

Future of AI

**How to get started towards
Artificial General Intelligence?**

Day 2 morning / Goal

1. AI that creates AI

- Is there a path to AGI (Artificial General Intelligence)?

2. Generative Deep Learning

The future of AI

1. Deep Learning



☐ “Biggest leap since invention of computers”

☐ Output of AI: Scalar values (numbers)

Output =

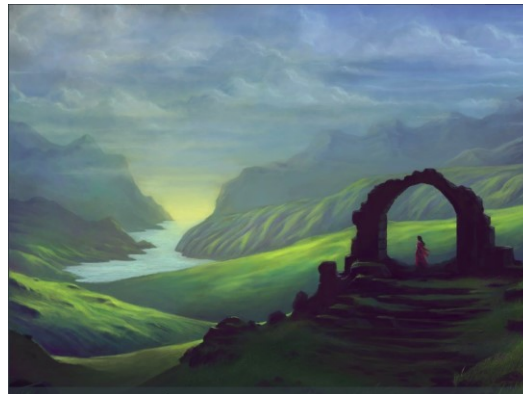
2. Generative Deep Learning



☐ GAN “the most interesting idea in the last 10 years in ML.”

☐ Output of AI: Vectors , Images

Output =



3. AI that creates another AI



☐ Progressive, AutoML

☐ Output of AI: Neural networks

Output =



A path to Artificial General Intelligence ?

How to create Artificial General Intelligence using narrow intelligence?

Narrow Intelligence
specializing in a task of

Identify category of task and
select a class of neural net

Dynamic model creation

Selection of a optimal model

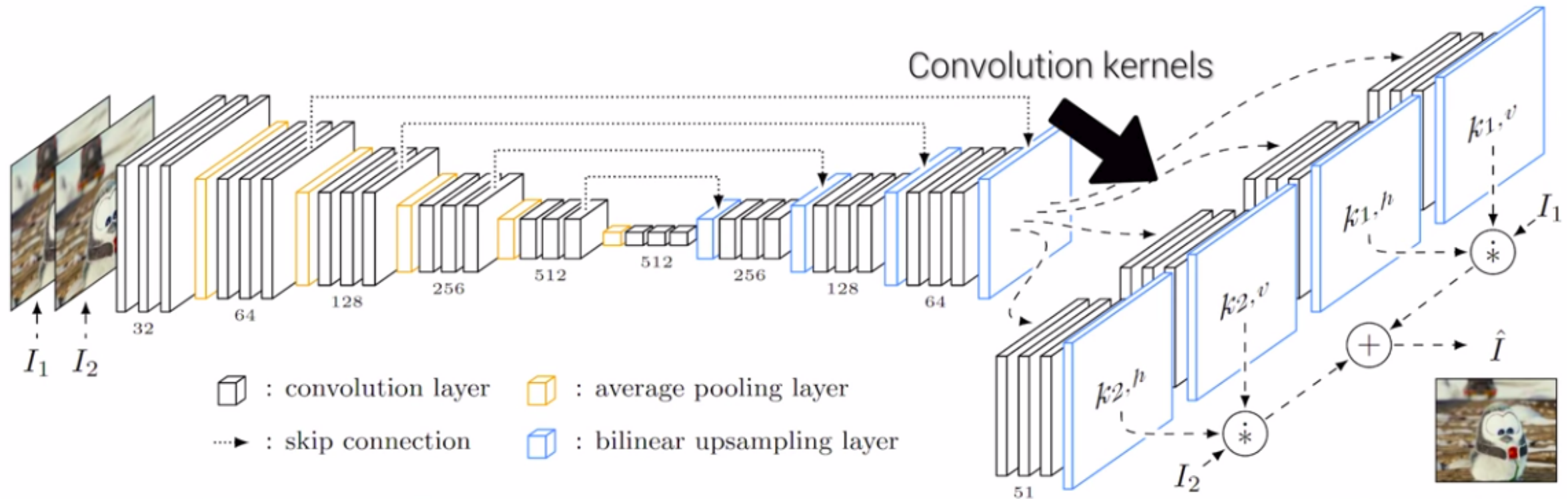


Dynamically created
Narrow Intelligences



A neural network can output a kernel!

Output of this neural network = A few Kernels



<https://arxiv.org/abs/1708.01692>

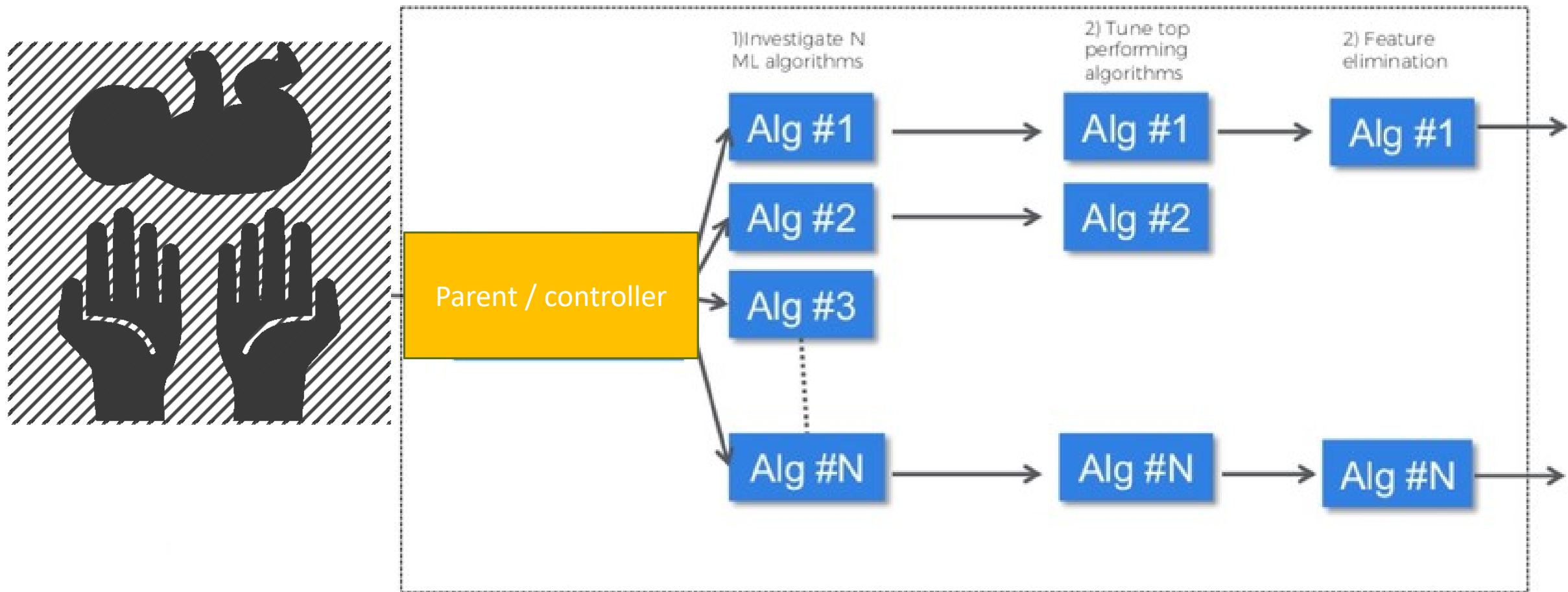
Video Frame Interpolation via Adaptive Separable Convolution

Credits: AI Learns Video Frame Interpolation | Two Minute Papers #197

Acknowledgments & Credits are mentioned to inspirational resources presented last slides. For more like this, <https://sites.google.com/view/AIforEveryone>

