 | 3 | 4 | 1 | 1 | 4 | 2 |
| 1, 3 | 1, 2 | 3 | 2 | 1, 3 | 1, 2 | 3 | 4 | 1 | 1 | 4 | 2 |
| 1 | 1, 2 | 3 | 2 | 1, 3 | 1 | 3 | 4 | 1 | 1 | 4 | 2 |
| 1 | 2 | 3 | 2 | 3 | 1 | 3 | 4 | 1 | 1 | 4 | 2 |