Arquitectura de Redes Neuronales

Universidad Autónoma de Manizales
Semillero de Bioinformática e Inteligencia Artificial

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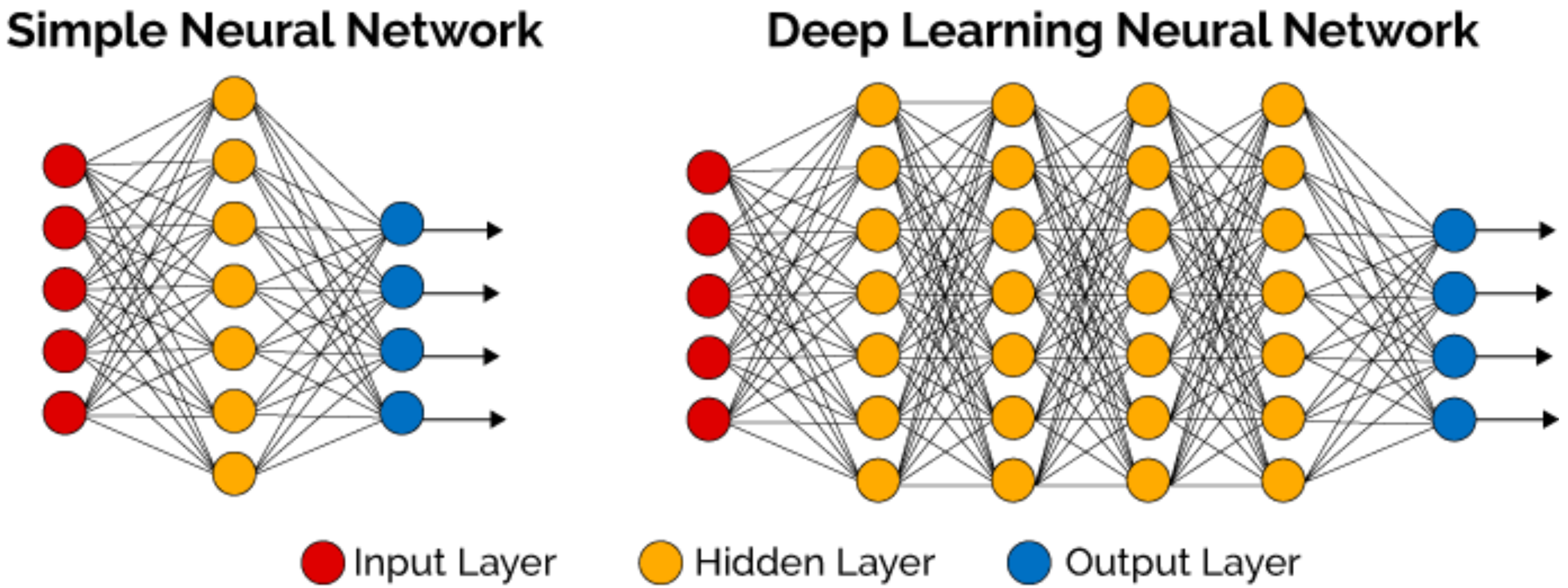
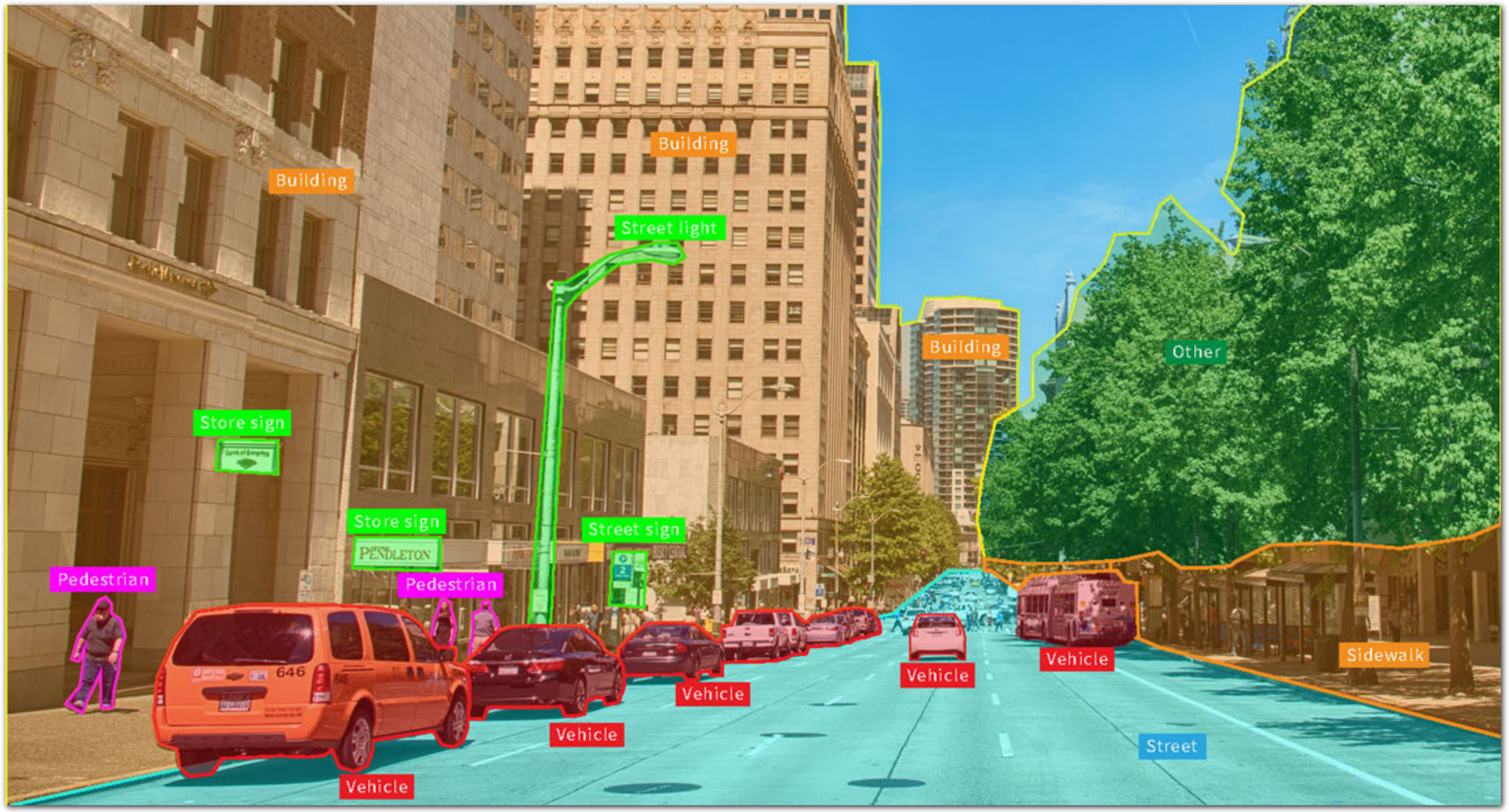
Fully Connected Neural Network



