

# Recurrent Neural Networks

## Recurrent Neural Networks

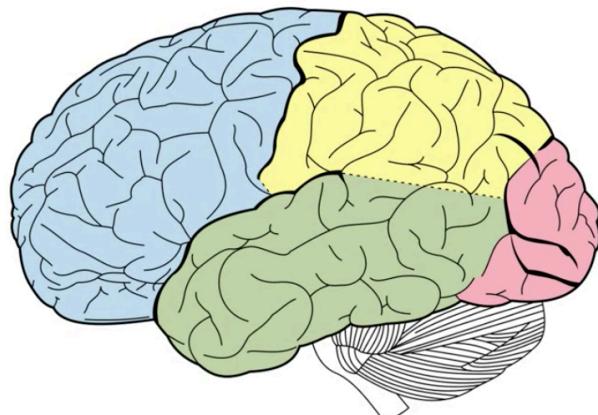
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Supervised	Artificial Neural Networks	Used for Regression & Classification
	Convolutional Neural Networks	Used for Computer Vision
	Recurrent Neural Networks	Used for Time Series Analysis
Unsupervised	Self-Organizing Maps	Used for Feature Detection
	Deep Boltzmann Machines	Used for Recommendation Systems
	AutoEncoders	Used for Recommendation Systems

# Recurrent Neural Networks

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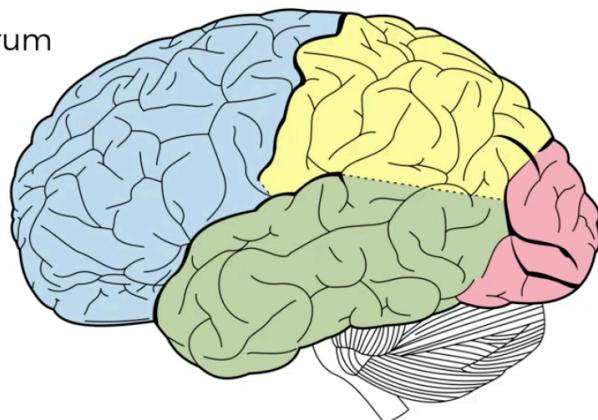
# Recurrent Neural Networks



