Machine Learning in Mathematica! - Learning a map

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Mathematica newly introduced machine learning to its kitty. And I was excited to see its capabilities! So I decided to test its RNN abilities..to begin with (Really RNN!).

So here is a simple problem for Mathematica's RNN chain to learn - A simple map 2x Mod 1.

You start with a number say x the next number in the series is $2x \ mod \ 1$. That multiplies the number by 2 and take only t

`Ex. x=1.2 , 2x mod 1 = 0.4`

The question I tried to ask was that does the RNN learn the map after some iterations?

Here is the code for doing the training:

```
f [x_] := Mod[2*x, 1];
data = NestList[f, 0.1, 100];
n = 1;
training =
RandomSample[
List /@ Most[#] -> List@Last[#] & /@ (Partition[data, n + 1, 1])];
net = NetChain[{GatedRecurrentLayer[40], GatedRecurrentLayer[40],
GatedRecurrentLayer[40], GatedRecurrentLayer[40],
GatedRecurrentLayer[20], GatedRecurrentLayer[20],
GatedRecurrentLayer[20], GatedRecurrentLayer[20], LinearLayer[1]},
"Input" -> {n, 1}, "Output" -> 1]
trained = NetTrain[net, training, TargetDevice -> "CPU"]
trainedmap [x_] := Flatten[Append[Rest[x], trained[x]]];
```

Here is the plot of the result where predicted is in blue and ground truth in yellow. I gave RNN an initial condition then its output was used over and over again.

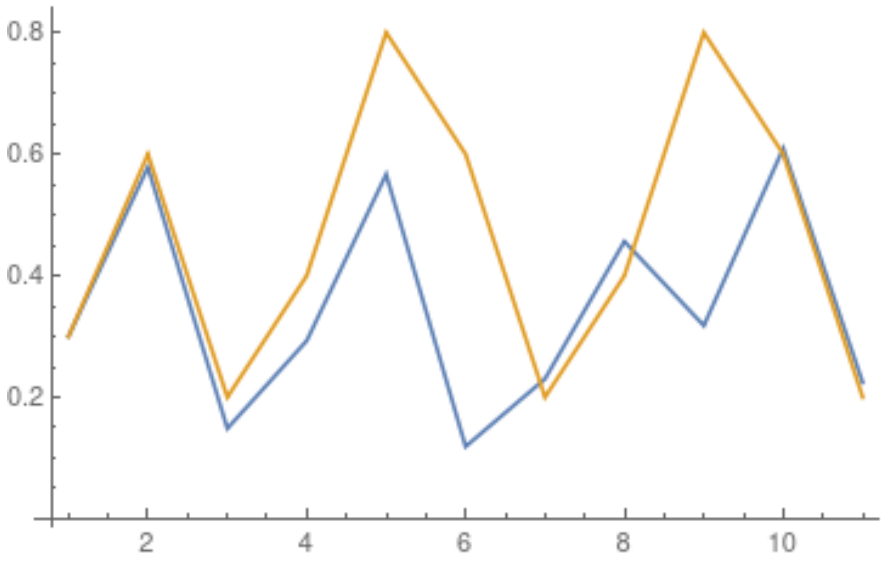

Figure 1: The predicted (in blue) the ground truth (in yellow). The solution diverges as iterations pass.

And Now the deeper question did it actually learn the function?

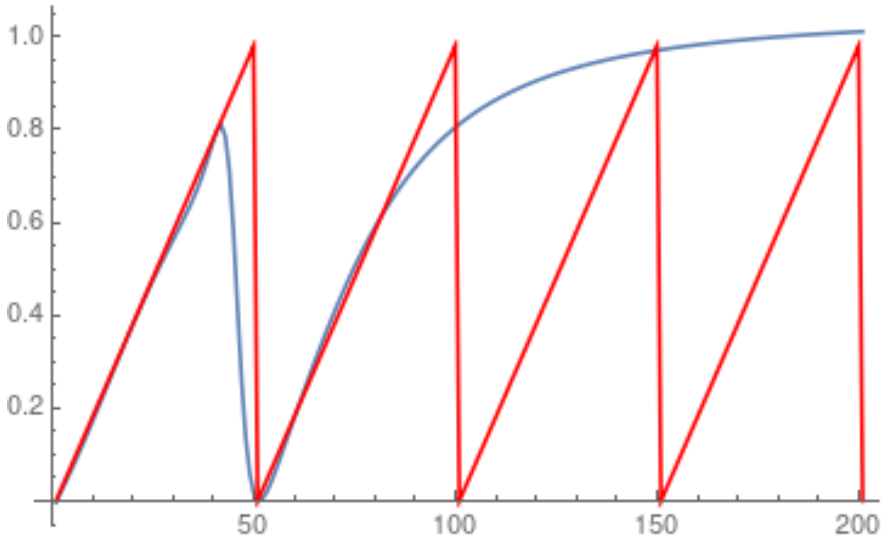

Figure 2: The True function in red and the learned one in blue.

The Red is the original function and the blue what RNN learns.

Can you make it better and learn the complete function!? That's for some other time.