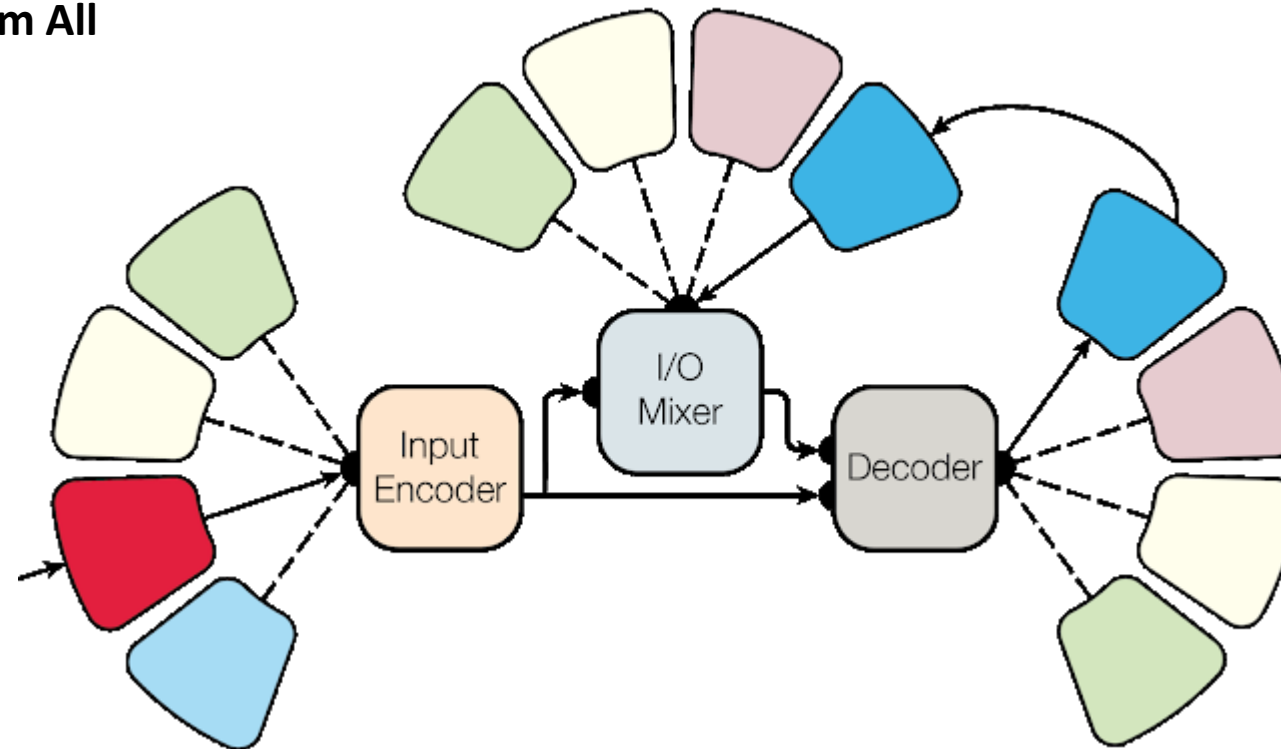
A path to Artificial General Intelligence ?

A neural network can create child neural network
& then select the best



Multimodal Neural Network Architecture That Has The Power To “Learn It All”

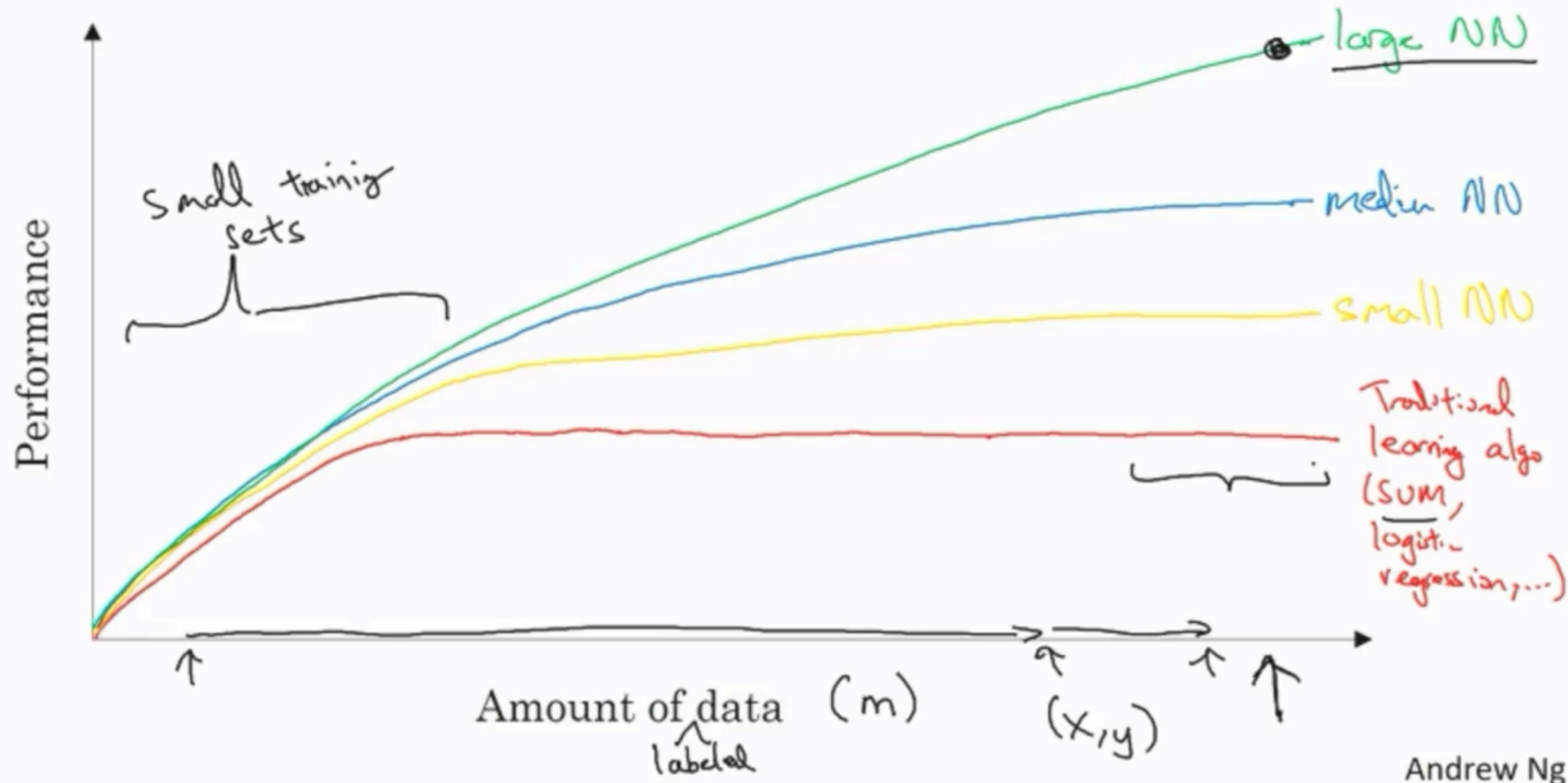
One Model To Learn Them All
By Google Brain



<https://arxiv.org/pdf/1706.05137.pdf>

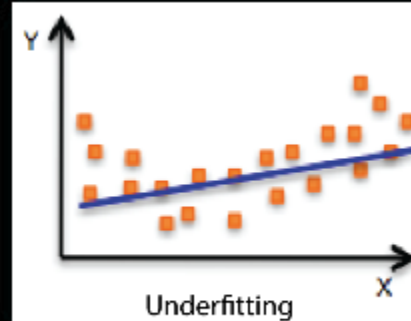
What is a good neural network?

