Assignment #4

CSE 447: Natural Language Processing
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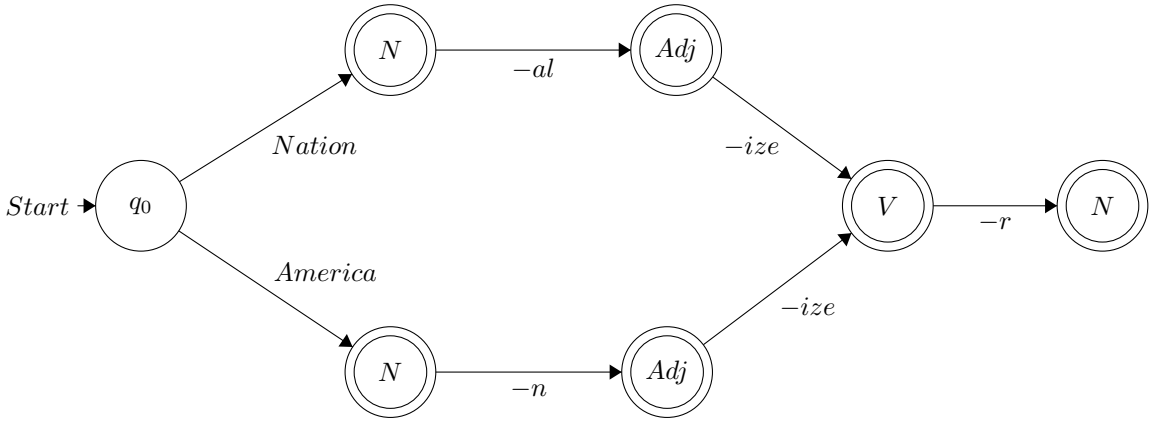
Written Problems

Problem 2



Problem 3

1.

$$\heartsuit_i(y', y) = \max_{y'' \in \mathcal{L}} s(\mathbf{x}, i-1, y'', y', y') + \heartsuit_{i-1}(y'', y')$$

$$b_i(y', y) = \arg\max_{y'' \in \mathcal{L}} s(\mathbf{x}, i-1, y'', y', y') + b_{i-1}(y'', y')$$

2.

In general, the space and time complexity of Viterbi grows exponentially. Space complexity grows to $\mathcal{O}(\ell * |L|^2)$ because there are exponentially many more label history combinations to store. In the case of time complexity, each label must now be examined twice. So, since we had $\mathcal{O}(\ell * |L|^2)$ in the bigram model, we grow exponentially to $\mathcal{O}(\ell * |L|^4)$ for the trigram model.