

Deep Learning for Absolute Beginners



@ark_aung

၆
၃ workshop ကဘာလဲ?

ဒီ workshop
ကကိုယ့်အတွက်လား?



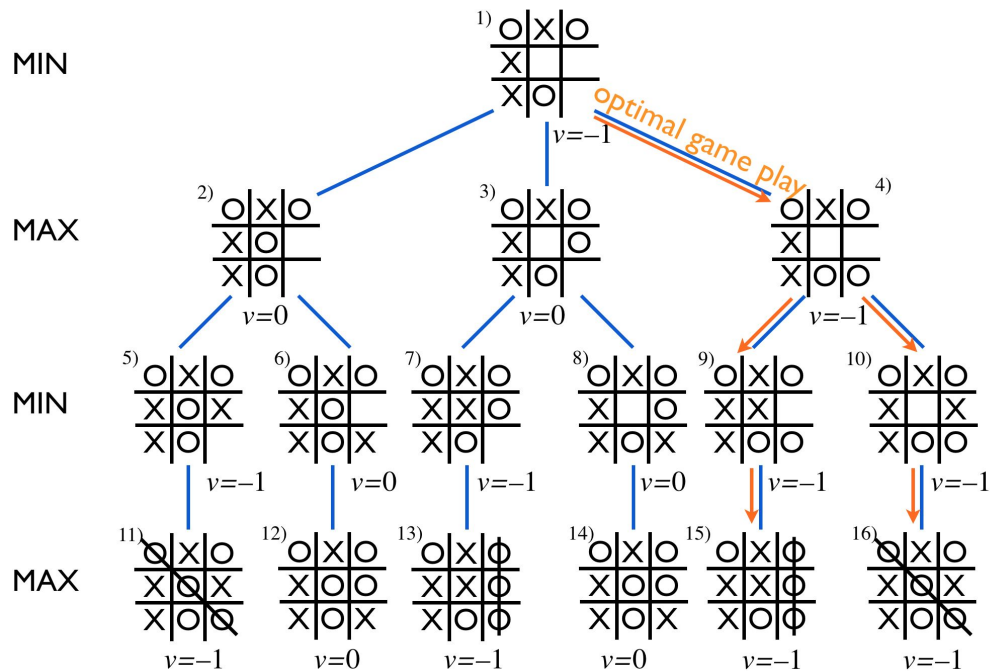
Artificial Intelligence

A Venn diagram illustrating the relationship between Artificial Intelligence, Machine Learning, and Deep Learning. It consists of three concentric circles. The outermost circle is white with a thick teal border and is labeled 'Artificial Intelligence'. Inside it is an orange circle labeled 'Machine Learning'. Inside the orange circle is a light blue circle labeled 'Deep Learning'. The entire diagram is set against a solid teal background.

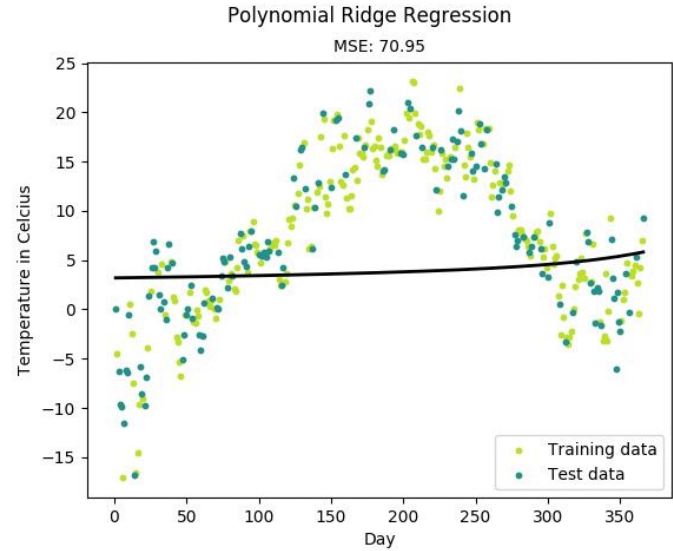
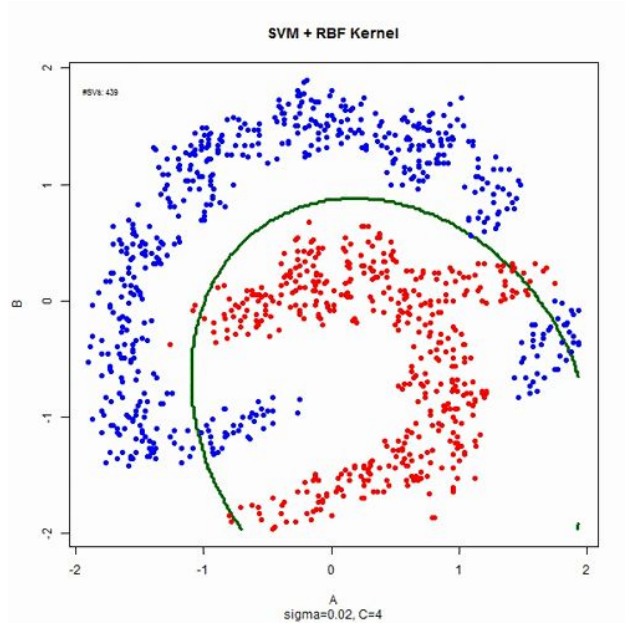
Machine Learning

Deep Learning

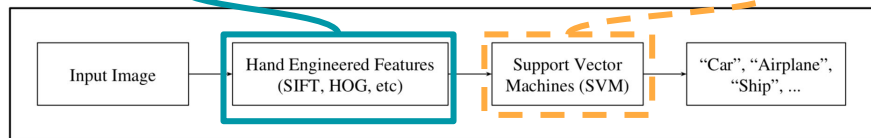
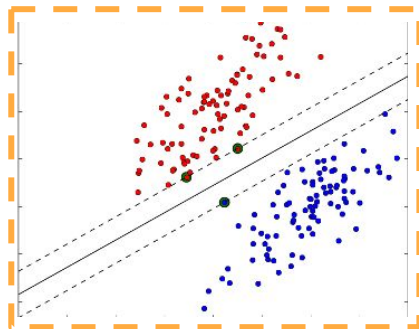
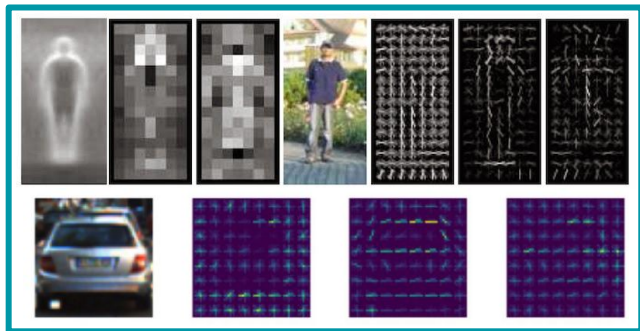
ရှေးရှေးတုန်းက AI ဆိုတာ



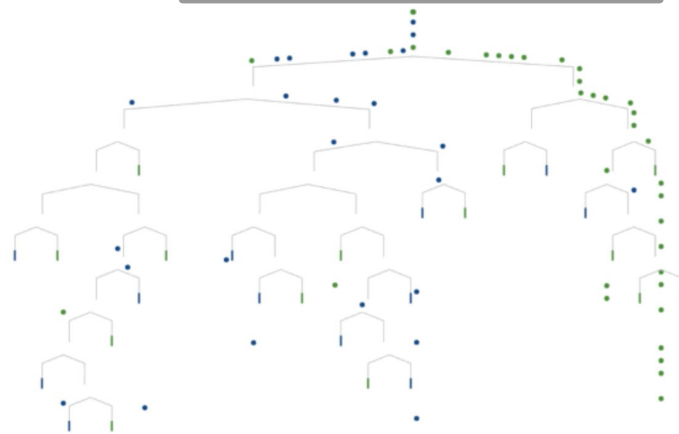
Machine Learning



Machine Learning



SKU	Make	Color	Quantity	Price
908721	Guess	Blue	789	45.33
456552	Tillys	Red	244	22.91
789921	A&F	Green	387	25.92
872266	Guess	Blue	154	17.56



Deep Learning

How does Facebook tag me in photos?

How does Google Assistant, Siri, Alexa work?

How does Google translate work?



