

INFSCI 2420 Assignment 2 HMM decoding

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1 Calculation

t =	0	1	2	3
H	0	$V_1(2) = P(H Start) * P(3 H)$ $= 0.8 * 0.4$ $= 0.32$	$P(H H) * P(1 H) = 0.7 * 0.2$ $= 0.14$ $P(H C) * P(1 H) = 0.4 * 0.2$ $= 0.08$ $V_2(2) = \max(0.32 * 0.14, 0.02 * 0.08)$ $= 0.0448$	$P(H H) * P(3 H) = 0.7 * 0.4$ $= 0.28$ $P(H C) * P(3 H) = 0.4 * 0.4$ $= 0.16$ $V_3(2) = \max(0.0448 * 0.28, 0.048 * 0.16)$ $= 0.012544$
C	0	$V_1(1) = P(C Start) * P(3 C)$ $= 0.2 * 0.1$ $= 0.02$	$P(C H) * P(1 C) = 0.3 * 0.5$ $= 0.15$ $P(C C) * P(1 C) = 0.6 * 0.5$ $= 0.3$ $V_2(1) = \max(0.32 * 0.15, 0.02 * 0.3)$ $= 0.048$	$P(C H) * P(3 C) = 0.3 * 0.1$ $= 0.03$ $P(C C) * P(3 C) = 0.6 * 0.1$ $= 0.06$ $V_3(1) = \max(0.0448 * 0.03, 0.048 * 0.06)$ $= 0.00288$
Start	1	0	0	0
End	0	0	0	0

1.1 Calculation in log space

All log and exp calculations are based on 10.

t =	0	1	2	3
H	0	$V_1(2) = \exp(\log(P(H Start)) + \log(P(3 H)))$ $= 10^{\log(0.8) + \log(0.4)}$ $= 0.32$	$\exp(\log(P(H H)) + \log(P(1 H))) = 10^{\log(0.7) + \log(0.2)}$ $= 0.14$ $\exp(\log(P(H C)) + \log(P(1 H))) = 10^{\log(0.4) + \log(0.2)}$ $= 0.08$ $V_2(2) = \max(0.0448, 0.0016) = 0.0448$	$\exp(\log(P(H H)) + \log(P(3 H))) = 10^{\log(0.7) + \log(0.4)}$ $= 0.28$ $\exp(\log(P(H C)) + \log(P(3 H))) = 10^{\log(0.4) + \log(0.4)}$ $= 0.16$ $V_3(2) = \max(0.012544, 0.00768) = 0.012544$
C	0	$V_1(1) = \exp(\log(P(C Start)) + \log(P(3 C)))$ $= 10^{\log(0.2) + \log(0.1)}$ $= 0.02$	$\exp(\log(P(C H)) + \log(P(1 C))) = 10^{\log(0.3) + \log(0.5)}$ $= 0.15$ $\exp(\log(P(C C)) + \log(P(1 C))) = 10^{\log(0.6) + \log(0.5)}$ $= 0.3$ $V_2(1) = \max(0.048, 0.006) = 0.048$	$\exp(\log(P(C H)) + \log(P(3 C))) = 10^{\log(0.3) + \log(0.1)}$ $= 0.03$ $\exp(\log(P(C C)) + \log(P(3 C))) = 10^{\log(0.6) + \log(0.1)}$ $= 0.06$ $V_3(1) = \max(0.001344, 0.00288) = 0.00288$
Start	1	0	0	0
End	0	0	0	0

2 Path and Backtrace

The best path is Start -> H -> H -> H

Backtrace:

- (1) [t=1] -> [s]: H -> Start; C -> Start
- (2) [t=2] -> [t=1]: H -> H; C -> H
- (3) [t=3] -> [t=2]: H -> H; C -> C