

Feedback Neural Network (a.k.a. Recurrent Neural Network)

Jae Yun JUN KIM*

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Due: Before the next lab session.

Evaluation: Submit your code (in groups of two or three people) to the course website on campus.ece.fr

Remark:

- Only groups of two or three people accepted. Forbidden groups of one or larger than three 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 questions.
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1 Tasks

1. Generate some input data (X) consisting of 40 sequences of 10 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. Use 30 first sequences for training and the rest (10 sequences) for testing.
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) using the 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