*Image Source: Wikipedia*

# Recurrent Neural Networks

Cerebrum



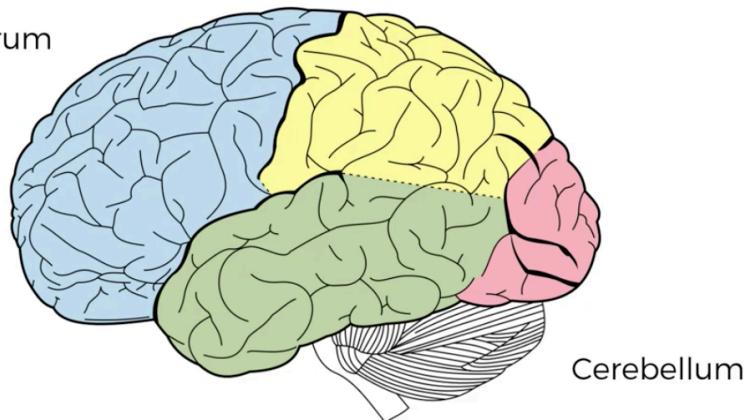
*Image Source: Wikipedia*

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# Recurrent Neural Networks

Cerebrum



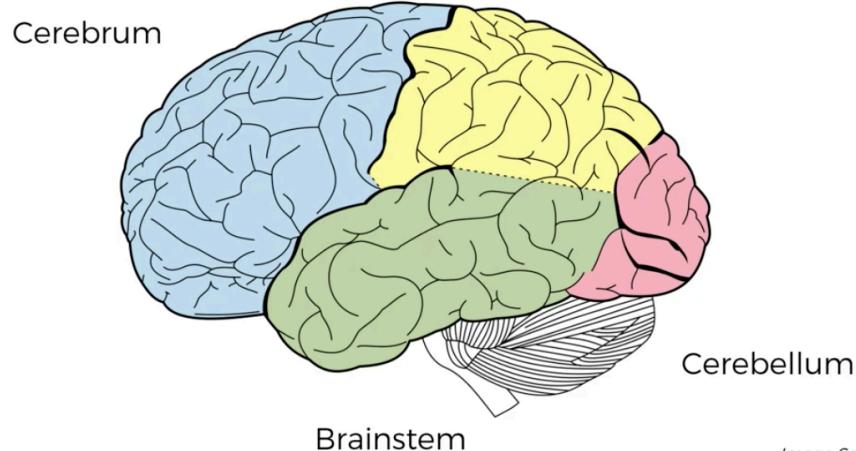
*Image Source: Wikipedia*

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The little brain

# Recurrent Neural Networks



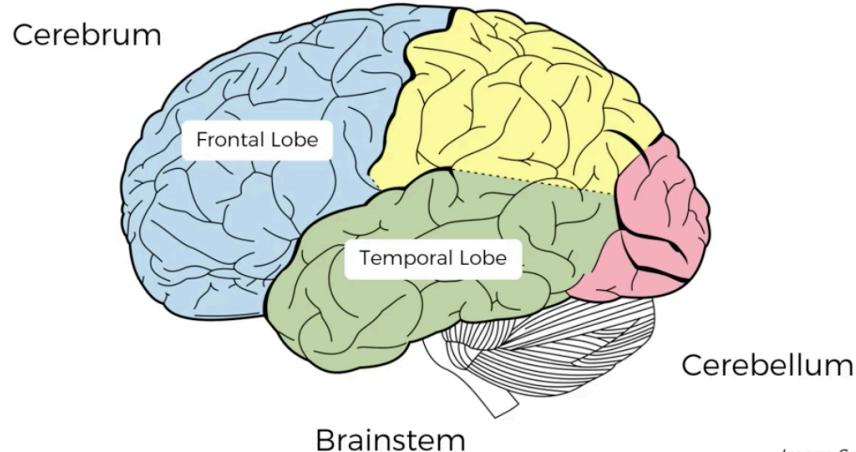
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Brainstem is the connection to other organs.

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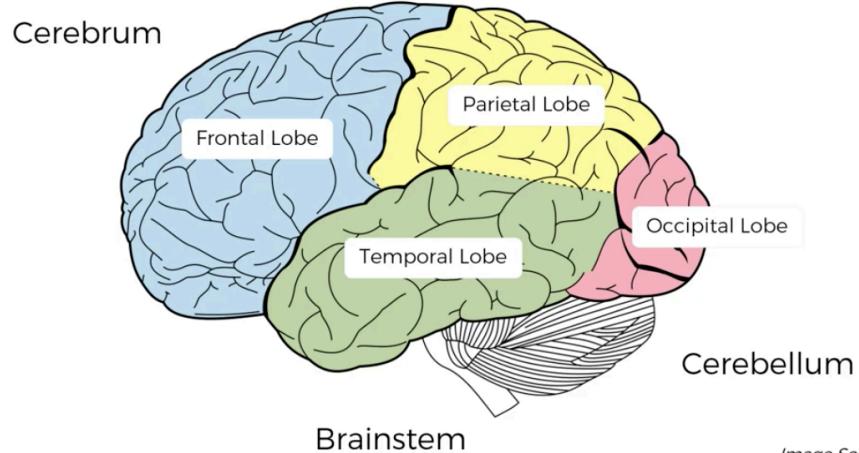