https://miro.medium.com

Computer Vision

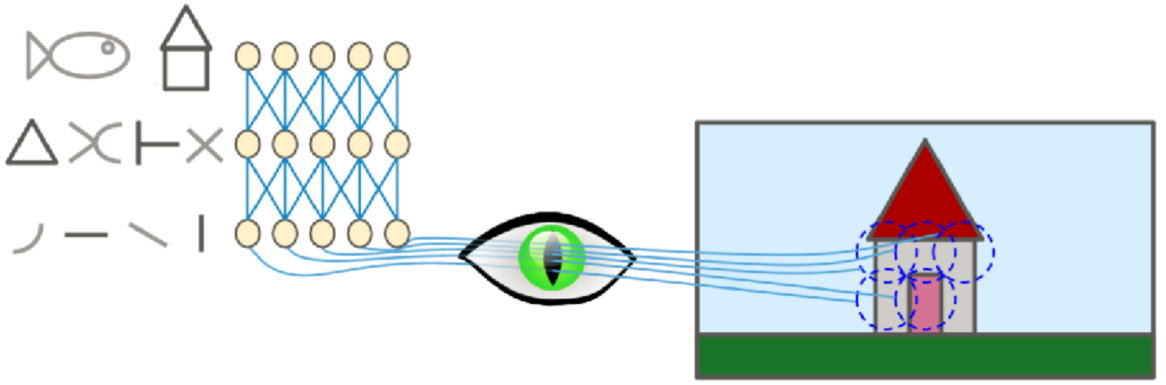
¿Cómo observa un computador?

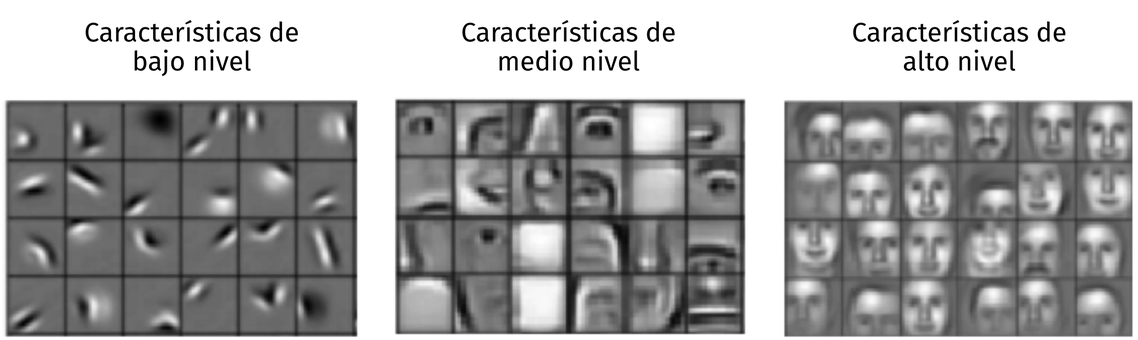


https://larevueia.fr

Computer Vision

David H. Hubel y Torsten Wiesel (1959): Muchas neuronas tienen un pequeño **campo receptivo local**, reaccionan sólo a los estímulos visuales situados en una región limitada del campo visual

