CS 224n Assignment #3: Dependency Parsing

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1 Machine Learning & Neural Networks

(a)   i. Using momentum helps to cancel out fluctuation by bumps in the contour of a loss function and reinforce the vector component to downward direction.

    ii. Parameters with small gradients will get larger updates, which in turn accelerates convergence. Parameters with large gradients will slow down, so overshooting can be prevented.

(b)   i. γ should be $\frac{1}{1-p_{drop}}$ to maintain overall magnitude of values in the layer.

    ii. During evaluation, deterministic results are preferred.

2 Neural Transition-Based Dependency Parsing

(a) Here are steps.

Stack	Buffer	New dependency	Transition
[ROOT]	[I, parsed, this, sentence, correctly]		Initial Configuration
[ROOT, I]	[parsed, this, sentence, correctly]		SHIFT
[ROOT, I, parsed]	[this, sentence, correctly]		SHIFT
[ROOT, parsed]	[this, sentence, correctly]	parsed $\rightarrow$ I	LEFT-ARC
[ROOT, parsed, this]	[sentence, correctly]		SHIFT
[ROOT, parsed, this, sentence]	[correctly]		SHIFT
[ROOT, parsed, sentence]	[correctly]	sentence $\rightarrow$ this	LEFT-ARC
[ROOT, parsed]	[correctly]	parsed $\rightarrow$ sentence	RIGHT-ARC
[ROOT, parsed, correctly]	[]		SHIFT
[ROOT, parsed]	[]	parsed $\rightarrow$ correctly	RIGHT-ARC
[ROOT]	[]	ROOT $\rightarrow$ parsed	RIGHT-ARC

(b) At each step, one word goes from the buffer to the stack OR one word is popped from the stack. So it takes $2n$ steps.

(e) Achieved UAS of 88.52 on the dev set and UAS of 89.11 on the test set.

(f)   i. • **Error type**: Verb Phrase Attachment Error
      • **Incorrect dependency**: wedding $\rightarrow$ fearing
      • **Correct dependency**: heading $\rightarrow$ fearing

    ii. • **Error type**: Coordination Attachment Error
      • **Incorrect dependency**: makes $\rightarrow$ rescue
      • **Correct dependency**: rush $\rightarrow$ rescue

    iii. • **Error type**: Prepositional Phrase Attachment Error
      • **Incorrect dependency**: named $\rightarrow$ Midland
      • **Correct dependency**: guy $\rightarrow$ Midland

    iv. • **Error type**: Modifier Attachment Error
      • **Incorrect dependency**: elements $\rightarrow$ most
      • **Correct dependency**: crucial $\rightarrow$ most