Q2. Hidden Markov Models for parts-of-speech tagging:

The introduction of python file:

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| Filename | Introduction |
| a.py | The source code for Question a) |
| b.py | The source code for Question b) |
| c.py | The source code for Question c) |
| d.py | The source code for Question d) |
| baseline.py | The implement of a majority-class baseline |
| HMM.py | The implement of the HMM model |
| utils.py | The source code for processing the data |
| evaluate.py | Evaluate the results of Question a)-d) |

The results.

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| --- | --- | --- | --- |
| Question | cmd | Results filename | Accuracy |
| a | python3 a.py | result/brown.test.baseline.txt | 90.99% |
| b | python3 b.py | result/brown.test.rule.txt | 91.55% |
| c | python3 c.py | result/brown.test.hmm.txt | 95.31% |
| d | python3 d.py | result/brown.test.beam\_search.txt | 95.32% |

Note: Running c.py needs more than one hour.

If you want to directly evaluate all models through the results file:

python3 evaluate.py

Output:

Question a

The accuracy of the baseline model is 0.9099062208408574

Question b

The accuracy of the baseline model with rule is 0.9155450536024757

Question c

The accuracy of the HMM model is 0.9530902817402512

Question d

The accuracy of the HMM model with beam search is 0.9532245396631469