Scale drives deep learning progress



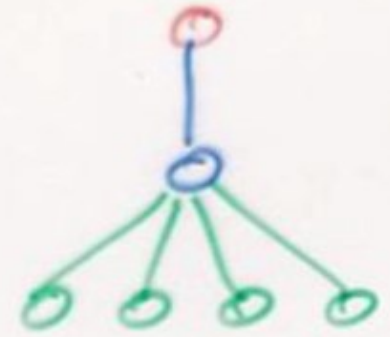
How to Design a good network

Develop 1st model

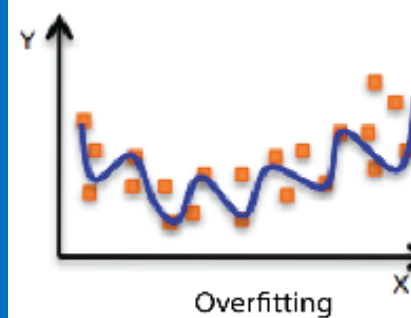


Underfitting

small capacity may prevent it from representing all structure in data

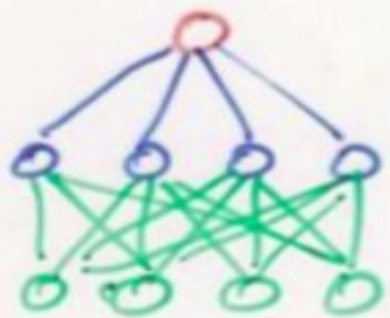


Develop model that overfits

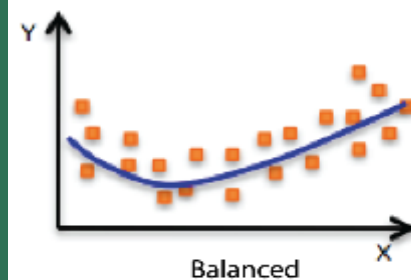


Overfitting

large capacity may allow it to memorize data and fail to capture regularities

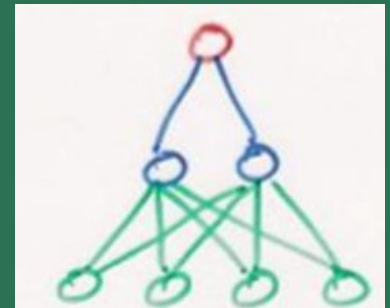


Adjust model's capacity to learn "just the patterns"