Monet → photo

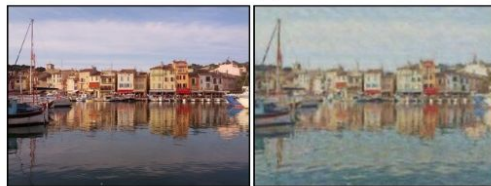
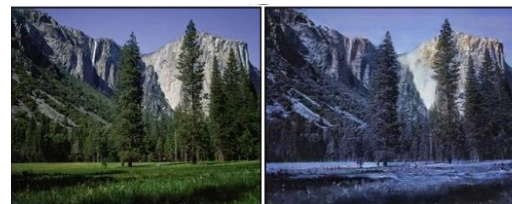
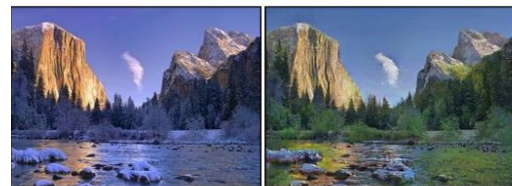


photo → Monet



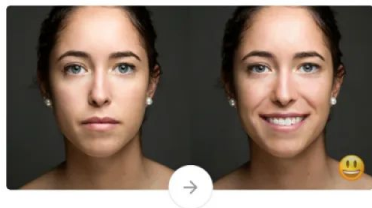
summer → winter



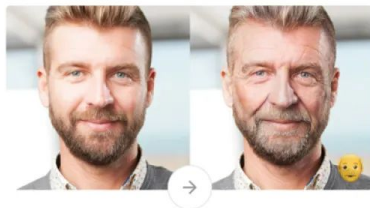
winter → summer



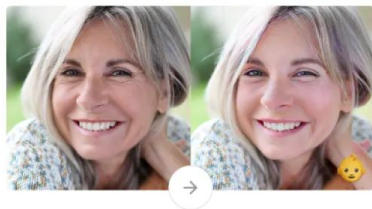
Make them smile



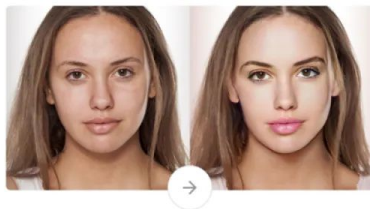
Meet your future self



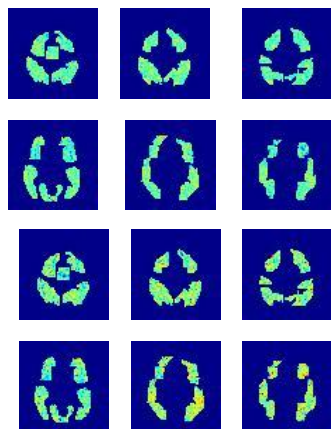
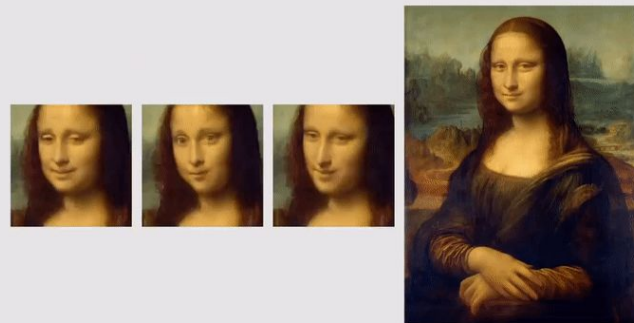
Look younger



Change your style

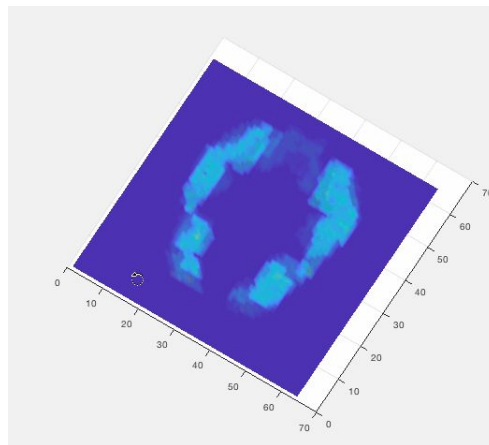


Living portraits



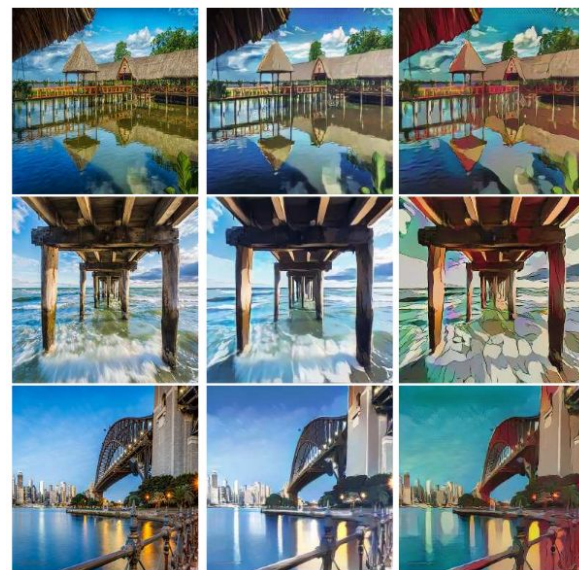
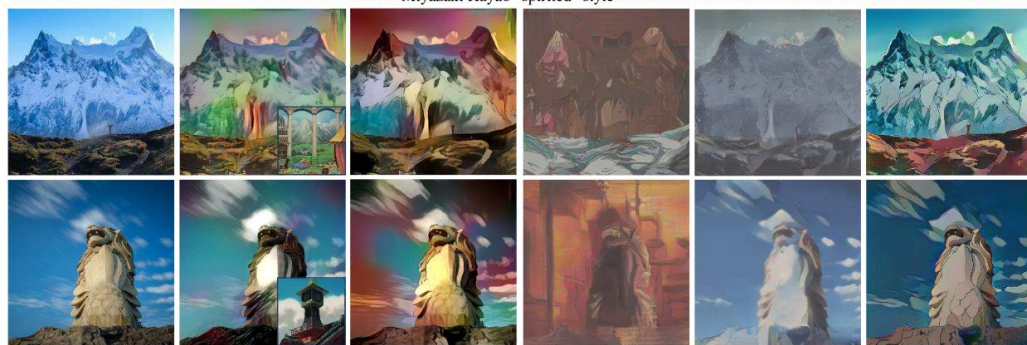
Picture