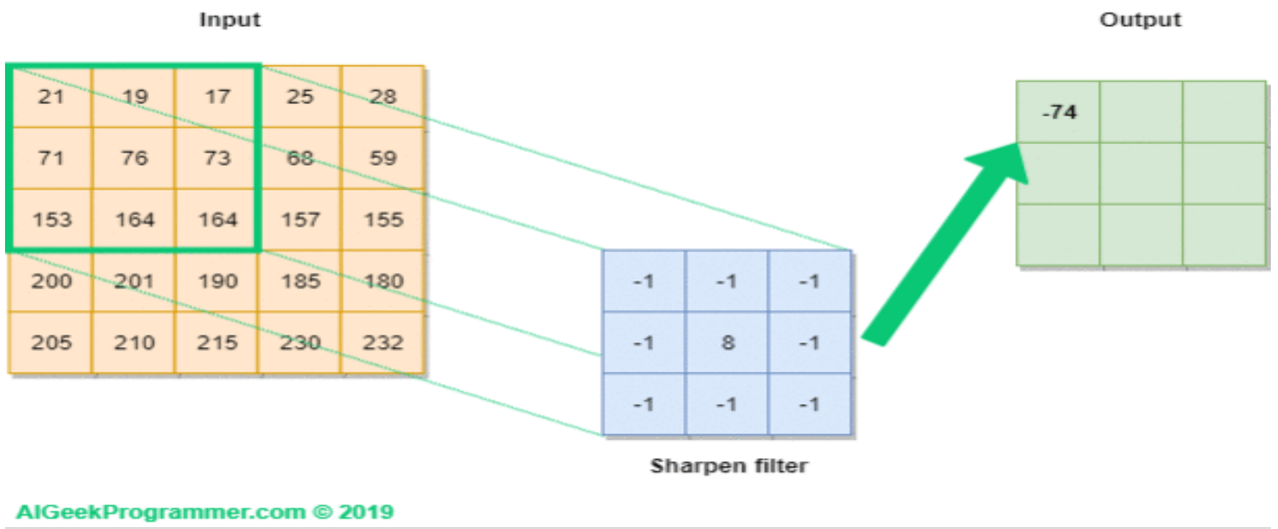




Convolutional Neural Networks

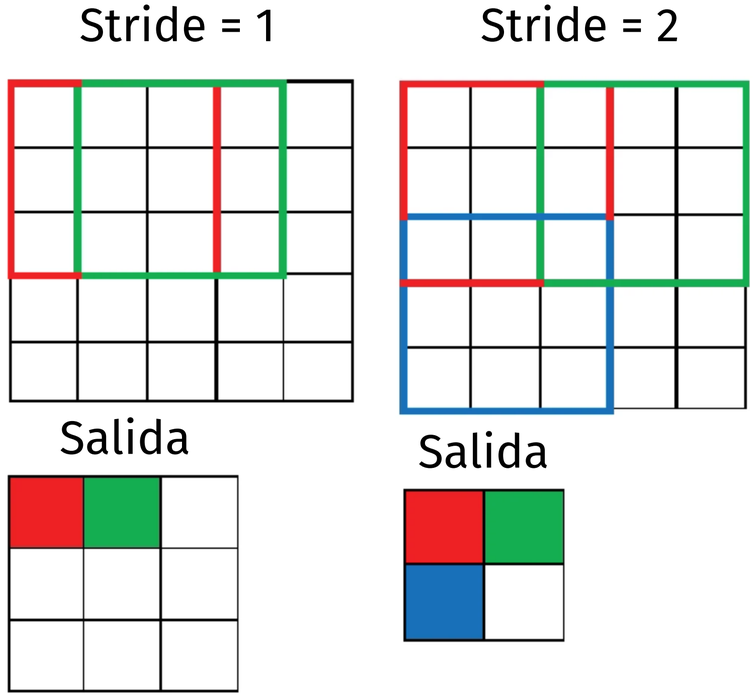
Convolución

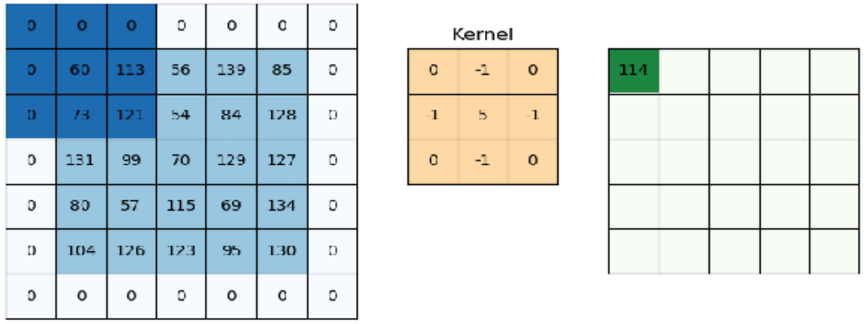
Mapa de activación
Mapa de características



Convolutional Neural Networks

Stride y Padding





$$n_{out} = \left(\frac{n_{in} + 2p - k}{s} \right) + 1$$

$n_{in} =$ *Tamaño de entrada*

$p =$ *Tamaño del padding*

$k =$ *Tamaño del filtro de la convolución*

$s =$ *Tamaño del stride*

$n_{out} =$ *Tamaño del mapa de características*

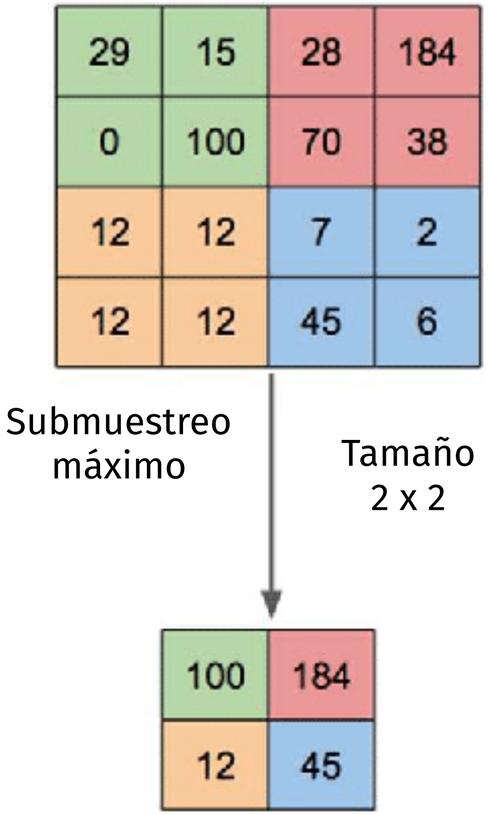
https://www.analyticsvidhya.com/blog/2022/03/basics-of-cnn-in-deep-learning/

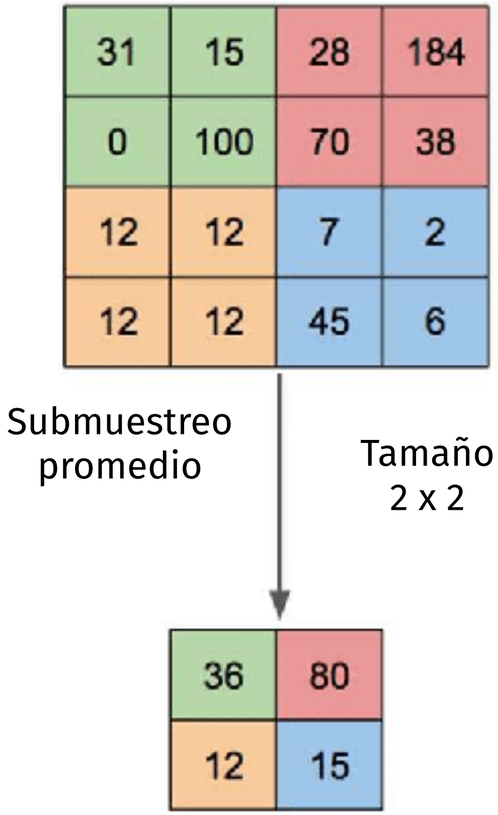
https://setosa.io/ev/image-kernels/

https://medium.com/@draj0718/zero-padding-in-convolutional-neural-networks-bf1410438e99