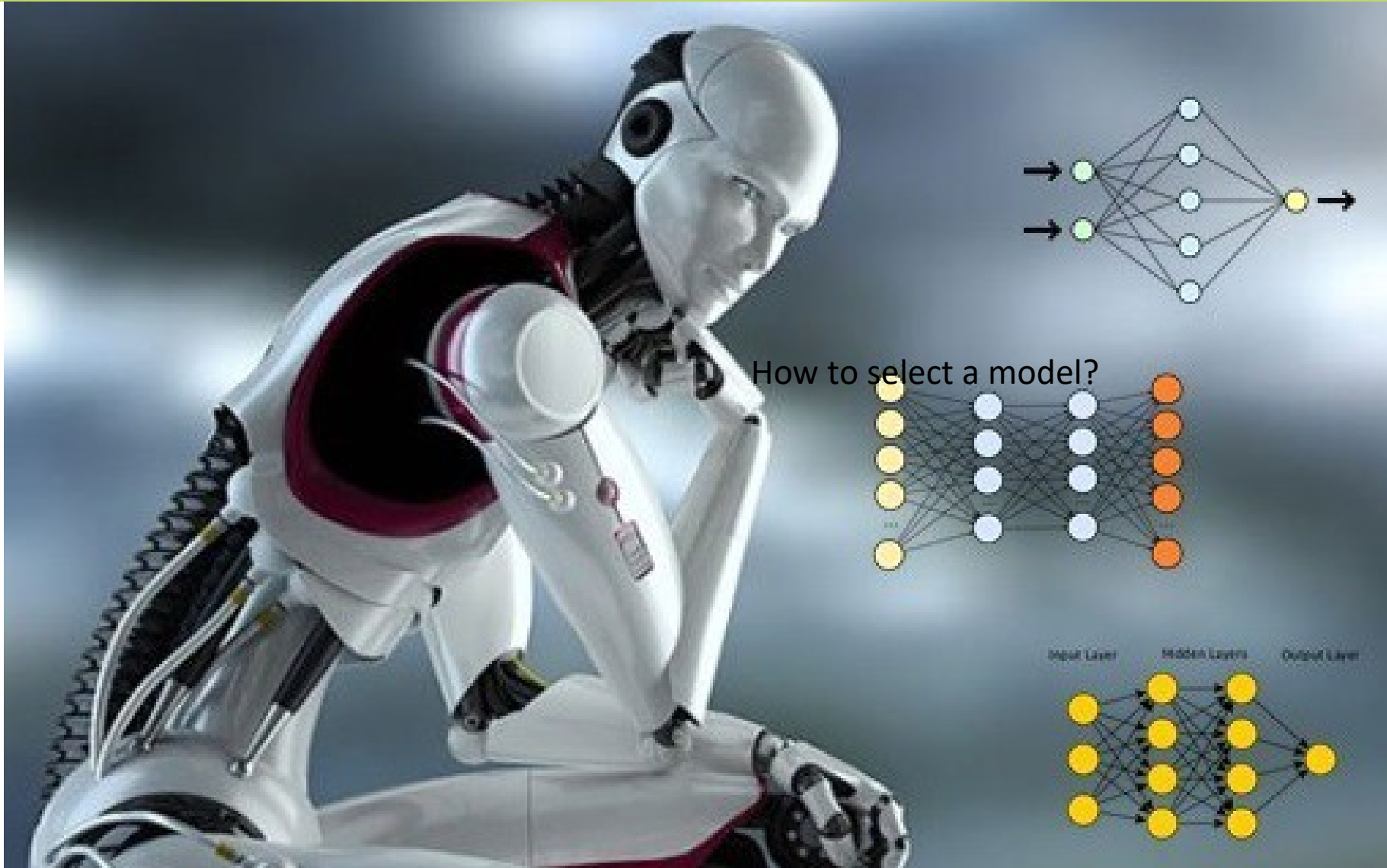


Balanced

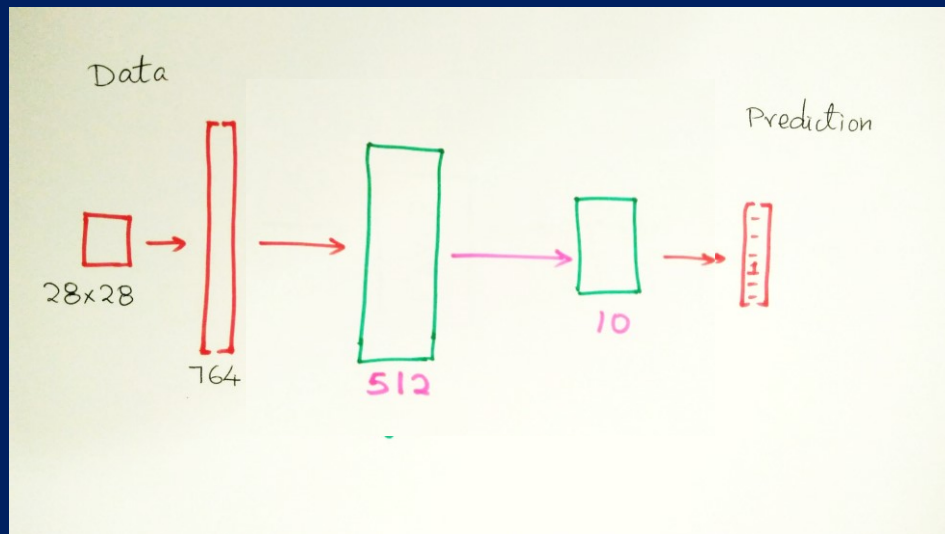
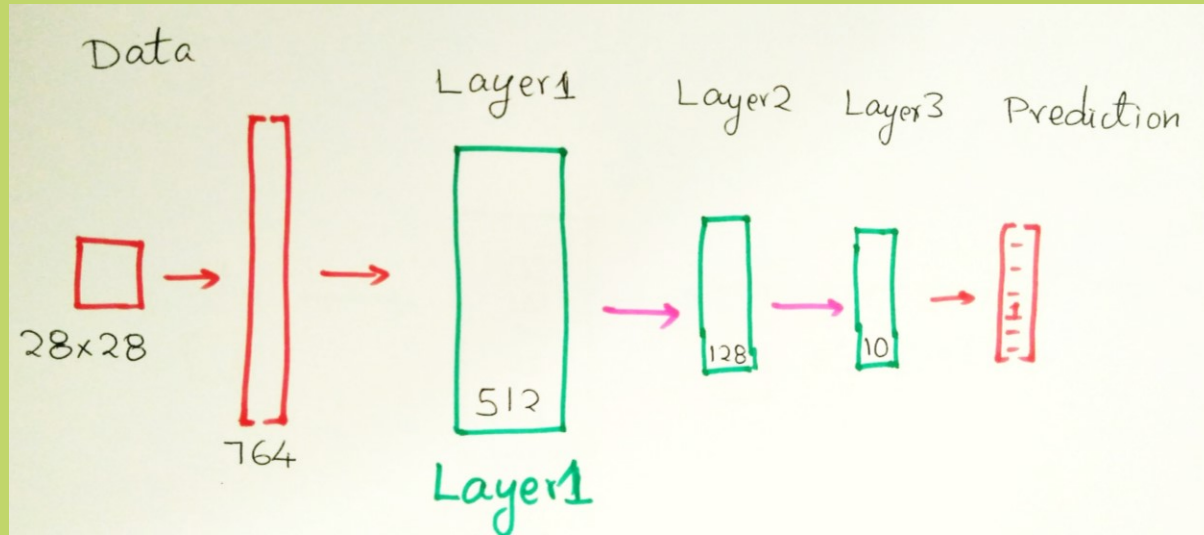
Limit the capacity so that only the representations can be learnt



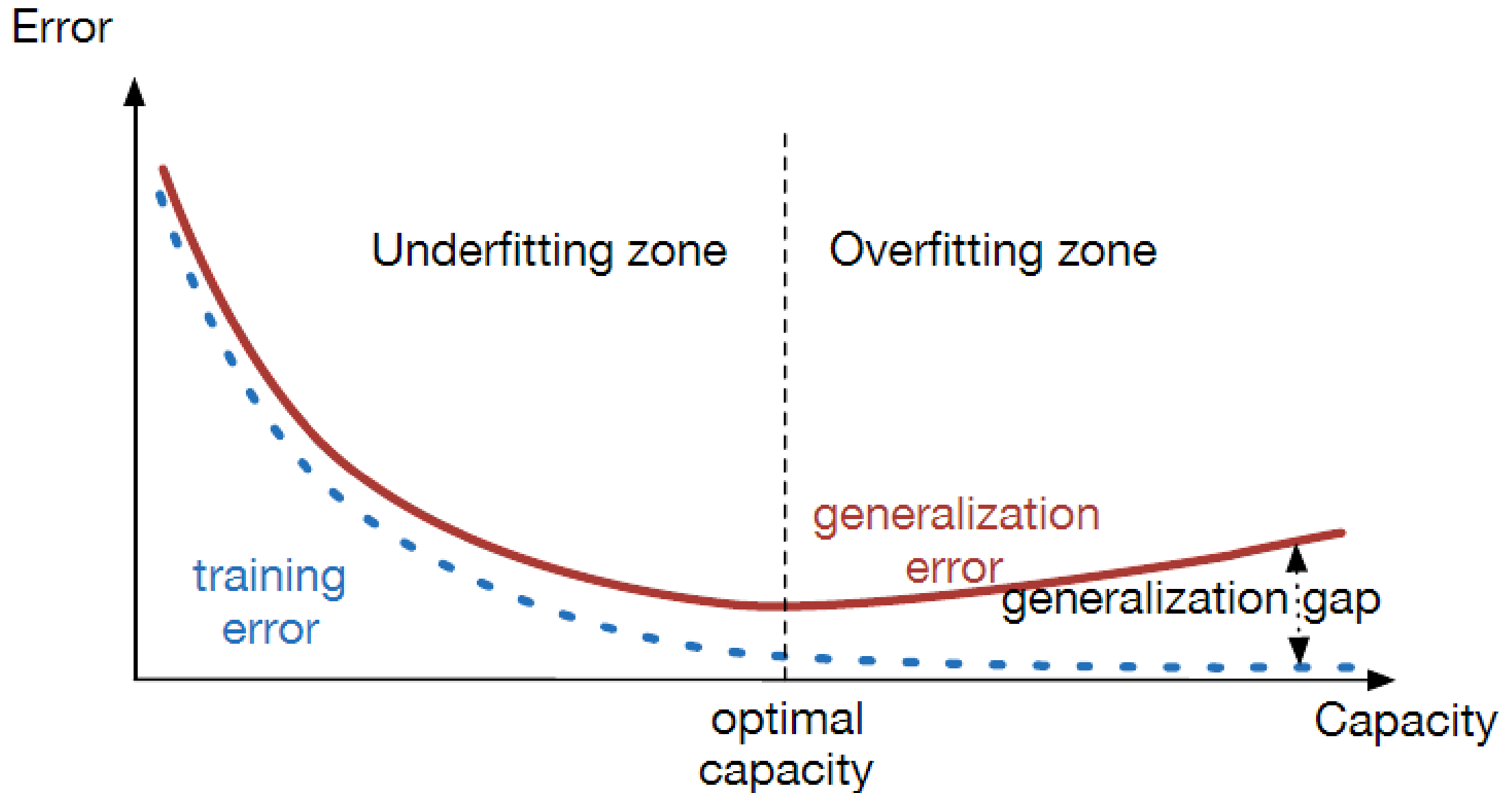
Can an algorithm can select a model?



How do humans select a model?

