1. Machine Learning & Neural Networks
    A. Adam Optimizer
        1. Momentum is a moving average of the gradients, meaning that keeps the direction that is consistent between nearby steps of optimization while diminishes the gradient that is variant or not consistent between nearby steps (e.g. fluctuations). Thus it keeps the gradient to go down without going to opposite directions which slows down the training.
        2. The parameters with smaller amount of update last time will have a bigger step of update this epoch; This helps learning because the parameters are all update in similar pace and thus can converge and get good result faster.
    B. Dropout
        1. Because the idea is to keep the overall weights to have similar mean value before or after dropout.
        2. Dropout can be applied during training time, because it avoids the model from leaning on some particular units, but average the information to each units, which is a good tool for regularization. But during test time, we don't to need any regularization methods for the model; besides, dropout in test time will result in random output, which would eventually affect the evaluation results' stability.
2. Neural Transition-Based Dependency Parsing
    a. As below

Stack	Buffer	New dependency	Transition
[ROOT, parsed, this]	[sentence, correctly]		SHIFT
[ROOT, parsed, this, sentence]	[correctly]		SHIFT
[ROOT, parsed, sentence]	[correctly]	this → sentence	RIGHT-ARC
[ROOT, parsed]	[correctly]	parsed → sentence	RIGHT-ARC
[ROOT, parsed, correctly]	[ ]		SHIFT.
[ROOT, parsed]	[ ]	parsed → correctly	RIGHT-ARC
[ROOT]	[ ]	ROOT → parsed	RIGHT-ARC

B. (2n) steps. Because for each word, we need one (SHIFT) step to include it in the stack and another (LEFT-ARC) or (RIGHT-ARC) to remove it from the stack. So two steps for each word.

F.
1)
• Error type: Verb phrase attachment error
• Incorrect dependency: wedding -> fearing
• Correct dependency: heading -> fearing
2)
• Error type: Coordination attachment error
• Incorrect dependency: makes -> rescue
• Correct dependency: rush -> rescue
3)

- Error type: prepositional phrase attachment error
- Incorrect dependency: named -> midland
- Correct dependency: guy -> mildland

4)
- Error type: modifier attachment error
- Incorrect dependency: elements -> most
- Correct dependency: crucial -> most

E. The best UAS in test set is 89.32