

# Assignment 3: Language Models Report

Using unsmoothed, laplace and interpolation to analyze language models.

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## 1. Introduction

The purpose of this report is to indicate the performance of our language models. In this report we shall mention how we selected the final parameters for  $n$  and which model performed the best.

## 2. Selecting ( $n$ )

During development we had to play around with the value for  $n$  with each model to see what value gave us the best performance. We would choose a value for  $n$ , run our model and compare the performance with a different value of  $n$  to identify the best value for  $n$ .

We found that for unsmoothed model type,  $n = 1$  worked best, for laplace model type,  $n = 2$  and for interpolation model type,  $n = 3$  worked best.

## 3. Best performing model

To look for the best performing model, we look at the perplexity values calculated by each model. After choosing the best value for  $n$  for each model and comparing the results, we observed that the best performing model was interpolation. As for interpolation, we were able to achieve the lowest perplexities among the 3 models.

### 3.1 Discussion of the relative performance of the smoothing variants and $n$ -gram settings.

To compare the different outputs we got for different values of  $n$ , we looked at the perplexities produced by different configurations model type and  $n$

At  $n=1$ , for the Laplace model the maximum perplexity observed is 47.3, meanwhile in Interpolation the maximum perplexity observed is 1.0.

At  $n=2$ , for the Laplace model the maximum perplexity observed is 28.1 which is less than the maximum perplexity observed in Interpolation.

At  $n=3$ , for the Laplace model the maximum perplexity observed is 5.04, meanwhile in Interpolation the maximum perplexity observed is 2.9.

At  $n=3$ , the maximum perplexity in Interpolation is far lower than the maximum perplexity in Laplace. In interpolation we observed the perplexities were all within the range 1.0-2.0. Thus we concluded that the best performing model is the interpolation model type with  $n = 3$ .