Convolutional Neural Networks

Pooling





$$M_p = \frac{M}{p}$$

$M =$ *Tamaño del mapa original*

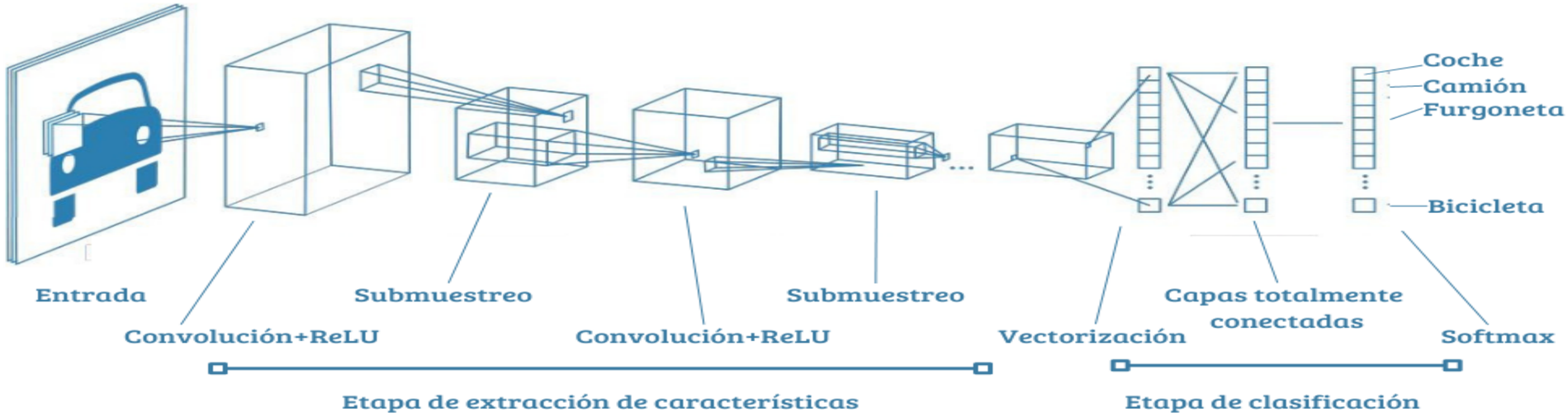
$p =$ *Tamaño del submuestreo*

$M_p =$ *Tamaño del mapa después de aplicar el submuestreo*

https://www.linkedin.com/pulse/max-pooling-combining-channels-using-11-convolutions-field-n-bhatt/
http://dx.doi.org/10.1088/1742-6596/1201/1/012052

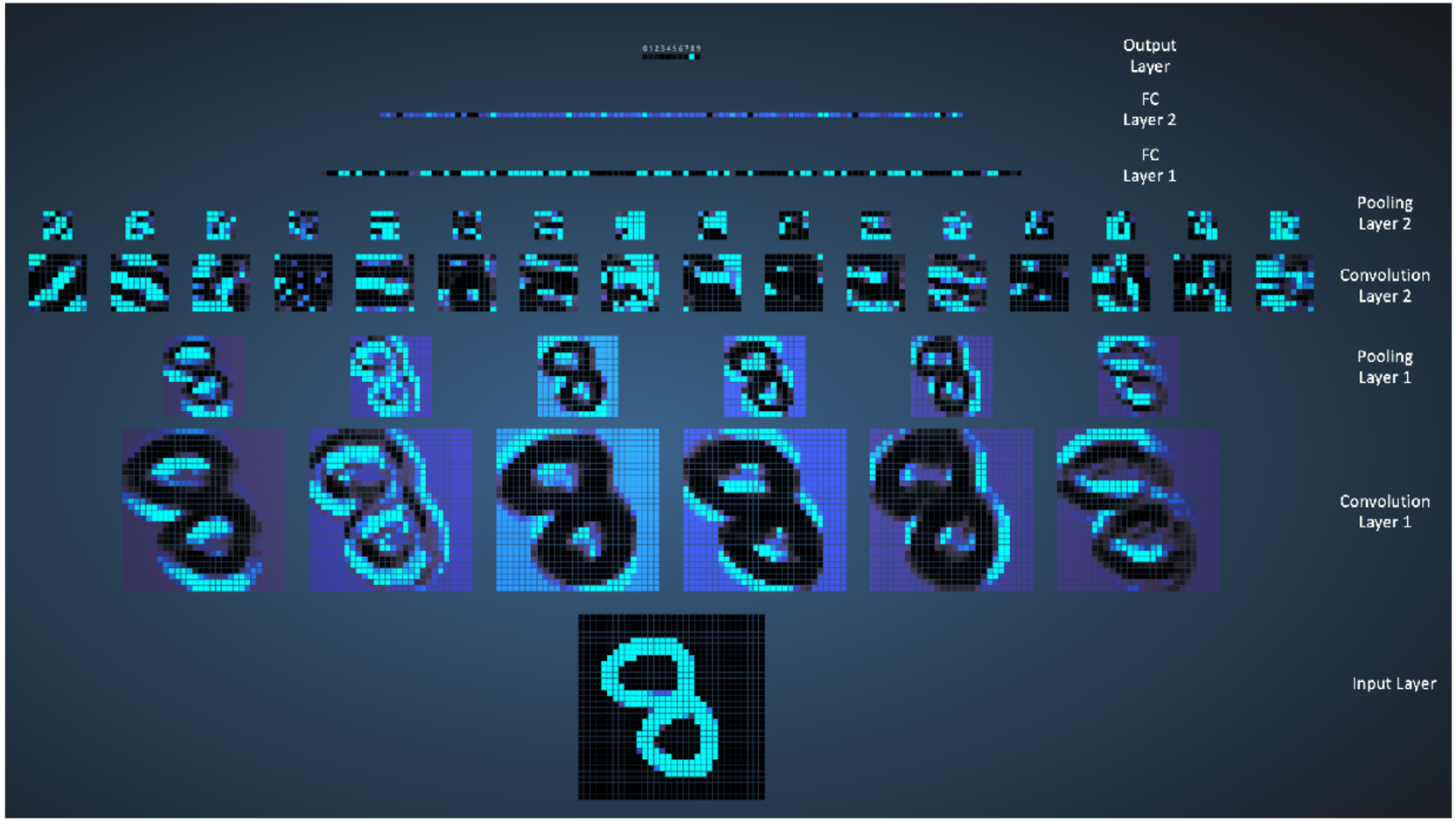
Convolutional Neural Networks

[Simulación de una CNN]



