Machine Learning

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Discussion Set 11 | University of Southern California

HMM

Problem 1

Suppose that we didn't know the emission probabilities or transition probabilities for this HMM. Instead, we had to estimate them from data. Consider the following data set:

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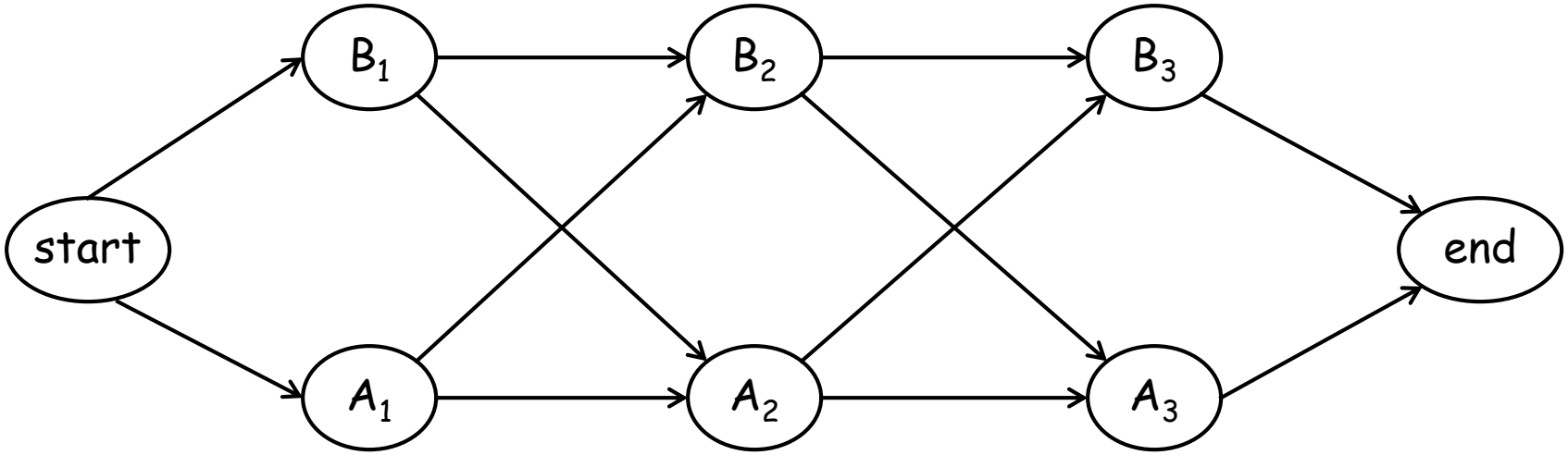
state: S S V V V S S S S S V S V V S V S S V V
  obs: G F G G F F F F G F G G G G F G F F G G
```

Based on this data, estimate the emission and the transition probabilities for this HMM.

Problem 2

Assuming the following HMM



with the following transition and emission probabilities

	A	B	End
Start	0.7	0.3	0
A	0.2	0.7	0.1
B	0.7	0.2	0.1

	S	x	y
Start	1	0	0
A	0	0.4	0.6
B	0	0.3	0.7

What is the most likely sequence of states that produced the input sequence *xyy* ?

Problem 3

Using $\gamma_s(t) = P(X_t = s|O_{1:T})$, prove that $\beta_s(T) = 1$.

Problem 4

Compute a new transition probability from state s to state s' by maximizing the complete log-likelihood $Q(\Theta)$ from the lecture slide 39.