

# CS159 Assignment 2 Write-up

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## 1 What is the best lambda smoothing parameter?

Lambda	Perplexity on development set	Perplexity on test set
0.1	11.542	12.805
0.01	10.627	12.159
0.001	12.266	14.568
0.0001	15.306	18.983
0.00001	19.355	25.098
0.000001	24.509	33.236
0.0000001	31.041	44.019
0.00000001	39.315	58.302

The best lambda on the development and test set is 0.01 for both. In other words, if we picked the best lambda based off of the development set, we would have gotten the best results for the test set as well.

Once the lambda got smaller from 0.01, perplexity for both sets increased consistently. It seemed that perplexity increased faster for the test set, although I am not sure why this is the case.

## 2 What is the best discount parameter?

Lambda	Perplexity on development set	Perplexity on test set
0.1	10.539	12.146
0.01	13.215	15.922
0.001	16.722	21.068
0.0001	21.176	27.901
0.00001	26.820	36.953
0.000001	33.969	48.944
0.0000001	43.022	64.825
0.00000001	54.489	85.858

The best discount value on the development and test set is 0.1 for both. In other words, if we picked the best discount based off of the development set, we would have gotten the best results for the test set as well.

Once the lambda got smaller from 0.1, perplexity for both sets increased consistently. It seemed that perplexity increased faster for the test set, just like the lambda-smoothing method.

## 3 Performance

Lambda-smoothing seemed to perform better in this experiment than discounting. Lambda-smoothing has a smaller (in both value and size) range of perplexities, ranging from 10.627 to 58.302, as opposed to discount's range of 10.539 to 85.858.

Discount's smallest development perplexity, 10.539, is not that significantly smaller than lambda smoothing's smallest development perplexity, 10.627, and the same is true for the test set. This difference is so small that it might not matter.

In general, it seemed that lambda-smoothing is more consistent and has lower perplexity overall.

## 4 Warm-up

I think I spent 7 hours on this assignment.

The most fun part was implementing the constructors/training. The least fun part was attempting to understand the theory and attempting to correctly implement the various equations to calculate probability (which I'm still not sure that I did right).

I personally think this assignment was a bit too long given the timescale, and could possibly benefit from some provided test sets.

## 5 Ethics

5. I find "the tyranny of AI design" the most problematic. It's a well-studied phenomenon that humans have a biased tendency to place trust in automated systems or to think of them as free of bias and thus inherently fair in judgment. Combine this human misconception with the fact that AIs actually tend to replicate and exacerbate human biases, and it may result in AI being a tool used to unintentionally (or intentionally) increase and normalize harmful biases.
6. Legal or consent issues regarding the data used to produce AI. AI requires massive amounts of data to train, and it's not always easy to gain permission/consent to use that data. One of the prominent topical debates on AI that I see relate to consent of artists to have their art used in art-generating AI.