Homework 1 - Perceptron

Results

	Testing errors in %	
	R_seq	R_char
independent multi-class classifier	71,2%	26,8%
structured, pair-wise dependency	29,2%	18,32%
structured, fixed n. of sequences	3,2%	3%

Comments

The results turned out as I expected, they show that by adding some prior knowledge about the task, we can get better results.
The third classifier had a much easier task than the first two ones due to the fact that it maximized over quite a small number of possible words, which is visible in its low errors.
The most problematic classifier was the second one, where the maximization was over all possible words of a given length, so it took me a while to figure out how to train it efficiently using some sort of dynamic programming approach. Even so, it takes quite a long time to train, something like 30 minutes, while the others are very quick. It could all be done much more efficiently of course if more vector operations were used, but I thought it would not be necessary in this particular task.

Overall I think that the important thing, when we want to have good results, is to incorporate as much prior knowledge about the task as possible, in order to "help" the classifier.

How to run the code

first it is necessary to navigate to the directory with the main.py script and create a python virtual environment:

python3 -m venv venv

then we have to activate it

source venv/bin/activate

then we need to install the requirements.

pip install -r requirements.txt

then we can run the script, which runs all 3 classifiers in the order as it is in the assignments.

```
python main.py
```

Description of code

The main part of the code can be found in linear_classifiers.py

The class **BasicLinearClassifier** corresponds to the **Task 2.1** (Independent linear multi class classifier)

The class **ConsecutiveLetterLinearClassifier** corresponds to the **Task 2.2** (Linear structured classifier modeling pair-wise dependency).

The class **FixedNSequencesLinearClassifier** corresponds to the **Task 2.3** (Linear structured classifier for fixed number of sequences).