Sentence





Miyazaki Hayao "spirited" style -



Software 1.0

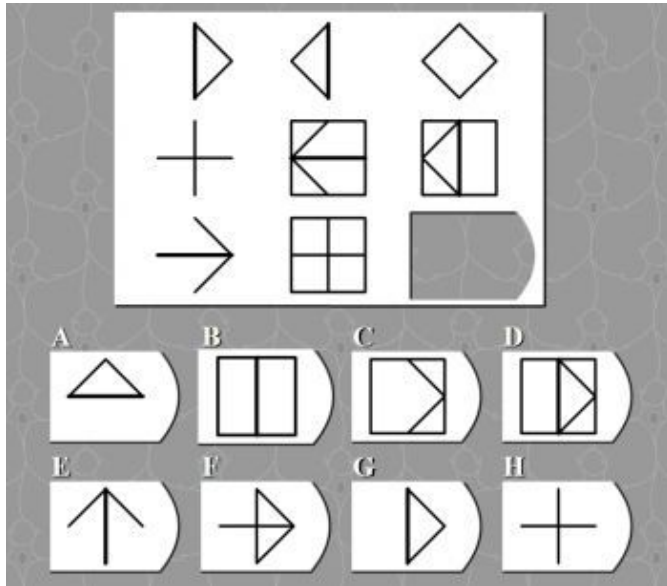
ဘယ်လိုလုပ်ရမလဲ

Software 2.0

ဘလုပ်ချင်တာလဲ

DATA

Patterns



Deciphering



What we see

7

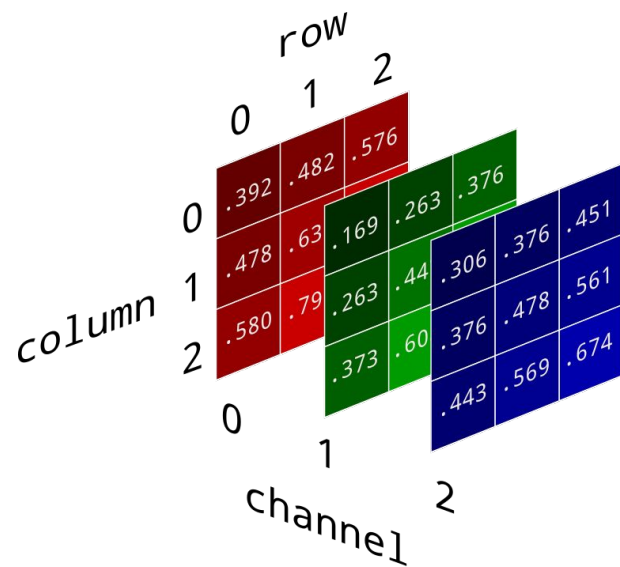
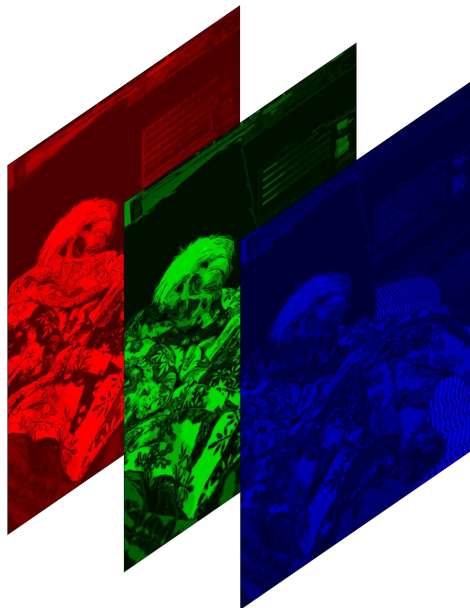
What a computer sees

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155	182	163	74	75	62	33	17	170	230	180	164
180	180	50	14	34	6	10	33	48	106	169	181
206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	281	237	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
188	88	179	209	186	215	211	188	139	75	20	169
189	97	165	84	10	168	134	11	31	62	22	148
199	168	191	193	168	227	178	143	182	106	36	190
205	174	156	252	236	231	149	178	228	43	85	234
190	216	116	149	236	187	85	150	79	38	218	241
190	224	147	108	227	210	127	102	36	101	255	224
190	214	173	66	103	143	96	50	2	109	249	215
187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	131	133	200	175	13	96	218

187	193	174	168	180	182	129	181	172	161	155	156
155	182	163	74	75	62	33	17	170	230	180	164
180	180	50	14	34	6	10	33	48	106	169	181
206	109	5	124	131	111	120	204	166	15	56	180
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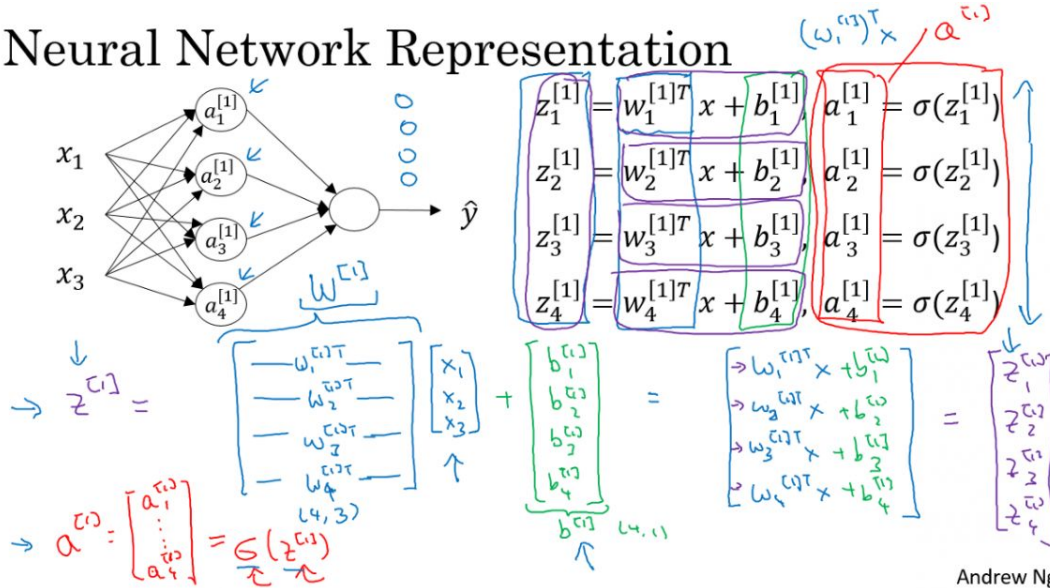


AI လို့ ပြောပြီဆိုတာနဲ့ ပြေးမြင်ကြတာတွေ



တကယ်တမ်း တော့...

Neural Network Representation



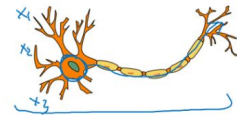
Forward and backward propagation

$$\begin{aligned} Z^{[1]} &= W^{[1]}X + b^{[1]} \\ A^{[1]} &= g^{[1]}(Z^{[1]}) \\ Z^{[2]} &= W^{[2]}A^{[1]} + b^{[2]} \\ A^{[2]} &= g^{[2]}(Z^{[2]}) \\ &\vdots \\ A^{[L]} &= g^{[L]}(Z^{[L]}) = \hat{Y} \end{aligned}$$

"It's like the brain."



$$\begin{aligned} dZ^{[L]} &= A^{[L]} - Y \\ dW^{[L]} &= \frac{1}{m} dZ^{[L]} A^{[L]T} \\ db^{[L]} &= \frac{1}{m} np.sum(dZ^{[L]}, axis=1, keepdims=True) \\ dZ^{[L-1]} &= dW^{[L]T} dZ^{[L]} g'^{[L]}(Z^{[L-1]}) \\ &\vdots \\ dZ^{[1]} &= dW^{[2]T} dZ^{[2]} g'^{[1]}(Z^{[1]}) \\ dW^{[1]} &= \frac{1}{m} dZ^{[1]} A^{[1]T} \\ db^{[1]} &= \frac{1}{m} np.sum(dZ^{[1]}, axis=1, keepdims=True) \end{aligned}$$