https://www.mathworks.com/discovery/convolutional-neural-network-matlab.html

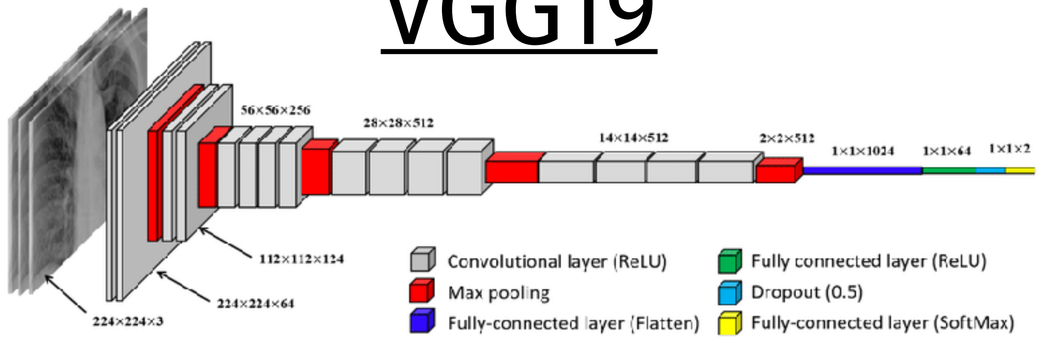
Convolutional Neural Networks



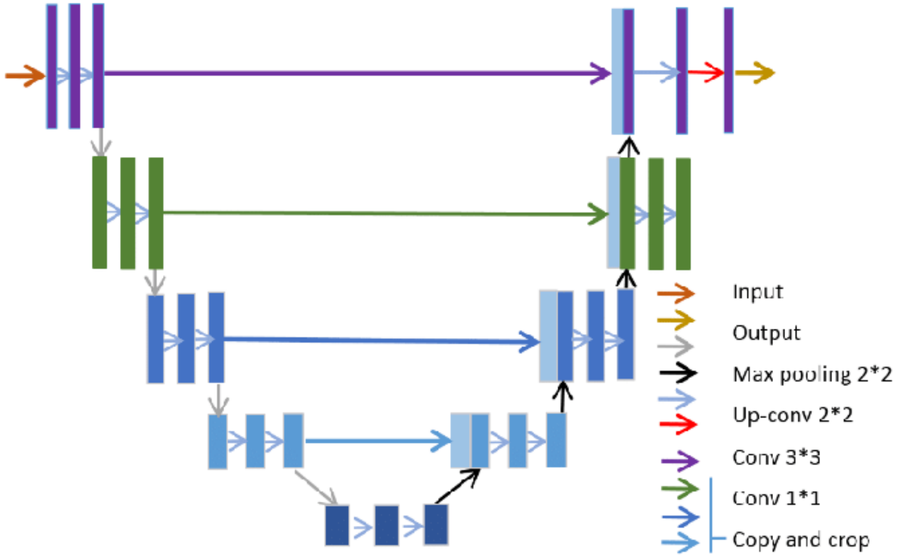
https://www.kdnuggets.com/2016/11/intuitive-explanation-convolutional-neural-networks.html/3