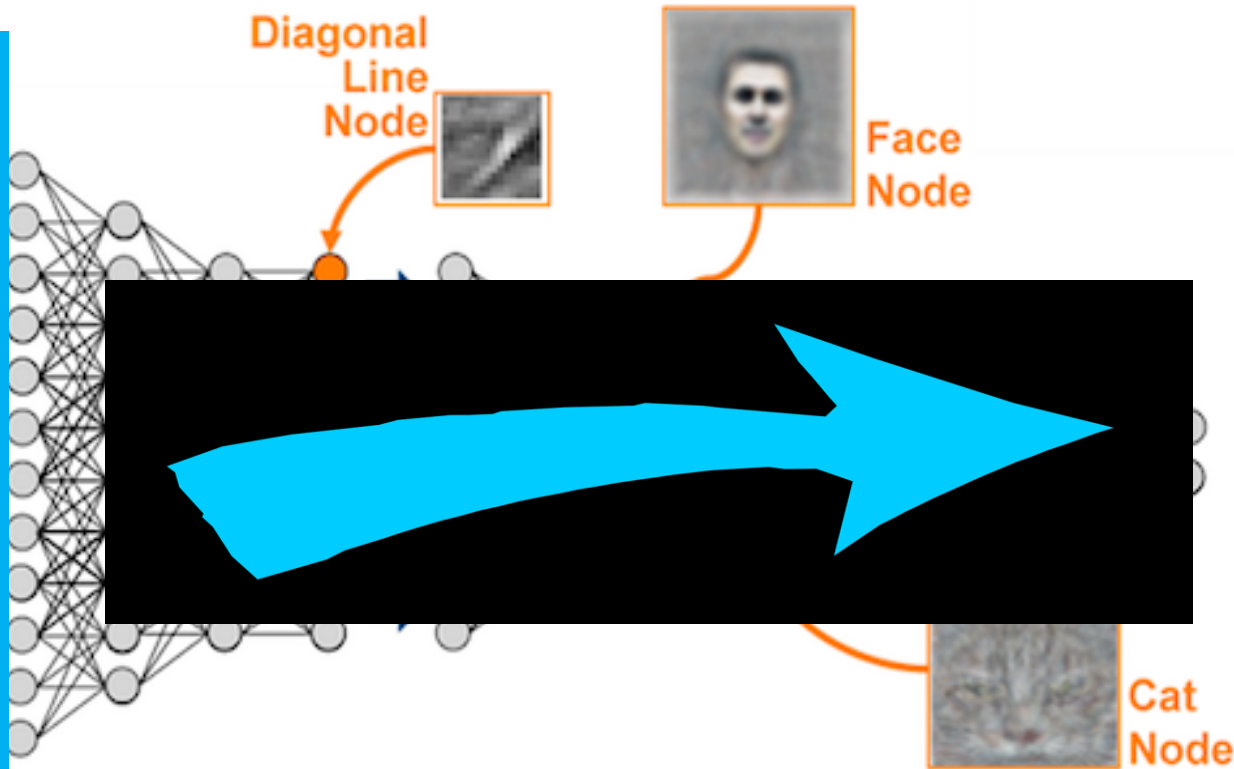


What is a optimal model?



