SI 630: Homework 3

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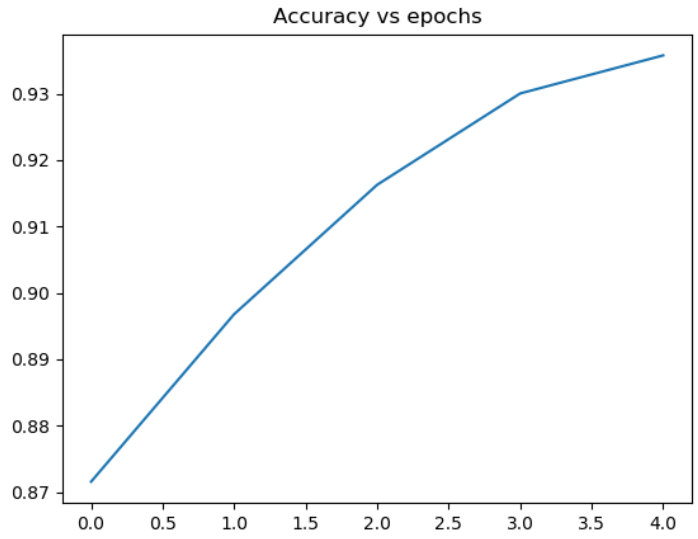
Task 1: Finish the implementation

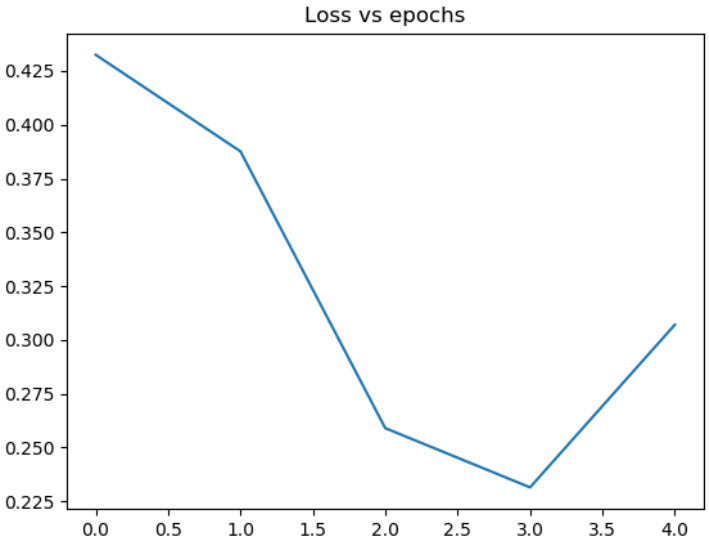
Ans: Implementation can be found in the model.py and main.py files

Task 2: Score Your System

Problem 2.1: Training model for 5 epochs

Ans:





Epoch 1:

UAS: 75.77

```
PS C:\Users\yashu\OneDrive\Desktop\2nd Sem\SI 630\HW3> python main.py --test --load_model_file saved_weights/parser-epoch-1.md
l
Loading saved parser for testing
Testing using model saved at saved_weights/parser-epoch-1.mdl
Loading data for testing
Loaded Train data
Loaded Dev data
Loaded Test data
loaded existing Vocab!
loaded existing embedding matrix!
converting data into ids..
Done!
- test UAS: 75.77
----
buffer: ['i', 'shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>']
action: shift
----
buffer: ['shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'i']
action: shift
----
buffer: ['an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'i', 'shot']
action: left arc, <d>:nsubj
----
buffer: ['an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'shot']
action: shift
----
buffer: ['elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'shot', 'an']
action: shift
----
buffer: ['with', 'a', 'banana']
stack:  ['<root>', 'shot', 'an', 'elephant']
action: left arc, <d>:det
```

```
action: right arc, <d>:nmod
----
buffer: []
stack:  ['<root>', 'shot', 'elephant']
action: right arc, <d>:dobj
----
buffer: []
stack:  ['<root>', 'shot']
action: right arc, <d>:root
        <root>
          |
         shot
  _______|_______
 |             elephant
 |     ________|_______
 |    |                banana
 |    |             ____|_____
 i    an          with        a
```