Convolutional Neural Networks

VGG19

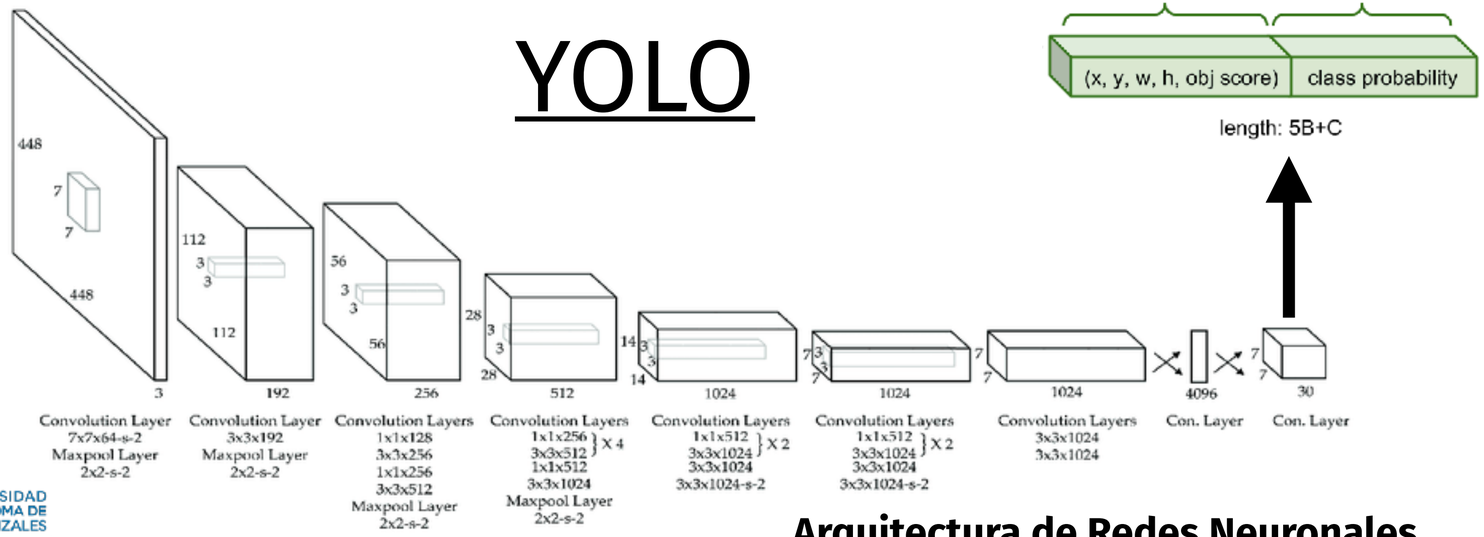


U-Net



YOLO

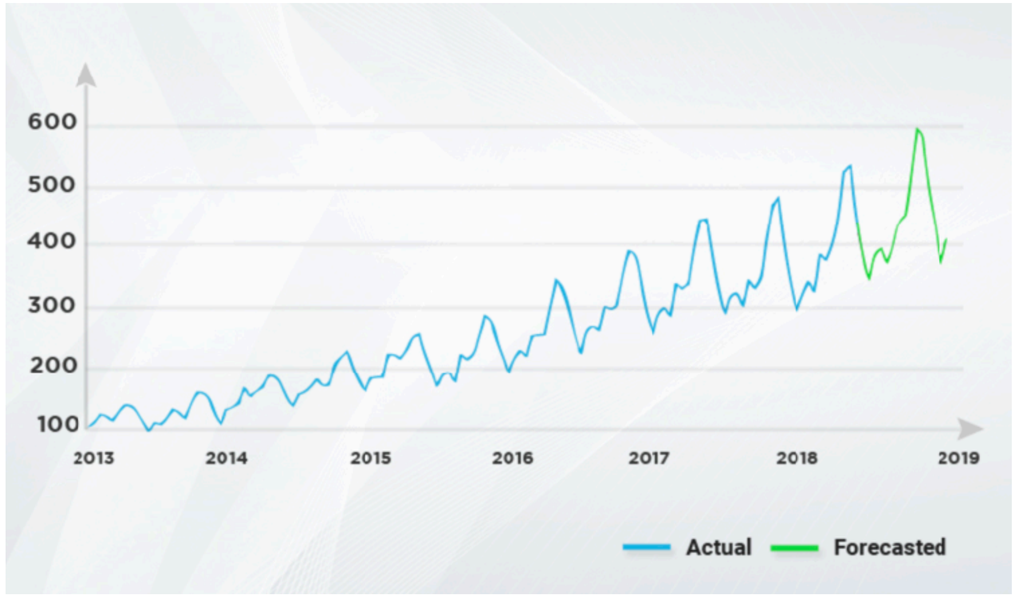
https://www.analyticsvidhya.com



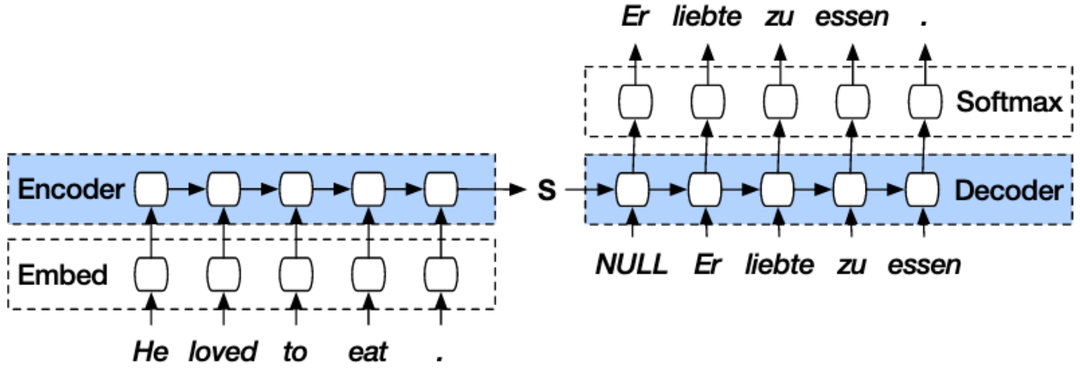
Sequence Modeling

Se refiere al procesamiento de datos secuenciales como las series de tiempo u oraciones y textos.

La característica principal de los datos secuenciales es que las muestras poseen algún tipo de dependencia entre ellas.