Improve power of generalization

Data



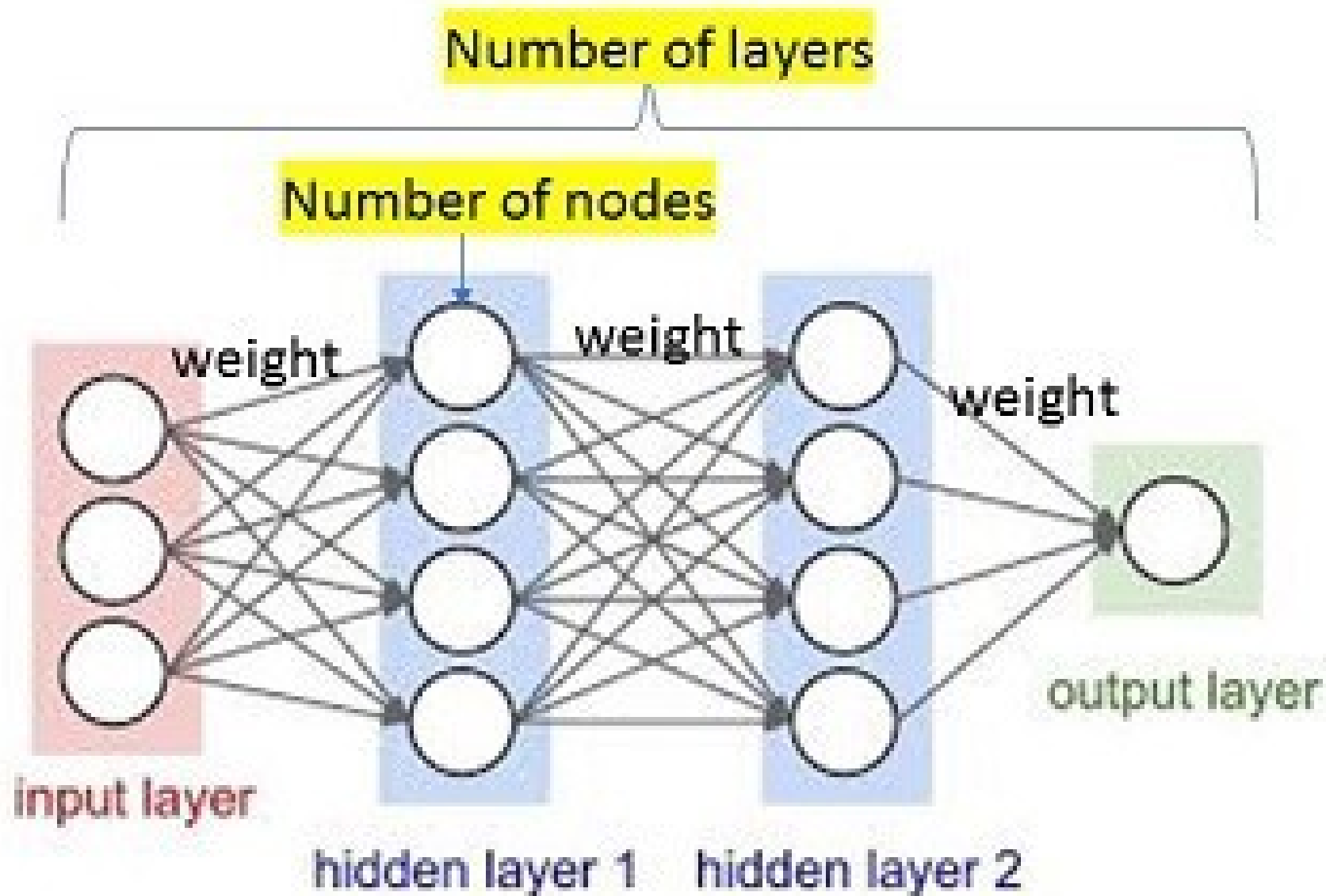
Representation of Data

Develop 1st model

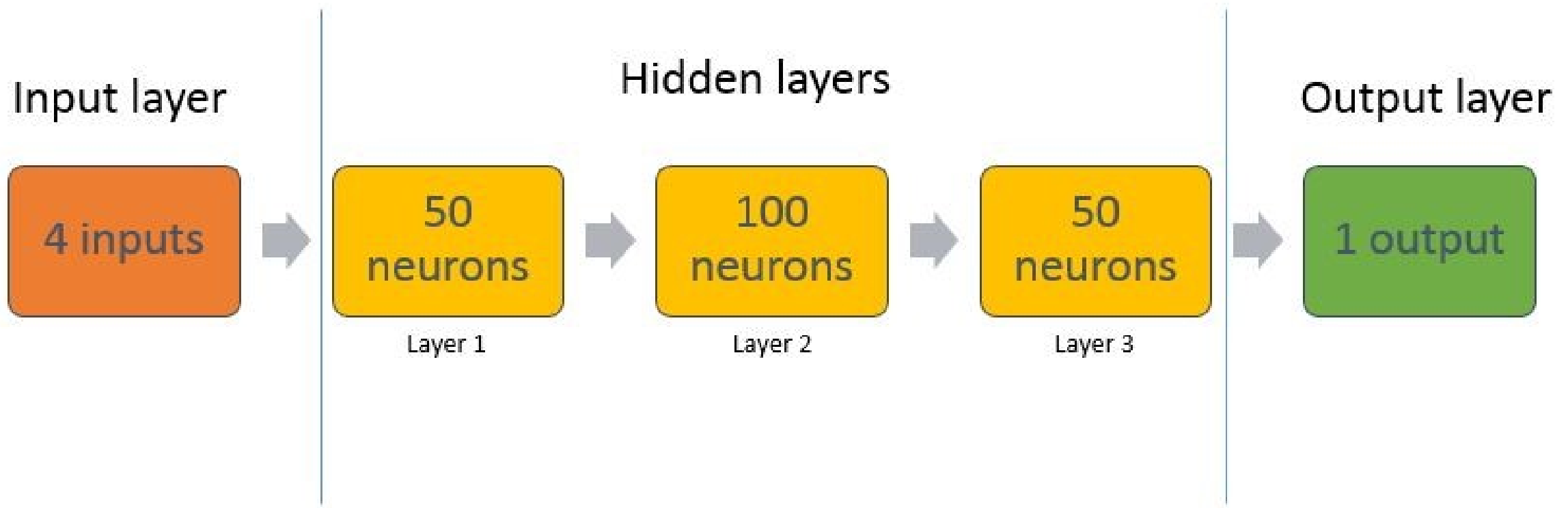
Develop model that overfits

Adjust model's capacity to learn
"just the patterns"

Can a program adjust the capacity of the network ?

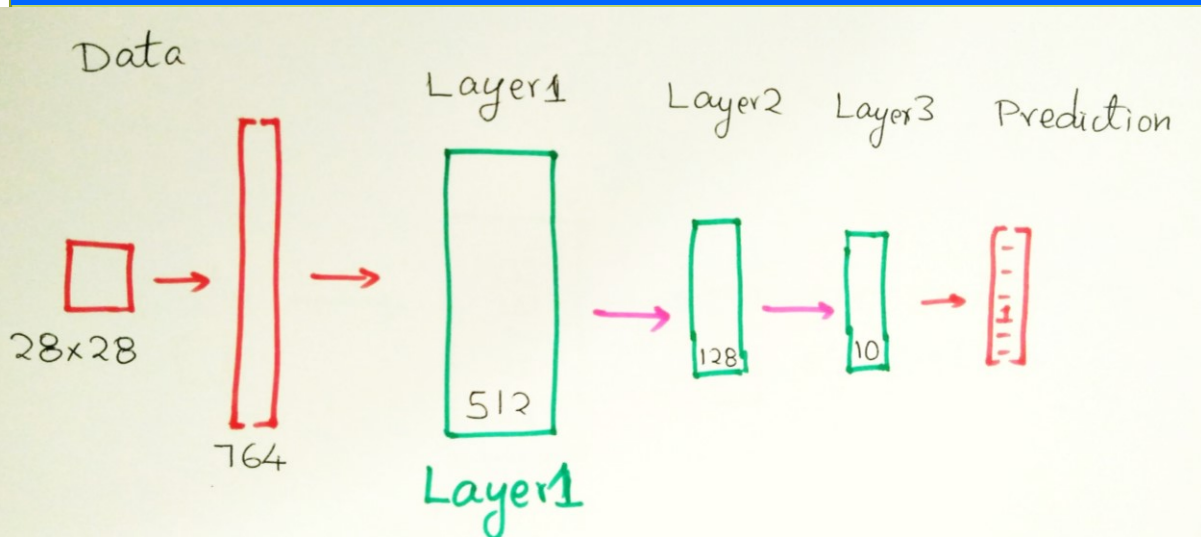


Tune Capacity of the model

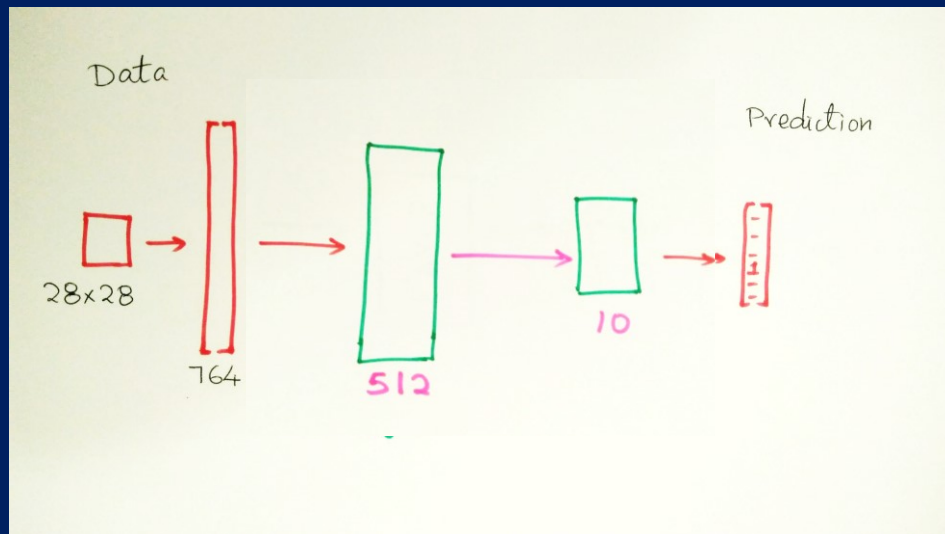


How to build Dynamic models?

