

# Homework 5

## 1 Fun with RNNs

In this project, you will work on extending `min-char-rnn.py`. You will experiment with the Shakespeare dataset (`shakespeare_train.txt`). The goals of this assignment are as follows:

### Part 1:

Please complete all the missing code in the file `min-char-rnn.py`. The code you need to fill in has been marked with `#your code`.

### Part 2:

Write a function to sample text from the model using different temperatures (temperature is an argument  $\tau$  to the softmax function). You can refer to the function “sample” in `min-char-rnn.py` and modify the softmax layer as follow:

$$\text{softmax}(k) = \frac{e^{\frac{Q(k)}{\tau}}}{\sum_{i=1}^K e^{\frac{Q(k)}{\tau}}}$$

Try different temperatures, and, in your report, include examples of texts generated using different temperatures. Briefly discuss what difference the temperature makes.

Include the listing (i.e., source code) of the function you wrote/modified to accomplish the task in the report.

You should either train the RNN yourself, or use the weights from Part 3 -- up to you.

### Part 3:

Write a function that uses an RNN to complete a string. That is, the RNN should generate text that is a plausible continuation of a given starter string. In order to do that, you will need to compute the hidden activity  $h$  at the end of the starter string, and then to start generating new text.

Include 5 interesting examples of outputs that your network generated using a starter string. (This part need not be easily reproducible).

Include the listing (i.e., source code) of the function you wrote in the report.

You should either train the RNN yourself, or use the weights from Part 3 -- up to you.

### Part 4:

The weights for a trained RNN are available here (`char-rnn-snapshot.npz`). Some sample from the RNN (at temperature=1) are here (`samples.txt`), and code to read in the weights is here (`read_in_npz.py`, if this doesn't work, try the pickle file (`char-rnn-snapshot.pkl`), and get a using `import cPickle as pickle; a = pickle.load(open("char-rnn-snapshot.pkl"))`).

In the samples that the RNN generated, it seems that a newline or a space usually follow the colon (i.e., “:”) character. In the weight data provided, identify the specific

weights that are responsible for this behavior by the RNN. In your report, specify the coordinates and values of the weights you identified, and explain how those weights make the RNN generate newlines and spaces after colons.

**Part 5(Optional):**

Identify another interesting behavior of the RNN, identify the weights that are responsible for it. Specify the coordinates and the values of the weights, and explain how those weights lead to the behavior that you identified. The behavior has to be more interesting than the behavior in Part 3 (i.e., character A following character B).

## 2 Submission

- You need to submit the following files:
  - 1) \*.py
  - 2) experiment report.pdf
- Please convert your experiment report to PDF format