Neural Transition-Based Dependency Parsing

1a. The stack, buffer and dependencies are as follows:

STACK	BUFFER	NEW DEPENDENCY	TRANSITION
[ROOT]	[I, attended, lectures, in, the, NLP class]		Initial configuration
[ROOT, I]	[attended, lectures, in, the, NLP, class]		SHIFT
[ROOT, I, attended]	[lectures, in, the, NLP, class]		SHIFT
[ROOT, attended]	[lectures, in, the, NLP class]	attended → I	LEFT-ARC
[ROOT, attended, lectures]	[in, the, NLP, class]		SHIFT
[ROOT, attended]	[in, the, NLP, class]	attended → lectures	RIGHT-ARC
[ROOT, attended, in]	[the, NLP, class]		SHIFT
[ROOT, attended, in, the]	[NLP, class]		SHIFT
[ROOT, attended, in, the, NLP]	[class]		SHIFT
[ROOT, attended, in, the, NLP, class]	[]		SHIFT
[ROOT, attended, in, the, class]	[]	NLP ← class	LEFT-ARC
[ROOT, attended, in, class]	[]	the ← class	LEFT-ARC
[ROOT, attended, class]	[]	in ← class	LEFT-ARC
[ROOT, attended]	[]	attended → class	RIGHT-ARC
[ROOT]	[]	ROOT → attended	RIGHT-ARC

1b: The number of steps that are required to parse a sentence of n words is $2n$.

This is because we need to push all the n words into the stack.

This requires n SHIFT transitions.

We need to build dependencies by popping out all the n words that are pushed into the stack.

This requires n transitions of either LEFT-ARC or RIGHT-ARC.

So, therefore the number of steps is $2n$.

If we consider pushing the ROOT into the stack also as a step, then it is $2n+1$. Otherwise, it is $2n$.

ie: Dev UAS Score   — 88·68
         Test UAS Score   — 89·02

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Average Train Loss: 0.06773455236187745
Evaluating on dev set
1445850it [00:00, 46258024.06it/s]
- dev UAS: 88.68
New best dev UAS! Saving model.


================================================================
TESTING
================================================================
Restoring the best model weights found on the dev set
Final evaluation on test set
2919736it [00:00, 54809296.63it/s]
- test UAS: 89.02
Done!
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1f:

   (i) Error – Verb Phrase attachment error
     Incorrect – acquisition → citing
     Correct – blocked → citing

   (ii) Error – Modifier attachment error
     Incorrect – left → early
     Correct → afternoon → early

   (iii) Error – Prepositional Phrase attachment error
     Incorrect – declined → decision
     Correct – reasons → decision

   (iv) Error – Coordination Attachment error
     Incorrect – affects → one
     Correct – Plants → one

1g:
     * Parts of speech tags helps in removing ambiguity for a word that has multiple possible meanings.
     For example, the word block when used as a noun refers to a solid piece of material whereas when used as verb it refers to obstructing or preventing.

     * Also, it helps in increasing parsing efficiency by identifying relationships between different components and gramatical structure.