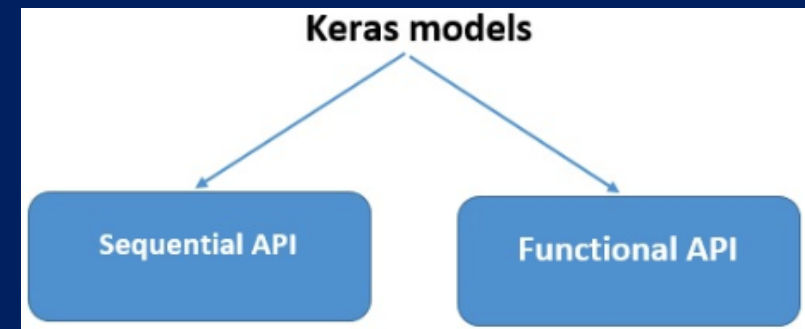
Keras Functional API



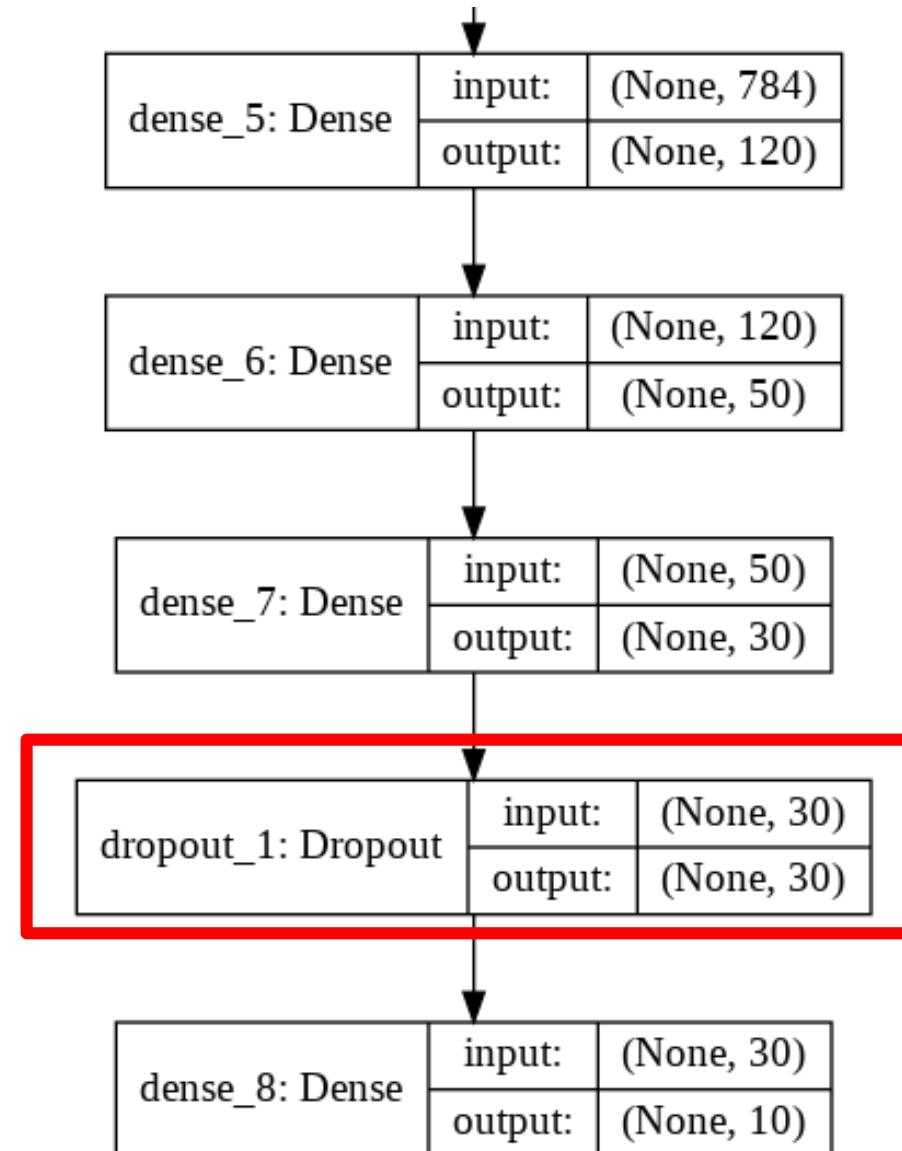
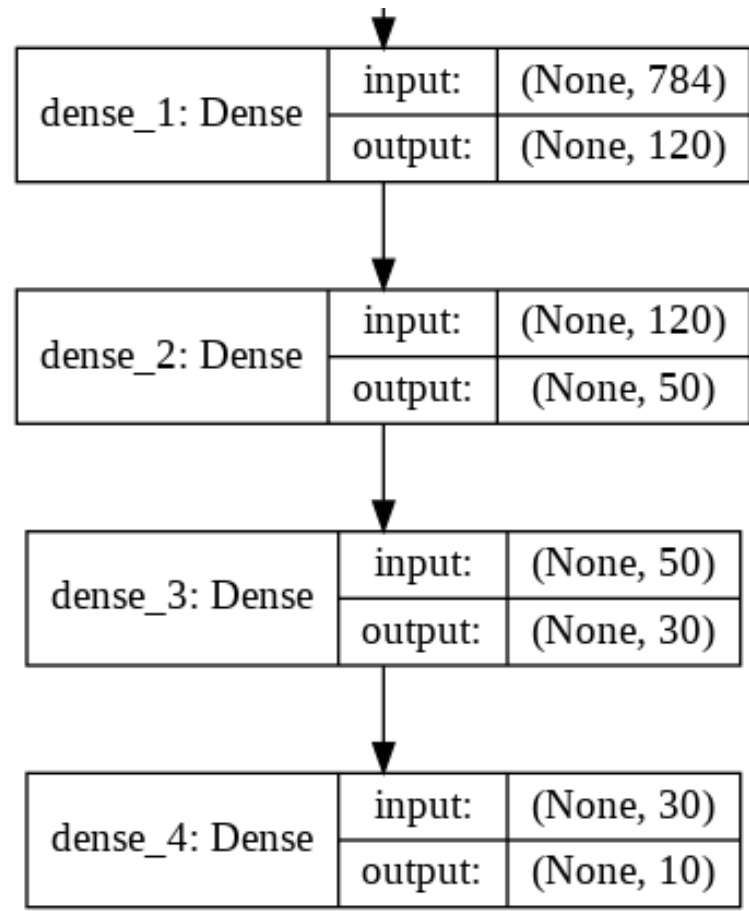
```
network.add( keras.layers.Dense(512))  
network.add( keras.layers.Dense(128))  
network.add( keras.layers.Dense(10))
```



```
network.add( keras.layers.Dense(512))  
network.add( keras.layers.Dense(10))
```



Tune Model for Generalization



Improve power of generalization

```
network = models.Sequential(name='My first Neural network , thanks Karunya')
```

```
layer1 = layers.Dense(120, input_shape=(28*28,), activation='relu')  
network.add(layer1)
```

```
layer2 = layers.Dense(50, activation='relu')  
network.add(layer2)
```

```
layer3 = layers.Dense(30, activation='relu')  
network.add(layer3)
```

```
layer4 = layers.Dropout(0.2)  
network.add(layer4)
```

```
layer5 = layers.Dense(10, activation='softmax')  
network.add(layer5)
```

#Step 3: Define the network architecture

```
network = models.Sequential(name='My first Neural')
layer1 = layers.Dense(120, input_shape=(28*28,))
network.add(layer1)
layer2 = layers.Dense(50, activation='relu')
network.add(layer2)
layer3 = layers.Dense(30, activation='relu')
network.add(layer3)
```

```
layer4 = layers.Dropout(0.2)
network.add(layer4)
```

```
layer5 = layers.Dense(10, activation='softmax')
network.add(layer5)
```