$x \rightarrow y$

Andrew Ng

Andrew Ng

Deep Learning ရဲ့

အသက်ကတော့

**Artificial Neural
Network**

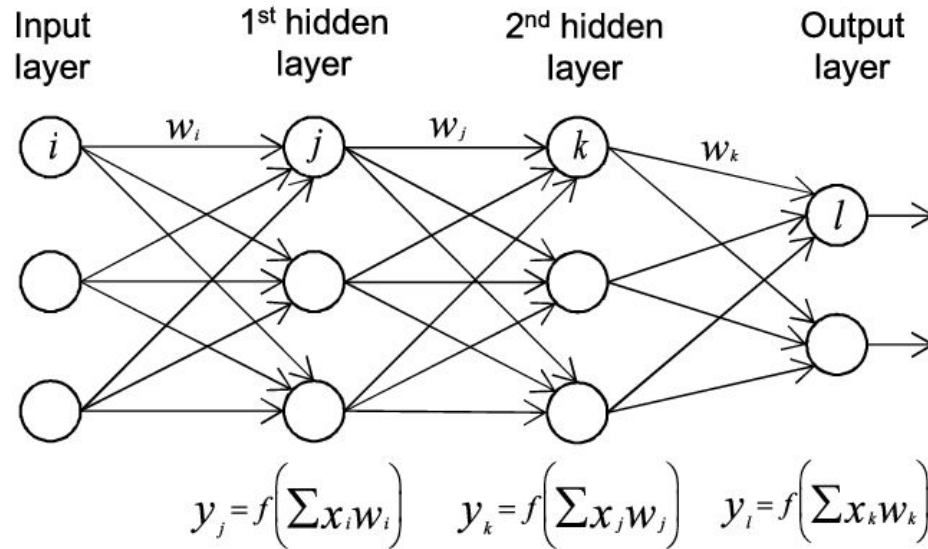
တွေပဲဖြစ်ပါတယ်။

**Artificial Neural
Network** တွေကို

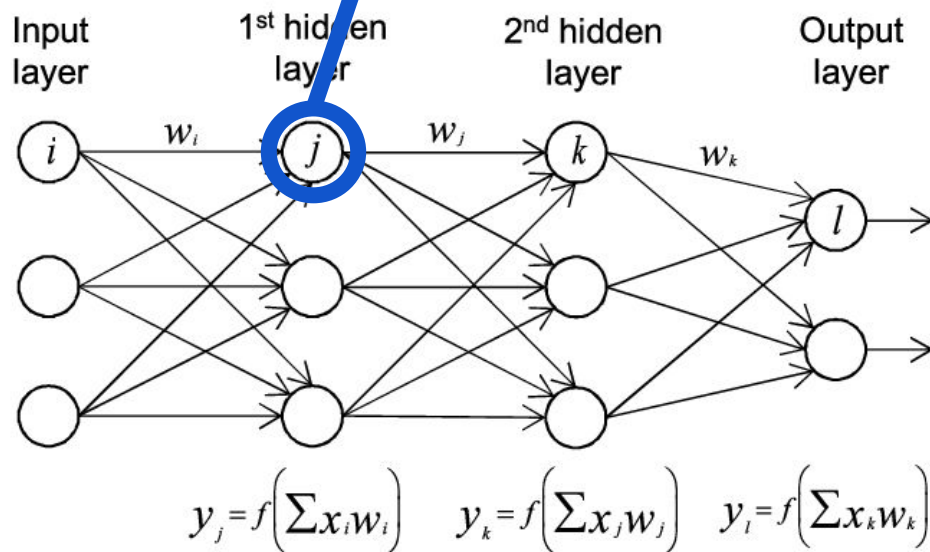
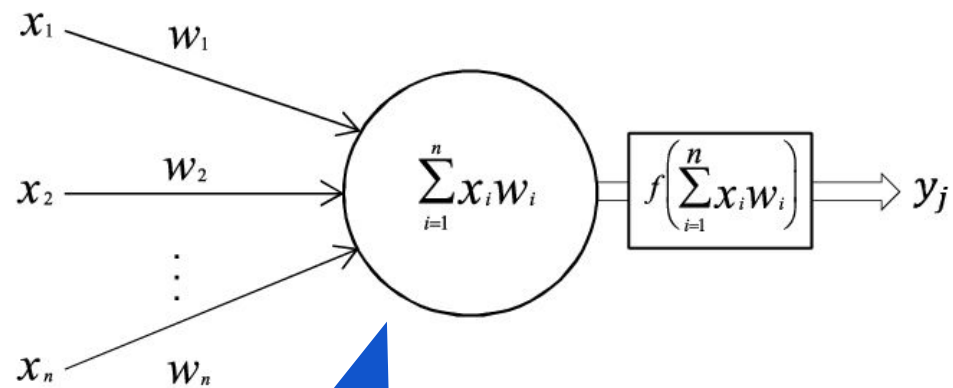
Multilayer

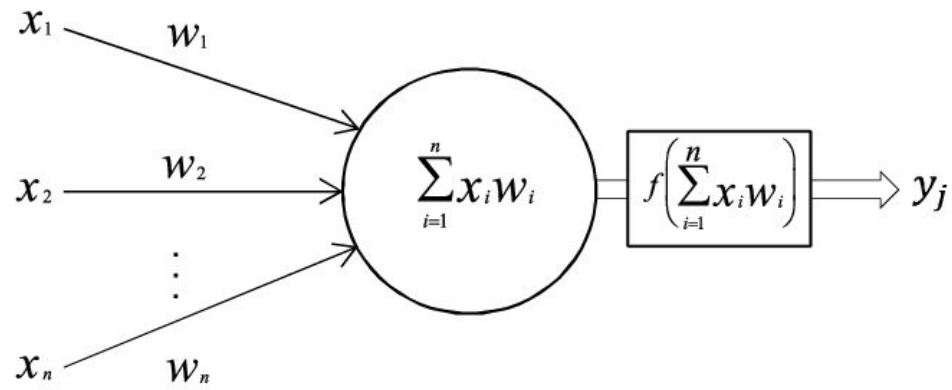
Perceptron

လို့လည်းခေါ်ကြပါတယ်



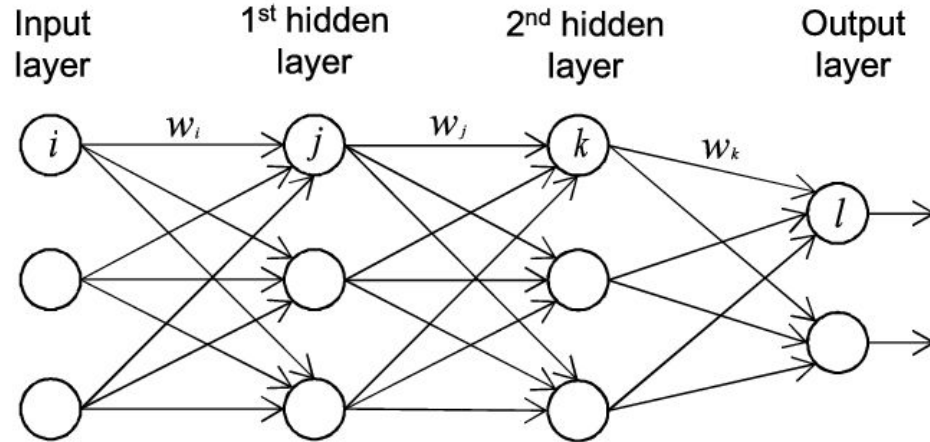
Artificial Neural
Network တွေကို
Neuron တွေပါတဲ့
Layer တွေနဲ့
ဖွဲ့စည်းထားပါတယ်။





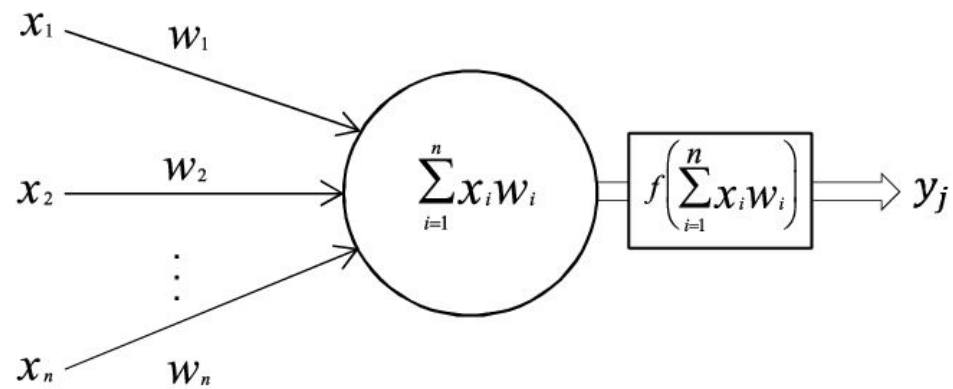
သိချင်တာက
ဘာလဲ

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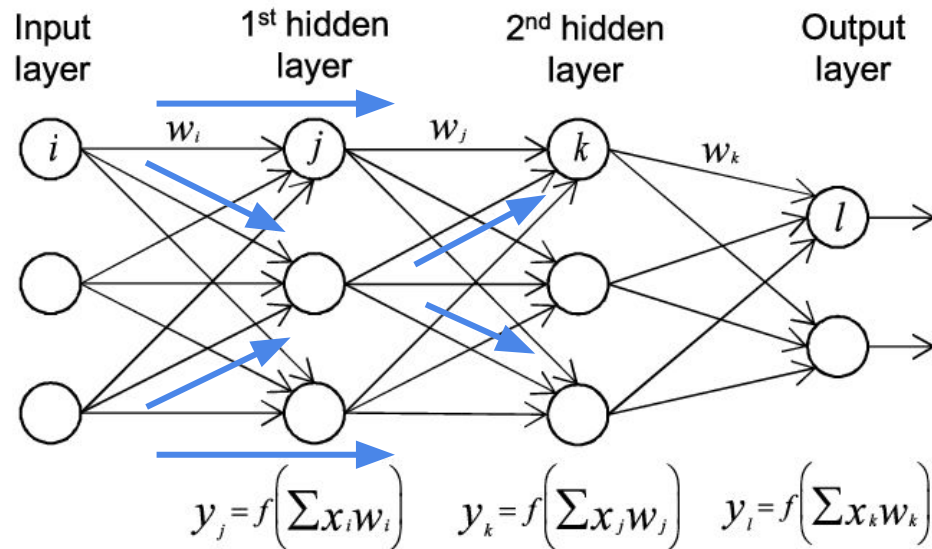