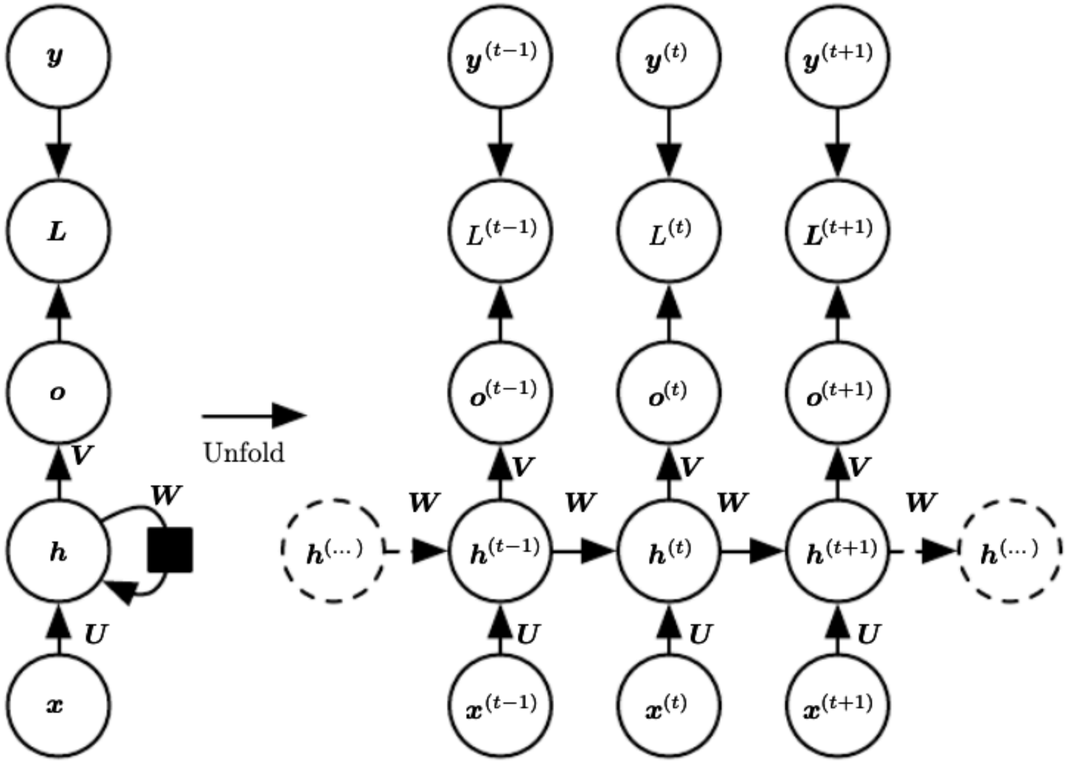


https://www.springboard.com



https://smerity.com

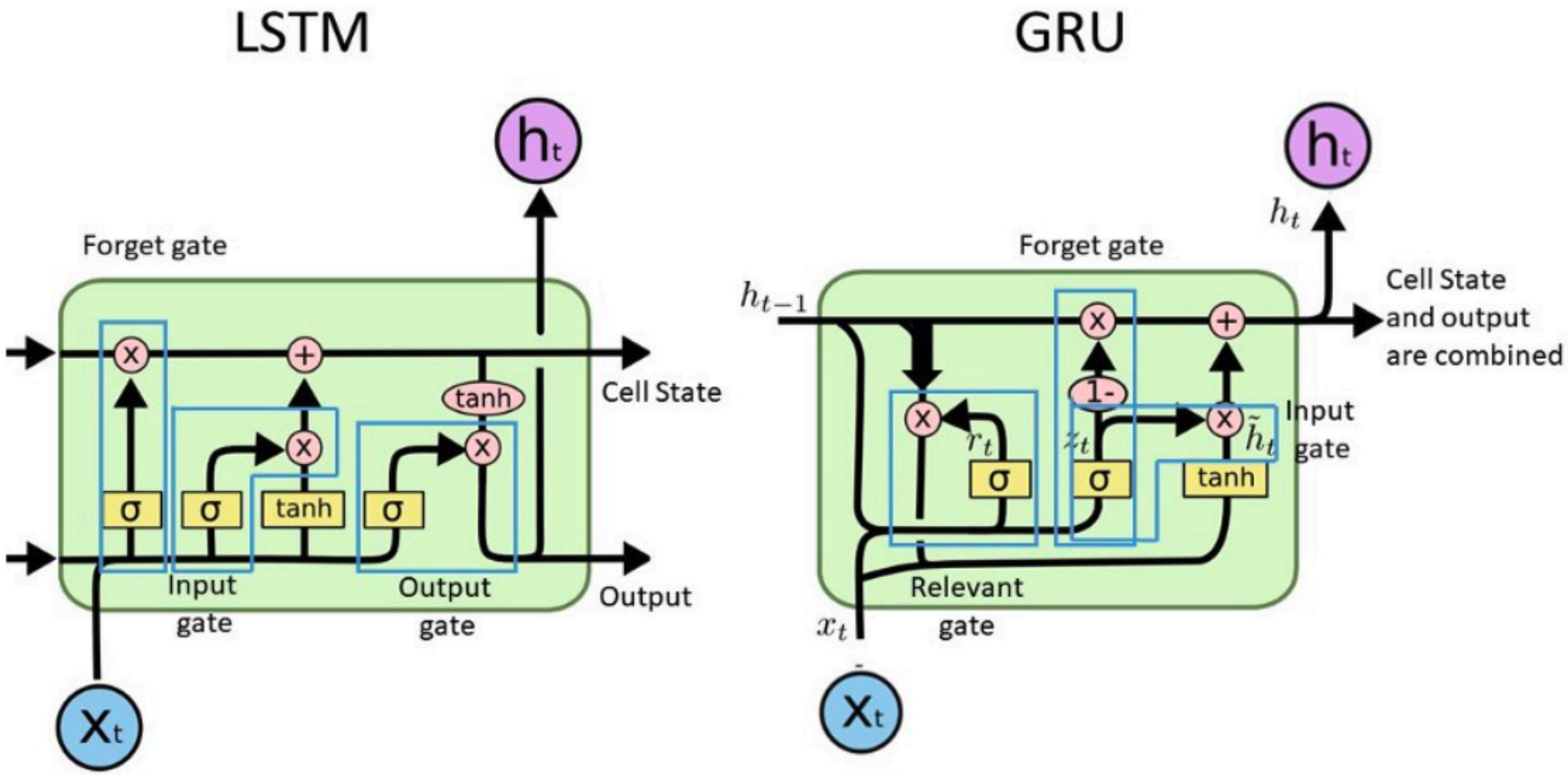
Recurrent Neural Networks



$$
\begin{aligned}
\boldsymbol{a}^{(t)} &= \boldsymbol{b} + \boldsymbol{W}\boldsymbol{h}^{(t-1)} + \boldsymbol{U}\boldsymbol{x}^{(t)}, \\
\boldsymbol{h}^{(t)} &= \tanh(\boldsymbol{a}^{(t)}), \\
\boldsymbol{o}^{(t)} &= \boldsymbol{c} + \boldsymbol{V}\boldsymbol{h}^{(t)}, \\
\hat{\boldsymbol{y}}^{(t)} &= \operatorname{softmax}(\boldsymbol{o}^{(t)}),
\end{aligned}
$$

