

Homework 2

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Homework 1

1. Conditional Random Fields

(a) Algorithm

```
1 for  $k \in \{0 \dots K\}$  do
2    $v_1(k) = s_1(k, \diamond)$ 
3 end
4 for  $m \in \{2, \dots, T\}$  do
5   for  $k \in \{0, \dots, K\}$  do
6      $v_m(k) = \sum_{k'} (s_m(k, k') + v_{m-1}(k'))$ 
7   end
8 end
9 return  $\sum_k s_{T+1}(\diamond, k) + v_T(k)$ 
```

Algorithm 1:

(b) The time complexity of the first for loop on line 1 is $O(K)$

The time complexity of the nested for loops on lines 4 through 6 is $O(T \cdot K^2)$, with the for loop on line 4 being $O(T)$, the for loop on line 5 being $O(K)$ and the summation on line 6 $O(K)$.

The summation on line 9 is $O(K)$.

Therefore, the total time complexity of the algorithm is $O(T \cdot K^2)$