*Image Source: Wikipedia*

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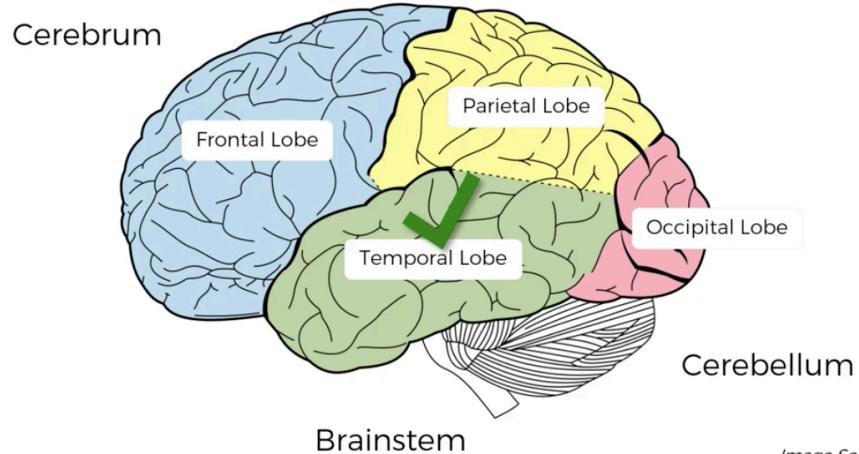


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# Recurrent Neural Networks



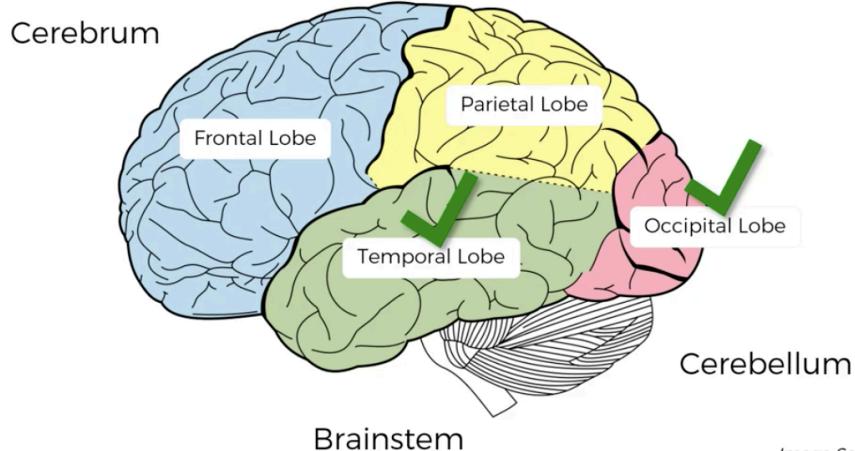
*Image Source: Wikipedia*

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As we know, weights are long term memory over neural network so that's why weights or ANN is similar to Temporal Lobe. Remember that weights are exist across whole brain but philosophy, it represents the long-term memory. Temporal lobe is concerns with cognition memory that's our long term memory.

# Recurrent Neural Networks



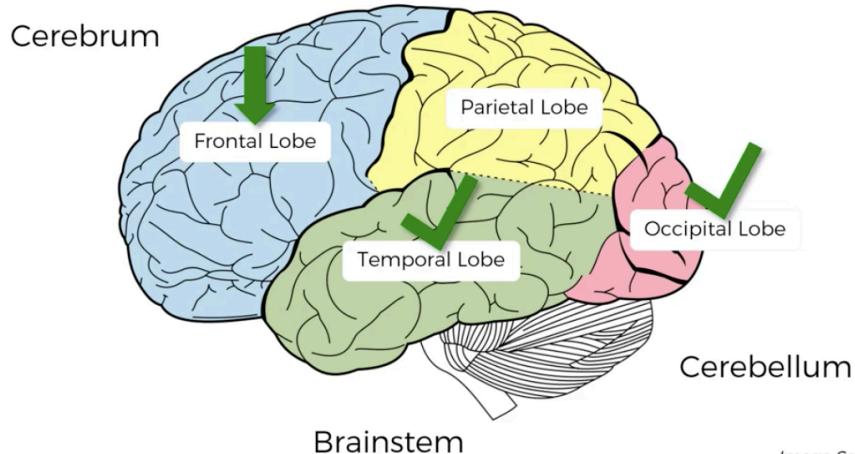
*Image Source: Wikipedia*

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CNN is the vision recognition of images and objects and it's similar to Occipital Lobe.