Epoch 2:

UAS: 80.27

```
PS C:\Users\yashu\OneDrive\Desktop\2nd Sem\SI 630\HW3> python main.py --test --load_model_file saved_weights/parser-epoch-2.md
l
Loading saved parser for testing
Testing using model saved at saved_weights/parser-epoch-2.mdl
Loading data for testing
Loaded Train data
Loaded Dev data
Loaded Test data
loaded existing Vocab!
loaded existing embedding matrix!
converting data into ids..
Done!
- test UAS: 80.27
----
buffer: ['i', 'shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>']
action: shift
----
```

Epoch 3:

UAS: 82.41

```
PS C:\Users\yashu\OneDrive\Desktop\2nd Sem\SI 630\HW3> python main.py --test --load_model_file saved_weights/parser-epoch-3.md
l
Loading saved parser for testing
Testing using model saved at saved_weights/parser-epoch-3.mdl
Loading data for testing
Loaded Train data
Loaded Dev data
Loaded Test data
loaded existing Vocab!
loaded existing embedding matrix!
converting data into ids..
Done!
- test UAS: 82.41
----
buffer: ['i', 'shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>']
action: shift
----
buffer: ['shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'i']
action: shift
```

Epoch 4:

UAS: 83.31

```
PS C:\Users\yashu\OneDrive\Desktop\2nd Sem\SI 630\HW3> python main.py --test
l
Loading saved parser for testing
Testing using model saved at saved_weights/parser-epoch-4.mdl
Loading data for testing
Loaded Train data
Loaded Dev data
Loaded Test data
loaded existing Vocab!
loaded existing embedding matrix!
converting data into ids..
Done!
- test UAS: 83.31
----
buffer: ['i', 'shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>']
action: shift
----
buffer: ['shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'i']
action: shift
----
buffer: ['an', 'elephant', 'with', 'a', 'banana']
```

Epoch 5:

UAS: 84.24

```
PS C:\Users\yashu\OneDrive\Desktop\2nd Sem\SI 630\HW3> python main.py --te
l
Loading saved parser for testing
Testing using model saved at saved_weights/parser-epoch-5.mdl
Loading data for testing
Loaded Train data
Loaded Dev data
Loaded Test data
loaded existing Vocab!
loaded existing embedding matrix!
converting data into ids..
Done!
- test UAS: 84.24
----
buffer: ['i', 'shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>']
action: shift
----
buffer: ['shot', 'an', 'elephant', 'with', 'a', 'banana']
stack:  ['<root>', 'i']
action: shift
----
buffer: ['an', 'elephant', 'with', 'a', 'banana']
```

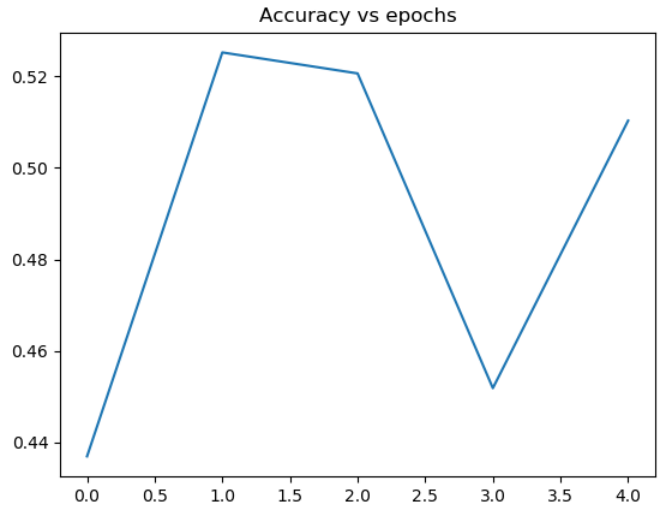
Problem 2.2. Write at least three sentences describing what you see in the graphs and when you would want to stop training.

