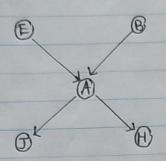
```
Data Hining 02
             Bayesian Classification 1X39 (X) 20039
  Bayer's Theorem
 e PCH(x) = x P(x 1H) PCH) (20 12X) 9 (80 13X) 9 =
 Hypothesis pcx) (X) 9

2 H: 2 C = C | 1 = (2) | 2 X) 9 | 8 = (2) | 12 X) 9
 we can determine the prior probability in several ways.
Eg: If we know that there are 301 applications are
      safe and 70% are risky.
   PCC: IX) = P(XIC:) PCC:)
              P(X) (R)) P(X) (R) P((R))
PCX) is constant ofor all relasses. Hence, only pCx1C;) pCci)
   PCXICi) = P(XI) Xxx Xxx Xxx Xn 1C;)
          = p(X11Ci) p(X21Go) ... p(Xn1Ci)
  • P(Xk | C;)= N( xk-0.5 ≤ xk ≤ xk+0.5, He; JG;) XX)9
   A is independent and B depends on A, then
   Example
   x = ( age = youth, income = medium, student = yes, credit_rating = fair)
   Let 0,= buy9 a computer cx= do not buy a computer
   B C CHIX) = 8 inchage (x | x) = 1200 apoint 8 = (x | x) 2 q
   PC(C11X) = P(X 1G) PACCI) A DOG = (28 A)
               PCX
    = p(x1=youth, x2=medium, xg=yes, x4= fair | c) p(c)
                P(X) = P(XIN XR N XB NX4)
   PCC1)=(A99(A18) PCC2)= 5 - (3 (A)9 () () ()
   p(x_1|c_1) = 2 p(x_2|c_1) = 4 p(x_3|c_1) = 6 p(x_4|c_1) = 6
   PCRICIPCE0=2x4x6x6x7=0.0282
999914
```

PCCRIX) = PCXICR) PCCR) PCX1 = P(XI | CR) P(XRICR) P(Xg | CR) P(X4 | CR) P(Ca) $P(x_1 | (x) = 3) P(x_2 | (x) = 2) P(x_3 | (x) = 1) P(x_4 | (x) = 2)$ ser w in state of the prior of grobability on 5 and same server of 5 P(XI(x) P((x) = 3 x x x 1 | x x x 5 = 12 x 5 = 0.0343 5 5 5 5 14 (5)3x14 · P(X1C1)P(C1) < P(X1C2)P(C2). (X)9 Therefore, the given observation belongs to the class C2/1 = PCXII CI) PCXRIGRO - PCXOICI) Bayesian Belief Networks (BBN) P(x|x,z) = P(x|z) means x,y,z are independent if A is independent and B depends on A, then P(XA, XB) = P(BIA) P(A) (not - grant probability use modern = smoon; day = see) = x Let 01 = base a computer ce do not base a comparer A-independent, 8-independent, c-has 2 PCABC) = PCC/ABIPCAIPCBIX) 9 - (XIPOTENTS = p(xi=gouth, xo=modium, xo=ges, xx= fair 1 ci) p (ci) p(A, B, C) = p(BIA) p(CIA) p(A) (C) →B →C P(ABC) = PCC(B) P(BIA) P(A) The MAlarm Example 10009 4 = 4010009 9 = 4010009 B = a burglary occurs J = Joha calls E = om earthquakes occurs H= Hory calls A = alorm rigning

Find the probability of John and Hany report the alarm and neither earthquakes nor burglary occur. A = Y, B = N, E = N, J = Y, H = Y.



P(A, B, E, J, H) = ?

- = PCJIA) x PCHIA) x P(AIB', E') x P(E') P(B')
- = 0,9x 0.7x 0.001x 0.998 x 0.999
- = 0.00063

No:

P(JABE) = P(J | A) × P(A | B' E) × P(B) P(E)

P(JABE) = P(J | A) × P(A | B' E) γ P(B) P(E)

P(JABE) = P(J | A) × P(A | B' E) γ P(B) P(E)

P(JABE) = P(J | A) × P(A | B' E) γ P(B) P(E)

 $p(J, A, B, E) = 0.9 \times 0.95 \times 0.001 \times 0.002 = 1.71 \times 10^{-6}$ $p(J, A, B, E') = 0.9 \times 0.94 \times 0.001 \times 0.999 = 8.443 \times 10^{-4}$ $p(J, A, B', E) = 0.9 \times 0.92 \times 0.999 \times 0.002 = 5.2148 \times 10^{-4}$ $p(J, A, B', E') = 0.9 \times 0.001 \times 0.999 \times 0.998 = 8.973 \times 10^{-4}$

PCJ; A, B, E) = PCJIA) P(A'J B, E) P(B) P(E)

= 0.05 x 0.05 x 0.001x 0.002 = 5x159

P(J, A', B, E') = P(J| A') P(A'| B, E') P(B) P(E')

= 0.05 x 0.06 x 0.001 x 0.990 = 2.994 x106

P(J, A', B', E) = P(J|A') P(A' | B', E) P(B') P(E)

= 0.05x 0.71x 0.999x 0.002 = 7.0929 x105

P(J, A', B', E') = P(J|A') P(A' | B', E') P(B') P(E')

= 0.05 x 0.999x 0.999 x 0.998 = 0.0498

= 521, 38763 x10+ = 0,0 521 +/