# Recurrent Neural Networks



*Image Source: Wikipedia*

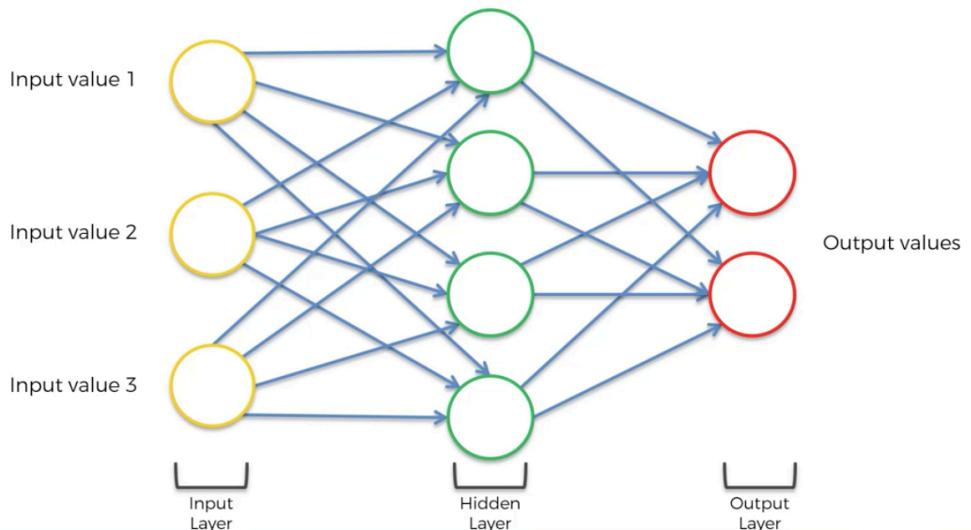
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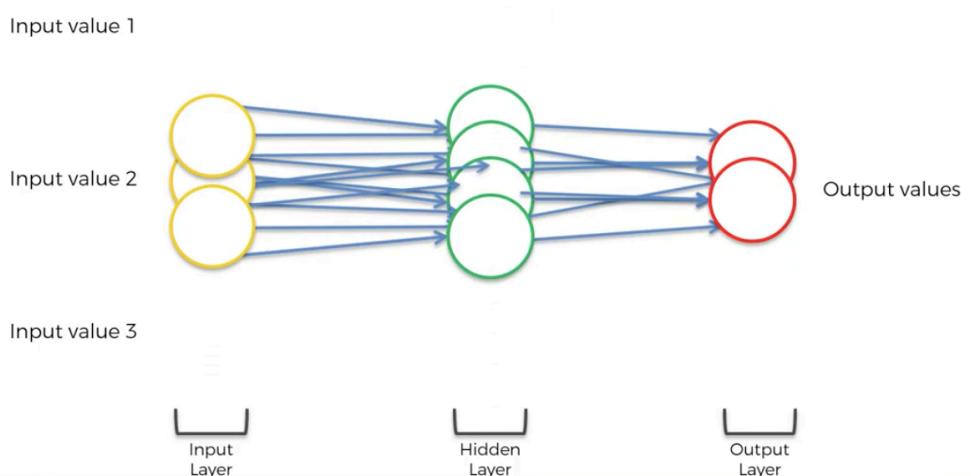
RNN's are like short term memory. They can remember things that just happen in the previous couple of observations and apply that in going forward and it's similar to frontal Lobe. Frontal lobe is also responsible for personality, behavior, motor cortex, working memory, etc.

Parietal lobe is responsible for sensation and perception and constructing a spatial coordination system to represent world around us.

# Recurrent Neural Networks



# Recurrent Neural Networks



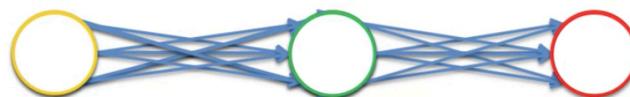
# Recurrent Neural Networks

Input value 1

Input value 2

Input value 3

Output values



Input  
Layer

Hidden  
Layer

Output  
Layer

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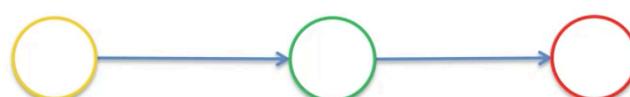
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we squash them in here. Neurons are still there but imagine it in a different dimension

