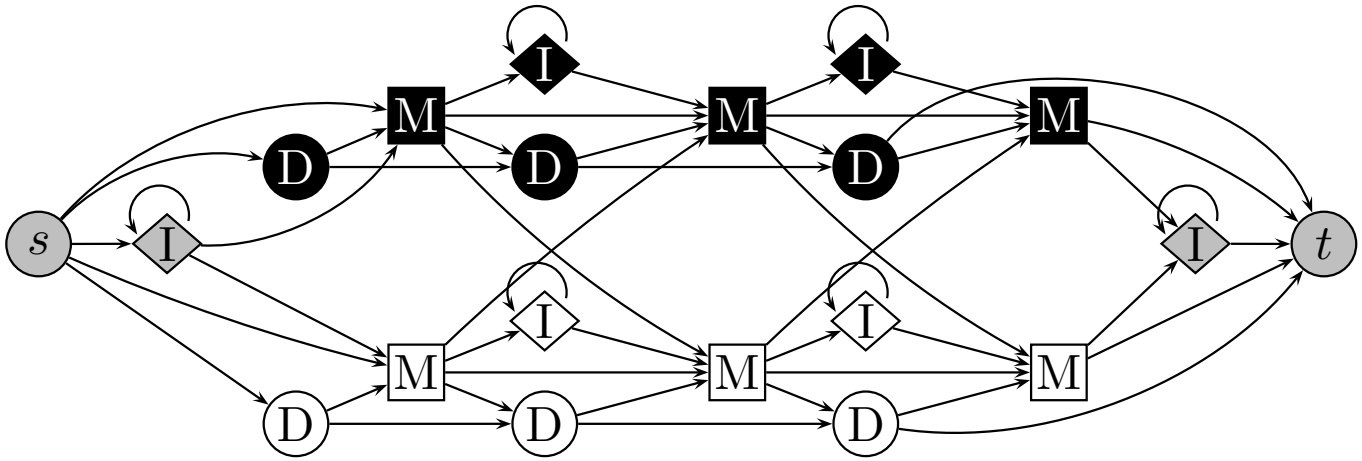
Annotation issues in jumping HMMs



State path: alignment of sequence to subtype profiles

Annotation: segments of inputs emitted by subtype profiles

Problems with most probable annotation:

— probably hard to decode

— many annotations with slightly shifted boundaries

Change the objective function for decoding

Gain function [Hamada et al. 2009]

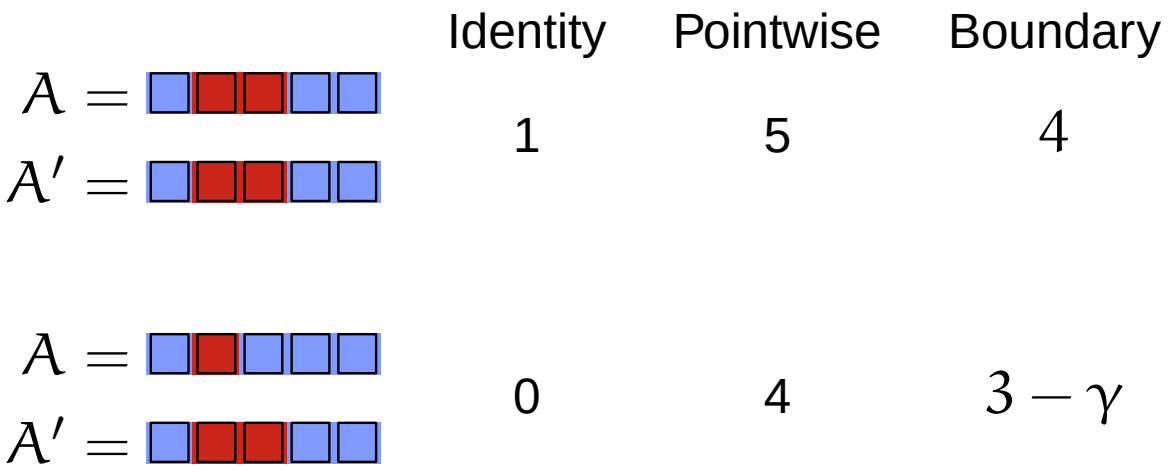
$G(A, A')$ measures accuracy of A wrt. correct annotation A'

Examples:

Identity: score 1 iff A completely correct, 0 otherwise

Pointwise: score +1 for every correct label in A

Boundary: score +1 for every correct boundary, $-\gamma$ for incorrect boundary



	Identity	Pointwise	Boundary
A = ■■■■■ A' = ■■■■■	1	5	4
A = ■■■■■ A' = ■■■■■	0	4	$3-\gamma$

Optimizing expected gain

Goal: find annotation A that maximizes

$$E_{A'|X}[G(A, A')] = \sum_{A'} G(A, A')P(A'|X)$$

Identity gain function: Viterbi algorithm

Pointwise gain function: Posterior decoding (forward-backward)

Boundary gain function: [Gross et al. 2007]

The choice of gain function is application-dependent