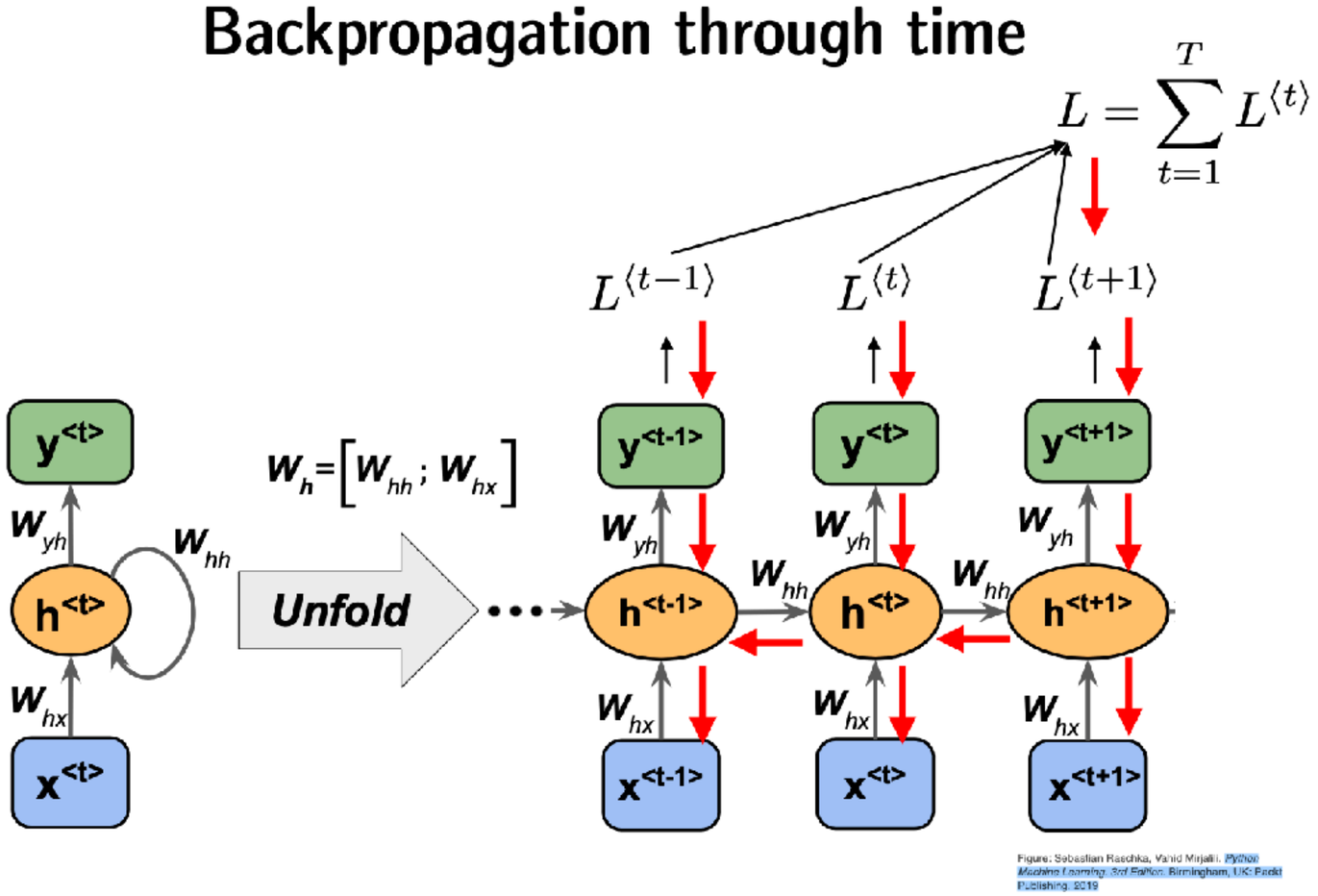
Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville

Recurrent Neural Networks



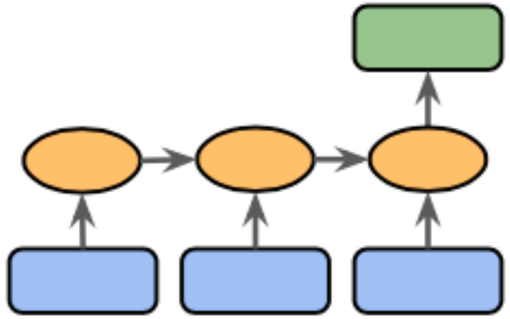
https://deeplearningmath.org

Recurrent Neural Networks

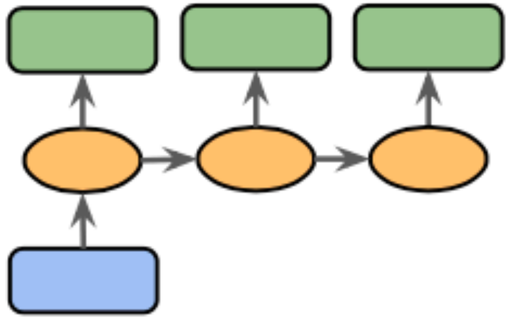


https://deeplearningmath.org

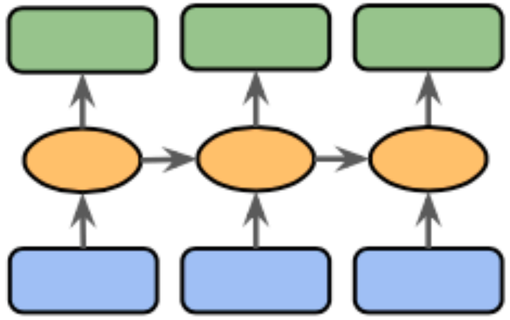
Recurrent Neural Networks



many-to-one



one-to-many



many-to-many

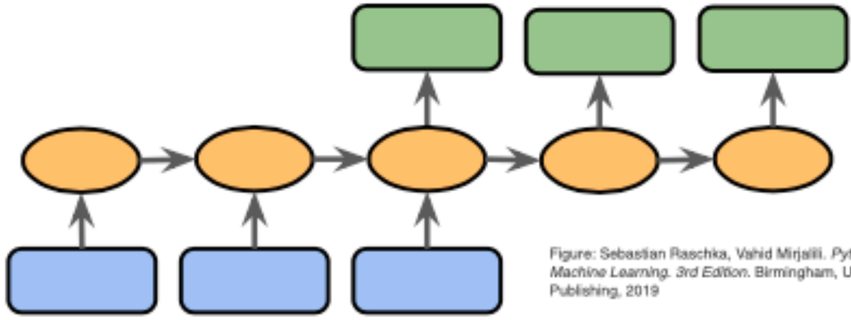


Figure: Sebastian Raschka, Vahid Mirjalili. *Python Machine Learning. 3rd Edition*. Birmingham, UK: Packt Publishing, 2019

many-to-many

https://deeplearningmath.org