# Recurrent Neural Networks

Input Vector

Output Vector



Input  
Layer

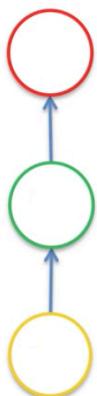
Hidden  
Layer

Output  
Layer

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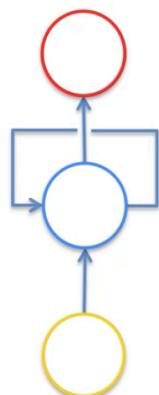
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# Recurrent Neural Networks



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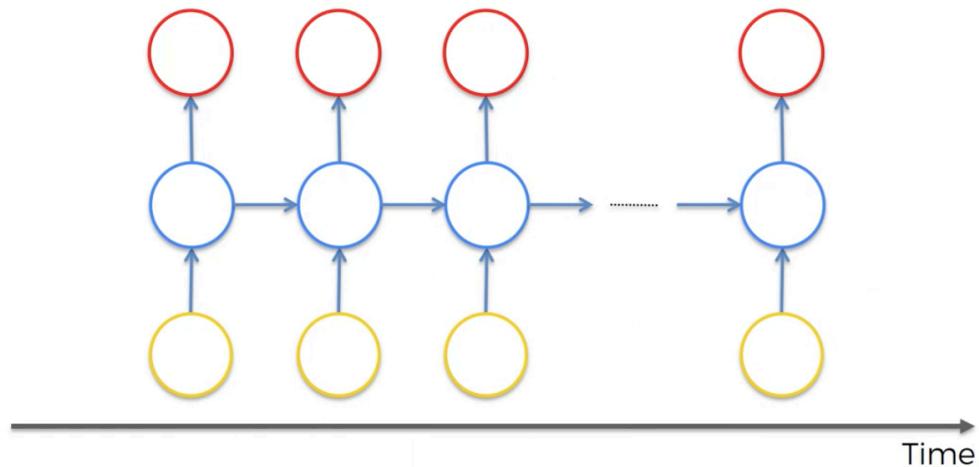
The line is the temporal loop and it's a old representation of RNN. It means that not only this hidden layer gives an output but also it feeds back to itself

