Andrew Tran

CS1675

Assignment 8 Report

Due: 3/28/19

1a)

P(B=T, E=T) = P(A=a, B=T, C=c, D=d, E=T, F=f)

= ∑ ∑ ∑ ∑ P(A=a)\*P(B=T)\*P(C=c)\*P(D=d|A=a, B=T, C=c)\*P(E=T|C=c)\*P(F=f|D=d)

2\*2\*3\*2 = 24 addition terms

Number of additions: **23**

Number of multiplications: 5 mults\*24 **= 120**

1b) ∑ ∑ ∑ ∑ P(A=a)\*P(B=T)\*P(C=c)\*P(D=d|A=a, B=T, C=c)\*P(E=T|C=c)\*P(F=f|D=d)

= P(B=T) \* **∑C** P(E=T|C=c)\*P(C=c) \* [**∑D** [**∑A** [P(D=d|A=a, B=T, C=c)\* P(A=a)] \* **∑F** P(F=f|D=d)]]

Number of additions: **17**

Number of multiplications: **23**

The number of additions and multiplications both decreased after interleaving products and sums which decreases the overall cost to compute.

|  |  |
| --- | --- |
| T | F |
| 0.02 | 0.98 |

2a)

P(pneumonia) =

|  |  |  |
| --- | --- | --- |
| pneumonia | T | F |
| T | 0.90 | 0.10 |
| F | 0.60 | 0.40 |

P(fever|pneumonia)

|  |  |  |
| --- | --- | --- |
| pneumonia | T | F |
| T | 0.70 | 0.30 |
| F | 0.50 | 0.50 |

P(paleness|pneumonia)

|  |  |  |
| --- | --- | --- |
| pneumonia | T | F |
| T | 0.90 | 0.10 |
| F | 0.10 | 0.90 |

P(cough|pneumonia)

|  |  |  |
| --- | --- | --- |
| pneumonia | T | F |
| T | 0.80 | 0.20 |
| F | 0.50 | 0.50 |

P(highWBC|pneumonia)

2b) Pneumonia= Pnm; Fever=F; Paleness=P; Cough=C; HighWBCcount=H

P(pnm = T|F = T, P = F, C = T, H = F) =

= P(F=T, P=F, C=T, H=F|Pnm=T)\*P(Pnm=T) / [P(F=T, P=F, C=T, H=F| Pnm=T)\* P(Pnm=T) + P(F=T, P=F, C=T, H=F| Pnm=F) \*P(Pnm=F)]

= P(F=T|Pnm=T)\*P(P=F|Pnm=T)\*P(C=T|Pnm=T)\*P(H=F|Pnm=T)\*P(Pnm=T) / [P(F=T|Pnm=T)\*P(P=F|Pnm=T)\*P(C=T|Pnm=T)\*P(H=F|Pnm=T)\*P(Pnm=T) + P(F=T|Pnm=F)\*P(P=F|Pnm=F)\*P(C=T|Pnm=F)\*P(H=F|Pnm=F)\*P(Pnm=F)]

= (0.90)(0.30)(0.90)(0.50)(0.02) / [(0.90)(0.30)(0.90)(0.50)(0.02) + (0.60)(0.50)(0.10)(0.50)(0.98)]

= **0.141**

2c) P(Pnm=T|F=T, C=T) =

= P(F=T|Pnm=T) \*P(C=T|Pnm=T)\*P(Pnm=T) / [P(F=T|Pnm=T)\*P(C=T|Pnm=T)\*P(Pnm=T) + P(F=T|Pnm=F)\*P(C=T|Pnm=F)\*P(Pnm=F)]

= (0.90)\*(0.90)\*(0.02) / [(0.90)\*(0.90)\*(0.02) + (0.60)\*(0.10)\*(0.98)]

**= 0.216**