A close-up of a diagram

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RNN

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Recurrence NN is used when the input has not always the same, when the order of the sequence of the elements are important or when we need to remember the action happened before. (example video, subtitles, ect)

A diagram of a graph

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A graph paper with math equations

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b(h) = bias.

A screenshot of a computer

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this represents the equation the output. W(ho) is the waste in respect to current layer plus the bias.

RRN the memories are built in the following way:

the hidden states take input from previous hidden state and the previous input. and this process create memory information.

Then, the memory goes out thought the output and passed to the next hidden state as input with the new input.

This process is keeping repeating until there are inputs.

RNN has no limitation in term of amount of memory stored but it has problem in term of vanishing or exploding gradient decent.

A screen shot of a graph

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b < 1 This could give problem because may and important fact happened in the previous layer could be discarded due to vanishing effect.

b > 1 this could give problem because may no important fact happened in the previous layer could became more important of other one.

in conclusion this RNN is a good model, but the issues with past memory could affect the quality of the prediction.

LSTM

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Th

A diagram of a computer network

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the hidden state h(t-1) and input(x(t)) pass through and sigmoid activation function learnable (which normalize the value between 0 and 1). This activation function is used to keep under control the problem of exploding gradient. This activation function is used to keep under control the problem of exploding gradient.

The output of this activation function is multiplied with the previous memory(C(t-1)).

This process guarantees that only the relevant information pass to the next cell.

A diagram of a computer network

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Input gate (short memory) determines how to update the memory. It generates a candidate’s memory.

The input and previous hidden state are the input of the Input gate and candite memory.

The candidate memory and input gate have learnable functions of h and x (as you can see from the equations).

The candidate memory includes of activation function tanh (which normalize the information allow to pass between -1 and1) and a learnable layer. This activation function is used to keep under control the problem of exploding gradient.

Input gate is composed of sigmoid learnable gate. The information allowed to pass through this gate are multiplied with the output of the candidate memory before being summed with the new memory that coming from the forget gate process.

This process embedded the memory of the past event with new memory (as you can see from the equation).

A diagram of a computer network

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The last gate is output gate.

It determinate how to update the hidden state in based on the newly updated memory.

The output gate is accessorized with sigmoid activation learnable.

the new memory before being multiplied with the inform pass through the output gate, the new information forms the new memory have to pass the tanh activation function.

the result of this process is the information that will be part of the next hidden state.

**Why sigmoid need sigmoid**

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A close up of a graph

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In addiction the sigmoid activation function comes with an extra layer. This layer is used to update the waste over time. this improves the quality of information that can pass.

A diagram of a device

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Indicate where in diagram where new memory is stored.

A diagram of a machine

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