HMM:-

Hidden states = Rainy (R), Sunny (S).

Observed states = walk (W), shop ($\bar{S}$), clean (C)

Transition matrix:-

	R	S
R	0.7	0.3
S	0.4	0.6

Emission Matrix:-

	W	$\bar{S}$	C
R	0.1	0.4	0.5
S	0.6	0.3	0.1

Initial Prob:-

P(R)	P(S)
0.6	0.4

$\pi = [0.6 \quad 0.4]$

Given Sequence:-

W $\bar{S}$ $\bar{S}$

Total permutation = hiddenstates ^ observed states.

$= 2^3$

$= \boxed{8}$

R R R

R R S

R S R

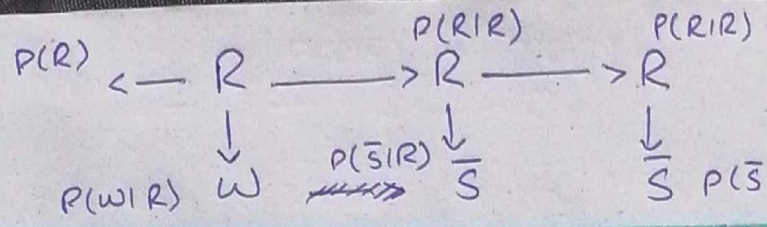
R S S

S R R

S R S

S S R

S S S.



1) ←R→R→R.

$P(RRR) = P(R) \times P(W|R) \times P(R|R) \times P(\bar{S}|R) \times P(R|R) \times P(\bar{S}|R)$

$= 0.6 \times 0.1 \times 0.7 \times 0.4 \times 0.7 \times 0.4$

$= 0.0047$

2) ←R→R→S.

$P(RRS) = P(R) \times P(W|R) \times P(R|R) \times P(\bar{S}|R) \times P(S|R) \times P(\bar{S}|R)$

$= 0.6 \times 0.1 \times 0.7 \times 0.4 \times 0.3 \times 0.4$

$= 0.0015$

3) ←R→S→R.

$P(RSR) = P(R) \times P(W|R) \times P(S|R) \times P(\bar{S}|\bar{S}) \times P(R|S) \times P(\bar{S}|R)$

$= 0.6 \times 0.1 \times 0.3 \times 0.3 \times 0.4 \times 0.4$

$= 0.00086$

4) ←R→S→S

$P(RSS) = P(R) \times P(W|R) \times P(S|R) \times P(\bar{S}|S) \times P(S|S) \times P(\bar{S}|S)$

$= 0.6 \times 0.1 \times 0.3 \times 0.3 \times 0.6 \times 0.3$

$= 0.00097.$

5) ←S→R→R =

$P(SRR) = P(S) \times P(W|S) \times P(R|S) \times P(\bar{S}|R) \times P(R|R) \times P(\bar{S}|R)$

$= 0.4 \times 0.6 \times 0.4 \times 0.4 \times 0.7 \times 0.4$

$= 0.010.$

6) ~~SRS~~ (w s̄ s̄)

$P(SRS) = P(S) \times P(w|S) \times P(R|S) \times P(\bar{S}|R) \times P(S|R) \times P(\bar{S}|S)$

$= \cancel{0.4 \times 0.6 \times \frac{0.6}{0.4} \times 0.3 \times 0.4 \times 0.4}$

$= 0.0069.$

$= 0.4 \times 0.6 \times 0.4 \times 0.4 \times 0.3 \times 0.3$

$= 0.0034.$

7) SSR.

$P(SSR) = P(S) \times P(w|S) \times P(S|S) \times P(\bar{S}|S) \times P(R|S) \times P(\bar{S}|R)$

$= 0.4 \times 0.6 \times 0.6 \times 0.3 \times 0.4 \times 0.4$

$= 0.0069$

8) SSS.

$P(SSS) = P(S) \times P(w|S) \times P(S|S) \times P(\bar{S}|S) \times P(S|S) \times P(\bar{S}|S)$

$= 0.4 \times 0.6 \times 0.6 \times 0.3 \times 0.6 \times 0.3$

$= 0.0077.$

$\max[P(RRR), P(RRS), P(RSR), P(RSS), P(SRR), P(SRS), P(SSR), P(SSS)]$

$= MAX(0.0047, 0.0015, 0.00086, 0.00097, 0.010, 0.0034, 0.0069, 0.0077)$

$= 0.010$

Maximum prob :-

$P(SRR) = 0.010.$

So the most likely sequence for the given sequence of observations [w s̄ s̄] is (S R R) → sunny, Rainy, Rainy

Sunny → Rainy → Rainy

↓ ↓ ↓

Walk Shop Shop