[Lab] Recurrent Neural Network

Jae Yun JUN KIM*

October 2, 2019

Due: Before the next lab session.
Evaluation: Interrogation during the next lab session about:

- code (in group of up to 3 people)

- (theoretical, practical) questions (individual)

Remark:

- Only groups of one/two/three people accepted. Forbidden groups of larger number of people.

- No late homework will be accepted.

- No plagiarism. If plagiarism happens, both the "lender" and the "borrower" will have a zero.

- Code yourself from scratch. No homework will be considered if you solve the problem using any ML library.

- Do thoroughly all the demanded tasks.

- Study the theory for the interrogation.

1 Tasks

1. Generate some input data (X) consisting of 30 sequences of 8 binary numbers, following a uniform distribution, where the probability of generating a "0" is the same as that of generating a "1". Make the output (y) for each sequence be the sum of its elements.

2. Implement a sequential `adder` using the `Elman recurrent neural network (RNN)` with

   a) backpropagation,

   b) resilient propagation,

   c) gradient clipping.

3. Show the results by comparing the outputs of your model to the actual output values for all three methods (backpropagation, resilient propagation and gradient clipping).

4. Now, choose some (reasonably) large initial values for the model parameters and see the convergence for all three methods.

5. Test your model with all three methods (backpropagation, resilient propagation and gradient clipping) by generating some new test data and compare the results.

---

*ECE Paris Graduate School of Engineering, 37 quai de Grenelle 75015 Paris, France; jae-yun.jun-kim@ece.fr

1