# Recurrent Neural Networks

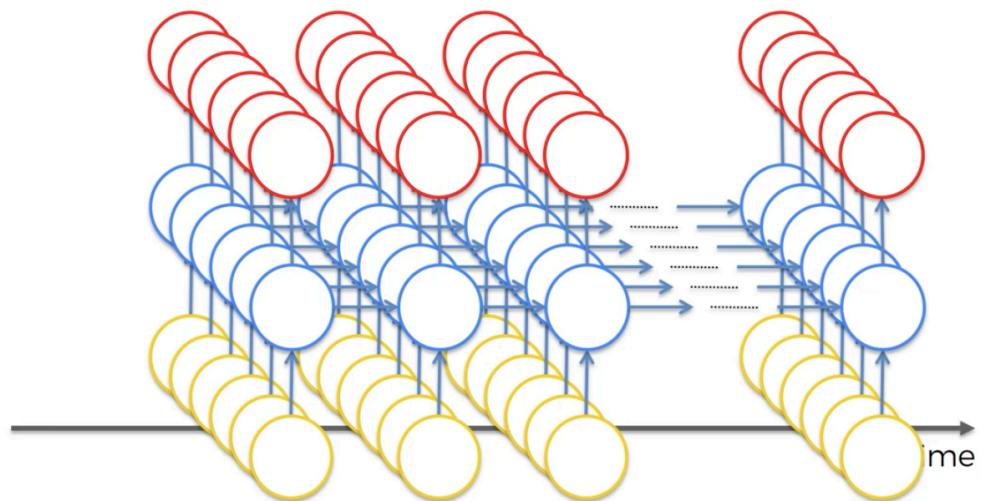


The common approach nowadays is to unwind this in the following manners

# Recurrent Neural Networks



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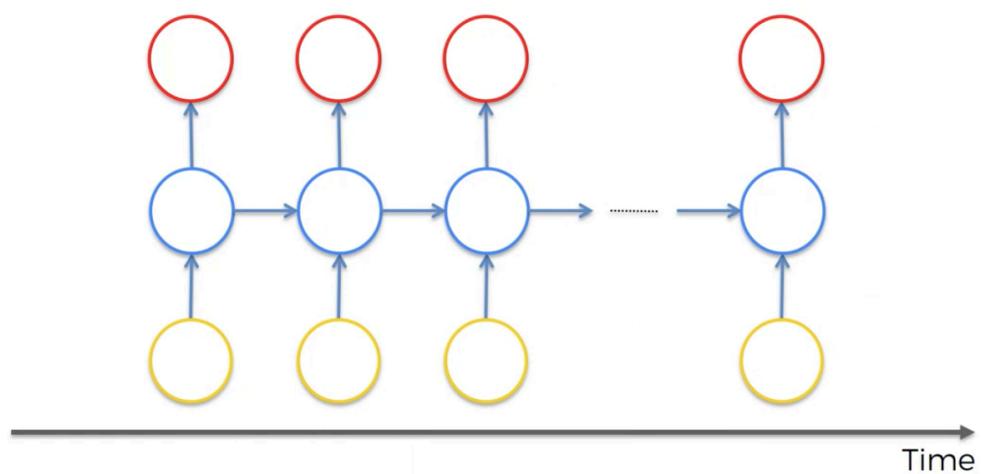


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This is in another dimension and it's what actually happening

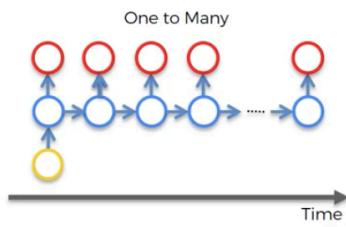
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# Recurrent Neural Networks



Reference: [karpathy.github.io](http://karpathy.github.io)

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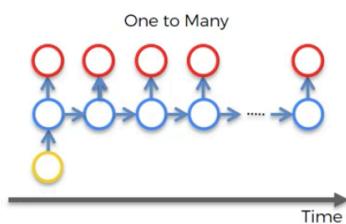
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# Recurrent Neural Networks



"black and white  
dog jumps over  
bar."

[karpathy.github.io](http://karpathy.github.io)



Reference: [karpathy.github.io](http://karpathy.github.io)

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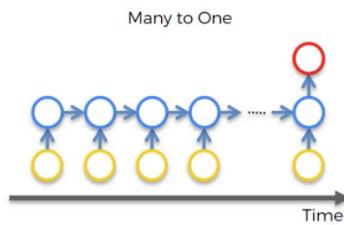
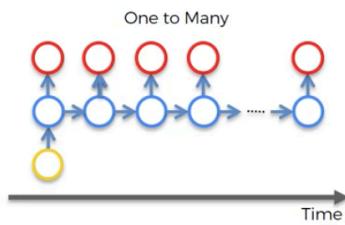
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In here we use CNN (for image features) and RNN (for the sentence)

# Recurrent Neural Networks



"black and white  
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[karpathy.github.io](http://karpathy.github.io)

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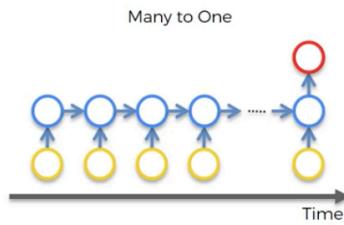
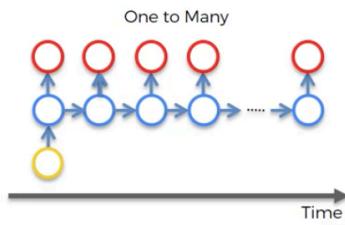
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# Recurrent Neural Networks



"black and white  
dog jumps over  
bar."