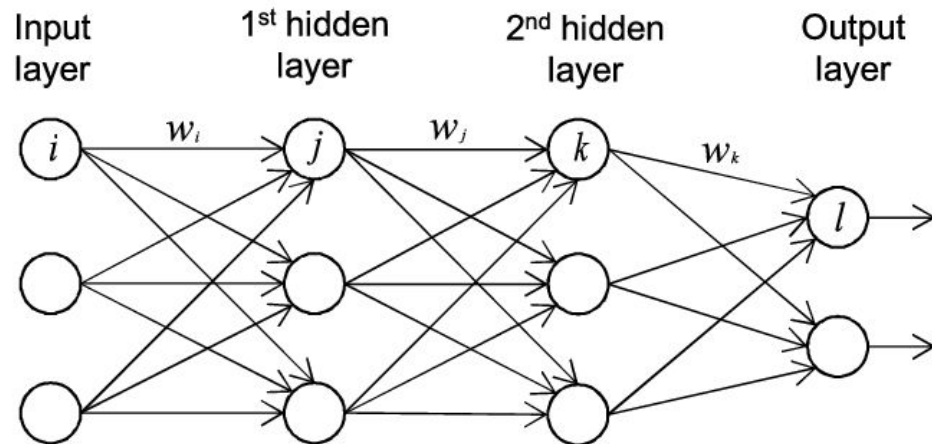
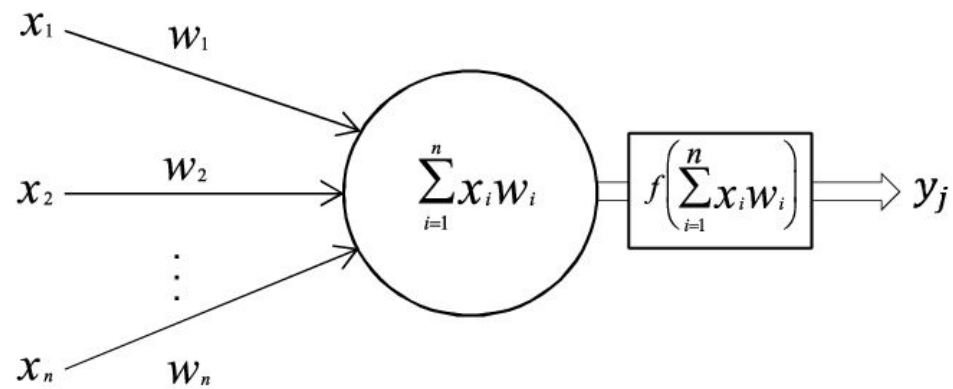
$$y_j = f\left(\sum x_i w_i\right) \quad y_k = f\left(\sum x_j w_j\right) \quad y_l = f\left(\sum x_k w_k\right)$$

7 အဖြေမှန်



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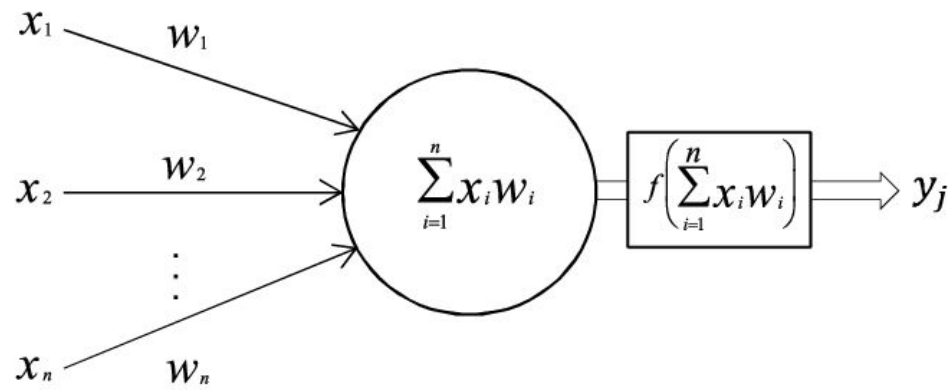


$$y_j = f\left(\sum x_i w_i\right) \quad y_k = f\left(\sum x_j w_j\right) \quad y_l = f\left(\sum x_k w_k\right)$$

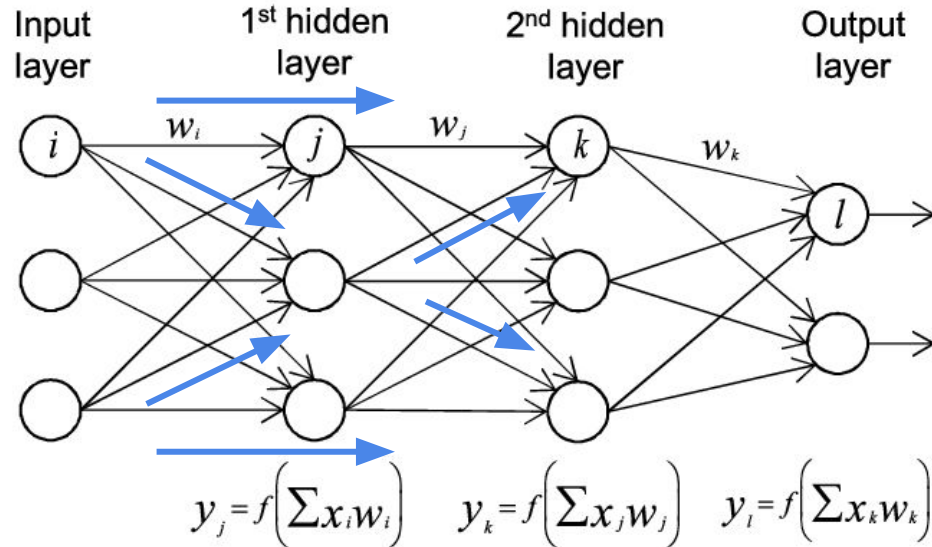
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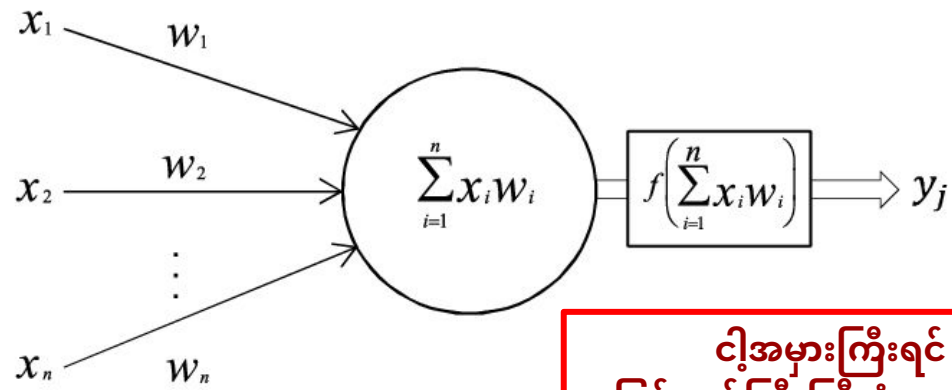
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1 ထင်တာ

