CSE 325/425 (Spring 2021) Homework 1

Due on 11:55pm, Feb 17, 2021

Grading: All questions have the same points (25 each). We will randomly grade some of the questions.

Submitting: Only electronic submissions on Coursesite are accepted. You can handwrite your answers on papers and then scan them to images. If you need to plot figures using a computer, the plotted files should be saved and included in the submitted pdf file. Submit a single pdf file named

<Your LIN>HW1.pdf

Other format will not be accepted.

Questions:

1. Verify that the Laplacian smoothing for a unigram language model leads to a probability distribution over the words in the vocabulary V.
2. Using the bi-gram language model, write down the likelihood of a corpus, considered as a single long sequence $[w_1, \ldots, w_n]$ of n words sampled from V.
3. Find the gradient of the multi-variate objective function $f(x, y) = x^2 - y^2$ with respect to the vector $[x, y]$.
4. Continuing the above question, use the gradient at the current location $[2, 1]$ to move the parameter to the next location using learning rate 0.1. Is the function value increased or decreased?