

HW1

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maximize

$$\begin{aligned}\max P(t_0, \dots, t_{n-1} | w_0, \dots, w_{n-1}) &= \max \frac{P(t_0, \dots, t_{n-1})}{P(w_0, \dots, w_{n-1})} \\ &= \max P(t_0, \dots, t_{n-1}, w_0, \dots, w_{n-1})\end{aligned}$$

Define

$$\begin{aligned}\delta_0(S) &= P(t_0 = S, w_0) = P(t_0 = S) P(w_0 | t_0 = S) \\ \delta_1(S) &= \max_V P(t_1 = S, t_0 = V, w_0, w_1) \\ &= \max_V P(w_1 | t_1 = S) P(t_1 = S | t_0 = V) P(w_0 | t_0 = V) P(t_0 = V) \\ &= P(w_1 | t_1 = S) \max_V P(t_1 = S | t_0 = V) \delta_0(V) \\ \delta_2(S) &= \max_{V_0, V_1} P(t_2 = S, t_0 = V_0, t_1 = V_1, w_0, w_1, w_2) \\ &= P(w_2 | t_2 = S) \max_{V_1} P(t_2 = S | t_1 = V_1) \delta_1(V_1) \\ \delta_3(S) &= P(w_3 | t_3 = S) \max_{V_2} P(t_3 = S | t_2 = V_2) \delta_2(V_2)\end{aligned}$$

, where we used markov property.

Modified Viterbi :

Initialization :