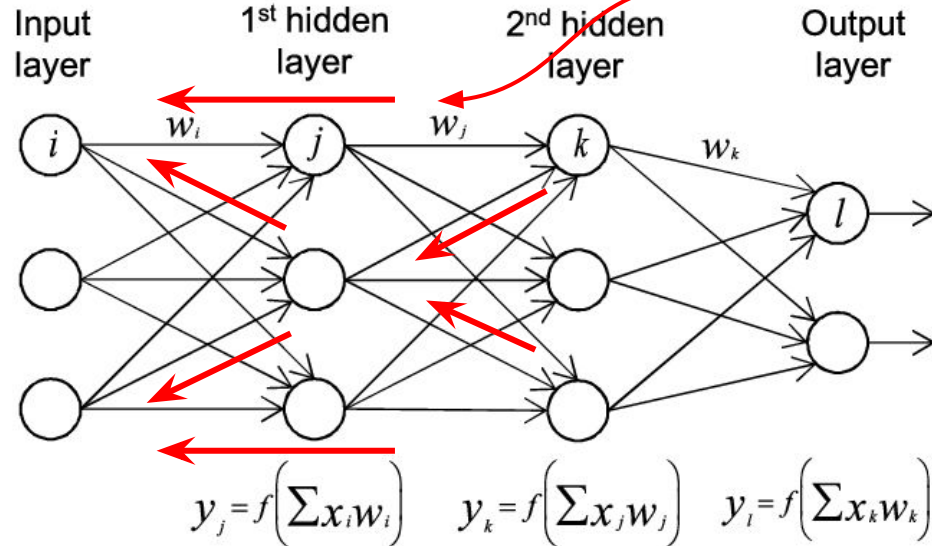
7 အမှန်က

ငါဘယ်လောက်တောင်
မှားနေလဲ? 🤔



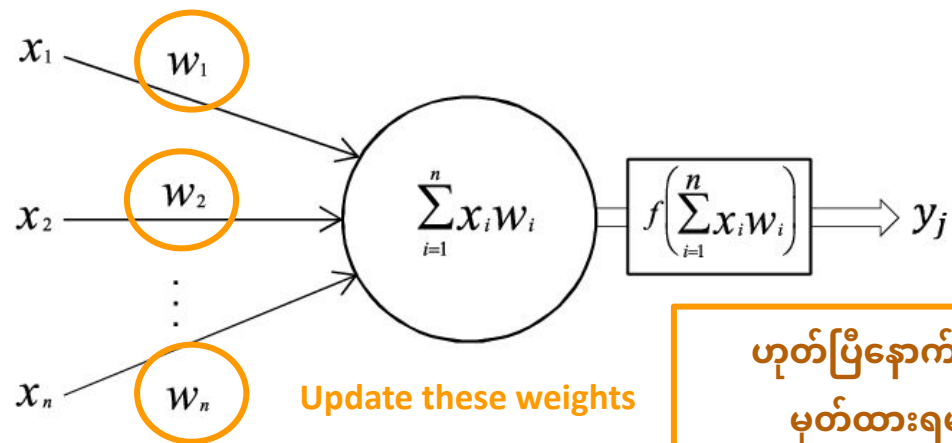
ငါ့အမှားကြီးရင်
ပြစ်ဒဏ်ကြီးကြီးခံရမယ် 😞

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1 ထင်တာ
7 အမှန်က

ငါဘယ်လောက်တောင်
မှားနေလဲ? 🤔

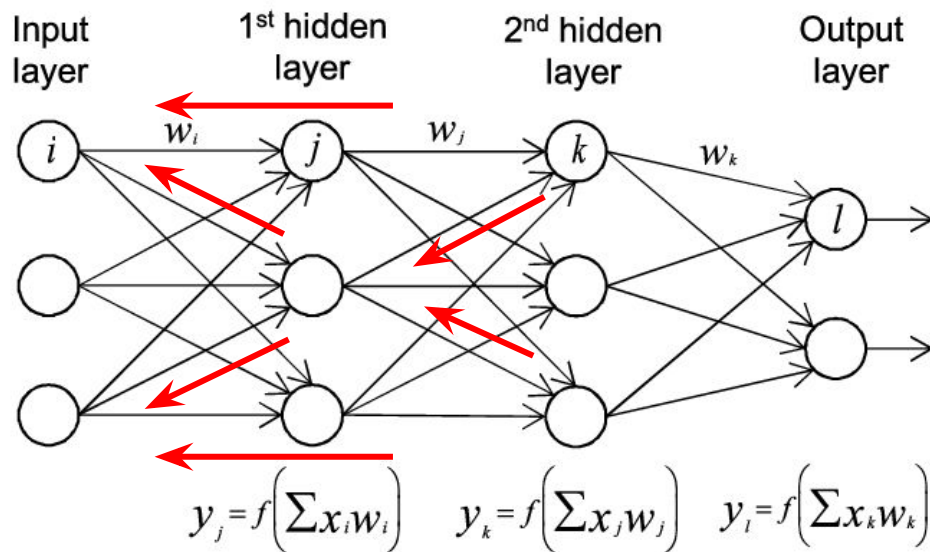


ဟုတ်ပြီနောက်မမှားအောင်
မှတ်ထားရမယ် 😊

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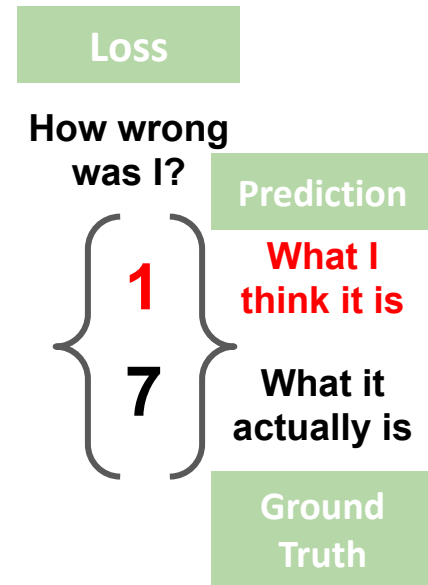
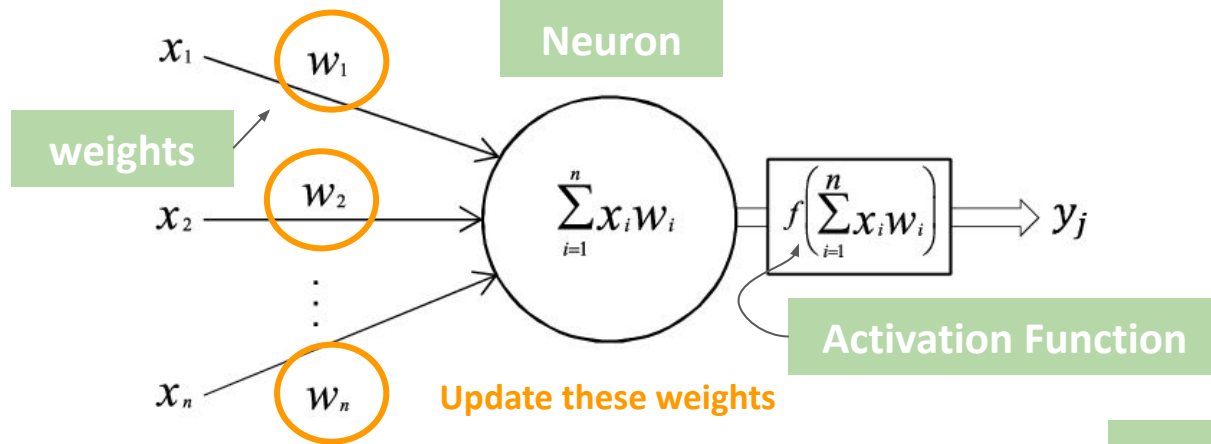


