

CS288 HW2: Machine Translation

Due: February 22nd 2023, 11:00PM PST

Overview

This homework will be focused on machine translation. This homework consists of two iPython notebooks and a written report. You can run and edit the iPython notebooks in any way you please (e.g., run it on your local machine, use an online service such as Google Colab or Kaggle, etc.). If you are using Kaggle, make sure you verify your phone number in order to get GPU access.

Background Reading

The following resources may be useful for this assignment:

- Statistical machine translation: https://cal-cs288.github.io/sp20/slides/cs288_sp20_05_statistical_translation_4up.pdf
- Neural machine translation: <https://web.stanford.edu/~jurafsky/slp3/10.pdf>

Assignment

This homework consists of two ipython notebooks, as well as a written report. Below, you'll find a handful of questions. Please answer these questions in \LaTeX and save them to a file named **report.pdf**. Submit this file and all outputs from the notebooks into a single **.zip** file for submission to Gradescope.

1. Alignment with IBM Model 1: You can download the file here (download as ipynb) and upload in Kaggle, Colab, your local computer, or whatever service you like for running notebooks https://colab.research.google.com/drive/1qVAiqxKh3NHFi52_90baYEPPTve7HuZ?usp=sharing
 - (a) Complete the notebook and save the following files:
 - **hw2a.ipynb**
 - **example_alignments.pkl**
 - **multi30k_alignments.pkl**
 - (b) Report: find at least one sentence from the Multi30K dataset where the IBM alignment model performs reasonably well, and find another one where it fails catastrophically, and include alignment visualizations for both examples in your report. You may want to consult a German-English dictionary for this part of the problem. Provide a brief explanation for why the alignment model did poorly on the failure case.
2. Neural Machine Translation: You can download the file here (download as ipynb) and upload in Kaggle, Colab, your local computer, or whatever service you like for running notebooks <https://colab.research.google.com/drive/1ROZQSNl1Fffy0jTQ8G76uzYPdWHeDt9?usp=sharing>
 - (a) Complete the notebook and save the following files:

- `hw2b.ipynb`
 - `predictions.json`
- (b) Report: generate attention visualizations for at least four sentences and describe general trends you observe in your report. What similarities or dissimilarities do you see between the attention maps and the alignment visualizations from Part A?

Debugging and Edstem

Please post questions about this homework in the corresponding thread on Edstem. Please limit your use of private questions unless absolutely necessary, as we do not have the staffing capacity to help with all requests for code debugging. If you believe you have found a legitimate bug in the solution, however, please contact us immediately.

Submission to Gradescope

Please submit the assignment to Gradescope. When you upload your submission to the Gradescope assignment, you should get immediate feedback that confirms your submission was processed correctly. Be sure to check this, as an incorrectly formatted submission could cause the autograder to fail. For this project, you should be able to see your test set accuracies and a confirmation that all required files were found, but you will not be able to see your score until later. The assignment will be graded primarily on your test set accuracies and written report.

Note that Gradescope will allow you to submit multiple times before the deadline, and we will use the latest submission for grading. Make sure you have the following files (with correct names and extensions):

- | | |
|--|---------------------------|
| • <code>predictions.json</code> | • <code>hw2a.ipynb</code> |
| • <code>example_alignments.pkl</code> | • <code>hw2b.ipynb</code> |
| • <code>multi30k_alignments.pkl</code> | • <code>report.pdf</code> |