"Thanks for a great  
party at the  
weekend, we really  
enjoyed it!"

sentiment: positive  
score: 86%

[dev.havenondemand.com](http://dev.havenondemand.com)

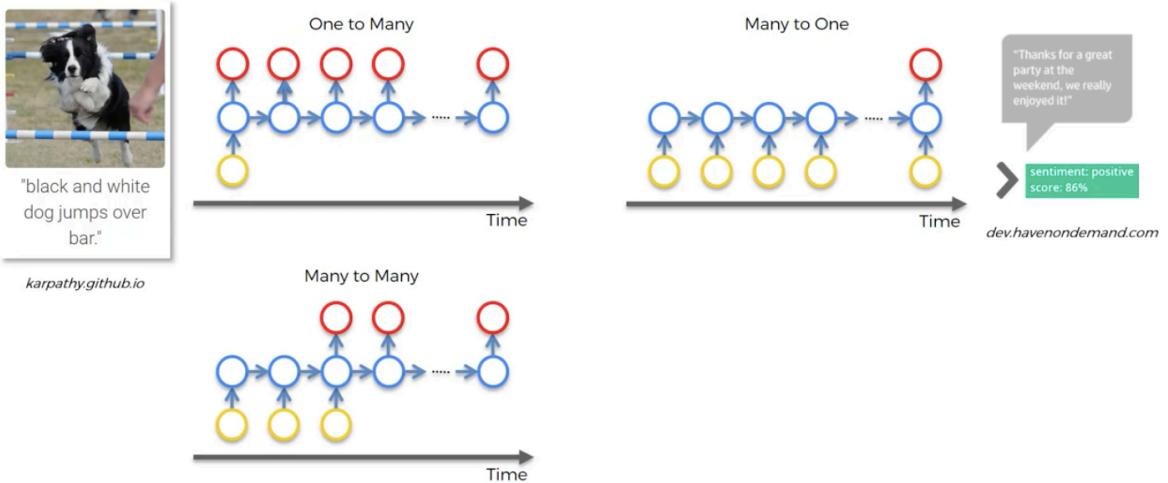
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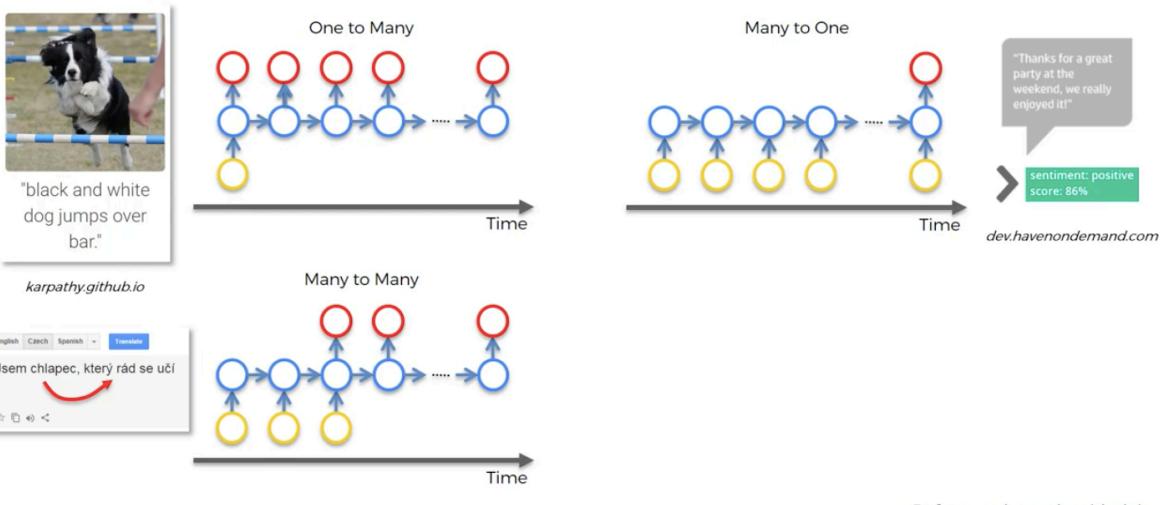
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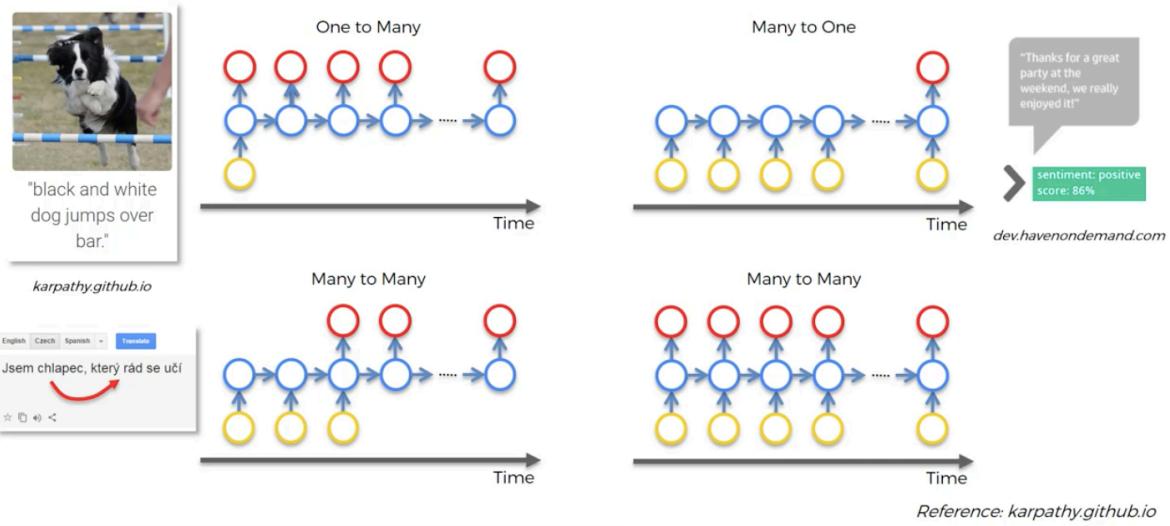