{ 1 } ထင်တာ
 { 7 } အမှန်က

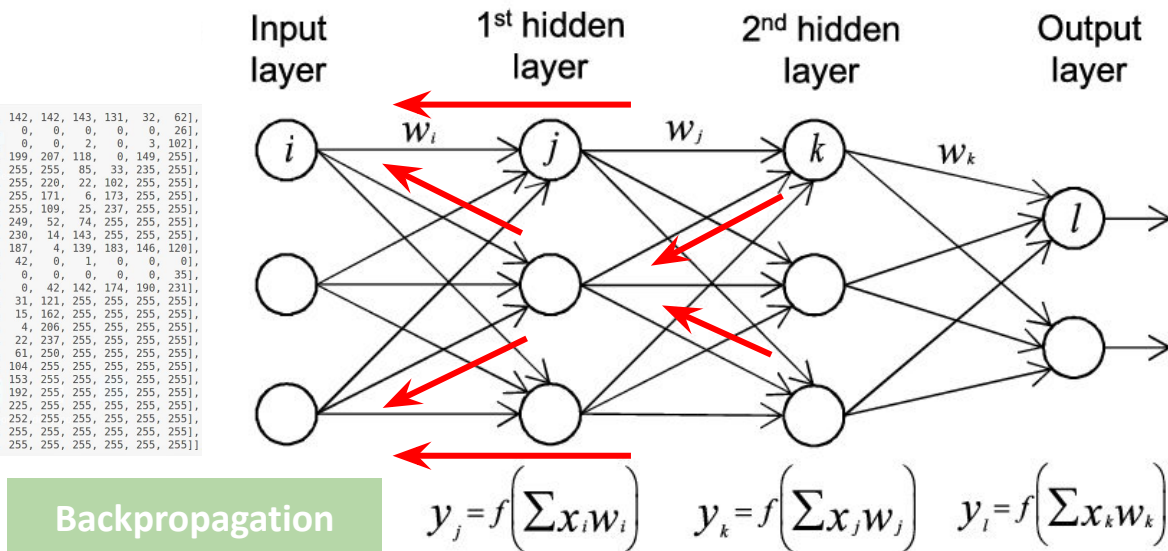
ငါဘယ်လောက်တောင်
မှားနေလဲ? 🤔

အခေါ်အဝေါ်များ

- **Loss** - ဘယ်လောက်မှားလဲဖော်ပြပေး
- **Backpropagation** - အမှားအပေါ်မူတည်ပြီးပြုပြင်ချက်
- **Learning Rate** - အမှားပြင်ပြင်းအား
- **Activation Function** - Neuron မှထွက်လာသောရလဒ်ကိုထပ်ဆင့် တွက်ချက်သော function
- **Neuron** - Neural Network ရဲ့အခြေခံအကျဆုံးတွက်ချက်မှု unit
- **Hidden Layer** - Neuron တွေစုစည်းထားတဲ့ Neural Network ရဲ့အတွင်းပိုင်း layer



```
[[120, 92, 101, 112, 142, 142, 143, 131, 32, 62],
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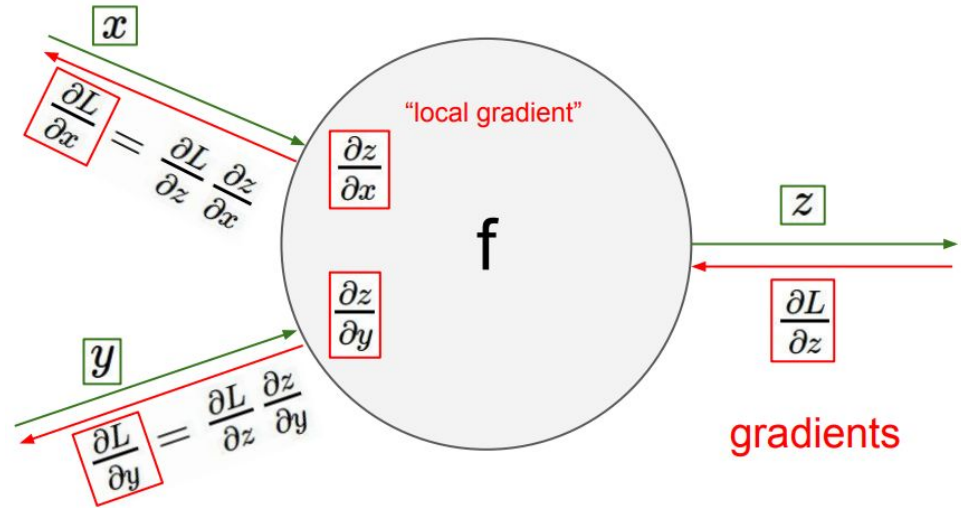
- **Backpropagation** ကတကယ်တန်းကျတော့ differential calculus ပါပဲ

velocity

position

$$v(t) = \frac{dx(t)}{dt}$$
$$a(t) = \frac{dv(t)}{dt} = \frac{d^2x(t)}{dt^2}$$

acceleration

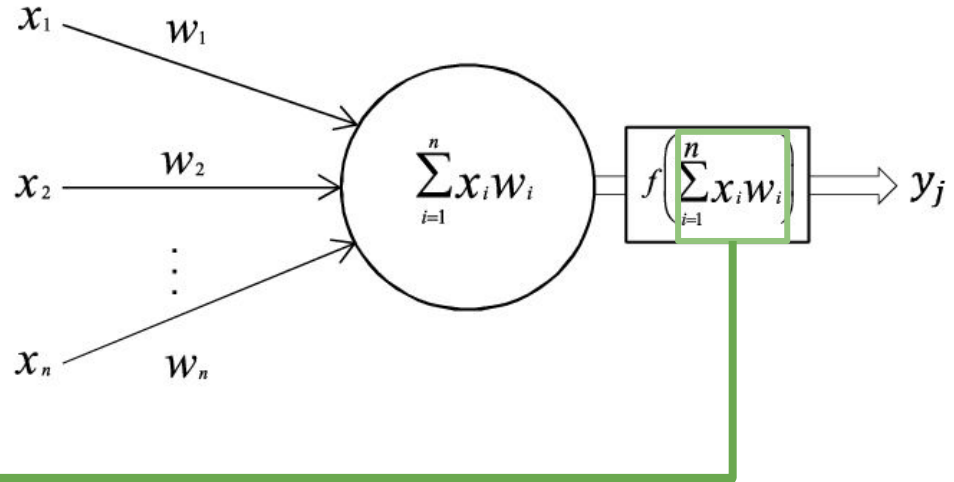
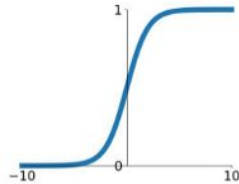


- Differentiate လုပ်တယ်ဆိုတာလည်း အရာတစ်ခုက နောက် အရာတစ်ခု ပြောင်းလဲမှုအပေါ်မူတည် ပြီး ပြောင်းလဲတဲ့ **နှုန်း** ကိုရှာချင်လို့ ဖြစ်ပါတယ်

- **Activation Function** - Neuron မှထွက်လာသောရလဒ်ကိုထပ်ဆင့်တွက်ချက်ပေးသော function
- Nonlinear function များသည် Neural Network များအတွက်အလွန်အရေးပါသည်

Sigmoid

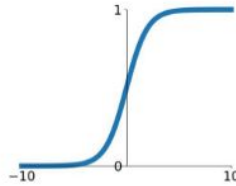
$$\sigma(x) = \frac{1}{1+e^{-x}}$$



- **Activation Function** - Neuron မှထွက်လာသောရလဒ်ကိုထပ်ဆင့်တွက်ချက်ပေးသော function
- Nonlinear function များသည် Neural Network များအတွက်အလွန်အရေးပါသည်

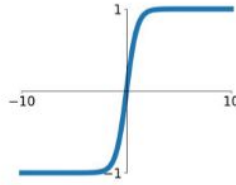
Sigmoid

$$\sigma(x) = \frac{1}{1+e^{-x}}$$



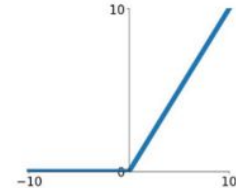