#Step 3: Define the network architecture

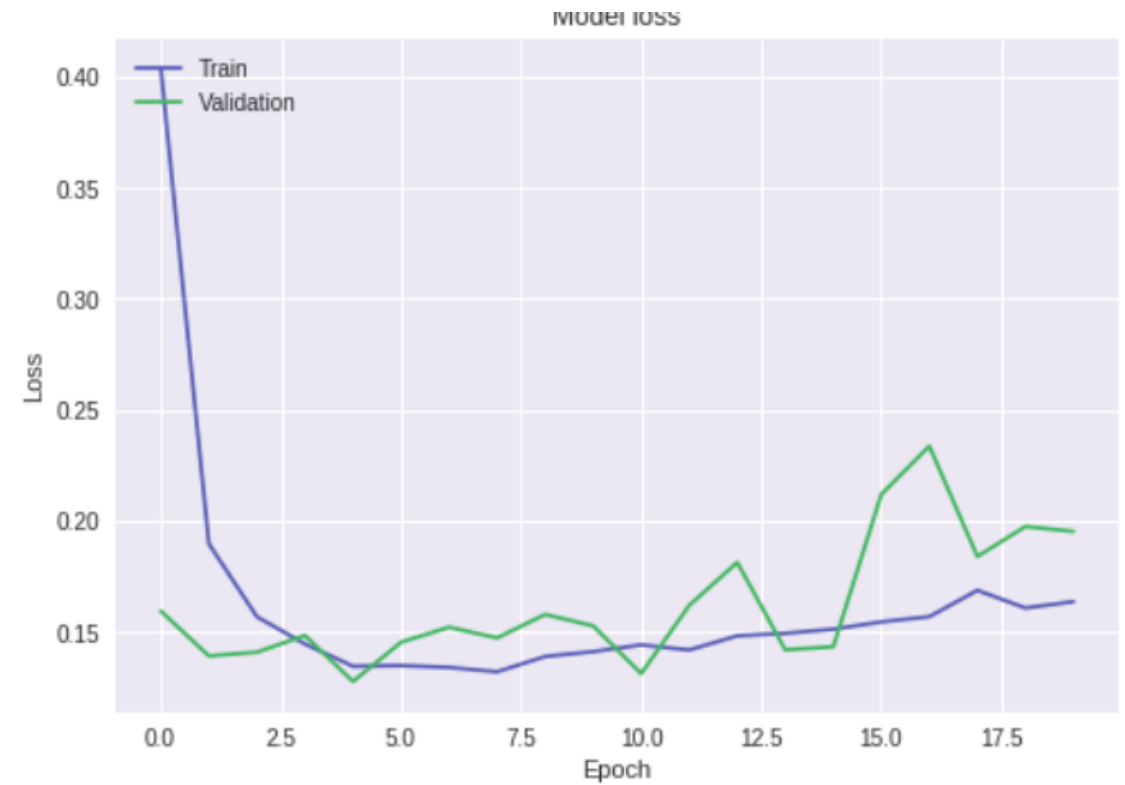
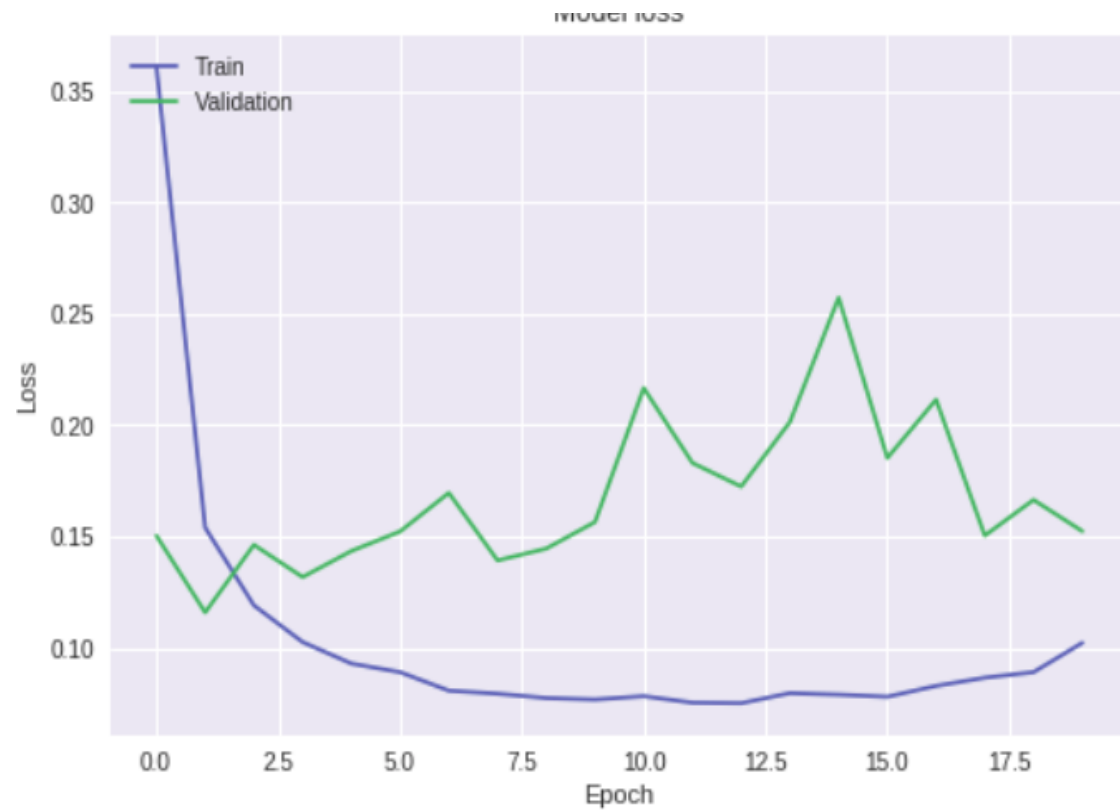
```
network = models.Sequential(name='My first Neural')
layer1 = layers.Dense(120, input_shape=(28*28,))
network.add(layer1)
layer2 = layers.Dense(50, activation='relu')
network.add(layer2)
```

```
layer2a = layers.Dropout(0.2)
network.add(layer2a)
```

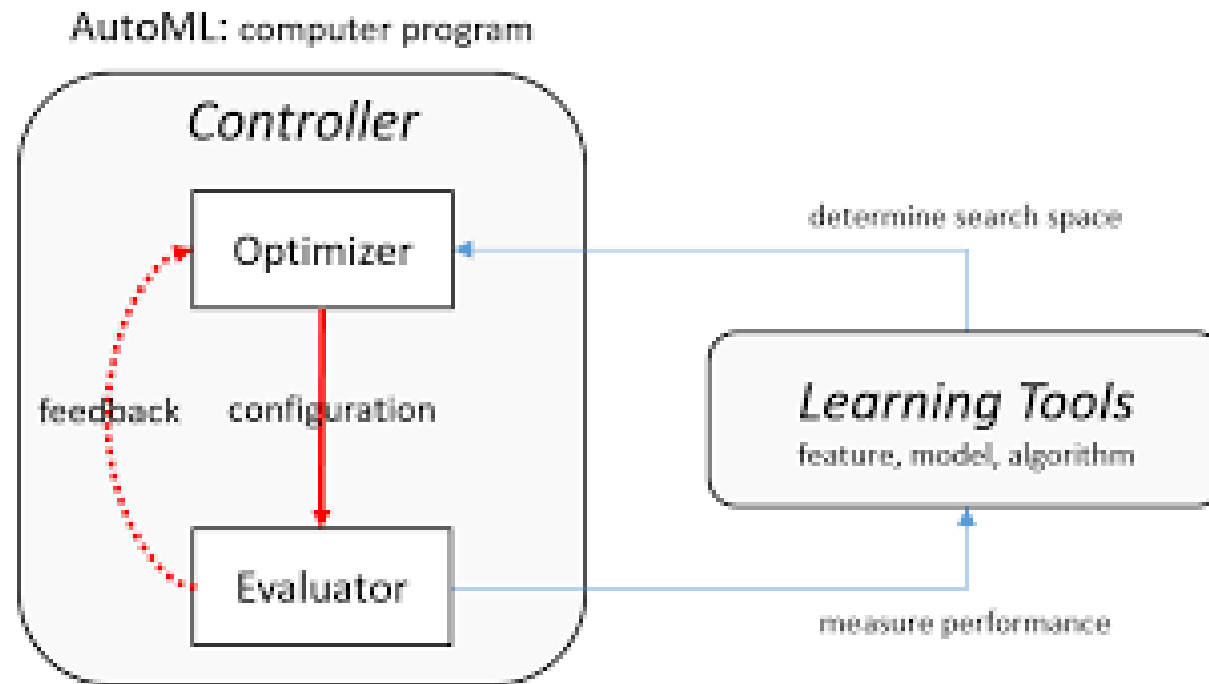
```
layer3 = layers.Dense(30, activation='relu')
network.add(layer3)
```

```
layer4 = layers.Dropout(0.2)
network.add(layer4)
```

```
layer5 = layers.Dense(10, activation='softmax')
network.add(layer5)
```



So how you design an “Auto ML” algo?



Next

☐ How can you invent AI?

Next: Explore the path to Artificial General Intelligence

Hands on

- Get started in writing your own Neural Architecture Search
 - [Design a model dynamically at run time.ipynb](#)