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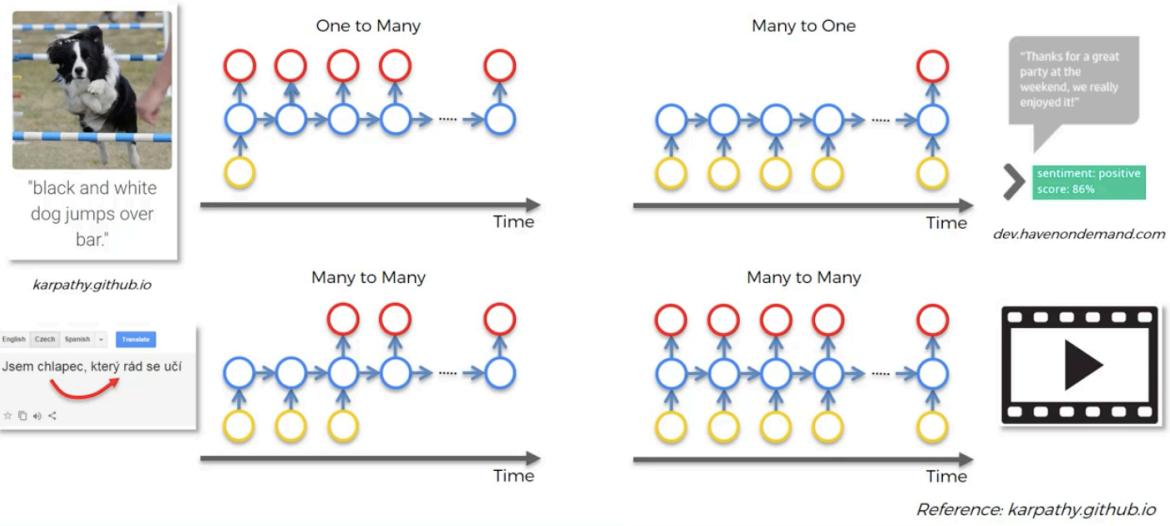
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# Recurrent Neural Networks



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For subtitling.

# The Activation Function

Additional Reading:

*Sunspring (movie, 2016)*

- Directed By Oscar Sharp
- Written by Benjamin



Link:

<https://arstechnica.com/the-multiverse/2016/06/an-ai-wrote-this-movie-and-its-strangely-moving/>