tanh

$$\tanh(x)$$



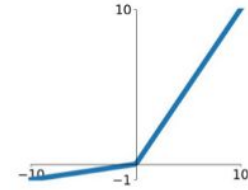
ReLU

$$\max(0, x)$$



Leaky ReLU

$$\max(0.1x, x)$$

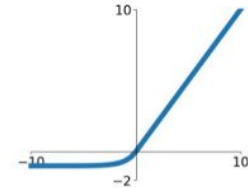


Maxout

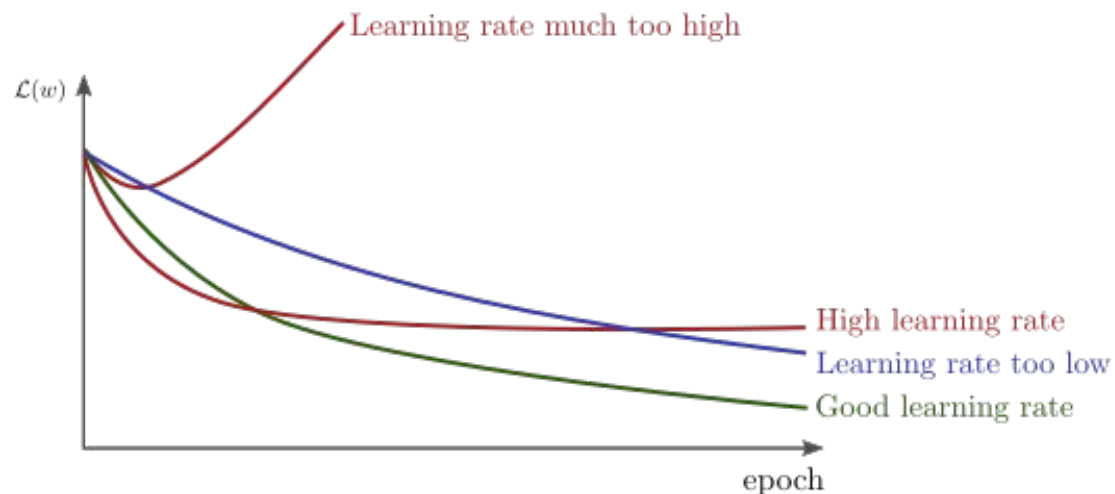
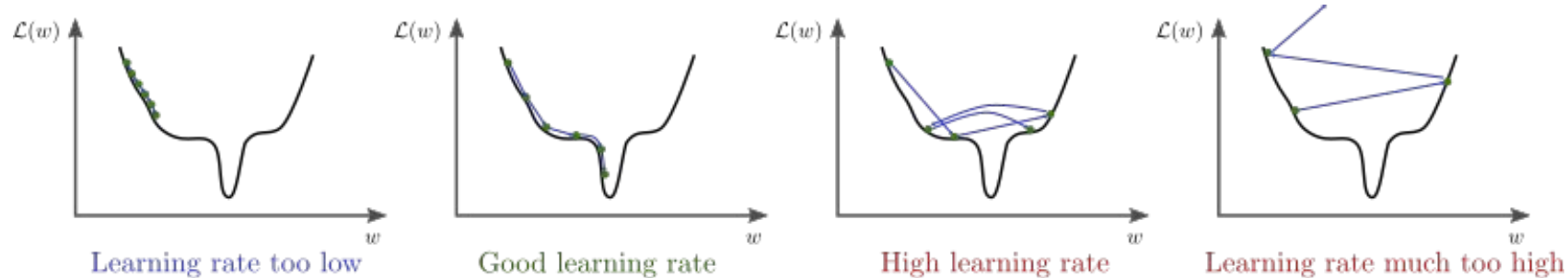
$$\max(w_1^T x + b_1, w_2^T x + b_2)$$

ELU

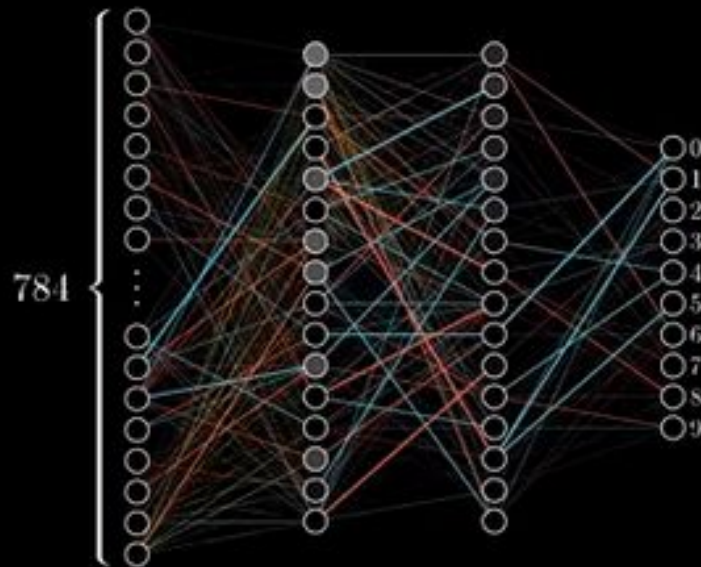
$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



● Learning Rate - အမှားပြင်ပြင်းအား



Training in
progress...



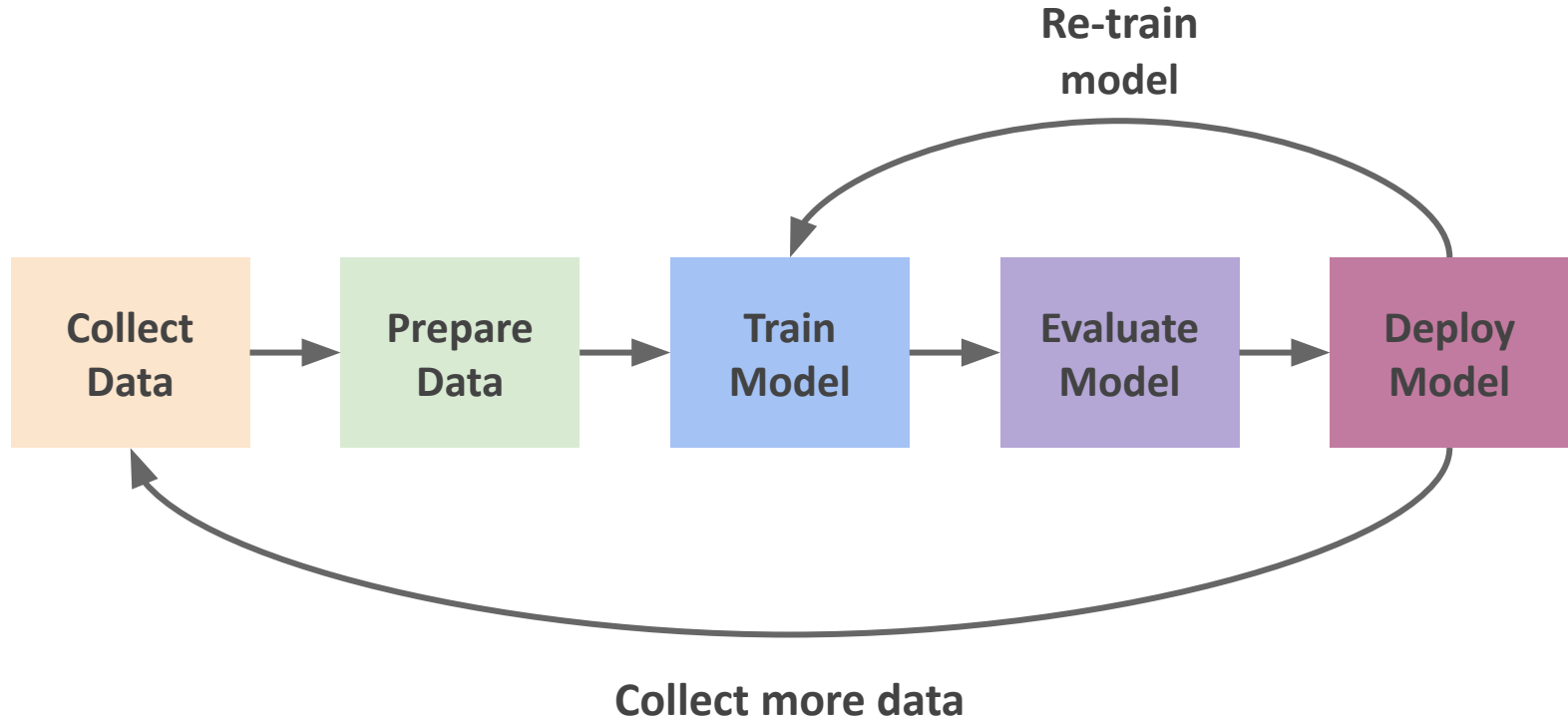
3blue1brown has one of the BEST animations for neural networks:

<https://www.youtube.com/watch?v=aircAruvnKk>

Neural Network Playground

Go To: <https://playground.tensorflow.org/>

Simplified Workflow



Training Ground!

Building a handwritten Myanmar Digit recognizer

Go To: https://github.com/ArkAung/dl_acy_workshop

Now let's go a step further!

Building a handwritten Myanmar Alphabet
recognizer

Go To: https://github.com/ArkAung/dl_acy_workshop

How to quickly create handwritten characters

<https://www.youtube.com/watch?v=x0yHH87gJCY>

You can get the slides at:

[https://github.com/ArkAung/dl_acy_workshop/raw/master/slides/
slides.pdf](https://github.com/ArkAung/dl_acy_workshop/raw/master/slides/slides.pdf)

You can reach out to me on Twitter and Facebook

 [@ark_aung](#)

 [Arkar Min Aung](#)

 [@ark_aung](#)

References

- [1] https://brohrer.github.io/convert_rgb_to_grayscale.html
- [2] <https://www.coursera.org/learn/machine-learning>
- [3] <https://www.cs.ryerson.ca/~aharley/vis/conv/flat.html>