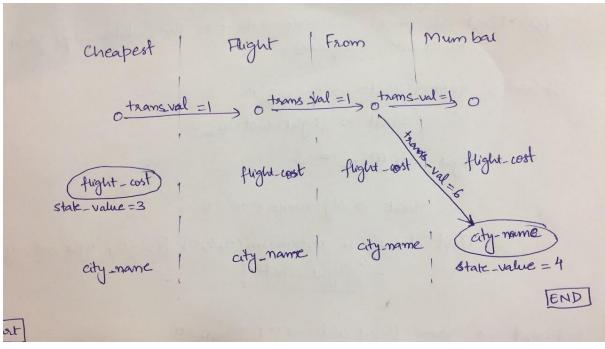# CRF trellis Solution

Solution to

1 : Find the path value of O -> O -> O -> city_name

2 : Find the path value of flight_cost-> O -> O -> city_name

① For label sequence : O→ O→O→ city-name → end

From start → O: w = 0

O→ O: w = 1

O→ O: w = 1

O → city-name = 6

state-value of city-name = 4 , city-name →end: 0

Total path value = 1+1+ 6+4+0= 12

② For label sequence : start → flight-cost→ O→ O→ flight-cost
→ end

· From start → flight-cost: w = 0

state-value of flight-cost = 3

flight-cost → O: w = 0

Total path value = 1+1+6+4+0 = 12

② For label sequence : start → flight-cost → 0 → 0 → flight-cost → end

· From start → flight-cost : $\omega = 0$

state-value of flight-cost = 3

flight-cost → 0 : $\omega = 0$

0 → 0 : $\omega = 1$

0 → flight-cost : $\omega = 0$

Total path value = 0+3+0+1+0 = 4

3: Solution to find the most probable path:

③ Find the most probable path for the given observation sequence :

1st label : 0 [from start → 0 ; $\omega_{trans} = 0$

flight-cost $\begin{cases} \text{start} \to \text{flight-cost} : \omega_{trans} = 0 \\ \text{flight-cost} : \omega_{state} = 3 \end{cases}$

city-name [start → city-name : $\omega = 0$

⇒ First label is max(0,3,0) for (0, flight-cost, city-name)
= flight-cost

2nd label → 0 [from flight-cost → 0 : $\omega_{trans} = 0$

2nd label $\rightarrow$ 0 [from flight-cost $\rightarrow$ 0 : $\omega_{trans} = 0$

flight-cost $\begin{bmatrix} \text{flight-cost} \rightarrow \text{flight-cost} : \omega_{trans} = 0 \\ \text{flight-cost} : \omega_{state} = 0 \end{bmatrix}$

city-name $\begin{bmatrix} \text{flight-cost} \rightarrow \text{city-name} : \omega = 0 \end{bmatrix}$

All 3 labels are possible. let's start with each one-by-one

3rd label :- let's start with 0

then $0 \rightarrow 0$: $\omega_{trans} = 1$

$0 \rightarrow$ flight-cost : $\omega_{trans} = 0$

$0 \rightarrow$ city-name : $\omega_{city-name} = 0$

$0 \rightarrow$ flight-cost : $\omega_{trans} -$

$0 \rightarrow$ city-name : $\omega_{city-name} = 0$

Considering flight-cost and city-name, will result in 0 transition values.

Therefore, 2nd label is 0 $\begin{bmatrix} \\ \end{bmatrix} \rightarrow$ since $0 \rightarrow 0$ will give maximum
& 3rd label is 0 path-value = 1

Similarly, 4th label can be calculated which gives maximum value over the path $\Rightarrow$ flight-cost $(6+4=10)$

So, the total path value $= 3 + 1 + 6 + 4 = 14$

for path sequence : start-value $\rightarrow$ flight-cost $\rightarrow 0 \rightarrow 0 \rightarrow$ city-name
$\downarrow$
end