AI Assignment - 7

Inference from Full Joint Probability Distribution

Sabarivasan Velayutham

205001085

CSE-B

Code:

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s = {'sunny': 0.3, 'cloudy': 0.3, 'rainy': 0.4}

w = {'true': 0.3, 'false': 0.7}


# Returning row values of events based on S event



def S_event(event):
    if 'sunny' in event:
        return 0
    elif 'cloudy' in event:
        return 1
    elif 'rainy' in event:
        return 2
    else:
        return 3


# Returning column values of events based on W event



def W_event(event):
```

```
    if 'W = T' in event:
        return 0
    elif 'W = F' in event:
        return 1
    else:
        return 2


# Finding probability based on the event



def P(jpdt, event):
    if '|' in event:
        event = event.split('|')
        row = S_event(event[0])
        col = W_event(event[0])

    else:
        row = S_event(event)
        col = W_event(event)

    return jpdt[row][col]



# Joint probability distribution table
jpdt = []

for i in s:
    probability = []
    for j in w:
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        probability.append(round(s[i] * w[j], 2))
    jpdt.append(probability)

# Finding row sum
for i in range(len(jpdt)):
    rsum = 0
    for j in range(len(jpdt[i])):
        rsum += jpdt[i][j]
    jpdt[i].append(rsum)

# Finding column sum
csum = []
for i in range(len(jpdt[0])):
    col_sum = 0
    for j in range(len(jpdt)):
        col_sum += jpdt[j][i]
    csum.append(col_sum)
jpdt.append(csum)

# Printing joint probability distribution table
print('\nJOINT PROBABILITY DISTRIBUTION TABLE\n')
print('S/W     \tW = T\t\tW = F\t\tSum\n')
print('S = Sunny ', end="\t")
for i in jpdt[0]:
    print(i, end="\t\t")
print()

print('\nS = Cloudy', end="\t")
for i in jpdt[1]:
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    print(i, end="\t\t")

print()


print('\nS = Rainy ', end="\t")

for i in jpdt[2]:

    print(i, end="\t\t")

print()


print('\nSum      ', end="\t")

for i in jpdt[3]:

    print(i, end="\t\t\t")


print("\n\nPRINTING PROBABILITIES OF EVENTS\n")


print('P(S = rainy ∧ W = T) = ', P(jpdt, 'S = rainy ∧ W = T'))

print('P(S = rainy) = ', P(jpdt, 'S = rainy'))

print('P(W = T) = ', P(jpdt, 'W = T'))

print('P(S = rainy | W = T) = ', P(jpdt, 'S = rainy | W = T'))
```

Output:

```
PS C:\Users\sabar\OneDrive\Desktop\LAB\Artificial Intelligence> python -u "c:\U
neDrive\Desktop\LAB\Artificial Intelligence\EX-7 Join Probability\jointprob.py"

JOINT PROBABILITY DISTRIBUTION TABLE

S/W             W = T           W = F           Sum

S = Sunny       0.09            0.21            0.3

S = Cloudy      0.09            0.21            0.3

S = Rainy       0.12            0.28            0.4

Sum             0.3                     0.7                     1.0

PRINTING PROBABILITIES OF EVENTS

P(S = rainy ∧ W = T) =  0.12
P(S = rainy) =  0.4
P(W = T) =  0.3
P(S = rainy | W = T) =  0.4
PS C:\Users\sabar\OneDrive\Desktop\LAB\Artificial Intelligence>
```