Pathological Tasks

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Sommario

1 Introduction

The problems discussed below were first proposed by Hochreiter and Schmidhuber [1] as examples of difficult problems because they require learning long term correlations and have been commonly used as benchmark tasks since.

2 Temporal order problem

3 Addition problem

The problem consists in performing an addition between two real numbers x_i and x_j in $[-1.1]$ belonging to a sequence of randomly generated numbers. The difficulty in this problem is that such numbers can be arbitraly distant in the input sequence, so the learning net must exhibit a long term memory. More specifically the input is a sequence of pairs; each pair is composed of a real number and a marker which can be in $\{1, 0\}$. The marker is used to select the two numbers in the sequence to add. The prediction is the last value in the output sequence, the target is $\frac{x_i+x_j}{2}$. The prediction y is considered correct if $|y - \frac{x_i+x_j}{2}| < 0.04$.

Sequences have random length, say L, between the minimal sequence length T and $T + \frac{T}{10}$, the position of the first marker is sampled in first $\frac{L}{10}$ positions, the last marker is instead sampled in $[\frac{4L}{10}, \frac{5L}{10}]$

4 Multiplication problem

The problem is very similar to the addition problem, here we select two numbers in the input sequences of real numbers in $[0, 1]$ and we need to predict the product.

5 Random permutation problem

Riferimenti bibliografici

[1] Sepp Hochreiter and Jürgen Schmidhuber. Long short-term memory, 1995.