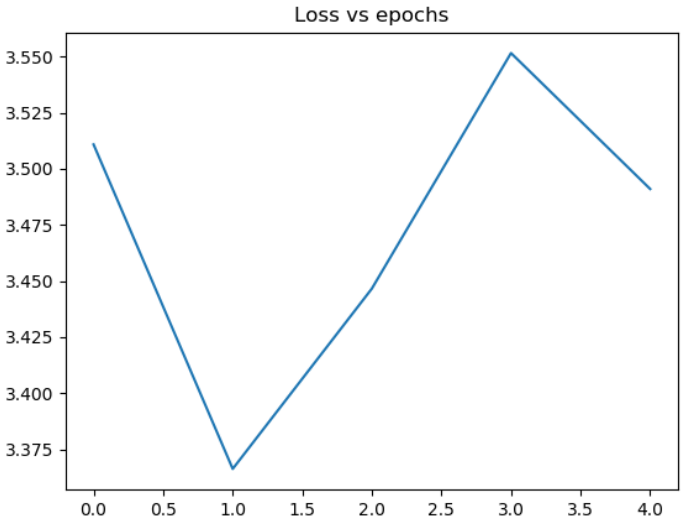
Ans: From the accuracy and loss graphs we can observe that the accuracy is increasing for each epoch. But whereas the loss is increasing after the 3rd epoch. But until 3rd epoch we can observe that the loss is decreasing which is good. From this I would like to come to conclusion that I would want to stop the training after 3rd epoch may be, just to make sure the loss is less and still the accuracy is good.

Task 3: Try different network designs and hyperparameters

Problem 3.1. Train your system for at least 5 epochs and generate the same plots as in Problem 2.1 for this new model's performance but include both the old model and the new model's performances in each.

Ans: I changed the activation function to Tanh from ReLu. Following are the graphs for the new model:



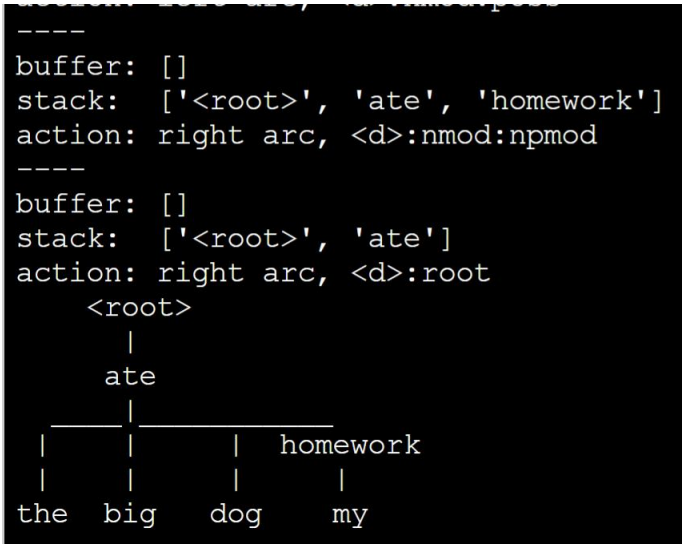


Here we can observe that the UAS values are small compared to the ReLu activation function. There is lot of fluctuations in the plots compared to the plots of ReLu activation function. Here for Tanh activation function plots, until first epoch both the accuracy and loss are positive but after that there is some negative effect. The loss improves after epoch 3 and also the accuracy. So we can say that ReLu model works better for this.

Task 4: What's the parser doing, anyway?

Problem 4.1. Using one of your trained models, report the shift-reduce output for the sentence "The big dog ate my homework" and the parse tree

Ans: Parse tree for python main.py --parse_sentence "The big dog ate my homework" --load_model_file saved_weights/parser-epoch-5.mdl



Problem 4.2. More than likely, the model has made a mistake somewhere. For the output, report what was the correct operation to make at each time step: shift, left-arc, right-arc

Ans: first step is correct. But for second step dog should be there. So left-arc. Then for right arc homework will be there. The and big will be under the dag after shift, left arc and then right arc respectively. My will be just shift.